A cost effectiveness analysis within a randomised controlled trial of post-acute care of older people in a community hospital

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Abstract

Objective To assess the cost effectiveness of post-acute care for older people in a locality based community hospital compared with a department for care of elderly people in a district general hospital, which admits patients aged over 76 years with acute medical conditions.
Design Cost effectiveness analysis within a randomised controlled trial.
Setting Community hospital and district general hospital in Yorkshire, England.
Participants 220 patients needing rehabilitation after an acute illness for which they required admission to hospital.
Interventions Multidisciplinary care in the district general hospital or prompt transfer to the community hospital.
Main outcome measures EuroQol EQ-5D scores transformed into quality adjusted life years (QALYs), and health and social service costs over six months from randomisation.
Results The mean QALY score for the community hospital group was marginally non-significantly higher than that for the district general hospital group (0.38 *v* 0.35) at six months after recruitment. The mean (standard deviation) costs per patient of the health and social services resources used were similar for both groups: community hospital group £7233 (€10 567; $13 341) (£5031), district general hospital group £7351 (£6229), and these findings were robust to several sensitivity analyses. The incremental cost effectiveness ratio for community hospital care dominated. A cost effectiveness acceptability curve, based on bootstrapped simulations, suggests that at a willingness to pay threshold of £10 000 per QALY, 51% of community hospital cases will be cost effective, which rises to 53% of cases when the threshold is £30 000 per QALY.
Conclusion Post-acute care for older people in a locality based community hospital is of similar cost effectiveness to that of an elderly care department in a district general hospital.

Introduction

Demographic transition in the developed world is prompting governments to develop care policies relevant to older people. In the United Kingdom the NHS Plan heralded the introduction of intermediate care services for older people.[1] Such care encompasses several service models but the evidence bases of clinical and health economics is poor. The potential of community hospitals to provide intermediate care has been recognised,[2] particularly as they comprise an existing and well developed healthcare resource.[3 4] We carried out a cost effectiveness study of community hospital care for older people in need of rehabilitation.

Methods

Our study was embedded within a randomised controlled trial of clinical and service use outcomes between a community hospital and an elderly care department in a district general hospital.[5] Patients registered with a doctor in the primary care trust served by the community hospital and admitted as emergency referrals to the elderly care department in the district general hospital were eligible for inclusion in the study if needing rehabilitation.

Outcome measure utilisation of resources

We measured health outcomes at baseline, one week after discharge, and three and six months after randomisation using the EuroQol EQ-5D. Scores were transformed into quality adjusted life years (QALYs).[6]

We recorded use of resources one week after discharge and three and six months after randomisation, using a questionnaire for patients and their carers. (See bmj.com for resource categories.) When data on resource use were missing, we assumed that frequency of use by the patient equalled the mean for the group. To investigate the reliability of recall, we checked the results of the first 40 patients against database records. The kappa statistic was used to investigate agreement.

Costs

We used a combination of local and national sources to calculate costs. Local information was used to calculate the costs of hospital stay with daily rates from the finance department responsible for the community hospital and from specialty costs from the financial returns for the district general hospital.[7] Daily rates for the community hospital include direct and indirect costs, with expenditure on support services and overheads for buildings as well as staffing costs (see bmj.com). Costs of readmissions were based on trust specific costs for health resource group,[8] with additional daily costs if hospital stay was greater than expected from the health resource group. Costs for use of community services were from the Personal and Social Services Research Unit.[9]

We calculated costs net of patient contributions when relevant. For community services we assumed that patients who contributed to these incurred the total cost of visits. For those contributing to the costs of institutional care, we assumed contributions as 30% of cost. Unit costs for equipment came from the NHS Purchasing and Supply Agency, websites of

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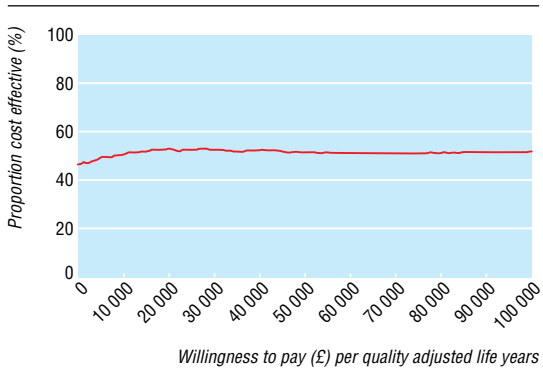

Cost effectiveness acceptability curve for older patients admitted to a community hospital compared with a district general hospital for rehabilitation (based on 1000 replications)

manufacturers and distributors, and the Personal Social Services Research Unit.[9]

We assumed that the only resources patients used were those captured during the six months of follow-up. The price year was 2001-2. Since the trial was less than a year, we did not discount costs and health benefits.

Analysis

We adopted a cost effectiveness approach to the analysis using the intention to treat principle. We compared differences between the groups for changes in QALY scores from baseline to assessments using *t* tests. These differences were also compared using analysis of covariance to adjust for age, sex, institutional care, mental status, and disability. We repeated the analyses after excluding participants who had died.

Use of resources is expressed as means (standard deviations). We calculated costs per patient by multiplying resource volumes by unit costs, and we compared the mean total costs for the groups using *t* tests. The incremental cost effectiveness ratio was calculated as the ratio of the differences between the groups for mean costs per patient and mean QALYs per patient. We assumed patients with missing QALY scores to have scores equal to the mean patient in the treatment group. We undertook non-parametric bootstrapping (50 000 replications) on the incremental cost and effectiveness.[10 11] A cost effectiveness acceptability curve was constructed.

Results

Overall 220 patients were randomised: 141 to the community hospital and 79 to the district general hospital. Twenty six patients did not achieve their allocated group. Fifty five patients died.

The mean QALYs were marginally greater for the district general hospital group at baseline but were higher for the community hospital group at each assessment (see bmj.com). The between group differences for the changes in QALYs scores from baseline to the assessments were not statistically significant with or without adjustment for baseline factors. When patients who had died were excluded from the analysis, the average QALYs increased for both groups but the between group differences for changes

Use of health and social care resources during six months' follow-up of older patients admitted to a community hospital or district general hospital for rehabilitation

	Community hospital group (n=141)			District general hospital group (n=79)		
	No of patients	Quantity of resource used	Mean (SD)	No of patients	Quantity of resource used	Mean (SD)
Index admission: length of hospital stay (days) after randomisation	141	—	22 (19)	79	—	23 (28)
Hospital readmissions (non-elective):						
No of admissions	48	66*	1 (1)	24	31	1 (1)
Length of stay (days)	48	867	13 (13)	24	492	16 (12)
No of visits to accident and emergency department	30	48	2 (1)	19	22	1 (0)
No of contacts with general practitioner	110	445	4 (3)	57	230	4 (4)
No of contacts with nurse	88	1121	13 (35)	48	375	8 (17)
No of contacts with consultant	63	248	4 (6)	29	80	3 (4)
No of contacts with therapy	83	455	5 (9)	46	295	6 (6)
No of visits from domestic services	52	9191	177 (179)	31	5649	182 (188)
No of days spent in non-residential respite care	22	454	21 (16)	11	240	22 (25)
No of visits from social worker	17	25	1 (1)	22	39	2 (1)
No of meals on wheels	30	1986	66 (53)	13	595	46 (51)
Other resources used	12	21	2 (2)	9	25	3 (4)
No of pieces of equipment and wheelchairs	67	147	2 (1)	40	87	2 (2)
No of journeys by ambulance transport	86	741	9 (17)	40	369	9 (23)
No of weeks in institutional care	48	711	15 (9)	34	423	12 (10)

*Excludes three episodes that were deemed to be non-elective, but were recorded as a length of stay of 0 in patient administration system. These episodes were included in the cost analysis. Also excludes three patients who recorded five readmissions on the questionnaire that were at hospitals in areas outside those covered by the patient administration system. These readmissions were included in the cost analysis.

from baseline to assessments remained statistically non-significant.

The groups had similar mean length of hospital stay after randomisation (community hospital 22 days, district general hospital 23 days), daily costs (community hospital £148, district general hospital £146), proportions of patients using resources (see table), and mean quantity of resources used. Agreement was moderate for service use (κ range 0.35-0.61) but fair for frequency of use (0.14-0.41).

The mean (standard deviation) costs per patient were similar for the community hospital and district general hospital groups (£7233 (£5031) *v* £7351 (£6229); mean difference −£118, 95% confidence interval −1639 to 1403); bootstrapped mean (standard deviation) costs were, respectively, £7243 (£5026) and £7375 (£6225). On the basis of these simulations, the mean incremental cost effectiveness ratio suggests that community hospital care is slightly more effective and less costly than district general hospital care. The results of the bootstrap simulation show similar cost effectiveness between the two settings (see bmj.com). The cost effectiveness acceptability curve (figure) suggests that if decision makers' willingness to pay per QALY was £10 000, then community hospital care would be cost effective in 51% of cases; this would be increased to only 53% if the threshold was raised to £30 000.

Sensitivity analyses

Sensitivity analyses concentrated on the main cost drivers of readmissions and institutional care. The analyses for institutional care involved varying the magnitude of patients' financial contributions for those who contributed to the cost of their care. When patients contributed the total cost of their care, the mean costs per patient for both arms were reduced and community hospital care remained a less expensive strategy, although the difference was non-significant (see bmj.com). When the public sector paid, the mean costs per patient increased relative to baseline but remained similar for the two groups.

In a further analysis, the costs of readmissions were calculated using health resource group costs only. Although the mean costs per patient fell in both groups, community hospital care remained non-significantly less costly. The daily rate for the community hospital was varied using two scenarios. In the first the rate was set at 10% higher than that of the district general hospital. The difference in the mean costs per patient between the two groups narrowed relative to baseline, but the costs at the community hospital were marginally higher. When the daily rate for the community hospital was set at 20% above that of the district general hospital, the mean costs per patient in the community hospital arm were greater. In the final analyses the daily rate for the district general hospital was reduced by 10% and 20%. In both cases the mean costs incurred by patients in the community hospital arm were statistically non-significantly higher than those in the district general hospital group.

Discussion

The health outcomes and costs associated with community hospital care for older people needing rehabilitation are similar to those of an elderly care department in a district general hospital.

What is already known on this topic

Community hospitals are a long established component of healthcare provision in England

Previous health economic studies of community hospital care have been methodologically weak and difficult to interpret

What this study adds

A locality based community hospital is as cost effective as a district general hospital for post-acute care of older people

Despite the long history of community hospital care in the United Kingdom, well carried out evaluation studies are scarce. Resource studies have investigated changes in district general hospital use associated with community hospital care by comparing patients in areas with and without access to community hospitals.[12–14] This is not ideal because two different settings (rural and urban) are under comparison, and there are confounders with potential to influence bed use and length of stay. The renewed interest in community hospitals for providing intermediate care[2] has highlighted the weak evidence base. Our results are applicable to one function, post-acute rehabilitation for older people, and one type of community hospital, a locality or primary care trust based community hospital primarily providing intermediate care.

The strengths of our study are its randomised design with six months' follow-up. The economic perspective has been a whole systems one of health and social care costs combined over the six months but excluded apportioning costs for informal carer burden.

Our study has some limitations. Firstly, it is a single site evaluation and represents only one of several models offered by community hospitals.[5] Secondly, the mean age of the population was 85 years; some patients had cognitive impairment so the reliability of recall is a concern. We therefore interviewed patients with their carers. Furthermore, information on hospital stay and readmissions was obtained from the hospital patient information system. We checked for reliability of some reported information against a database and found moderate agreement. Finally, we extrapolated the data at six months to one year on the basis that these values were maintained during the remainder of the year, but these probably changed.

The results of our study suggest that using this locality based model of community hospital care for this group of patients is of similar cost effectiveness to district general hospital care provided in an elderly care department. Post-acute rehabilitation provided by a community hospital therefore can be an effective model for intermediate care.

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Competing interests: JY and JG have worked in the community hospital involved in this study.

Ethical approval: This study was approved by the research ethics committee of Bradford Hospitals NHS Foundation Trust.

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Believability of relative risks and odds ratios in abstracts: cross sectional study

Peter C Gøtzsche

Abstract

Objective To compare the distribution of P values in abstracts of randomised controlled trials with that in observational studies, and to check P values between 0.04 and 0.06.

Design Cross sectional study of all 260 abstracts in PubMed of articles published in 2003 that contained "relative risk" or "odds ratio" and reported results from a randomised trial, and random samples of 130 abstracts from cohort studies and 130 from case-control studies. P values were noted or calculated if unreported.

Main outcome measures Prevalence of significant P values in abstracts and distribution of P values between 0.04 and 0.06.

Results The first result in the abstract was statistically significant in 70% of the trials, 84% of cohort studies, and 84% of case-control studies. Although many of these results were derived from subgroup or secondary analyses, or biased selection of results, they were presented without reservations in 98% of the trials. P values were more extreme in observational studies ($P < 0.001$) and in cohort studies than in case-control studies ($P = 0.04$). The distribution of P values around $P = 0.05$ was extremely skewed. Only five trials had $0.05 \le P < 0.06$, whereas 29 trials had $0.04 \le P < 0.05$. I could check the calculations for 27 of these trials. One of four non-significant results was significant. Four of the 23 significant results were wrong, five were doubtful, and four could be discussed. Nine cohort studies and eight case-control studies reported P values between 0.04 and 0.06, but in all 17 cases $P < 0.05$. Because the analyses had been adjusted for confounders, these results could not be checked.

Conclusions Significant results in abstracts are common but should generally be disbelieved.

Introduction

Abstracts of research articles are often the only part that is read, and only about half of all results initially presented in abstracts are ever published in full.[1] Abstracts must, therefore, reflect studies fairly and present the results without bias. This is not always the case. In a survey of 19 clinical trials that contained a mixture of significant and non-significant results, the odds were nine times higher for inclusion of significant results in the abstract.[2] Another survey found that bias in the conclusion or abstract of comparative trials of two non-steroidal anti-inflammatory drugs consistently favoured the new drug over the control drug in 81 trials and the control drug in only one.[3] And a survey of 73 recent observational studies found a preponderance of P values in abstracts between 0.01 and 0.05 that indicated biased reporting or biased analyses.[4]

I explored in a large sample of research articles whether P values in recent abstracts are generally believable.

References w1-w19 and a table giving the recalculations for P values are on bmj.com

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