How useful are non-random comparisons of outcomes and quality of care in purchasing hospital stroke services
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Stroke services.

Type of intervention
Treatment, rehabilitation.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with stroke totalling 361 patients: 192 patients were located in district one (D1) and 169 in district two (D2). The demographic data were as follows:

Women: D1 (52%), D2 (51%);
Age (years): D1 (72), D2 (75);
Ethnic minority: D1 (19%), D2 (14%);
Owner-occupiers: D1 (8%), D2 (28%);
Manual workers: D1 (25%), D2 (32%);
Age left education (years): D1 (14), D2 (14);
Living alone: D1 (41%), D2 (45%);
Median pre-stroke Barthel score: D1 (20), D2 (20);
Median pre-stroke NEADL: D1 (15), D2 (15);
Mean Guy's prognostic score: D1 (-5.5), D2 (-4.8);
Unconscious history: D1 (17%), D2 (18%).

Setting
Hospital. The economic study was carried out in the UK.

Dates to which data relate
Effectiveness and resource data were obtained from a stroke register which ran from January 1991 in District one and March 1991 in District two until March 1992. 1990 prices were used.

**Source of effectiveness data**
Single study.

**Link between effectiveness and cost data**
Costing was undertaken prospectively on the same patient population used in the effectiveness study.

**Study sample**
Of a study population totalling 361 consecutive patients admitted with stroke, 192 and 169 patients were located in district one (D1) and district two (D2), respectively. Stroke was defined as 'rapidly developing clinical symptoms and/or signs of focal, and at times global (...) loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no cause apparent other than that of a vascular origin'. It was not stated whether power calculations determined sample size. The study also consisted of 103 carers.

**Study design**
A multi-centre (4 sites) prospective observational study, in which patients and their carers were followed-up after six months. The percentage of patients lost to follow-up in D1 was 14% and 12% in D2. The percentage of those unable to complete the 6-month questionnaire in D1 and D2 was 4% and 4%, respectively.

**Analysis of effectiveness**
Analysis of the clinical study was based on intention to treat. Outcomes assessed in the study included mortality, disability, perceived health, mood, and satisfaction with services. Details of function before the stroke were recorded at admission, using the Barthel score and Nottingham Extended Activities of Daily Living score (NEADL). Stroke severity was assessed using the Guy’s prognostic score. At six months, the survivors received a postal follow-up form, which comprised the Barthel index, NEADL, Nottingham Health Profile (NHP), the short form of the Geriatric Depression Score (GDS), the London Stroke Satisfaction Score, and a questionnaire regarding service use. Both patients (District 1, n=107 and District 2, n=84) and carers (n=103) values were assessed. Statistically significant differences (P < 0.01) were found between the two districts with respect to age and owner-occupier variables. Age standardisation did take place and also multiple logistic regression analysis was used to examine differences in outcome between districts to allow for the potential confounding effects of age, stroke severity and other socio-economic variables.

**Effectiveness results**
The comparison of patient outcomes at six months (unless otherwise stated) between districts one and two, respectively, are:

- Age-standardised mortality: (D1, n=192, D2, n=169), 15% vs. 17% (1 month) and 33% vs. 40% (6 months);
- Survivor outcomes (D1, n=107, D2, n=84): Median Barthel score: 13 vs 13; Median NEADL: 5 vs. 3; Median GDS: 8 vs. 7; NHP (means) - Energy: 59 vs. 54; Pain: 26 vs. 26; Emotion: 32 vs. 29; Sleep: 34 vs. 30; social isolation: 31 vs. 23; physical mobility: 52 vs. 52.
- Patient satisfaction (hospital): 54% vs. 49%
- Patient satisfaction (community): 46% vs. 48%.

The comparison of carers' outcomes at six months between districts one and two, respectively are:
Median GDS 5 vs. 3.5; NHP (means) - Energy: 34 vs. 36; Pain: 12 vs. 14; Emotion: 27 vs. 21; Sleep: 30 vs. 27; social integration: 16 vs. 12; physical mobility: 14 vs. 15.

Carer satisfaction (Hospital): 71% vs. 84%;
carer satisfaction (community): 37% vs. 41%.

Services received by patients after discharge showed little difference between districts, although visits by home helps were more commonly reported by patients discharged from district 2 hospitals (45% vs. 26%, p < 0.01).

Clinical conclusions
The standard of care was below that set by the Royal College of Physicians (London) in both districts and there were no significant differences between the districts in age-standardised mortality at 1 and 6 months, Barthel score, extended ADL score, Geriatric Depression score, Nottingham Health Profile score and patient satisfaction with services at six months. Carer outcomes did not differ between districts. A comprehensive district stroke service was not associated with major differences in patients' outcomes or standards of care.

Measure of benefits used in the economic analysis
Since the clinical study did not find statistically significant differences in outcomes between the two groups, the economic study was based on difference of costs only.

Direct costs
Measurement of resources was based on actual data (units of analysis). Costs of health services (hospital) broken down by specialty were obtained from North East Thames regional finance and are based on district returns to region on forms FR11 and FR12. The figures apply to 1990. Costs and quantities of resource use were analysed separately.

Currency
UK pounds sterling (€).

Sensitivity analysis
Multiple logistic regression analysis was used to examine differences in outcome between districts to allow for the potential confounding effects of age, stroke severity and other socio-economic variables.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
General medicine annual costs were estimated as 7.2 million and 4.4 million in districts one and two, respectively. In part, these differences in costs reflect differences between teaching and non-teaching districts. Geriatric medicine costs were very similar at 4.9 million and 4.6 million for districts one and two, respectively. The largest relative differences were in rehabilitation therapy with costs of 1.5 million and 555,000 in districts one and two, respectively. The excess general medical costs in district 1 represented the larger numbers of staff employed in general medicine and some tertiary specialties.

Synthesis of costs and benefits
Not applicable.
Authors' conclusions
The study has shown that widely used patient and carer outcomes of care did not differ between two districts with different structures of stroke services, one of which had a stroke unit. Purchasing organised stroke care might be expected to lead to better quality of care but the bias inherent in any non-random comparison may make it impossible to interpret observed differences and may lead to spurious decisions apparently based on 'evidence'. In this case the process and outcomes of care are similar and information on costs supports the case for organised stroke care.

CRD Commentary
The study design was possibly sufficient to answer the question posed given that the authors carried out multiple logistic regression analysis to examine differences in outcome between districts to allow for potential confounding variables. The authors argued that local comparisons of process and outcome between providers is the only way of making choices and to do so one needs to perform a before and after analysis, which are unfortunately non-random and open to bias. The authors' argument for not adjusting the 'bias' problem is that to do so is imperfect and may obscure modest but important differences or even produce spurious associations. Information regarding costing was sparse. Details of the cost per patient would have been useful. Overall, as suggested by the authors, this study must be used with caution given its non-random nature.

Implications of the study
Given that caution must be applied to the study, there are few policy implications. Cost savings/minimisation gained from further analysis would have major implications on the way in which stroke services are organised.

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