Alternative strategies for stroke care: cost-effectiveness and cost-utility analyses from a prospective randomized controlled trial

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
Three strategies of care for patients with moderately disabling stroke were under evaluation. The alternatives compared were stroke unit care, stroke team care and domiciliary stroke care.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis; cost-utility analysis.

Study population
The study population comprised acute stroke patients within 72 hours of stroke onset. Details of the inclusion and exclusion criteria were provided in the parent clinical study (Kalra et al., see Other Publications of Related Interest).

Setting
The setting was secondary care. The economic study was carried out in the United Kingdom.

Dates to which data relate
The effectiveness data were derived from a randomised controlled trial published in 2000. Resource use was gathered prospectively and retrospectively for the same sample population as that which provided the effectiveness data. The costs were standardised to 1997/98 prices.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing exercise was based on the same sample population as that used in the effectiveness analysis. A prospective exercise was carried out for supplementary information, while a retrospective method was used to collect health service resources.

Study sample
Full details of the study sample were provided in the parent clinical study (Kalra et al., see Other Publications of Related Interest). A total of 457 acute stroke patients were randomly allocated to stroke unit (n=152), stroke team (n=152) or domiciliary care (n=153).
Study design
Full details of the study design were provided in the parent clinical study (Kalra et al., see Other Publications of Related Interest). The effectiveness was derived from a randomised controlled trial.

Analysis of effectiveness
Full details of the effectiveness analysis were provided in the parent clinical study (Kalra et al., see Other Publications of Related Interest). The primary outcome measure was defined as mortality or institutionalisation over a 1-year period.

Effectiveness results
On the primary outcome measure, the stroke unit had significantly better outcomes compared with the stroke team or domiciliary care. The outcome measure was 14% (21 of 152) for the stroke unit versus 30% (45 of 149) for the stroke team, (p<0.001) and 24% (34 of 144) for domiciliary care, (p<0.03).

The proportion of patients alive without severe disability at 1 year was also significantly higher for the stroke unit than for the stroke team or domiciliary care. The proportion was 85% (129 of 152) for the stroke unit versus 66% (99 of 149) for the stroke team, (p<0.001) and 71% (102 of 144) for domiciliary care, (p<0.002).

Clinical conclusions
The results of the trial suggested that stroke units yield better survival and institutionalisation rates than the stroke team and domiciliary care.

Measure of benefits used in the economic analysis
The measure of benefit used was survival or institutionalisation rates over a 1-year period. In additionally, the quality-adjusted life-years (QALYs) were calculated and included as a secondary measure of benefit. The health states were evaluated with the EuroQol (EQ-5D) at 6, 12, 26 and 52 weeks after stroke onset. The utility weights for health states were derived from a UK general population survey.

Direct costs
The direct costs included in the analysis were those of the health service and other formal care agencies. The categories covered were hospital resource use, therapy and other public sector services. Hospital and therapy data were extracted for each patient on an ongoing basis. Data on other public sector services were collected prospectively for each patient using an adapted version of the Client Service Receipt Inventory. For some costing items the authors used information from families, health and social services records, and direct observations of services provided. Resource use and the costs were reported separately. An exhaustive list of each category was provided in the paper. Local unit costs were used and were supplemented by national average costs when the former were not available. The costs were not discounted as the time horizon chosen was 12 months. The costs were expressed in 1997/98 prices and were inflated when appropriate using the NHS Executive hospital and community health services inflation index.

Statistical analysis of costs
The costs were treated stochastically. Descriptive statistics such as the mean, standard deviation (SD), mean difference, and 95% associated confidence intervals were reported. Means across the three groups were compared using a one-way analysis of variance with the Bonferroni procedure being used to adjust for multiple testing. Non-parametric methods were used to ensure the robustness of the parametric test. A chi-squared test was used to compare the proportion of avoided deaths or institutionalisations across the three groups.

Indirect Costs
The informal care received by the patients represented the indirect costs included in the analysis. For each patient, the amount of informal care received was based on the number of weeks in the year over which care was received.
Informal care costs were estimated using either the UK minimum wage rate (3.53/hour, the opportunity cost method) or the unit cost of a social services home help worker (10.61/hour, the replacement cost method). The authors stated that they used both methods as there is currently no agreement on which approach should be used. The costs were not discounted since the chosen time horizon was 12 months. The costs were expressed in 1997/98 prices and were inflated when appropriate using the NHS Executive hospital and community health services inflation index.

**Currency**
UK pounds sterling (€).

**Sensitivity analysis**
A sensitivity analysis was performed to verify the impact of informal care on the overall costs. Minimum wage or home help worker rates were applied to study the effect of informal care on the results.

**Estimated benefits used in the economic analysis**
The number of patients who avoided death or institutionalisation at the 12-month follow-up was 129 (87%) for the stroke unit, 102 (69%) for the stroke team, and 109 (78%) for the domiciliary care group, (chi-squared 13.66, p<0.001).

Over the 12-month period, the mean QALYs were 0.297 (SD=0.257) for the stroke unit, 0.216 (SD=0.370) for the stroke team, and 0.221 (SD=0.344) for the domiciliary care group, (F2=2.78, p<0.063).

**Cost results**
Over the 12-month period, the total mean cost per patient, excluding informal care, was 11,450 (SD=9,745) for the stroke unit, 9,527 (SD=8,664) for the stroke team, and 6,840 (SD=9,353) for the domiciliary care group, (F2=8.96, p<0.000).

Over the 12-month period, when including informal care based on the minimum wage rate, the total cost per patient was 16,574 (SD=13,157) for the stroke unit, 12,512 (SD=10,369) for the stroke team, and 10,296 (SD=11,613) for the domiciliary care group, (F2=8.96, p<0.000); and

based on the home help rate, the total cost per patient was 26,738 (SD=26,817) for the stroke unit, 18,494 (SD=18,785) for the stroke team, and 17,226 (SD=21,442) for the domiciliary care group (F2=7.57, p<0.001).

The authors reported a comprehensive costing of resource use in the paper, along with cost tables. The reader is referred to the paper for any specific item presented in the analysis.

**Synthesis of costs and benefits**
The costs and effects were combined using the incremental cost-effectiveness ratio (ICER). Uncertainty was handled through the use of cost-effectiveness acceptability curves. Dominance and extended dominance were studied before calculating the ICER.

The stroke team was dominated by domiciliary care on both outcome measures, from all cost perspectives, thus reducing the comparison to stroke unit versus domiciliary care.

The additional cost of avoiding an additional 1% of deaths and institutionalisations in the stroke unit group compared with domiciliary care ranged from 534 to 1,033, depending on the perspective adopted.

The ICERs per additional QALY gained ranged from 64,323 to 136,609, depending on the cost perspective taken.

The cost-effectiveness acceptability curve showed that domiciliary care had the highest probability of being cost-effective across the full range of values reported for the willingness-to-pay for additional QALYs gained.
Authors' conclusions
The results of the economic evaluation suggested improved health outcomes were obtained in the stroke unit group, but at a higher cost. When reporting on stroke studies, the perspective adopted must be taken into consideration.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparators was clear. They appear to have represented current practice in the authors' setting. You should decide if this is widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The authors made use of a well-designed published study to derive the effectiveness of the alternatives of interest. It is quite likely that the sample was representative of the study population because of the study design. Full details of the effectiveness study were provided in the parent clinical study (Kalra et al., see Other Publications of Related Interest).

Validity of estimate of measure of benefit
The inclusion of QALYs as well as the primary outcome as measures of benefits increases significantly the comparability of this study with similar studies. Utility weights for health states were obtained using the EQ-5D, which would appear to be a validated instrument for this purpose. The reason for selecting these outcomes was clear and the investigators provided sufficient evidence in the paper.

Validity of estimate of costs
All the relevant categories of cost appear to have been included in the analysis given the perspective adopted. The authors reported resource use and the costs separately in well-presented tables, which facilitate the comprehension and understanding of the findings. This is a good source for other studies and it may be of great interest to decision-makers. The authors used appropriate statistical methods to analyse the cost data. The sources of the unit costs, prices and quantities were clear, which enhances the overall generalisability of the results.

Other issues
The results were reported according to the recent guidelines for reporting economic evaluations alongside clinical trials. The authors acknowledged several limitations of the analysis. The most important of these was the unavoidable double counting of therapy costs, which arose because such costs were collected separately from the data collected at patient level. Also, the fact that the study was powered to detect differences in the primary outcomes but not in costs, and the generalisability of the findings to settings outside the United Kingdom (on which the authors made appropriate comment in their discussion).

Implications of the study
The authors emphasised that decision-makers should take the appropriate perspective into consideration when making recommendations on stroke patients. The findings of the study indicated that improved health outcomes were obtained with the stroke unit strategy, but at a higher cost.

Source of funding
Funded by the NHS R&D Executive's Health Technology Assessment Programme (grant 93/03/026). Service aspects of the project were funded by a grant from the Bromley Health Authority.

Bibliographic details