Specialist nurse-led clinics to improve control of hypertension and hyperlipidaemia in diabetes: economic analysis of the SPLINT trial  
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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
The study investigated the use of specialist nurse-led clinics to improve the control of hypertension and hyperlipidaemia in patients with diabetes. This intervention was compared with traditional hospital-based diabetic care.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of healthy diabetic patients.

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

Dates to which data relate
The effectiveness data were derived from studies published between 1988 and 2001. The price year was 2003.

Source of effectiveness data
The effectiveness data were derived from a review of published studies, supplemented with the authors' own assumptions.

Modelling
The intervention was evaluated by linking the cost-effectiveness of antihypertensive and lipid-lowering treatments with the cost and level of behavioural change. To provide estimates of life-time treatment costs and benefits for blood pressure and lipid lowering, a lifetime Markov model was constructed and evaluated. The model was evaluated with and without drugs that lower the likelihood of disease. The difference between model estimates was used to calculate the net costs and survival gains from treatment.

Outcomes assessed in the review
The outcomes assessed in the review were:

- the numbers of patients achieving the cholesterol and blood pressure targets;
the annual risk of death for patients who have had a stroke or myocardial infarction (MI), adjusted by age and gender;
the age- and gender-adjusted likelihood of dying each year from non-cardiovascular causes;
the risk ratio for lipid and blood pressure lowering when given drugs; and
the utility values associated with the health states of post-MI, healthy and post-stroke.

Study designs and other criteria for inclusion in the review
Only those studies most closely relevant to the Specialist Nurse-Led Intervention to Treat and Control Hypertension and Hyperlipidemia in Diabetes (SPLINT) trial were included in the review. The SPLINT trial was used to evaluate the specialist nurse-led clinics. The risk ratio for blood pressure lowering was taken from the UK Prospective Diabetes Study (UKPDS), while that for lipid lowering was taken from the Heart Protection Study (HPS).

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Approximately 9 studies were included in the review.

Methods of combining primary studies
The authors reported that they did not attempt meta-analyses of trials because of the need to summarise the surrogate end point (not consistently reported across trials) as well as relative reductions in cardiovascular end points.

Investigation of differences between primary studies
Not reported.

Results of the review
The nurse-led clinic reduced blood pressure by 1.2 mmHg, (p=0.21), and lipids by 0.28 mmol/L, (p=0.0004) in comparison with conventional care.

Drug treatment with statins reduced the mean total serum cholesterol by 1.7 mmol/L at one year. Statin treatment achieved a relative risk reduction of 27% (95% confidence interval, CI: 33 to 21) in MI and 25% (95% CI: 34 to 15) in stroke.

A significant reduction in mean arterial blood pressure of 5.7 mmHg was achieved by tight control after 1 year. Tight control achieved relative risk reductions in MI of 21% (95% CI: 41 to -7) and stroke 44% (95% CI: 65 to 11).

The quality-adjusted utility weight applied to each health state was 1 for healthy, 0.88 for post-MI and 0.5 for post-stroke.
Methods used to derive estimates of effectiveness
The authors supplemented the data derived from the review of the literature with their own assumptions.

Estimates of effectiveness and key assumptions
The authors assumed that the emerging benefits of treatment over time in the implementation trials and treatment trials were linearly proportionate. They also assumed that the implementation and treatment cohorts had similar profiles of treatment and costs.

Measure of benefits used in the economic analysis
The measure of benefits used was the quality-adjusted life-years (QALYs). Quality of life weights were derived from published values.

Direct costs
The direct costs to the health care service appear to have been included in the analysis. These covered the costs of drugs and acute and chronic treatment after stroke and MI (derived from published sources), the costs of the specialist nurse-led clinics, overheads covering administrative support and some clerical work, and the clinic room rental cost. The costs of the specialist nurse-led clinics included staff costs (both clinical time and clerical support). Discounting was relevant, as the costs were incurred over the lifetime of the patient, and was appropriately performed using an annual rate of 5%. The study reported both total and incremental costs. The price year was 2003.

Statistical analysis of costs
The costs were treated as point estimates (i.e. the data were deterministic).

Indirect Costs
The indirect costs were not included.

Currency
The costs were converted from pounds sterling (£) to US dollars ($), applying a World Health Organization general goods and services purchasing power parity. $1 = 0.65.

Sensitivity analysis
Uncertainty surrounding estimates from the treatment and policy models was explored using cost-effectiveness acceptability curves, generated from Monte Carlo analyses (10,000 evaluations of each model).

In the treatment model, parameters were sampled randomly from distributions for costs of acute and chronic stroke and MI, and risk ratios for blood pressure and lipid lowering. In the policy model, modelled distributions for net costs and benefits of treatment and changes in surrogate outcomes were sampled randomly.

Estimated benefits used in the economic analysis
The QALYs gained by the blood pressure control treatment were 0.53 per patient.

The QALYs gained by the lipid control treatment were 0.46 per patient.

The authors did not report the QALYs gained using blood pressure and lipid control specialist clinics.

Cost results
The cost per patient of the specialist clinic was $605 to achieve blood pressure control and $888 to achieve lipid control.

Blood pressure control treatment alone generated savings of $747 per patient, while lipid control treatment generated additional costs of $3,780.

**Synthesis of costs and benefits**

The costs and benefits were combined using an incremental cost-utility ratio (i.e. the additional cost per QALY gained). For blood pressure control treatment, the authors found savings of $1,400 per QALY gained. The incremental cost-utility ratio of lipid control treatment was $8,230 per QALY gained.

The authors calculated the cost-effectiveness of introducing specialist nurse-led clinics to improve the care of hospital-managed patients with diabetes. The change in surrogate outcome due to treatment was multiplied by the cost per patient of the specialist nurse clinic, then divided by the product of the QALYs gained through treatment and the change in surrogate outcome achieved by the specialist clinic. This ratio was then added to the treatment incremental cost-utility ratio (reported above). Hence, for example, the cost-effectiveness of a specialist clinic for blood pressure control would be calculated as follows: 

\[
(5.7 \times 605)/(0.53 \times 1.2) - 1,400.
\]

Therefore, the incremental cost-utility ratio for specialist clinics was $4,020 per QALY gained for blood control pressure and $19,950 per QALY gained for lipid control.

The results of the sensitivity analysis showed that, at a cost-effectiveness threshold of $50,000 per QALY gained, the probability that the blood pressure clinic was cost-effective was 77%, the probability that the lipid control clinic was cost-effective was 99%, and the probability of a combined clinic being cost-effective was 83%.

**Authors' conclusions**

The authors concluded that their study demonstrated that the provision of specialist nurse-led clinics, as adjunctive care, was likely to be cost-effective in lowering blood pressure and cholesterol in the hospital-based management of diabetes.

**CRD COMMENTARY - Selection of comparators**

A justification was given for using hospital-based diabetes care as the comparator. In England about one-half of diabetics have their care managed in hospitals. You should decide if this is current practice in your own setting.

**Validity of estimate of measure of effectiveness**

The authors did not report that a systematic review of the literature had been conducted to identify all relevant research and minimise biases. Despite this, the authors derived the majority of effectiveness data from three large prospective trials (i.e. SPLINT, UKPDS and HPS), all using similar health outcomes. The authors reported that they did not attempt meta-analyses of trials because of the need to summarise the surrogate end point (not consistently reported across trials) as well as relative reductions in cardiovascular end points. The authors supplemented the results of the review of the literature with their own assumptions. Appropriate probabilistic sensitivity analyses, which assessed the overall uncertainty in the model, were used to assess uncertainty in the parameters.

**Validity of estimate of measure of benefit**

The estimation of benefits was modelled. As the authors had to combine the outcomes of both the treatment and implementation interventions, the calculations were difficult to follow and to understand.

**Validity of estimate of costs**

The perspective used in the economic analysis was not reported, but it appears to have been that of the health care
system. All relevant major cost categories and costs for this perspective appear to have been included in the analysis. The costs and the quantities were not reported separately, which will limit the generalisability and transferability of the authors' results. The costs were derived from published sources and from resource use based on the SPLINT trial. Appropriate probabilistic sensitivity analyses, which assessed the overall uncertainty in the model, were used to assess uncertainty in the cost parameters. Since the costs were incurred over the lifetime of a patient, discounting was relevant and was appropriately performed. The authors also provided extensive details on the currency exchange rates used to convert UK to US $. The price year was reported, which will aid any future inflation exercises.

Other issues
The authors reported that the impact of the specialist nurse clinics was similar to other "resourced" behavioural change studies targeted at clinicians and patients. The issue of generalisability to other settings was partly addressed by the authors, who used purchasing power parity exchange rates to convert from UK to US $, and hence make their results more applicable to US settings. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. However, it was difficult to follow the authors' methodology and rationale when combining the cost-effectiveness of treatment and implementation together, to obtain a "policy model" cost-effectiveness result. The authors reported no further limitations to their study.

Implications of the study
The authors reported that the benefits of improved blood pressure and lipid control were such that investment in nurse clinics appeared good value for money. The authors stated that further research with specialist nurse-led clinics and interventions for hospital-based diabetic patients would be informative.

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Other publications of related interest


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Subject indexing assigned by NLM

MeSH
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control; Diabetes Mellitus /economics /nursing /physiopathology; Diabetic Angiopathies /economics /nursing /prevention & control; England; Health Policy; Humans; Hyperlipidemias /prevention & control; Hypertension /prevention & control; Specialties, Nursing

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