Economics of lipid lowering in primary prevention: lessons from the West of Scotland coronary prevention study

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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 use of statin treatment (pravastatin) for the primary prevention of first events associated with coronary artery disease (CAD) was examined. The analysis was based on findings from the West of Scotland Coronary Prevention Study (WOSCOPS).

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population (taken from the WOSCOPS findings) comprised Scottish males aged between 45 and 64 years, who had a mean cholesterol level of 271 mg/dL (7.0 mmol/L) and no evidence of prior myocardial infarction (MI).

Setting
The setting was primary care. The economic study was carried out in Glasgow, Scotland.

Dates to which data relate
The dates when the resource use data were collected were not reported, but they might be found in the WOSCOPS (Shepherd et al. 1995, see ‘Other Publications of Related Interest’ for bibliographic details). Some effectiveness data (event-specific survival curves) were taken from the Scottish Record Linkage System on events recorded between 1981 and 1994. The costs were estimated at 1996 prices.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The resource use and cost data were collected prospectively using average estimates from a sample of more than 200 hospital trusts and event-specific average lengths of hospital stay in patients from the WOSCOPS.

Study sample
It was unclear whether power calculations had been used to determine the sample size. The choice of the patient sample was not justified in relation to the generalisability of the findings. A total of 6,595 patients were included in the trial. It was unclear how many were in each study group, although this information might be available in the original study.
Study design
The study was a randomised controlled trial with an average follow-up of 4.9 years. Further details of the trial were not given, but might be available in the original study (Shepherd et al. 1995, see 'Other Publications of Related Interest' for bibliographic details).

Analysis of effectiveness
The basis for the analysis of the clinical study (intention to treat or treatment completers only) was not stated in this study, although it might have been reported elsewhere (Shepherd et al. 1995, see 'Other Publications of Related Interest' for bibliographic details).

The primary outcomes were the number of transition events avoided, the number of hospital-bad-stay avoided and the number-needed-to-treat. It was unclear whether the groups were comparable at analysis in terms of demographics and prognostic factors.

Effectiveness results
Pravastatin treatment yielded a 31% reduction in the risk of nonfatal MI or death from coronary disease.

The results of this analysis showed that almost 320 men out of 10,000 treated with pravastatin would have avoided the transition to cardiovascular disease over the 5 years of the WOSCOPS. This included the avoidance of immediate cardiovascular death in 33, nonfatal MI in 138, hospital admission for angina in 68, revascularisation in 33, and nonfatal stroke or transient ischaemic attack in 47.

It was calculated that 31.4 patients at the specific level of risk of the WOSCOPS cohort (an average 1.5% annual risk of a cardiovascular event) would need to start treatment to prevent one transition event. In addition, the prevention of transition events by pravastatin treatment resulted in a total of 2,017 hospital-bed-days saved.

Clinical conclusions
There is evidence to support the use of pravastatin for the prevention of CAD in individuals with an average 1.5% risk of a cardiovascular event.

Modelling
An economic model of prevention was created to assess the number of “transition events”, such as fatal or nonfatal MI, silent MI, coronary artery bypass grafting, coronary angioplasty, the need for angiography, stroke or transient ischaemic attack, and hospitalisation for angina. Transitions were recorded each month over a 5-year period. A primary premise of the model was that an initial cardiovascular event constituted an irreversible transition from health to sickness, the avoidance of which was considered valuable to society.

Measure of benefits used in the economic analysis
The measure of benefit used was the number of life-years gained (LYG). This was calculated as the difference between the age and gender-specific cumulative survival curve for Scotland and the event-specific curves derived using data from the Scottish Record Linkage System.

Direct costs
The Scottish health care costs included combined average estimates from extra contractual tariffs from a sample of more than 200 hospital trusts. The resource use data on event-specific average lengths of stay were taken from the WOSCOPS, while prices were taken from the average 1996 cost of initial management for each event in the Scottish
health care system. The resource quantities and the costs were not reported separately. Discounting was conducted at a rate of 6%, as recommended by the UK Treasury. The costs did not include those for management subsequent to the first hospital admission or pre-admission management, indirect costs, or costs borne by the patient.

Statistical analysis of costs
The data were deterministic. No statistical analysis of the costs was carried out.

Indirect Costs
The indirect costs were not included.

Currency
UK pounds sterling (£). A conversion to US dollars ($) was also reported, although the conversion rate used was not given.

Sensitivity analysis
There was no formal sensitivity analysis. However, the authors did consider the effects of applying recent European Joint Committee recommendations, where patients with a risk in excess of 2% per year were treated. They also considered existing Scottish guidelines, where a 10-year risk of an event was in excess of 30%.

Estimated benefits used in the economic analysis
The prevention of events arising from pravastatin treatment resulted in a total of 2,460 LYG.

Cost results
The cost of treating 10,000 men with pravastatin was 23,340,984. This was offset by 529,214 in savings arising from the prevented disease.

Synthesis of costs and benefits
The benefits and costs were combined as the costs per LYG.

The cost per LYG was 8,121 ($12,682).

When discounted at 6%, the cost per LYG was 20,375 ($31,818).

The effect of European Joint Committee recommendations (considering patients with a risk of an event greater than 2% per year) meant that treatment would be necessary in approximately 40% of the study population. Under this scenario, the number-needed-to-treat was 22.5. The cost per LYG was 5,601 ($8,747), or 13,995 ($21,855) when discounted at 6%.

In the Scottish population (where current guidelines support treatment in individuals with a 10-year risk of an event at greater than 30%) where 1.5% of the "healthy" 35- to 64-year-old population were treated, the discounted cost per life-year saved was 9,680 ($15,116).

When added to the proportion eligible for secondary prevention, a total of 9.3% of the 35- to 64-year-old population would be eligible for statin treatment.

Authors' conclusions
The use of statins (beyond those patients at high risk of cardiovascular event) for the primary prevention of coronary
artery disease (CAD) is justified in this cost-effectiveness analysis.

**CRD COMMENTARY - Selection of comparators**
The rationale for the choice of the comparator (placebo) was clear. You should judge whether this comparator is relevant in your setting, or whether other comparators from other procedures could also be relevant.

**Validity of estimate of measure of effectiveness**
The analysis was based on a randomised controlled trial, which was appropriate given the study question. It was not possible to comment on the internal validity of the trial, as details on power calculations to determine the sample size, methods of randomisation, blinding and loss to follow-up were not reported. There were no reported statistical analyses to account for potential biases and confounding factors. However, this information might be available in the WOSCOPS report, (see 'Other Publications of Related Interest' for bibliographic details). In addition, given that the study sample comprised males aged between 45 and 64 years, and the comparability of the patient groups at analysis could not be determined, the generalisability of the findings is limited.

**Validity of estimate of measure of benefit**
The measure of benefit was the LYG, which was derived from national statistics for Scotland. No comments were offered on the reliability or validity of these sources.

**Validity of estimate of costs**
It appears that those categories of costs relevant to the health care perspective were included. Excluded costs relating to patient management at the pre-hospital admission and post first admission stages might have been relevant, thus the cost-effectiveness of the intervention may have been overestimated. The costs and the quantities were not reported separately, thus limiting the generalisability of the study in other settings. The resource quantities and the costs were taken from a single study (WOSCOPS) but the dates when the resource use data were collected were not given. There was no formal statistical or sensitivity analysis of the costs or resource use. All these issues potentially limit the interpretation of the findings. However, the authors did provide a useful exploration of variation in the results according to differences in current thresholds for treatment. Discounting was appropriate for this intervention study and was conducted at a rate of 6%. Currency conversions were undertaken to reflect US dollar results, although no conversion rate was reported.

**Other issues**
The authors did not compare their findings with those from other studies, so it is not known how far their results agree with other published results. The generalisability of the findings to other populations, countries and settings is likely to be limited and this was, to some extent, acknowledged in the authors’ conclusions. Although the authors do not appear to have presented their results selectively, the paper was limited by incomplete information in both the effectiveness and cost analyses. However, the conclusions reflected the scope of the analysis. The authors reported no limitations to their study.

**Implications of the study**
Whilst the authors advocated the use of primary prevention statin therapy beyond high-risk patients, they acknowledged that current health care systems might not be willing to withstand the higher costs involved. However, they pointed out a number of factors that might further augment the cost-effectiveness of this therapy. For example, the reduction in treatment cost, increased patient compliance and greater cholesterol reduction per unit cost.

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None stated.
Bibliographic details

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Other publications of related interest

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