Cost-effectiveness of prescribing statins according to Pharmaceutical Benefits Scheme criteria

Lim S S, Vos T, Peeters A, Liew D, McNeil J J

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 Pharmaceutical Benefits Scheme (PBS) criteria for prescribing lipid-lowering therapy. The PBS criteria for initiation of statin therapy were based on levels of cholesterol and cholesterol fractions, with cut-offs varying according to the presence or the absence of other risk factors. The PBS criteria were compared with treatment criteria based on a 15-year risk of coronary heart disease (CHD) mortality with cut-offs of 2.5% and 5%. The statin therapy used was pravastatin (40 mg/day).

Type of intervention
Primary prevention. Secondary prevention was specifically excluded from the study.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised men and women aged 25 to 85 years who were eligible for statin therapy according to PBS criteria. People with pre-existing CHD or diabetes mellitus were excluded.

Setting
The setting was primary care. The economic study was carried out in Australia.

Dates to which data relate
The analysis of effectiveness used Australian CHD mortality rates for 1999 as the basis for extrapolation over a 15-year period. The prices used related to 1999.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
The effectiveness and cost data were based on Australian population sources.

Modelling
The CHD Prevention Model was used to establish the risk of CHD mortality in the Australian population over a 15-year period and to estimate the net cost of treatment. The model was not described in this paper, although details are available elsewhere (see Other Publications of Related Interest).
Outcomes assessed in the review
The data derived from the literature were:

the proportion of the risk group that was eligible for lipid lowering treatment according to PBS criteria and 15-year risk of CHD mortality cut-off points of ≥2.5% and ≥5%;

the relative risk reduction of 40 mg/day pravastatin; and

compliance rates with statins.

Study designs and other criteria for inclusion in the review
The treatment eligibility data were derived from a published model, which was based substantially on the Multiple Risk Factor Intervention Trial. The effectiveness data for pravastatin came from a study in the west of Scotland.

Sources searched to identify primary studies
Not relevant.

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

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

Number of primary studies included
Not relevant.

Methods of combining primary studies
Not relevant.

Investigation of differences between primary studies
Not relevant.

Results of the review
The proportion of the risk group that was eligible for lipid-lowering treatment was 61% for a risk of greater than 10% and, at the other extreme, 11% for a risk of less than 2.5%

The relative risk reduction of 40 mg/day pravastatin was 38% (range: 23 - 50).

An exponential decline in compliance was modelled, which levelled off at 50% after 3 years.

Measure of benefits used in the economic analysis
The authors considered years of life saved as the most appropriate measure to be included in the economic analysis.

Direct costs
The effectiveness and cost parameters entered in the model were reported separately. The direct costs to the health
service were included in the analysis. These were the annual drug costs per person and the mean treatment-related costs (including general practitioner consultations, serum lipid and liver function tests). Potential health care cost-savings from disease prevention were calculated as savings per death prevented. These cost-savings were based on the Australian Disease Costs and Impact Study 1993-94, and were adjusted for inflation to 1999. The drug costs were taken from the 1999 PBS dispensed cost of 40 mg/day pravastatin. The source of the treatment-related costs was not reported. The model was used to extrapolate over a 20-year time period. An overall annual discount rate of 3% was used for all future costs. The study reported the net costs, which were calculated as the cost of treatment less the potential cost-savings from prevention of disease. In addition, adjustments for future decreases in drug costs and treatment costs for non-compliers were factored in. A 5-year lag period was applied between the mean accrual of treatment costs and the occurrence of death.

Statistical analysis of costs
No statistical analysis of the costs was reported.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
Australian dollars (Aus$).

Sensitivity analysis
Uncertainty related to variability in the data was explored using replacement sampling with 2,000 iterations. Uncertainty distributions were used to investigate trends in CHD mortality, effectiveness of and compliance with medication, and cost data. The authors did not justify the distributional assumptions, nor did they describe how the ranges of the distributions were chosen.

Estimated benefits used in the economic analysis
For men, the years of life saved (80% uncertainty range in brackets) were 55,000 (range: 37,000 - 70,000) when using PBS criteria for the initiation of primary prevention statin therapy, 130,000 (range: 94,000 - 170,000) when using criteria based on an \( \geq 2.5\% \) 15-year risk of CHD mortality, and 87,000 (range: 4,000 - 110,000) when using criteria based on a \( \geq 5\% \) 15-year risk of CHD mortality.

For women, the years of life saved were 48,000 (range: 33,000 - 63,000) when using PBS criteria for initiation of primary prevention statin therapy, 77,000 (range: 52,000 - 98,000) when using criteria based on a \( \geq 2.5\% \) 15-year risk of CHD mortality, and 43,000 (range: 29,000 - 54,000) when using criteria based on a \( \geq 5\% \) 15-year risk of CHD mortality.

The duration of benefits was modelled over 20 years for both the PBS criteria and the comparator criteria. The analysis considered the cost of extra surveillance by a general practitioner.

Cost results
For men, the total cost (millions of dollars; 80% uncertainty range in brackets), discounted at 3% per annum, was Aus$6,300 (range: 5,000 - 7,800) when using PBS criteria for initiation of primary prevention statin therapy. This compared with Aus$4,800 (range: 3,900 - 5,800) when using criteria based on a \( \geq 2.5\% \) 15-year risk of CHD mortality, and Aus$2,500 (range: 2,000 - 3,000) when using criteria based on \( \geq 5\% \) 15-year risk of CHD mortality.

For women, the total cost (millions of dollars; 80% uncertainty range in brackets), discounted at 3% per annum, was Aus$4,700 (range: 3,700 - 5,800) when using PBS criteria for initiation of primary prevention statin therapy. This compared with Aus$3,300 (range: 2,600 - 3,900) when using criteria based on a \( \geq 2.5\% \) 15-year risk of CHD mortality.
mortality and Aus$1,700 (range: 1,400 - 2,100) when using criteria based on a \( \geq 5\% \) 15-year risk of CHD mortality.

The effects on costs of patient non-compliance with medication regimes and of additional surveillance by the general practitioner were included in the analysis. Anticipated decreases in drug costs were also allowed for in the analysis.

The costs for both PBS criteria and risk of CHD treatment strategies were modelled for 20 years.

*Synthesis of costs and benefits*

The costs and benefits were combined by calculating a cost-effectiveness ratio. An incremental analysis was not performed.

For men, the cost per life-year saved (80% uncertainty range in brackets) was Aus$110,000 (range: 96,000 - 150,000) when using PBS criteria for initiation of primary prevention statin therapy, Aus$31,000 (range: 27,000 - 40,000) when using criteria based on a \( \geq 2.5\% \) 15-year risk of CHD mortality, and Aus$23,000 (range: 20,000 - 29,000) when using criteria based on a \( \geq 5\% \) 15-year risk of CHD mortality.

For women, the cost per life-year saved (80% uncertainty range in brackets) was Aus$87,000 (range: 80,000 - 130,000) when using PBS criteria for initiation of primary prevention statin therapy, Aus$39,000 (range: 33,000 - 53,000) when using criteria based on a \( \geq 2.5\% \) 15-year risk of CHD mortality, and Aus$37,000 (range: 32,000 - 51,000) when using criteria based on a \( \geq 5\% \) 15-year risk of CHD mortality.

*Authors' conclusions*

Better targeting of statin therapy, compared with the use of Pharmaceutical Benefits Scheme (PBS) criteria, would substantially improve the cost-effectiveness of primary prevention in the treatment of coronary heart disease (CHD).

Treatment using a cut-off point of greater than 2.5% 15-year risk of CHD mortality resulted in similar treatment costs in the first year, but with twice the health impact in terms of deaths averted and years of life saved.

*Crd Commentary - Selection of comparators*

A justification was given for the comparator used. It was a more sophisticated method of identifying absolute risk and was used in European and American guidelines. You should decide if this represents criteria for prescribing statins in your own setting.

*Validity of estimate of measure of effectiveness*

The analysis was based on a model populated with survey data, which was appropriate for the study question. The authors noted that although the results were based on data from a 1989 study, which may not represent the current study population, the model could easily be updated as more recent data become available. The model used the same patient data for the intervention and comparator groups.

*Validity of estimate of measure of benefit*

The measure of benefit used was years of life saved. The estimation of benefits was modelled.

*Validity of estimate of costs*

The cost analysis was performed from the perspective of a national health service. It appears that all the relevant categories of costs have been included in the analysis. Some relevant costs were omitted from the analysis. For example, the authors did not include the costs of the possible adverse effects of pravastatin beyond monitoring with two extra general practitioner consultations and two series of blood tests. Although some costs were omitted from the analysis, it is unlikely that their omission would have affected the authors' conclusions. The costs were reported separately from other model parameters, thus enhancing the reproducibility of the study in other settings. A Monte Carlo simulation was run to explore uncertainty in the costs. Discounting was applied, which was appropriate given the 20-year time horizon.
Costs, rather than charges, were reported. The treatment costs were taken from 1999, while potential cost-savings were from a study conducted for 1993-94 and were adjusted to 1999 prices.

Other issues
The authors did not make appropriate comparisons of their findings with those from other studies. However, they reported that no randomised clinical trial had been performed that considered all of the variables. The authors did not directly address the issue of the generalisability of the results to other settings. However, they explored the effect of disease prevalence in detail. The authors do not appear to have presented their results selectively.

Implications of the study
The authors stated that, to improve cost-effectiveness, therapy targeted at the primary prevention of CHD needs to be based on population-specific, multifactorial risk. Clinicians need to have access to simple tools to estimate the patients' risk of CHD.

Source of funding
Supported by a grant from the Strategic Research and Development Council (SRDC), the National Health and Medical Research Council, and by the Public Health Division, Department of Human Services, Victoria, Australia.

Bibliographic details

PubMedID
11758073

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Aged, 80 and over; Australia /epidemiology; Coronary Disease /mortality /prevention & control; Cost-Benefit Analysis; Female; Humans; Hydroxymethylglutaryl-CoA Reductase Inhibitors /economics /therapeutic use; Hyperlipidemias /drug therapy; Insurance, Pharmaceutical Services; Male; Middle Aged; Models, Econometric; Monte Carlo Method; Practice Guidelines as Topic; Pravastatin /economics /therapeutic use; Risk Factors

AccessionNumber
22001002063

Date bibliographic record published
30/04/2005

Date abstract record published
30/04/2005