Generalized cost-effectiveness analysis of pharmaceutical interventions for primary prevention of cardiovascular disease in Thailand

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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.

CRD summary
The objective was to assess the cost-effectiveness of drugs to lower blood pressure and cholesterol, to prevent cardiovascular disease. The authors concluded that primary prevention, with the polypill or a combination of three generic blood pressure lowering drugs was very cost-effective, in Thailand, for those with a 10-year cardiovascular disease risk of 5% or more. The methods were adequate. Each intervention was not compared with the next best alternative, but the authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of drugs to lower blood pressure and cholesterol, to prevent cardiovascular disease.

Interventions
The medications were: calcium-channel blockers; diuretics; angiotensin-converting enzyme (ACE) inhibitors; beta-blockers; statins; angiotensin-receptor blockers; a polypill, of a statin at full dose, and three blood pressure lowering drugs at half standard doses; a diuretic with a calcium-channel blocker and ACE inhibitor; and a diuretic with a calcium-channel blocker, ACE inhibitor and statin.

These interventions were compared with no routine intervention, which was the usual care. The interventions were assessed for three populations, which varied according to their 10-year risk of cardiovascular disease: 5% to 9.9%; 10% to 19.9%; and 20% or more.

Location/setting
Thailand/primary care.

Methods
Analytical approach:
The analysis was based on a Markov model. The time horizon was the lifetime of the patient. The authors stated that the perspective was that of the health sector, which included the costs to the government and health-related costs to patients and their families.

Effectiveness data:
The clinical and effectiveness data were from published studies and sources. The main effectiveness estimates were the relative risks, with each medication, of reducing ischaemic heart disease, ischaemic stroke and haemorrhagic stroke. These estimates were mostly from two published studies, which reported interventions that were proven in clinical trials to be effective in preventing ischaemic heart disease and stroke. The long-term cardiovascular event risks were based on risk predictions developed by the authors for Thailand, using Framingham equations.

Monetary benefit and utility valuations:
Not reported.
Measure of benefit:
The measure of benefit was disability-adjusted life-years (DALYS) averted. Future benefits were discounted at an annual rate of 3%.

Cost data:
The direct costs included the prevention medications; health centre visits; primary care centre visits; laboratory tests; and treatment for stroke and ischaemic heart disease. The authors reported that medication, laboratory tests, and health care visit costs were from the Thai Ministry of Public Health. The costs of treating stroke and heart disease were from a published Thai study and the Neurological Institute in Bangkok. All costs were inflated to 2004 prices, using the consumer price index. Future costs were discounted at an annual rate of 3%. All costs were reported in Thai baht (THB).

Analysis of uncertainty:
A probabilistic sensitivity analysis was conducted, by assigning probability distributions to the model parameters, with 2,000 iterations. The results were presented as 95% confidence intervals, and as the likelihood that the intervention would be cost-effective, at a particular cost-effectiveness threshold.

Results
For all patients (combined), usual care was associated with 400,000 DALYs, and a cost of THB 120 billion.

By cardiovascular disease risk population, beta-blockers generated the lowest number of DALYS: 190,000 for those with 10-year risk of 5% to 9.9%; 150,000 for those with a risk of 10% to 19.9%; and 120,000 for those with a risk of 20% or more. The polypill generated the most DALYS: 1,100,000 for those with a risk of 5% to 9.9%; 910,000 for those with a risk of 10% to 19.9%; and 720,000 for those with a risk of 20% or more.

The most costly intervention was angiotensin-receptor blockers, generating costs of THB 31 billion for those with a risk of 5% to 9.9%; THB 17 billion for those with a risk of 10% to 19.9%; and THB 6.9 billion for those with a risk of 20% or more. The polypill generated savings of: THB 12 billion for those with a risk of 5% to 9.9%; THB 16 billion for those with a risk of 10% to 19.9%; and THB 16 billion for those with a risk of 20% or more.

For all three risk populations, compared with usual care, the polypill and a diuretic plus calcium-channel blocker plus ACE inhibitor were found to be dominant, as they were less costly and more effective than the other options. For those with a risk of 20% or more, diuretics, a diuretic plus calcium-channel blocker plus ACE inhibitor plus statin, and ACE inhibitors were also dominant over usual care.

The probabilistic sensitivity analysis showed that all interventions, irrespective of 10-year risk of cardiovascular disease, were more than 50% likely to be cost-effective, compared with usual care, at a willingness-to-pay threshold of three times the per capita gross domestic product. The authors assessed an expansion pathway, in which they added more and more interventions into an optimal intervention package. They found that progressively adding statins to the optimal package was cost-effective.

Authors’ conclusions
The authors concluded that primary cardiovascular disease prevention, with the polypill or a combination of three generic blood pressure lowering drugs, was very cost-effective in Thailand, for those with a 10-year cardiovascular disease risk of 5% or more.

CRD commentary
Interventions:
The interventions were described and the rationale for their selection was clear, as the usual care in Thailand (no active treatment) was compared with the proposed preventive strategies.

Effectiveness/benefits:
No details of a systematic literature review, to identify and select the published sources, were reported, making it impossible to determine if all the relevant evidence was considered. The clinical data sources were not described in detail, but are likely to have had high internal validity, as they included two published meta-analyses of randomised
controlled trials, which generally provide robust evidence. DALYs were an appropriate benefit measure, for assessing the burden of cardiovascular disease on patients’ health, but the methods used to obtain the disutility weights, and their sources, were not reported.

Costs:
The perspective was explicitly reported to be that of the health sector. For this perspective, it appears that all the major relevant costs were included. The sources for these costs were reported, as was the price year, time horizon, discount rate and currency.

Analysis and results:
The cost and outcome information was synthesised in a decision-analytic Markov model. The details of the model were reported, with a diagram. It was clear that the polypill was the most cost-effective intervention, as it generated the most benefit and saved the most costs, for each population, but the cost-effectiveness of each intervention should have been compared head-to-head, rather than just against usual care. Uncertainty in the model's results was adequately tested in a probabilistic sensitivity analysis. As the main limitation to their study, the authors reported that no single study compared the effectiveness of the interventions head-to-head.

Concluding remarks:
The methods were adequate. The costs and outcomes of each intervention were not assessed incrementally to those of its next best alternative, but the authors' conclusions appear to be valid.

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