Cost-effectiveness of options for the diagnosis of high blood pressure in primary care: a modelling study


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
This study examined the cost-effectiveness of three strategies for the diagnosis of hypertension, in people aged 40 years or older who had an initial clinic screening blood pressure higher than 140 over 90mmHg. The authors concluded that 24-hour monitoring was cost-effective for diagnosing hypertension, in a range of age groups, for men or women. The cost-effectiveness methods were appropriate, the sources were valid, and the uncertainty was extensively tested. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of three strategies for the diagnosis of hypertension, in people aged 40 years or older who had an initial clinic screening blood pressure measurement higher than 140 over 90mmHg.

Interventions
The three interventions were blood pressure monitoring at monthly intervals over three months in the clinic, regularly over a week at home, or continuously over 24 hours.

Location/setting
UK/primary care and home.

Methods
Analytical approach:
The analysis was based on a Markov model, with a lifetime horizon and 10 cohorts of men or women aged 40, 50, 60, 70, or 75 years. The authors stated that it was carried out from the perspective of the UK NHS and personal social services.

Effectiveness data:
The clinical data were from a selection of published sources. The specificity of blood pressure monitoring for each option was a key input for the model and the data were from a recent meta-analysis. The treatment effect for antihypertensive drugs was from a meta-analysis of clinical trials. The long-term risk of cardiovascular events due to hypertension was derived using Framingham risk equations and data from the Health Survey for England (HSE) 2006 and other published sources. Some assumptions were needed; for example, the accuracy of continuous blood pressure monitoring was assumed to be 100%.

Monetary benefit and utility valuations:
The utility values for cardiovascular conditions were from a published study. Those for the general population without a cardiovascular event were age and gender specific and were from the HSE, which collected them using the European Quality of life (EQ-5D) instrument.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and were discounted at an annual rate of 3.5%.
Cost data:
The economic analysis included the costs of diagnosis (equipment, consumables, maintenance and staff time), antihypertensive treatment (drugs and annual clinical review), and management of cardiovascular disease (CVD). The costs of CVD were from published reports and national estimates. Most of the other costs were from official NHS sources. The drug costs were based on the most commonly used generic drugs, and the proportion of people on one, two, or three drugs, from the HSE. All costs were in UK £ and were at 2009 to 2010 prices. A 3.5% annual discount rate was applied.

Analysis of uncertainty:
The overall uncertainty was investigated, in a probabilistic sensitivity analysis, using Monte Carlo simulation. Each model input was assigned a distribution based on its point estimate and standard error. Deterministic sensitivity analyses were performed to identify the most influential inputs.

Results
Continuous monitoring was the most cost-effective strategy. Compared with home or clinic monitoring, continuous monitoring was cost saving in all age and gender groups and improved health outcomes for men or women aged over 50 years.

For example, the expected cost savings for a 60-year-old man, compared with clinic monitoring, were £26 with home monitoring and £112 with continuous monitoring. The incremental QALYs were 0.003 with home monitoring and 0.017 with continuous monitoring.

For younger cohorts, continuous monitoring was cost saving, but provided fewer QALYs. It was still the preferred strategy, as the incremental cost per QALY gained with clinic monitoring was over £50,000 (the cost-effectiveness threshold).

The probabilistic analysis showed that continuous monitoring was the preferred strategy (most cost-effective) in almost all simulations.

The deterministic analysis confirmed its superiority, except in two scenarios: when testing at home was assumed to be equally sensitive to continuous testing (home preferred), and when treatment for those who were falsely diagnosed with hypertension reduced their cardiovascular risk (clinic preferred).

Authors' conclusions
The authors concluded that 24-hour monitoring was cost-effective for diagnosing hypertension in a range of age groups for men or women.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear as the available strategies were considered. The authors reported that continuous monitoring was the reference standard for the diagnosis of hypertension.

Effectiveness/benefits:
The clinical data were generally from valid sources, including meta-analyses of clinical trials for the treatment effect and a meta-analysis of recent studies for the test accuracy. The long-term CVD risks were projected using well known and validated equations. The clinical parameters were extensively tested in the sensitivity analysis, which showed that the findings were robust. QALYs were an appropriate benefit measure as hypertension affects survival and quality of life. The utility values were from appropriate sources.

Costs:
The economic analysis was satisfactorily conducted. The cost categories and their sources were appropriate for the perspective of the public payer. The unit costs were reported for most items, but the costs of CVD were presented as combined totals. The resource consumption for the three strategies was clearly reported. The sources for the unit costs and resource use were representative of the UK. The price year and discounting were clearly reported. The impact of variations in the key economic inputs was extensively tested in the sensitivity analyses.
Analysis and results:

An incremental approach was used to combine the costs and benefits of the three diagnostic strategies. The incremental costs and QALYs were reported for all age and gender subgroups. Valid approaches were used to assess uncertainty and the results were extensively reported and discussed. The authors stated that their results were similar to those of other economic evaluations that compared the three options. They acknowledged that their results might be conservative against continuous monitoring, since the cost of hypertension treatment was assumed to be very low (producing low cost savings). The transferability of the results was not explicitly addressed, but the findings might be valid for other settings with similar costs and clinical practices.

Concluding remarks:

The cost-effectiveness methods were appropriate, the sources were valid, and the uncertainty was extensively tested. The authors’ conclusions appear to be robust.

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