The economics of improving medication adherence in osteoporosis: validation and application of a simulation model
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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
This study assessed the cost-effectiveness of a hypothetical behavioural intervention to improve adherence to osteoporosis medication in women starting bisphosphonate therapy. The authors concluded that behavioural interventions were likely to be cost-effective in most scenarios, especially for older women, if the intervention's efficacy could be maintained over time. The methods were robust and transparent, which ensures the validity of the authors' conclusions, but the results were very dependent on several model parameters.

Type of economic evaluation
Cost-utility analysis

Study objective
This study assessed the cost-effectiveness of a hypothetical behavioural intervention to improve adherence to osteoporosis medication in women starting bisphosphonate therapy.

Interventions
The intervention was motivational interviewing, in which trained health educators delivered counselling over the telephone about once a month. This was compared with no behavioural intervention. Bisphosphonate therapy consisted of 70mg alendronate weekly.

Location/setting
USA/primary care.

Methods
Analytical approach:
The analysis was based on a state transition model, with individual patient micro-simulations and a lifetime horizon. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical data were from a selection of relevant published studies. Assumptions were made for the treatment onset and offset periods. The treatment discontinuation rates and re-initiation without intervention were from an analysis of claims data. The intervention was assumed to reduce treatment discontinuation by 30% among women aged 65 years, based on a review of interventions to improve adherence to osteoporosis medications. The fracture rates were mostly from the Rochester Epidemiology Project Study. The efficacy of bisphosphonate treatment was from a meta-analysis of randomised controlled trials of alendronate in women.

Monetary benefit and utility valuations:
The utility values for various fractures were from published studies.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of bisphosphonates, based on their average wholesale price, and the acute and long-term costs of fracture, which were mainly from a study of fracture costs in the USA. The cost of the intervention was assumed by the authors. All costs were in US dollars ($) and a 3% annual discount rate was applied. The price year was 2010.

Analysis of uncertainty:
One-way sensitivity analyses were carried out to investigate uncertainty, using published and assumed ranges of values for selected inputs and focusing on the assumed efficacy and cost of the intervention. Two-way sensitivity analyses were carried out on the intervention cost and effectiveness, for women aged 65, 75, and 85 years. Each analysis was a first-order Monte Carlo simulation.

Results
In a cohort of 65-year-old women, the projected costs without the intervention were $25,149 and the QALYs were 9.273. The hypothetical intervention increased the QALYs to 9.285 at an additional cost of $358, resulting in an incremental cost per QALY gained of $29,571. The incremental cost per QALY gained was $119,161 for 65-year-old men.

The most influential inputs were the cost and efficacy of the intervention and the assumptions for the offset period. When the efficacy of the intervention was reduced to 10%, the cost per QALY rose to $71,566 (for 65-year-old women). When the duration of the intervention effect was reduced from five years to one year the incremental cost per QALY was $136,870.

The results were also sensitive to variations in the cost and effectiveness of bisphosphonates. The cost-effectiveness of the intervention was below the threshold of $50,000 per QALY in most scenarios for 65-year-old women; lower cost-effectiveness ratios were found for women aged 75 or 85 years.

Authors’ conclusions
The authors concluded that behavioural interventions were likely to be cost-effective in most scenarios, especially for older women, if the intervention’s efficacy could be maintained over time.

CRD commentary
Interventions:
The reason for selecting the comparators was clear; the proposed hypothetical intervention was compared against no such intervention, which was the usual care in the authors’ setting.

Effectiveness/benefits:
Sources for the clinical inputs appear to have been valid and appropriate. For example, the treatment effect was from a meta-analysis of randomised controlled trials and the epidemiological data were from large cohort studies, conducted in the authors’ setting. The key methods of these source studies (patient population, study design, and sample size) were reported. Some assumptions were needed, mainly for the offset and onset periods for the treatment effect, which had a substantial impact on the cost-effectiveness results. Extensive sensitivity analysis was conducted on these parameters. QALYs were an appropriate benefit measure for capturing the impact of the disease on the patients’ health, but no information on the derivation of the utility values was given.

Costs:
A broad perspective was adopted and a wide range of costs was included. Productivity losses were not considered, due to the age of the patients (65 years). The costs were not fully described; fracture costs were from other publications and the cost items were not reported. No resource quantities were reported. The authors stated that they used the wholesale price for medications, which might have overestimated their costs as discounts are often available to health plans and patients, but it might also have underestimated them for patients reinitiating treatment and switching to non-generic bisphosphonates. The impact of variations in selected inputs was tested in the sensitivity analyses. Details, such as the price year and discount rate, were reported.

Analysis and results:
An incremental approach was used to synthesise the costs and benefits of the two interventions. The uncertainty was satisfactorily investigated and the key results of the sensitivity analyses were presented and discussed. To validate the model results, projections of 10-year and lifetime fracture risks were compared with estimates from the published literature. The authors acknowledged some limitations to their analysis, which mainly related to the need for some key assumptions. The transferability of the results was not explicitly addressed and they might be difficult to transfer to other settings.

Concluding remarks:
The methods were robust and transparent, which ensures the validity of the authors’ conclusions, but the results were very dependent on several model parameters.

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