The cost-effectiveness of bisphosphonates in postmenopausal women based on individual long-term fracture risks


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 study evaluated the cost-effectiveness of bisphosphonates in comparison with no treatment for postmenopausal women, using individual estimates for the risks of fracture. A key aspect of the economic evaluation was the sub-group analysis based on age and clinical risk factors. The study demonstrated that bisphosphonates may represent a cost-effective treatment, especially for elderly women and those with a history of fracture. The quality of the study was generally good, although some important assumption were made.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective of the study was to develop a decision analytic model evaluating the cost-effectiveness of bisphosphonates in comparison with no treatment for postmenopausal women, using individual estimates for the risks of fracture. The sub-group analyses (20 sub-groups determined from age and clinical risk factors) represented the key aspect of the economic evaluation.

Interventions
The study examined 5-year therapy with bisphosphonates (risedronate and alendronate) in postmenopausal women. This was compared with a strategy of no treatment.

Location/setting
UK/primary care.

Methods
Analytical approach:
A decision analytic model was constructed in order to determine the clinical and economic impact of bisphosphonate use over no treatment in different cohorts of women defined by age and risk factors. The model was populated on the basis of individual risk factors. The time horizon of the analysis was 10 years. The perspective of the analysis was not explicitly stated.

Effectiveness data:
The primary sources used to derive clinical estimates were based on a selection of known relevant studies. Fracture risks (hip, vertebral, wrist, humerus) were derived from the Health Improvement Network research database, which uses data gathered by general practitioners (GPs) in a very large cohort of UK women aged 50 to 100. Risk factors were selected on the basis of data derived from a large meta-analysis of prospective epidemiological studies. Other variables were based on a large report, the European Prospective Osteoporosis Study. However, the key clinical estimate was the fracture risk reduction due to bisphosphonates, which was obtained from a published health technology assessment (HTA) issued by the National Institute for Clinical Excellence (NICE). Equal efficacy was assumed for alendronate and risedronate.

Monetary benefit and utility valuations:
Utility estimates were based on a NICE HTA that used age-specific EuroQol (EQ-5D) utilities.
Measure of benefit:
The summary benefit measure used was the quality-adjusted life-years (QALYs). These were estimated using the decision model. An annual discount rate of 1.5% was applied.

Cost data:
The categories of costs included in the analysis were bisphosphonate prescriptions, bone mineral density measurement, GP visits and services related to the treatment of fractures. The costs and quantities were based on a publication by NICE and were reported as macro-categories. The costs were discounted at an annual rate of 6%. The costs were in UK pounds sterling (£). The price year was not reported.

Analysis of uncertainty:
Several univariate sensitivity analyses were performed in order to determine the threshold values of key model inputs at which the results of the base-case analysis would change. Bootstrapping was conducted to obtain confidence intervals (CIs) around mean estimates.

Results
The expected costs and QALYs were not reported.

In general, the cost-effectiveness analysis showed that the incremental cost per QALY gained with bisphosphonates was better (i.e. lower) for elderly women and in women with a history of fracture. For example, the ratio was £8,000 in women aged at least 90 years without fracture history (£17,000 for women with low baseline fracture risk and £4,000 for women with high baseline fracture risk). The ratio was £38,000 in women aged 50 to 59 years and older with a fracture history (£58,000 for women with low baseline fracture risk and £35,000 for women with high baseline fracture risk).

Using a cost-acceptability ratio of £30,000 per QALY gained, bisphosphonate treatment became cost-effective for patients with a 5-year risk of 9.3% (95% CI: 8.0 to 10.5) for osteoporotic fractures and 2.1% (95% CI: 1.5 to 2.7) for hip fractures.

When bone mineral density was included in the risk assessment, the cost per QALY gained was £35,000 in women at age 60 with a fracture history and a T-score of -2.5, and £3,000 at age 80.

The results of the sensitivity analysis confirmed the robustness of the base-case results. In general, the key finding of the analysis was that the cost-effectiveness of bisphosphonates was dramatically dependent on risk factors and characteristics such as age, body mass index, early menopause and baseline T-score.

Authors’ conclusions
The authors concluded that bisphosphonates represent a cost-effective treatment for elderly women and those with fracture history.

CRD commentary
Interventions:
The selection of the bisphosphonates under examination was based on the choice of the most commonly used treatments in the authors’ setting. The exclusion of etidronate was due to the lack of clinical data on hip fracture efficacy.

Effectiveness/benefits:
The clinical data were derived from studies that appear to have been identified selectively. These studies seem to have been the most relevant for this analysis in the authors’ setting. In particular, the main strength of the analysis was the use of a large national database with long follow-up that allowed an individual-based analysis to be conducted. The authors noted that a key assumption of the model was that bisphosphonates reduce the risk of fractures in all women, irrespective of their characteristics, and this may not be the case in some situations.

Costs:
The categories of costs included in the analysis and their sources suggested that the perspective of the UK National Health Service may have been adopted, although this was not explicitly stated. Unit costs were presented for some items but, in general, information on resource use was not reported separately from the costs. Often, macro-categories of costs were presented. Furthermore, the price year was not reported. This may limit the possibility of replicating the analysis in other settings and in other time periods. Discounting was performed in accordance with UK guidelines.

Analysis and results:
The costs and benefits were appropriately synthesised. The issue of uncertainty was implicitly addressed by the model type, with patient-level simulations. In addition, sub-group analyses were performed and were extensively described. The authors stated that caution will be required when extrapolating these findings to other countries, owing to differences in both epidemiological and economic data. Some limitations of the analysis were also highlighted.

Concluding remarks:
The quality of the study methodology was very high, and the methods and results were well reported. The authors’ conclusions appear appropriate.

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