Cost effectiveness of ultrasound and bone densitometry for osteoporosis screening in post-menopausal women
Mueller D, Gandjour A

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 determine the cost-effectiveness of osteoporosis screening in women aged 50 to 90 years. The authors concluded that quantitative ultrasound then dual X-ray absorptiometry (DXA) was cost-effective compared with no screening. DXA alone was also cost-effective compared with quantitative ultrasound then DXA, except for women aged 60 to 70 years. On the whole, the methods were appropriate and clearly reported. The conclusions reached by the authors appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to determine the cost-effectiveness of osteoporosis screening in women aged 50 to 90 years.

Interventions
Screening by quantitative ultrasound to select patients for dual X-ray absorptiometry (DXA), followed by treatment with alendronate if required, was compared with immediate access to DXA without pre-screening, and with no screening (and no treatment).

Location/setting
Germany/out-patient.

Methods
Analytical approach:
A state-transition Markov model, with a one-year cycle and a lifetime horizon, was developed to capture the ongoing fracture risk over time. The authors reported that the perspective of the German statutory health insurer was adopted.

Effectiveness data:
A literature search for meta-analyses and randomised controlled trials (RCTs), published between 2005 and 2007, was conducted in the PubMed database. The efficacy results from RCTs were pooled using the Mantel-Haenszel method. Other model parameters, such as the incidence of fractures, mortality, and sensitivity and specificity of diagnostic tests, were from published studies and official reports. The main measure of effectiveness was the incidence of a fracture.

Monetary benefit and utility valuations:
The utility values were from published studies. For the health state of no fracture, the utility values were derived, using a time trade-off questionnaire, from a sample of the general population. For the health states of fractures, the utility values were derived, using the European Quality of Life (EQ-5D) questionnaire and expert opinion.

Measure of benefit:
The primary measure of benefit was the quality-adjusted life-year (QALY) and these were discounted at an annual rate of 3%.

Cost data:
The analysis included the cost of screening and diagnosis, medication, treatment of fractures, and general health care
during additional years of life. The costs of screening, diagnosis, and medication were from estimates in German guidelines, price lists for out-patient treatment, and a public database of medication costs. The medication resource use was adjusted according to an adherence rate derived from German prescription data. In-patient costs were a weighted average of diagnosis-related group data. Out-patient treatment costs were from a large random-sample survey. The price year was 2006 and all costs were reported in Euros (EUR). They were adjusted for inflation using the German consumer price index and they were discounted at an annual rate of 3%.

Analysis of uncertainty:
A one-way sensitivity analysis of all the model parameters was carried out. A probabilistic sensitivity analysis was also performed, by assigning probabilistic distributions to the model parameters. A Monte Carlo simulation was completed and the results were presented on cost-effectiveness acceptability curves.

Results
The incremental cost per QALY gained for quantitative ultrasound then DXA compared with no screening was EUR 3,529 for those aged 50 to 60 years, EUR 9,983 for those aged 60 to 70 years, EUR 4,382 for those aged 70 to 80 years, and EUR 1,987 for those aged 80 to 90 years. The incremental cost per QALY gained with no pre-screening (DXA only) compared with quantitative ultrasound then DXA was EUR 5,331 for those aged 50 to 60 years, EUR 60,804 for those aged 60 to 70 years, EUR 14,943 for those aged 70 to 80 years, and EUR 3,654 for those aged 80 to 90 years.

The one-way sensitivity analysis showed that the incremental cost-effectiveness ratio was sensitive to the relative risk of fracture with alendronate and the discount rate. The probabilistic sensitivity analysis showed that, at a willingness-to-pay of EUR 10,000 per QALY gained, quantitative ultrasound then DXA had a probability of being cost-effective over no screening of almost 90%, except for women aged 60 to 70 years, for whom the probability was less than 50%.

Authors’ conclusions
The authors concluded that quantitative ultrasound then DXA was cost-effective compared with no screening and no treatment. DXA alone was also cost-effective compared with quantitative ultrasound then DXA, except in women aged 60 to 70 years.

CRD commentary
Interventions:
The interventions were clearly reported and they appear to have been the relevant strategies in the authors' setting.

Effectiveness/benefits:
Some of the effectiveness estimates were from a literature review that identified RCTs and meta-analyses. Well-conducted RCTs and meta-analyses are regarded as high-quality sources for clinical data. The authors reported some of the details of the literature review, and additional details were given in supplementary material. The effectiveness estimates were reported in full and the measure of benefit was appropriate.

Costs:
The costs appear to have reflected the perspective stated. The resource quantities and unit costs were reported separately and appear to have been appropriate. The cost estimates were from sources relevant to the setting. Some costs, such as those of drugs taken after a fracture, were excluded and the authors noted that this might have underestimated the costs saved by the prevention of fractures. The details of other adjustments to the costs, including the price year and the discount rate, were reported.

Analysis and results:
The authors conducted an appropriate incremental analysis and the full results were presented. The methods used throughout the evaluation were well reported, and diagrams were presented. The uncertainty was assessed through a series of deterministic and probabilistic sensitivity analyses. The authors acknowledged the main limitations of their analysis.

Concluding remarks:
On the whole, the methods were appropriate and clearly reported. The conclusions reached by the authors appear to be
valid.

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