Cost-effectiveness of preventing hip fractures in the elderly population using vitamin D and calcium

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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.

Health technology
Ergocalciferol and calciferol (Vitamins D) and calcium supplementation.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Elderly women with and without a low body mass index (BMI) (high risk group).

Setting
Community and nursing homes.

Dates to which data relate
The effectiveness data relate to studies conducted between 1992 and 1994. The price year was not stated but some cost data relate to 1994.

Source of effectiveness data
Effectiveness data was derived from a review/synthesis of previously completed studies.

Outcomes assessed in the review
The outcomes assessed were reduction in all fractures and hip fractures for each treatment regime.

Study designs and other criteria for inclusion in the review
The study designs included in the review were randomised trials and a placebo-controlled randomised trial. Other criteria included age, BMI and abode (community, sheltered accommodation and nursing homes).

Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Three primary studies were included in the review.

Methods of combining primary studies
Narrative method.

Results of the review
For subcutaneous administration of Vitamin D there was a reported reduction in all fractures by 25% and of hip fractures by 22%. For a regime of oral administration of Vitamin D and Calcium there was a reported 21% reduction in all fractures and a 28% reduction in hip fractures after 3 years, with a 55% reduction after five years. Another study reported 21.6% of all hip fractures occurring in women with low BMI (<20kg/m²) which represented 12.2% of the study population. Another study reported a 55% reduction in hip fractures after four-years administration of Vitamin D, translating these data into a discounted cumulative incidence of 5.34% for avoided hip fractures in women of low BMI and over 75 years of age.

Measure of benefits used in the economic analysis
Averted fractures (any site) and averted hip fractures.

Direct costs
Costs were taken from the British National Formulary (BNF) and Monthly Index of Medical Specialities (MIMS). For the parenteral regime, costs included: NHS fee for vaccination as an estimate for GPs’ fee for administration, syringes and needles. For the oral regime, GPs’ time was included in the annual health check at no extra cost. All costs and outcomes were discounted at 6% for four years. Additionally the cost of a hip fracture was used to calculate the net cost per averted hip fracture.

Indirect Costs
Not included.

Currency
UK pounds sterling ().

Sensitivity analysis
Not carried out.

Estimated benefits used in the economic analysis
For subcutaneous administration of Vitamin D there was a reported reduction in all fractures by 25% and of hip fractures by 22%. For oral administration of Vitamin D and Calcium there was a reported 21% reduction in all fractures and a 28% reduction in hip fractures after 3 years, with a 55% reduction after five years. Another study reported 21.6% of all hip fractures occurring in women with low BMI (<20kg/m²) which represented 12.2% of the study population. Another study reported a 55% reduction in hip fractures after four-years administration of Vitamin D,
translating these data into a discounted cumulative incidence of 5.34% for avoided hip fractures in women of low BMI and over 75 years of age.

Cost results
Inclusion of calcium significantly increased the cost to 14,240 for any fracture and 22,379 for hip fractures. An estimate of 5,000 was employed for a hip fracture.

Synthesis of costs and benefits
The costs and benefits were combined through the measure of cost per fracture avoided (community, community (low BMI), nursing home, nursing home (low BMI)). For example, the cost per averted fracture amongst women living in the community using vitamin D alone was 946, and the cost per averted hip fracture was 2,317. No incremental analysis was performed, but consistently the parenteral regime was cheaper than the oral one. The oral regime will, however, only save resources if targeted on high risk women (e.g. low BMI in nursing homes).

Authors’ conclusions
The authors concluded that preventing hip fractures using injectable vitamin D was likely to produce savings for the NHS. The use of calcium as a supplement will increase costs significantly unless the intervention is targeted on high risk women.

CRD Commentary
Overall the study appears of reasonable quality, however there are several study design problem areas (additional to the ones described by the authors) which may limit its external validity. Firstly, the economic question is based and heavily dependent on the estimates of effectiveness of the two regimes as judged by the studies reviewed. Unfortunately in the study little visibility is given to the limitations of the three effectiveness studies and consequently the reader is left with the uncertainty of the limitations of the economic analysis. This limitation is made worse by the absence of any explicit sensitivity analysis.

Secondly the text is not really sufficient to explain how the economic model applies to the four populations to which it refers. For example the study by Weinstein (reference 11 in the text), of unknown design, only appears in the results section and is used to justify a modelling of a 55% reduction in the incidence of hip fractures after four years of "taking vitamin D". Two of the studies reviewed came from outside of the UK (France and Finland) and, as such, there is doubt concerning their generalisability to the UK context. Finally costs appear to be mainly acquisition ones, but little information is given about the "cost of a hip fracture" (5,000) upon which the claim of resourcing savings is made.

Implications of the study
Overall prevention of osteoporotic fractures in elderly women may be cost saving, especially if parenteral Vitamin D is used in high risk groups such as low BMI nursing home residents.

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