Can hip protector use cost-effectively prevent fractures in community-dwelling geriatric populations?
Honkanen L A, Mushlin A I, Lachs M, Schackman B R

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
The study examined the use of external hip protectors (HPs) among community-dwelling individuals and among individuals permanently living in nursing-home settings.

Type of intervention
Primary prevention.

Economic study type
Cost-utility analysis.

Study population
The target population comprised a hypothetical cohort of community-dwelling individuals aged 65 years and older who had not fractured their hip before.

Setting
The setting was the community and institutional care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data used to populate the model were derived from studies published between 1988 and 2004. Most of the cost data were derived from sources published between 1993 and 2002. The price year was 2004.

Source of effectiveness data
The clinical parameters associated with HP use included:

- the age-, sex- and functional status-dependent transition probabilities in the community and nursing home for fracture;
- the change in functional status;
- the discontinuation of HP use and death;
- the annual transition probability to permanent nursing home, with and without fracture;
- the discontinuation rate for HP use;
- HP efficacy; and
- the daily use of HP.
Modelling
A state-transition Markov model was constructed using TreeAge Pro decision analysis software (TreeAge Software, Inc., Williamstown) to estimate the costs and benefits of HP use. The model was based on one developed for nursing-home residents (Honkanen et al. 2005, see 'Other Publications of Related Interest' below for bibliographic details), which was slightly modified to include community-dwelling individuals. A lifetime horizon was used in the model and the cycle length was 1 year. A number of modelling assumptions were presented. Age-, sex- and functional status-dependent transition probabilities were not reported in the current study, although the authors reported that they are available in a separate appendix which can be obtained from them on request.

Sources searched to identify primary studies
The clinical effectiveness data were derived from a number of published studies. However, apart from two cohort studies, the study designs were not reported in the current study. For further details the reader is referred to a separate appendix (available from the authors on request).

Methods used to judge relevance and validity, and for extracting data
The process used to identify the data was not reported. No inclusion criteria were specified for any of the parameters. The method used to select the estimates was neither reported nor discussed.

Measure of benefits used in the economic analysis
The measure of benefit was the quality-adjusted life-years (QALYs). The quality of life weights were derived from published literature. The one-time fracture-associated QALY decrement was obtained from published studies that used the time trade-off technique. The benefits were appropriately discounted at a rate of 3%.

Direct costs
The costs and the quantities were not analysed separately. The medical costs, cost of death and hip fracture repair costs were obtained from published sources and reflected third-party costs to Medicare and Medicaid. Costs incurred by patients were considered, but were excluded because the authors could not identify reliable sources of such data. The cost per HP was based on supplier costs. Lifetime costs were discounted at a rate of 3%. The cost data were adjusted for inflation using the Consumer Price Index. The price year was 2004.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
Productivity costs were not included in the analysis. Patient time costs were considered, but the authors could not identify reliable sources of such data.

Currency
US dollars ($).

Sensitivity analysis
Parameter uncertainty was investigated through one-way sensitivity analyses on all model parameters. The ranges used were obtained from the medical literature or, when published data were not available, parameters were tested using a range between one half and twice that of the baseline value. Using a cost-effectiveness threshold of $50,000, all variables that had an impact on this threshold in the one-way sensitivity analyses were tested in a multi-way probabilistic sensitivity analysis using Monte Carlo simulation. The model was simulated 10,000 times. However, the probability distributions assigned were not reported.
Estimated benefits used in the economic analysis
The estimated benefits were reported according to the age of the individual at which HP use was initiated.

In women, the use of HPs improved QALYs only in those who initiated HP use at the age of 75 years (0.0074 QALYs gained), 80 years (0.0203 QALYs gained) and 85 years (0.0406 QALYs gained).

In men, the use of HPs improved QALYs only in those who initiated HP use at the age of 85 years (0.0116 QALYs gained).

In all other cases, the use of HPs resulted in decreased QALYs.

Cost results
The use of HPs resulted in net cost-savings only in women and men initiating HP use at the age of 80 years ($68 and $65 per patient, respectively) and at the age of 85 years ($200 and $403 per patient, respectively).

Synthesis of costs and benefits
An incremental cost-utility analysis was performed. The HP programme was compared with no HP programme.

The analysis demonstrated that HP use was the dominant strategy only in women who initiated use at the age of 80 or 85 years, and in men who initiated use at the age of 85 years.

For women aged 75 years, the incremental cost-effectiveness ratio was $19,017 per QALY gained.

HP use was dominated in all other cases.

One-way sensitivity analyses demonstrated that the results were most sensitive to variation in the QALYs gained. In the case of no HP-related QALY reduction, HP use became a cost-effective option for all cohorts at a willingness-to-pay threshold of $50,000 per QALY.

Probabilistic sensitivity analyses demonstrated that, at the same threshold, HP use was cost-effective for women initiating use at age 75 and for men initiating use at age 85 years, in 68% and 61% of simulations, respectively.

Authors' conclusions
For both sexes, the use of hip protectors (HPs) appears to have been cost-effective compared with no HP use, but only in older patients.

CRD COMMENTARY - Selection of comparators
It would appear that HPs are used as a hip fracture prevention method in the authors' setting. You should decide if the comparator is a valid health technology in your own setting.

Validity of estimate of measure of effectiveness
The model parameters were derived from published studies. However, the study designs were not comprehensively discussed and it is not possible to judge the validity of the data given the information reported. No systematic search for data was reported and it is not possible to say if the best available evidence was used.

Validity of estimate of measure of benefit
The estimation of health benefits (QALYs) was modelled using a Markov model. The methods used to estimate the utility weights were not described in detail as they were taken from published literature. The benefits were appropriately discounted.
Validity of estimate of costs
The study reported that the costs were collected from a "societal perspective". However, productivity costs were not taken into consideration. In fact, the perspective of a third-party payer appears to have been adopted. The costs and the quantities were not analysed separately and only summary average costs per patient were reported, which will not enable the analysis to be easily reworked for other settings. The costs were treated deterministically, but extensive sensitivity analyses were conducted. The economic inputs were varied over plausible ranges, which will enhance the generalisability of the authors' results. The lifetime costs were discounted and the price year was reported, which will assist with reflation exercises in other settings.

Other issues
The authors compared their findings with those from other studies and discussed methodological differences. The issue of the generalisability of the study results to other settings was addressed by conducting extensive sensitivity analyses, and the results were presented appropriately. This enhances the external validity of the analysis. The authors' conclusions reflected the scope of the analysis. Several limitations to the study were reported. For instance, the efficacy of HPs was obtained from studies with limited internal validity. Also, direct patient costs (out-of-pocket) were not accounted for in the analysis and this might have led to an underestimation of the cost-effectiveness of HP use. Finally, HP-related QALY reductions were based on expert opinion, not empirical clinical data, and this might have affected the results.

Implications of the study
The authors recommend that HPs should be provided to older age cohorts for both sexes and their use should be covered by third-party payers. In addition, more research is needed to quantify HP-related QALY reductions and to identify the limitations of HPs to wearers and health professionals.

Source of funding
None stated.

Bibliographic details

PubMedID
17087691

DOI
10.1111/j.1532-5415.2006.00939.x

Other publications of related interest
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MeSH