Hip protectors decrease hip fracture risk in elderly nursing home residents: a Bayesian meta-analysis

CRD summary
The authors concluded that hip protectors reduce the risk of hip fracture in elderly nursing home residents, but these results might have been influenced by the methodological limitations of the included studies. This was a well-conducted and clearly reported review, and the conclusions are likely to be reliable.

Authors’ objectives
To determine if hip protectors reduce the risk of hip fractures in elderly residents of nursing homes, using a Bayesian approach.

Searching
MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, the Cochrane Database of Systematic Reviews, the Cochrane CENTRAL Register, ACP Journal Club Online, DARE, EMBASE, CINAHL and AgeLine were searched without language restrictions from inception to February 2006; the search terms were reported. In addition, references (including those of a recent Cochrane review) were screened and experts in the field contacted for details of further studies.

Study selection
Study designs of evaluations included in the review
Cluster randomised controlled trials (CRTs) and individually randomised controlled trials (IRTs) with a median or mean minimum follow-up period of 6 months were eligible for inclusion. Studies were excluded if they replaced patients who died or dropped out with other eligible patients. CRTs that did not report an adjustment for cluster randomisation were included. The duration of the included studies ranged from 11 to 15 months.

Specific interventions included in the review
Studies that evaluated a policy of providing free hip protectors were eligible for inclusion. The included studies evaluated the Safe-hip protector, the JOFA AB hip protector, and a hip protector designed by the study authors. One study used an educational cointervention or encouraged adherence.

Participants included in the review
Studies of elderly nursing home residents of either gender were eligible for inclusion in the review. One study included only women. No further details of the patients were reported.

Outcomes assessed in the review
Studies that assessed hip fractures were eligible for inclusion in the review.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected the studies and resolved any disagreements through consensus.

Assessment of study quality
Two reviewers independently assessed validity and resolved any disagreements through consensus. Studies were assessed for computerised central randomisation, use of sham hip protectors, extractable intention-to-treat data, losses to follow-up, adherence to hip protectors in treatment group, study duration, adjustment for clustering in the calculation of sample size and analysis, and the reporting of the intracluster correlation coefficient (ICC) or variance inflation factor (VIF).

Data extraction
Two reviewers independently extracted the data and resolved any disagreements through consensus. Where required,
authors were contacted for additional information.

**Methods of synthesis**

**How were the studies combined?**

Binary outcome data from CRTs and the IRT were combined using a Bayesian random-effects model. The pooled odds ratio with 95% credibility interval of a patient experiencing one or more hip fractures in the treatment group compared with the control group was calculated using Markov chain Monte Carlo simulations. The model included an adjustment for clustering. Noninformative priors were used. Assumptions used in the model were pre-specified.

**How were differences between studies investigated?**

Multiple sensitivity analyses were performed, imputing ICC values ranging from 0.01 to 0.5 for CRTs that did not report the ICC or the VIF.

**Results of the review**

Four randomised controlled trials (n=1,922) were included: one IRT (n=72) and three CRTs (n=1,850) that randomised according to nursing home or room number.

One study reported computerised central randomisation. None of the studies reported the use of sham hip protectors. All four studies reported extractable intention-to-treat data. Losses to follow-up (where reported) ranged from 2 to 47% across treatment groups, and adherence to hip protectors ranged from 34 to 70%. One of the three CRTs adjusted for clustering in the calculation of sample size and analysis. None of the CRTs reported the ICC or VIF.

Assuming a mean ICC of 0.0247 for all CRTs, hip protectors were associated with a statistically significant reduction in the odds of one or more hip fractures compared with control (odds ratio 0.40, 95% credibility interval: 0.25, 0.61). All studies showed a reduction in the percentage of patients with one or more hip fractures in the treatment group compared with the control group.

The results were robust in multiple sensitivity analyses imputing different values for the ICC. No evidence of nonconvergence was found in any analysis.

**Authors' conclusions**

Analysis based on a Bayesian approach showed that hip protectors reduce the risk of hip fracture in elderly nursing home residents. However, these results might have been influenced by the methodological limitations of the included studies.

**CRD commentary**

The review addressed a clear question that was defined in terms of the participants, intervention, outcomes and study design. Several relevant sources were searched and no language restrictions were applied. It is unclear whether unpublished studies were eligible, thus the potential for publication bias cannot be assessed. Methods were used to minimise reviewer error and bias in the study selection, validity assessment and data extraction processes. Validity was assessed using specified criteria and the results of this assessment reported. Assumptions underlying the Bayesian model were reported and multiple sensitivity analyses were used to examine the effect of varying the ICC value. This was a well-conducted and clearly reported review. The authors' conclusion takes account of the methodological limitations of the included studies, and is likely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that future randomised controlled trials should report the ICC and cluster sizes, and that guidelines for systematically reviewing and pooling data from CRTs should be developed.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.