Meta-analysis of the impact of 9 medication classes on falls in elderly persons
Woolcott JC, Richardson KJ, Wiens MO, Patel B, Marin J, Khan KM, Marra CA

CRD summary
The authors of this review concluded that use of sedatives and hypnotics, antidepressants and benzodiazepines showed a significant association with falls in elderly people. Despite some reporting limitations, the overall analysis appeared sound and the conclusions are likely to be reliable.

Authors' objectives
To update a previous meta-analysis (see Other Publications of Related Interest) on the association of medication use and falling in the elderly.

Searching
The authors searched EBM, CINAHL, EMBASE and MEDLINE databases for English-language articles published between April 1996 and August 2007. Search terms were reported. References of retrieved articles were searched and leading investigators in the area of falls in the elderly were contacted for further studies.

Study selection
Eligible studies needed to present original data from a randomised controlled trial (RCT), case-control study, cohort study or cross-sectional study. Studies needed to assess the association between medication use and falls in people aged 60 years or older. The authors did not state how many reviewers were involved in the process of study selection.

Nine drug classes were analysed: antihypertensives, diuretics, beta-blockers, sedatives and hypnotics, neuroleptics and antipsychotics, antidepressants, benzodiazepines, narcotics and non-steroidal anti-inflammatory drugs. Participants were located in long-term care facilities, hospital acute medical facilities or in the community. Mean age ranged from 65 to 90 years. Across the studies both incident reports and recall methods of fall ascertainment were used. The number and nature of confounders adjusted for in analyses varied across the studies. Follow-up in the prospective cohort studies ranged from six months to 37.8 months.

Assessment of study quality
Studies were assessed independently by at least two reviewers for methodological quality using a published checklist. Disagreements were resolved by a third author. Medication and fall ascertainment were rated as good or poor based on criteria from the previous systematic review.

Data extraction
All medication risks were required to be presented as odds ratios (ORs) associated with exposure or nonexposure or as 2x2 tables of reported falls by given exposure relative to non-exposure along with 95% confidence intervals (CIs). When exposure data were not published, authors were contacted to provide data necessary to calculate them. If the risks could not be calculated, the exposure was excluded from the final analysis. Where studies reported adjusted ORs, the covariates that were adjusted for were also extracted. Study-specific fall definitions were compared to two different consensus definitions. It appeared that two reviewers were involved in the process of data extraction for the review.

Methods of synthesis
Updated Bayesian pooled estimates of ORs with 95% credible intervals (Crls) were calculated for the impact of medication use on the likelihood of falling, using the results of the previous meta-analyses as prior unadjusted ORs. Uninformative priors were used for drug classes not assessed in the previous meta-analyses.

Sensitivity and subgroup analyses were conducted. Where fewer than four studies were available for a particular drug class, pooled ORs were calculated using non-Bayesian frequentist methods.
Results of the review

Twenty-two studies were included in the review (n=79,081): 10 cohort studies, five case-control studies and seven cross-sectional studies. Six studies were considered to have good medication or falls ascertainment.

Bayesian unadjusted OR estimates were: antihypertensive agents OR 1.24 (95% CrI 1.01 to 1.50); diuretics OR 1.07 (95% CrI 1.01 to 1.14); beta-blockers OR 1.01 (95% CrI 0.86 to 1.17); sedatives and hypnotics OR 1.47 (95% CrI 1.35 to 1.62); neuroleptics and antipsychotics OR 1.59 (95% CrI 1.37 to 1.83); antidepressants OR 1.68 (95% CrI 1.47 to 1.91); benzodiazepines OR 1.57 (95% CrI 1.43 to 1.72); narcotics OR 0.96 (95% CrI 0.78 to 1.18); and nonsteroidal anti-inflammatory drugs OR 1.21 (95% CrI 1.01 to 1.44). OR estimates were also presented using studies adjusting for a range of variables.

Stratification of studies had little effect on Bayesian OR estimates. However, an increased likelihood of falling was estimated for sedatives and hypnotics, neuroleptics and antipsychotics, antidepressants, benzodiazepines and nonsteroidal anti-inflammatory drugs in studies judged to have good medication and falls ascertainment. Full details of all results, including frequentist, were included in the paper.

Authors' conclusions

Use of sedatives and hypnotics, antidepressants and benzodiazepines demonstrated a significant association with falls in elderly people.

CRD commentary

Inclusion criteria for the review question were broadly defined. It was unclear whether more than one reviewer was involved in study selection to avoid the introduction of bias and error. Searching encompassed a range of databases and other sources of information, although it appeared that only English-language research was eligible, which raised the possibility of language bias. Study quality was assessed, but the results were not reported. Details of studies were provided. Meta-analysis appeared appropriate. Consideration was given to between-study clinical and statistical heterogeneity and the influence of confounding variables. Despite some reporting limitations, the overall analysis appeared sound and the conclusions are likely to be reliable.

Implications of the review for practice and research

Practice: Not stated

Research: Further research with larger sample sizes in both community and long-term care facility settings should improve the quality of information about fall risks and medication.

Funding

Canadian Institutes of Health Research, Michael Smith Foundation for Health Services Research and Government of Canada Research Chair in Pharmaceutical Outcomes.

Bibliographic details


PubMedID

19933955

DOI

10.1001/archinternmed.2009.357

Original Paper URL

http://archinte.ama-assn.org/cgi/content/abstract/169/21/1952

Other publications of related interest


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Accidental Falls /statistics & numerical data; Aged; Aged, 80 and over; Anti-Inflammatory Agents, Non-Steroidal /adverse effects; Antidepressive Agents /administration & dosage /adverse effects; Antipsychotic Agents /adverse effects; Bayes Theorem; Benzodiazepines /administration & dosage /adverse effects; Cardiovascular Agents /adverse effects; Case-Control Studies; Cross-Sectional Studies; Diuretics /adverse effects; Humans; Hypnotics and Sedatives /administration & dosage /adverse effects; Narcotics /adverse effects; Odds Ratio; Randomized Controlled Trials as Topic; Risk Factors; Sensitivity and Specificity

**AccessionNumber**
12009110243

**Date bibliographic record published**
25/11/2009

**Date abstract record published**
17/03/2010

**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.