Multifactorial assessment and targeted intervention for preventing falls and injuries among older people in community and emergency care settings: systematic review and meta-analysis

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BMJ 2008;336:130-3
doi:10.1136/bmj.39412.525243.BE

This article is an abridged version of a paper that was published on bmj.com on 18 December 2007. Cite this version as: *BMJ* 18 December 2007, 10.1136/bmj.39412.525243.BE

ABSTRACT

Objective To evaluate the effectiveness of multifactorial assessment and intervention programmes to prevent falls and injuries among older adults recruited to trials in primary care, community, or emergency care settings.

Design Systematic review of randomised and quasi-randomised controlled trials, and meta-analysis.

Data sources Six databases (Medline, Embase, CENTRAL, CINAHL, PsycINFO, Social Science Citation Index) to 22 March 2007, reference lists of included studies, and previous reviews.

Review methods Eligible studies were randomised or quasi-randomised trials that evaluated interventions to prevent falls that were based in emergency departments, primary care, or the community, that assessed multiple risk factors for falling and provided or arranged for treatments to address these risk factors.

Data extraction Outcomes were number of fallers, fall related injuries, fall rate, death, admission to hospital, contacts with health services, move to institutional care, physical activity, and quality of life. Methodological quality assessment included allocation concealment, blinding, losses and exclusions, intention to treat analysis, and reliability of outcome measurement.

Results 19 studies, of variable methodological quality, were included. The combined risk ratio for the number of fallers during follow-up among 18 trials was 0.91 (95% confidence interval 0.82 to 1.02) and for fall related injuries (eight trials) was 0.90 (0.68 to 1.20). No differences were found in admissions to hospital, emergency department attendance, death, or move to institutional care. Subgroup analyses found no evidence of different effects between interventions in different locations, populations selected for high risk of falls or unselected, and multidisciplinary teams including a doctor, but interventions that actively provide treatments may be more effective than those that provide only knowledge and referral.

Conclusions Evidence that multifactorial fall prevention programmes in primary care community or emergency care settings are effective in reducing the number of fallers or fall related injuries is limited. Data were insufficient to assess fall and injury rates.

INTRODUCTION

Assessment of multiple risk factors for falls followed by targeting interventions to an individual's risk factors is thought to lead to greater reductions in falls than dealing with risk factors in isolation. The UK's national service framework for older people[1] required the National Health Service to establish multifactorial programmes for fall prevention. Such services (falls clinics) exist throughout the UK NHS but vary in location, skill mix, assessments, and interventions offered.[2] We re-examined the evidence for the effectiveness of multifactorial assessment and targeted intervention for fall prevention.

METHODS

We included randomised and quasi-randomised controlled trials of interventions to prevent falls or fall related injuries that carried out a multifactorial falls risk assessment; provided treatments by healthcare professionals, directly or by referral; was delivered to individuals; and was a service based in an emergency department, primary care, or the community. Control groups could receive standard care or no fall prevention intervention.

We considered all studies referenced by the Cochrane review "Interventions for preventing falls in elderly people."[3] We applied its search strategy to six databases (see bmj.com) and we also searched the databases using extra terms for multifactorial fall prevention programmes and for older adults (see bmj.com). The reference lists of two other reviews[4,5] and studies considered for inclusion were scanned for other potentially eligible studies.

Study selection, data extraction, and quality assessment

We extracted data on study and intervention characteristics, quality assessment, outcomes, composition of the multidisciplinary teams, and the main types of assessment and intervention. We recorded data on the number of fallers, fall rate, number of recurrent fallers (≥2 falls in a predefined period), time to first fall, fall related injuries, admissions to hospital, unscheduled contacts with health services, death, move to institutional care, health related quality of life, and physical activity or mobility. We used

the quality assessment checklist published in the Cochrane review,[3] with the addition of two questions about cluster randomised trials (see bmj.com).

Statistical methods

We used random effects meta-analysis[6] for statistical combination of the results of studies and measured heterogeneity using the I^2 statistic.[7] For studies with follow-up of more than 12 months we used data collected at 12 months if available. For studies with less than 12 months of follow-up we used the longest duration reported. If data were not reported according to intention to treat we attempted to restore participants to the correct group. When the number reported was not clear we used the number randomised as the denominator.

We carried out four subgroup analyses; hospital based versus primary care or community based studies, populations selected for high risk of falling versus unselected populations, intervention team including a doctor versus no doctor, and interventions that provided treatments to address risk factors versus those that provided only knowledge and referral. We used interaction tests for subgroup analyses[8] and carried them out only for outcomes when there were at least two trials in each of the subgroups.

We included cluster randomised trials in the analyses along with individually randomised trials. The numerator and denominator for each outcome were adjusted by dividing by the design effect, using an estimate of the intracluster correlation coefficient from the study or assuming a value of 0.01.[9] We did sensitivity analyses assuming a range of intracluster correlation coefficients from 0.001 to 0.1.

RESULTS

Overall, 1633 references were identified, of which 44 were potentially eligible studies. Nineteen studies from eight countries (see bmj.com), totalling 6397 participants, were included (see bmj.com). Two were cluster randomised, using doctors and practices as the unit of randomisation.[w2 w16] Two[w11 w18] randomised participants to three arms; two arms were relevant to this review. Thirteen studies recruited high risk populations and six unselected populations.

In 12 studies the control group received usual care or no intervention. In four studies[w11 w13 w15 w16] participants received multifactorial risk assessment and then were randomised to individualised interventions or not. These studies were included with the others in analyses. In three studies the control groups received an intervention unconnected with fall prevention.[w6 w7 w16]

Studies varied in the risk assessments carried out. Most of the studies, however, included assessments of gait and balance (n=13), drug review (n=13), and assessment of the home environment (n=16). Three studies used screening tests for risk of falling whose components were not specified but probably included these three assessments. Interventions to reduce risk factors were more variable. Some studies provided limited treatment options such as referral to a doctor, supplemented by information. Others included a range of potential interventions.

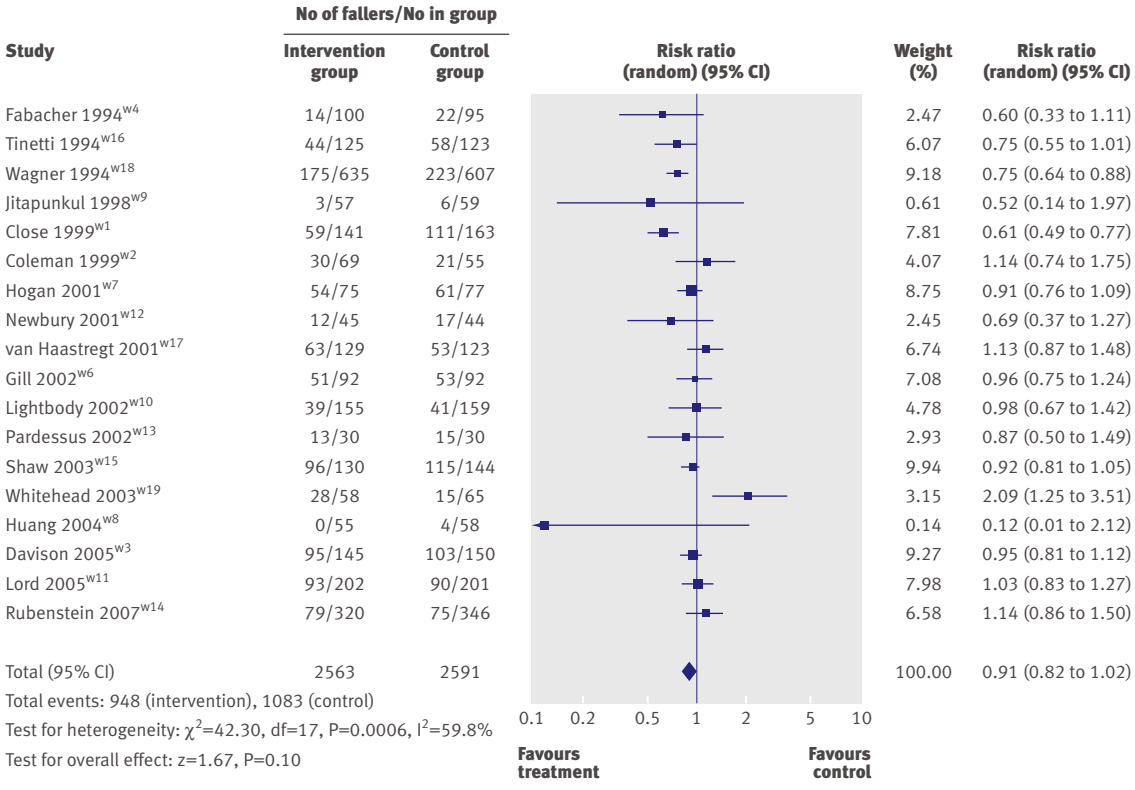

Fig 1 Meta-analysis of number of fallers during follow-up

Some studies had major methodological drawbacks. The mean quality score was 23.8 of a possible 36 (omitting the two items for cluster randomised trials; range 18-28, also see bmj.com). Only five of the 17 individually randomised studies reported methods of randomisation with secure allocation concealment, and one of these stated only that allocations were concealed. One study was quasi-randomised[w14] and the other 11 did not report sufficient information or used insecure methods.

One study[w17] achieved partial blinding of care providers by ensuring that doctors were not aware of patients' allocations; however, nurses providing the intervention were not blinded. One study[w15] reported blinded outcome assessment and five used partial blinding of outcome assessment, in which staff who reviewed outcomes or interviewed participants were not aware of allocations.[w3 w7 w12 w14 w16]

Five studies reported more than 20% losses and exclusions of randomised participants. Principles of intention to treat analysis were adhered to poorly in several studies.

Follow-up duration was variable, ranging from two months[w8] to three years.[w9] Fourteen studies reported outcomes for 12 months and four of these studies also carried out a longer follow-up. Data for 12 months' follow-up were not reported by five studies.[w5 w8-w10 w19] One study[w4] used different methods for follow-up of the trial arms.

Eleven studies used reliable methods to collect data; most used a diary or calendar, plus telephone contact if a calendar was not returned or a fall was reported. Three studies recorded falls only at intervals, and five collected data on falls only at the end of follow-up.

Of the two cluster randomised trials included in the review, one[w2] reported the use of adequate methods of analysis to account for clustering.[w16]

No clear overall effect was found on the number of fallers during follow-up (fig 1) or fall related injuries (fig 2). No difference between the groups was detected in any of the other outcomes, with the exception of attendance at a general practitioner's surgery, which increased in the intervention group in one study[w10] (see bmj.com). No studies reported quantitative data on health related quality of life or physical activity, and it was not possible to extract data on fall rates.

Considerable heterogeneity was found in the analyses of fallers (I^2=59.8%), fall related injuries (55.6%), and recurrent falls (74.6%). The interaction tests did not suggest evidence of a difference in treatment effect between the subgroups for site of delivery, whether a doctor was involved, and whether participants had been selected for higher risk of falls (see bmj.com). A larger reduction was found in the number of fallers in trials with higher intensity interventions, which was of borderline statistical significance (see bmj.com): higher intensity subgroup risk ratio 0.84 (95% confidence interval 0.74 to 0.96), knowledge and referral subgroup 1.00 (0.82 to 1.22); interaction test χ^2=3.95, P=0.05.

Using values between 0.001 and 0.1 for the intracluster correlation coefficient for the two cluster randomised trials made little difference to the analyses, and the conclusions remained unchanged for all outcomes.

DISCUSSION

We found little evidence to support the effectiveness of multifactorial interventions to prevent falls and injuries in older people in community and emergency care settings. No clear reduction was found in the number of people having at least one fall, the number having fall related injuries, or use of health services. For some outcomes the results were heterogeneous; subgroup analyses showed no differences in effectiveness between hospital and primary care based studies, populations with risk factors and unselected populations, and interventions that included a doctor. One subgroup analysis suggested that interventions that provide treatments for risk factors may be more effective than those that provide only knowledge and referral.

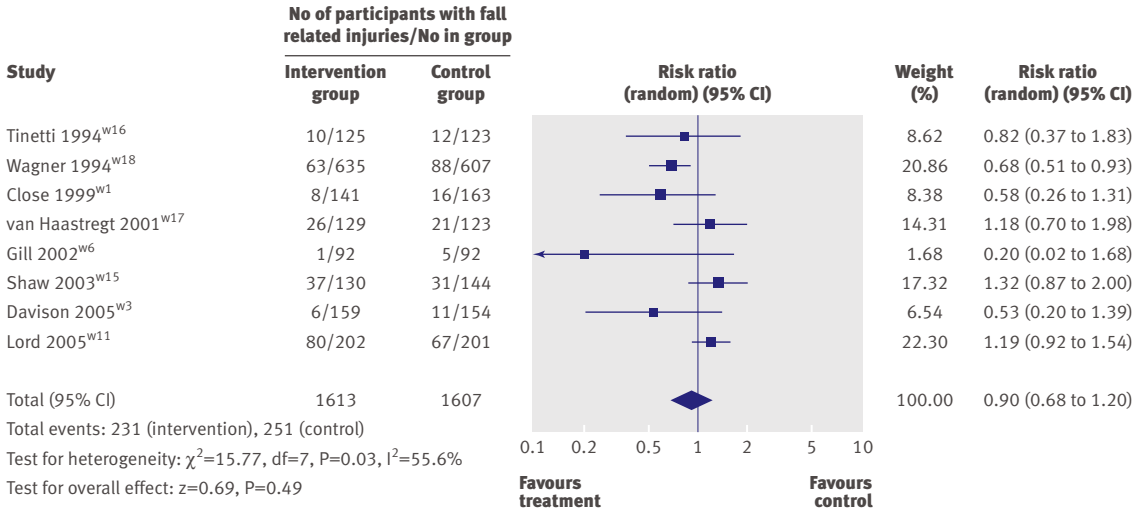

Fig 2 Meta-analysis of fall related injuries

WHAT IS ALREADY KNOWN ON THIS TOPIC

Systematic reviews suggest that the most effective way to reduce falls is multifactorial risk assessment and individualised interventions against risk factors

This type of intervention has been recommended for the UK National Health Service, and a variety of such services have been introduced

WHAT THIS STUDY ADDS

Evidence of benefit from multifactorial risk assessment and targeted intervention for falls in primary care, community, or emergency care settings was limited and reductions in the number of fallers may be smaller than thought

Current evidence is not conclusive because of methodological shortcomings and lack of data on important outcomes such as fall rates and injuries

Our analysis suggests that any benefits from this type of intervention might be smaller than previously thought. This conclusion is mainly based on the analysis of the number of fallers, which was the most commonly reported outcome. We were unable to synthesise data for rates of falling or injuries, identified as essential outcomes for fall prevention trials.[10] It is possible that multifactorial interventions might reduce the rate of falls without affecting the number of fallers.

Previous reviews have identified multifactorial risk assessment and individualised interventions as probably one of the most effective fall prevention interventions. The differences between our conclusions and those of others are largely due to the set of included studies. The Cochrane review included 11 trials (of which we excluded two from this review) in four separate meta-analyses and its conclusions were based on two analyses of unselected populations (four trials) and populations with previous falls (five trials): risk ratios for number of fallers 0.73 (95% confidence intervals 0.63 to 0.85) and 0.86 (0.76 to 0.98). Our meta-analysis of the number of fallers included 18 trials, six of which were not in the Cochrane review. These new trials showed either no significant reduction in the number of fallers in the intervention group or, in one case, a significant increase.

Limitations of included studies

Most of the trials were small and many had methodological drawbacks. A major limitation of the existing evidence is the lack of data on important outcomes. Only eight studies reported fall related injuries and they recorded this outcome in different ways (see bmj.com). None reported the rate of peripheral fractures, recommended as the only robust method of measuring fall related injuries.[10] Several important outcomes, such as quality of life, were not reported.

The meta-analyses of the number of fallers, recurrent fallers, and fall related injuries showed statistical heterogeneity, which was not explained by subgroup analyses. Studies were carried out in several countries and differences between the populations or healthcare systems might have contributed to the heterogeneity. Methodological heterogeneity is also likely to have played a part in the observed statistical heterogeneity. The variable risk of bias in the studies may have led to variation in the estimates of treatment effect. Similarly, different durations of follow-up may have led to heterogeneity of effect estimates. Fourteen of the 19 studies reported data at 12 months, with four using shorter durations and one presenting data at three years only.

Differences were found between studies in recording of outcomes, notably the number of fallers; some studies reported only the number who had fallen in the past three months rather than over the whole follow-up period. Also, some studies excluded particular types of falls (for example, those due to an acute medical event).

Implications for clinical practice and for research

Although multifactorial fall risk assessment and intervention seems a plausible strategy for preventing falls and fall related injuries in older people it is not supported by strong evidence. Current evidence suggests that it may reduce the number of fallers by only a modest amount. Evidence of its effects on other outcomes such as the rate of falls and injuries is insufficient. Higher intensity interventions that provide treatments to address risk factors, rather than information and referral, may be more effective.

We thank Lesley Gillespie for her detailed and helpful comments on an earlier draft and Chris McCarthy for help with data extraction.
Contributors: See bmj.com.
Funding: This study was funded by the National Institute of Health Research service delivery and organisation programme, project No SDO/139/2006.
Competing interests: None declared.
Ethical approval: Not required.
Provenance and peer review: Not commissioned; externally peer reviewed.

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Accepted: 5 November 2007