Interventions for preventing falls in older people living in the community (Review)

Gillespie LD, Robertson MC, Gillespie WJ, Lamb SE, Gates S, Cumming RG, Rowe BH

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[Intervention Review]

Interventions for preventing falls in older people living in the community

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ABSTRACT

Background

Approximately 30% of people over 65 years of age living in the community fall each year.

Objectives

To assess the effects of interventions to reduce the incidence of falls in older people living in the community.

Search strategy

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register, CENTRAL (*The Cochrane Library* 2008, Issue 2), MEDLINE, EMBASE, CINAHL, and Current Controlled Trials (all to May 2008).

Selection criteria

Randomised trials of interventions to reduce falls in community-dwelling older people. Primary outcomes were rate of falls and risk of falling.

Data collection and analysis

Two review authors independently assessed trial quality and extracted data. Data were pooled where appropriate.

Main results

We included 111 trials (55,303 participants).

Multiple-component group exercise reduced rate of falls and risk of falling (rate ratio (RaR) 0.78, 95%CI 0.71 to 0.86; risk ratio (RR) 0.83, 95%CI 0.72 to 0.97), as did Tai Chi (RaR 0.63, 95%CI 0.52 to 0.78; RR 0.65, 95%CI 0.51 to 0.82), and individually prescribed multiple-component home-based exercise (RaR 0.66, 95%CI 0.53 to 0.82; RR 0.77, 95%CI 0.61 to 0.97).

Assessment and multifactorial intervention reduced rate of falls (RaR 0.75, 95%CI 0.65 to 0.86), but not risk of falling.

Overall, vitamin D did not reduce falls (RaR 0.95, 95%CI 0.80 to 1.14; RR 0.96, 95%CI 0.92 to 1.01), but may do so in people with lower vitamin D levels.

Overall, home safety interventions did not reduce falls (RaR 0.90, 95%CI 0.79 to 1.03; RR 0.89, 95%CI 0.80 to 1.00), but were effective in people with severe visual impairment, and in others at higher risk of falling. An anti-slip shoe device reduced rate of falls in icy conditions (RaR 0.42, 95%CI 0.22 to 0.78).

Gradual withdrawal of psychotropic medication reduced rate of falls (RaR 0.34, 95%CI 0.16 to 0.73), but not risk of falling. A prescribing modification programme for primary care physicians significantly reduced risk of falling (RR 0.61, 95%CI 0.41 to 0.91).

Pacemakers reduced rate of falls in people with carotid sinus hypersensitivity (RaR 0.42, 95%CI 0.23 to 0.75). First eye cataract surgery reduced rate of falls (RaR 0.66, 95%CI 0.45 to 0.95).

There is some evidence that falls prevention strategies can be cost saving.

Authors' conclusions

Exercise interventions reduce risk and rate of falls. Research is needed to confirm the contexts in which multifactorial assessment and intervention, home safety interventions, vitamin D supplementation, and other interventions are effective.

PLAIN LANGUAGE SUMMARY

Interventions for preventing falls in older people living in the community

As people get older, they may fall more often for a variety of reasons including problems with balance, poor vision, and dementia. Up to 30% may fall per year. Although one in five falls may require medical attention, less than one in 10 results in a fracture. Fear of falling can result in self-restricted activity levels. It may not be possible to prevent falls completely, but people who tend to fall frequently may be enabled to fall less often.

This review looked at which methods are effective for older people living in the community, and includes 111 randomised controlled trials, with a total of 55,303 participants.

Exercise programmes may target strength, balance, flexibility, or endurance. Programmes that contain two or more of these components reduce rate of falls and number of people falling. Exercising in supervised groups, participating in Tai Chi, and carrying out individually prescribed exercise programmes at home are all effective.

Multifactorial interventions assess an individual person's risk of falling, and then carry out or arrange referral for treatment to reduce their risk. They have been shown in some studies to be effective, but have been ineffective in others. Overall current evidence shows that they do reduce rate of falls in older people living in the community. These are complex interventions, and their effectiveness may be dependent on factors yet to be determined.

Taking vitamin D supplements probably does not reduce falls, except in people who have a low level of vitamin D in the blood. These supplements may be associated with high levels of calcium in the blood, gastrointestinal discomfort, and kidney disorders.

Interventions to improve home safety do not seem to be effective, except in people at high risk, for example with severe visual impairment. An anti-slip shoe device worn in icy conditions can reduce falls.

Some medications increase the risk of falling. Ensuring that medications are reviewed and adjusted may be effective in reducing falls. Gradual withdrawal from some types of drugs for improving sleep, reducing anxiety and treating depression has been shown to reduce falls.

Cataract surgery reduces falls in people having the operation on the first affected eye. Insertion of a pacemaker can reduce falls in people with frequent falls associated with carotid sinus hypersensitivity, a condition which may result in changes in heart rate and blood pressure.

BACKGROUND

Description of the condition

About a third of community-dwelling people over 65 years old fall each year (Campbell 1990; Tinetti 1988), and the rate of fall-related injuries increases with age (Sattin 1992). Falls can have serious consequences but if injury does occur it is usually minor: bruising, abrasions, lacerations, strains and sprains. Less than 10% of falls result in fracture (Campbell 1990; Tinetti 1988); however, fall-associated fractures in older people are a significant source of morbidity (Sattin 1992) and mortality (Keene 1993).

Despite early attempts to achieve a consensus definition of "a fall" (Buchner 1993; Kellogg 1987) many definitions still exist in the literature. Investigators have adapted these consensus definitions for use with specific target populations or interventions (Hauer 2006; Zecevic 2006). It is particularly important to have a clear, simple definition for studies in which older people document their own falls; their concept of a fall may differ from that of researchers or health care professionals (Zecevic 2006). A recent consensus statement defines a fall as "an unexpected event in which the participant comes to rest on the ground, floor, or lower level" (Lamb 2005). The wording recommended when asking participants is "In the past month, have you had any fall including a slip or trip in which you lost your balance and landed on the floor or ground or lower level?" (Lamb 2005).

Risk factors for falling have been identified by epidemiological studies of varying quality. These are summarised in the guideline produced by the American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention (AGS/BGS 2001). About 15% of falls result from an external event that would cause most people to fall, a similar proportion have a single identifiable cause such as syncope or Parkinson's disease, and the remainder result from multiple interacting factors (Campbell 2006).

Since many risk factors appear to interact in those who suffer fall-related fractures (Cummings 1995), it is not clear to what extent interventions designed to prevent falls will also prevent hip or other fall-associated fractures. Falls can also have psychological consequences: fear of falling and loss of confidence that can result in self-restricted activity levels resulting in reduction in physical function and social interactions (Vellas 1997). Falling puts a strain on the family and is an independent predictor of admission to a nursing home (Tinetti 1997).

Description of the intervention

Many preventive intervention programmes based on reported risk factors have been established and evaluated (AGS/BGS 2001). These have included exercise programmes to improve strength or balance, education programmes, medication optimisation, and environmental modification. In some studies single interventions have been evaluated; in others, interventions with more than one component have been used. Delivery of multiple-component interventions may be based on individual assessment (a multifactorial intervention) or the same components are provided to all participants (a multiple intervention).

Why it is important to do this review

The best evidence for the efficacy of interventions to prevent falling should emerge from large, well-conducted randomised controlled trials, or from meta-analysis of smaller trials. A systematic review is required to identify the large number of trials in this area and summarise the evidence for health care professionals, researchers, policy makers and others with an interest in this topic. We have split the previous Cochrane review "Interventions for preventing falls in elderly people" (Gillespie 2003) into two reviews to separate interventions for preventing falls in older people living in the community from those in nursing care facilities and hospitals (Cameron 2005). This is partly due to the increase in the number of trials in both settings, but also because participant characteristics and the environment may warrant different types of interventions in the different settings, possibly implemented by people with different skill mixes. Gillespie 2003 has now been withdrawn from *The Cochrane Library*.

OBJECTIVES

To summarise the best evidence for effectiveness of interventions designed to reduce the incidence of falls in older people living in the community.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials and quasi-randomised trials (e.g. allocation by alternation or date of birth).

Types of participants

We included trials of interventions to prevent falls if they specified an inclusion criterion of 60 years or over, or clearly recruited participants described as elderly, seniors or older people. Trials that

included younger participants, for example recruited on the basis of a medical condition such as a stroke or Parkinson's disease, have been included if the mean age minus one standard deviation was more than 60 years. We included trials where the majority of participants were living in the community, either at home or in places of residence that, on the whole, do not provide residential health-related care or rehabilitative services, for example hostels, retirement villages, or sheltered housing. Trials with mixed populations (community and higher dependency places of residence) were either included in this review, or the Cochrane review on fall prevention in nursing care facilities or hospitals (Cameron 2005); however, they were eligible for inclusion in both reviews if data were provided for subgroups based on setting. Inclusion in either review was determined by discussion between the authors of both reviews and based on the proportion of participants from each setting.

Types of interventions

This review focusses on any intervention designed to reduce falls in older people (i.e. designed to minimise exposure to, or the effect of, any risk factor for falling). We included trials where the intervention was compared with 'usual care' (i.e. no change in usual activities), or a 'placebo' control intervention (i.e. an intervention that is not thought to reduce falls, for example general health education or social visits). Studies comparing two types of fall-prevention interventions were also included.

Types of outcome measures

We included only trials that reported outcomes relating to rate or number of falls, or number of participants sustaining at least one fall during follow up (fallers). Prospective daily calendars returned monthly for at least one year is the preferred method for recording falls (Lamb 2005). However, falls outcome measurement in the included studies vary and we have included trials where falls were recorded retrospectively, or not monitored continuously throughout the trial. The following are the outcomes for the review.

Primary outcomes

- Rate of falls
- Number of fallers

Secondary outcomes

- Number of participants sustaining fall-related fractures.
- Adverse effects of the interventions.
- Economic outcomes.

Search methods for identification of studies

Electronic searches

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (May 2008), the Cochrane Central Register of Controlled Trials (The Cochrane Library 2008, Issue 2), MEDLINE (1950 to May 2008), EMBASE (1988 to May 2008), CINAHL (Cumulative Index to Nursing and Allied Health Literature) (1982 to May 2008), PsycINFO (1967 to Sept 2007) and AMED (Allied and Complementary Medicine) (1985 to Sept 2007). Ongoing trials were identified by searching the UK National Research Register (NRR) Archive (to September 2007), Current Controlled Trials (accessed 31 March 2008), and the Australian New Zealand Clinical Trials Registry (accessed 31 March 2008). We did not apply any language restrictions.

In MEDLINE (OvidSP) subject-specific search terms were combined with the sensitivity-maximising version of the MEDLINE trial search strategy (Lefebvre 2008), but without the drug therapy floating subheading which produced too many spurious references for this review. The strategy was modified for use in *The Cochrane Library,* EMBASE, and CINAHL (*see* Appendix 1 for details).

Searching other resources

We checked reference lists of articles. Ongoing and unpublished trials were also identified by contacting researchers in the field.

Data collection and analysis

Selection of studies

One review author (LDG) screened the title, abstract and descriptors of identified studies for possible inclusion. From the full text, two authors independently assessed potentially eligible trials for inclusion and resolved any disagreement through discussion. We contacted authors for additional information if necessary.

Data extraction and management

Data were independently extracted by pairs of review authors using a pre-tested data extraction form. Disagreement was resolved by consensus, or third party adjudication.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias using the recommendations in the Cochrane Handbook (Higgins 2008a) (*see* 'Differences between protocol and review'). The following domains were assessed: sequence generation; allocation concealment;

and blinding of participants, personnel and outcome assessors (for falls and fractures) (*see* Higgins 2008a for criteria used for judging risk of bias). We also included an item assessing risk of bias in recall of falls (Was ascertainment of fall outcomes reliable?). This was coded 'yes' (low risk of bias) if the study used active registration of falls, for example a falls diary; 'no' (high risk of bias) if ascertainment relied on participant recall at longer intervals during the study or at its conclusion; and 'unclear' (uncertain risk of bias) if there was retrospective recall over a short period only, or details of ascertainment were not described. Review authors were not blinded to author and source institution. They did not assess their own trials. Disagreement was resolved by consensus, or third party adjudication.

Measures of treatment effect

We used results reported at one year if these were available for trials that monitored falls for longer than one year.

We used the generic inverse variance method for the presentation of results and pooling of data separately for rate of falls and number of people falling (fallers). This option enables pooling of adjusted and unadjusted treatment effect estimates (rate ratios or risk ratios) reported in the paper or calculated from data presented in the paper. The generic inverse variance option requires entering the natural logarithm of the rate ratio or risk ratio and its standard error; we calculated these in Excel. When rate ratios or risk ratios were not provided by the authors but raw data were available, we first used Excel to calculate an incidence rate ratio and 95% confidence interval, and Stata to calculate a risk ratio and 95% confidence interval. For cluster randomised trials, we performed adjustments for clustering if this was not done in the published report (*see* 'Unit of analysis issues').

Data relating to rate of falls

For the rate of falling based on the number of falls over a period of time, if appropriate data were available we present a rate ratio and 95% confidence interval for each study using the generic inverse variance option. The rate ratio compares the rate of events (falls) in the two groups during the trial.

We used a rate ratio (for example incidence rate ratio or hazard ratio for all falls) and 95% confidence interval if these were reported in the paper. If both adjusted and unadjusted rate ratios were reported we have used the unadjusted estimate, unless the adjustment was for clustering. If a rate ratio was not reported we have calculated this, and a 95% confidence interval, if appropriate raw data were reported. We used the reported rate of falls (falls per person year) in each group and the total number of falls for participants contributing data, or we calculated the rate of falls in each group from the total number of falls and the actual total length of time falls were monitored (person years) for participants contributing data. In cases where data were only available for people who had completed the study, or where the trial authors had stated there were no losses to follow up, we assumed that these participants had been followed up for the maximum possible period.

Data relating to number of fallers or participants with fall-related fractures

For these dichotomous outcomes, if appropriate data were available we present a risk ratio and 95% confidence interval for each study using the generic inverse variance option. A risk ratio compares the number of participants in each group with one or more fall events.

We used a reported estimate of effect (risk ratio (relative risk), odds ratio or hazard ratio for first fall) and 95% confidence interval if available. If both adjusted and unadjusted estimates were reported we used the unadjusted estimate, unless the adjustment was for clustering. If an effect estimate and 95% confidence interval was not reported and appropriate data were available, we calculated a risk ratio and 95% confidence interval. For the calculations we used the number of participants contributing data in each group if this was known; if not reported we used the number randomised to each group.

Unit of analysis issues

Data from trials which were cluster randomised, for example by medical practice, were adjusted for clustering (Higgins 2008b) using an intra-class correlation coefficient (ICC) of 0.01 reported in Smeeth 2002. We ignored the possibility of a clustering effect in trials randomising by household.

Assessment of heterogeneity

Heterogeneity between pooled trials was assessed using a combination of visual inspection of the graphs along with consideration of the Chi^2 test (with statistical significance set at $P < 0.10$), and the I^2 statistic (Higgins 2003).

Data synthesis

We have pooled results of trials with comparable interventions and participant characteristics using the generic inverse variance method in Review Manager (RevMan 5). We calculated pooled rate ratios for falls and risk ratios for fallers with 95% confidence intervals using the fixed-effect model. Where there was substantial statistical heterogeneity we pooled the data, if appropriate, using the random-effects model.

Results from trials in which participants have a single condition (e.g. stroke, Parkinson's disease) have been included in the analyses with the conditions shown in footnotes.

Grouping of studies for data synthesis

We grouped interventions for pooling using the fall prevention classification system that has been developed by the Prevention of Falls Network Europe (ProFaNE). Interventions have been grouped by combination (single, multiple or multifactorial) and then by the type of intervention (descriptors). The possible intervention descriptors are: exercises, medication (drug target i.e. withdrawal, dose reduction or increase, substitution, provision), surgery, management of urinary incontinence, fluid or nutrition therapy, psychological interventions, environment/assistive technology, social environment, interventions to increase knowledge, other interventions (Lamb 2007).

Subgroup analysis and investigation of heterogeneity

We minimised heterogeneity as much as possible by grouping trials as described previously. In some categories of intervention, for example surgery, data have been pooled within meaningful subgroups e.g. cataract surgery.

We explored significant heterogeneity by carrying out the following subgroup analyses.

- Higher versus lower falls risk at enrolment (i.e. comparing trials with participants selected for inclusion based on history of falling or other specific risk factors for falling, versus unselected).

- For the multifactorial interventions we subdivided trials that actively provided treatment to address identified risk factors versus those where the intervention consisted mainly of referral to other services or the provision of information to increase knowledge.

We used the test for subgroup differences available in RevMan 5 for the fixed-effect model to determine if the results for subgroups were statistically significantly different when data were pooled using this method. We used meta-regression in Stata to test for subgroup differences when the random-effects model was used.

Economics issues

We have noted the results from any comprehensive economic evaluations incorporated in the included studies, and report the costs and consequences of the interventions as stated by the authors. We also extracted other healthcare cost items when reported.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of studies awaiting classification; Characteristics of ongoing studies.

Results of the search

The search strategies identified a total of 4372 references (*see* Appendix 1). Removal of duplicates and spurious records resulted in 3200 references. We obtained copies of 621 papers for consideration.

Included studies

This review contains 111 trials with 55,303 participants. Details are provided in the Characteristics of included studies, and are briefly summarised below. Due to the size of the review not all links to references have been inserted in the text, but can be viewed in Appendix 2.

Design

The majority of included studies were individually randomised. Ten studies were cluster randomised by community physician practice, retirement village, or senior centre (Assantachai 2002; Coleman 1999; Lord 2003; Pit 2007; Reinsch 1992; Rubenstein 2007; Spice 2009; Steinberg 2000; Tinetti 1994; Wolf 2003). Four studies included individually randomised participants but also cluster randomised by household where more than one person in the household was recruited (Brown 2002; Carpenter 1990; Stevens 2001; Van Rossum 1993).

Sample sizes

Included trials ranged in sample size from 10 (Lannin 2007) to 9940 (Smith 2007). The median sample size was 239 participants.

Setting

Location

The included trials were carried out in 15 countries: Australia (N = 20), Canada (N = 7), Chile (N = 1), China (N = 1), Finland (N = 3), France (N = 3), Germany (N = 3), Japan (N = 3), Netherlands (N = 5), New Zealand (N = 5), Norway (N = 1), Switzerland (N = 2), Taiwan (N = 3), Thailand (N = 2), United Kingdom (N = 22), USA (N = 29) (*see* Appendix 2). Latham 2003 was conducted in Australia and New Zealand.

Sampling frame

Participants were recruited using a variety of sampling frames: nine trials recruited from specialist clinics or disease registers (Ashburn 2007; Campbell 2005; Foss 2006; Grant 2005; Green 2002; Harwood 2005; Liu-Ambrose 2004; Sato 1999; Swanenburg 2007); five from geriatric medicine or falls clinics (Cumming 2007; Dhesi 2004; Hill 2000; Steadman 2003; Suzuki 2004);

seven from state or private health care databases (Buchner 1997a; Li 2005; Lord 2005; Luukinen 2007; Speechley 2008; Wagner 1994; Wyman 2005); six recruited participants who had attended hospital emergency departments after a fall (Close 1999; Davison 2005; Kenny 2001; Kingston 2001; Lightbody 2002; Whitehead 2003) and two trials enrolled some of their participants from emergency departments, but also from a primary care setting (Hendriks 2008; Prince 2008). Two trials recruited from ambulatory care centres (Rubenstein 2000; Rubenstein 2007).

Nine trials recruited participants at discharge from in-patient care. Of these, three (Latham 2003; Nikolaus 2003; Pardessus 2002) included people who had been admitted for investigation of a fall or who were considered frail, three recruited older people who had sustained a hip fracture (Harwood 2004; Huang 2005; Sherrington 2004), two (Hauer 2001; Lannin 2007) recruited prior to discharge from a rehabilitation unit, and Cumming 1999 recruited from hospital wards, clinics and day care centres.

Three trials recruited from electoral rolls (Day 2002; Fabacher 1994; Stevens 2001), one (Korpelainen 2006) from a birth cohort, and four from retirement communities (Lord 2003; Resnick 2002; Wolf 1996; Wolf 2003).

Participants for 14 trials were recruited from primary care patient registers (*see* Appendix 2). One study (Trivedi 2003) recruited both from primary care patient registers and from a database of participants in a large cohort study. Dukas 2004 recruited from amongst participants in a long-standing cohort study.

The remaining 48 trials recruited by advertisement, or through social organisations such as senior citizens centres, or reported the sampling frame as "community dwelling" (*see* Appendix 2).

Participants

The inclusion/exclusion criteria and other participant details are listed for each study in the Characteristics of included studies.

All participants were women in 23 trials (*see* Appendix 2); two trials only recruited men (Rubenstein 2000; Speechley 2008). The remaining studies recruited men and women in varying proportions, with men in the majority in only nine trials (Ashburn 2007; Carter 1997; Coleman 1999; Fabacher 1994; Green 2002; Huang 2004; Rubenstein 2007; Schrijnemaekers 1995; Trivedi 2003).

Fifty-two included studies specified a history of falling or evidence of one or more risk factors for falling in their inclusion criteria. The remaining 59 studies recruited participants without a specific history of falling, or risk factors for falling other than age or frailty (*see* Appendix 2). Lower serum vitamin D, i.e. vitamin D insufficiency or deficiency, was an inclusion criterion in three trials of vitamin D supplementation (Dhesi 2004; Pfeifer 2000; Prince 2008).

Sixty-six of the 111 included studies specifically excluded participants with cognitive impairment or severe cognitive impairment, either defined as an exclusion criterion (or its absence as an inclusion criterion), or implied by the stated requirement to be able to give informed consent and/or to follow instructions (*see* Appendix 2). In four trials (Close 1999; Cumming 1999; Cumming 2007; Jitapunkul 1998) participants with poor cognition were included provided data could be obtained from carers. Poor cognition was one of a number of falls risk factors indicating eligibility for inclusion in Luukinen 2007.

In the remaining 40 studies, cognitive status was not stated as an inclusion or exclusion criterion. It is likely, given the importance of adequate cognition for the provision of informed consent for participation, that the majority of participants in these studies did not have serious cognitive impairment (*see* Appendix 2).

Seven trials recruited on the basis of a specific condition but also had an age inclusion criterion: severe visual impairment (Campbell 2005), mobility problems one year after a stroke (Green 2002), operable cataract (Foss 2006; Harwood 2005), hip fracture (Huang 2005), carotid sinus hypersensitivity (Kenny 2001), and Parkinson's disease (Sato 1999), while three did not have an age inclusion criterion: Parkinson's disease (Ashburn 2007), and hip fracture (Harwood 2004; Sherrington 2004). These, and 14 other trials that did not describe a minimum age inclusion criterion, met our inclusion criterion of having a mean age minus one standard deviation of more than 60 years.

Interventions

Interventions have been grouped by combination (single, multiple or multifactorial) and then by the type of intervention (descriptors) as described in 'Methods' 'Grouping of studies for data synthesis'. Twenty-one trials contain more than two arms, therefore trials may appear in more than one category of intervention (and more than one comparison in the analyses).

Single interventions

A single intervention consists of only one major category of intervention which is delivered to all participants; these have been grouped by type of intervention.

Exercises

Forty-three trials tested the effect of exercise on falls (*see* Appendix 2).

The ProFaNE taxonomy classifies exercises as supervised or unsupervised. Some degree of supervision was described, or could be assumed from the structure of classes, in all but two trials where the intervention was walking (Pereira 1998; Resnick 2002). In the latter study, participants who accepted the option of walking an indoor route at an outpatients department were probably supervised. The term "supervised" covers a number of different models of supervision ranging from direct supervision of either the individual or group of individuals while exercising, to occasional (albeit regular) telephone follow up to encourage adherence. Some

trials reported initial supervision while participants were mastering exercises, but subsequent exercising was unsupervised.

In most trials the intervention was delivered in groups, but in 12 trials it was carried out on an individual basis (Ashburn 2007 (Parkinson's disease); Campbell 1997; Campbell 1999; Green 2002 (stroke); Latham 2003; Lin 2007; Nitz 2004; Protas 2005; Robertson 2001a; Sherrington 2004 (hip fracture); Steadman 2003; Wolf 1996).

The trials were grouped by exercise modality into six categories using the ProFaNE taxonomy (*see* Table 1). In some trials the interventions fell within one category: gait, balance and functional training (Cornillon 2002; Liu-Ambrose 2004; McMurdo 1997; Wolf 1996); strength/resistance training (Fiatarone 1997; Latham 2003; Liu-Ambrose 2004; Woo 2007); flexibility training (no trials included flexibility training alone); 3D training: Tai Chi (Li 2005; Voukelatos 2007; Wolf 1996; Wolf 2003; Woo 2007) and square stepping (Shigematsu 2008); general physical activity (walking groups Pereira 1998; Resnick 2002; Shigematsu 2008); endurance training (no trials included endurance training alone). The remaining trials with exercise alone as an intervention included more than one category of exercise.

Table 1. Categories of exercise (ProFaNE) in interventions containing exercise alone

Study ID	Gait/ balance/functional training	Strength /resistance training	Flexibility	3D (Tai Chi, dance etc)	General physical activity	Endurance	Other
Ashburn 2007	*****	*****	*****				*****
Ballard 2004	*****	*****	*****			*****	
Barnett 2003	*****	*****	*****			*****	
Brown 2002	*****	*****	*****			*****	
Buchner 1997a		*****				*****	
Bunout 2005		*****			*****		
Campbell 1997	*****	*****	*****		*****		
Campbell 1999	*****	*****	*****		*****		
Carter 2002	*****	*****	*****				
Cerny 1998	*****	*****	*****			*****	
Cornillon 2002	*****	?	?			?	?
Day 2002	*****	*****	*****				
Fiatarone 1997		*****					
Green 2002							***** physiotherapy

Table 1. Categories of exercise (ProFaNE) in interventions containing exercise alone *(Continued)*

Hauer 2001	*****	*****	*****			*****	
Helbostad 2004	*****	*****					
Korpelainen 2006	*****			***** dance			***** stamping
Latham 2003		*****					
Li 2005				*****			
Lin 2007	*****	*****	*****				
Liu-Ambrose 2004	***** agility training group	***** resistance training group					
Lord 1995	*****	*****	*****				
Lord 2003	*****	*****	*****	***** dance			
Luukinen 2007	*****		*****		*****		***** self care
McMurdo 1997	*****						
Means 2005	*****	*****	*****				
Morgan 2004	*****	*****	*****				
Nitz 2004	*****		*****			*****	
Pereira 1998					*****		
Reinsch 1992	***** stand up/step up	***** stand up/step up					
Resnick 2002					*****		
Robertson 2001a	*****	*****	*****		*****		
Rubenstein 2000	*****	*****				*****	
Sherrington 2004	*****						

Table 1. Categories of exercise (ProFaNE) in interventions containing exercise alone (*Continued*)

Shigematsu 2008				***** square stepping group	***** walking group		
Skelton 2005	*****	*****	*****			*****	
Steadman 2003	*****						
Suzuki 2004	*****	*****	*****	*****			
Voukelatos 2007				*****			
Weerdesteyn 2006	*****						
Wolf 1996	***** balance platform training group			***** Tai Chi group			
Wolf 2003				*****			
Woo 2007		***** resistance training group		***** Tai Chi group			

***** indicates exercise categories in intervention
"groups" are separate arms in the trial i.e. people were randomised to the separate groups

Four trials compared different exercise programmes (Nitz 2004; Shigematsu 2008; Steadman 2003), or method of delivery (group or home based) (Helbostad 2004).

Medication (drug target)

Thirteen studies (23,112 enrolled participants) evaluated the efficacy of vitamin D supplementation, either alone or with calcium co-supplementation for fall prevention (Bischoff-Ferrari 2006; Dhesi 2004; Dukas 2004; Gallagher 2001; Grant 2005; Harwood 2004; Latham 2003; Pfeifer 2000; Porthouse 2005; Prince 2008; Sato 1999; Smith 2007; Trivedi 2003). Two studies (Grant 2005; Harwood 2004) contain multiple intervention arms.
Campbell 1999, in a 2 x 2 factorial design, reported the results of an exercise programme and a placebo-controlled psychotropic medication withdrawal programme.
Falls were a secondary outcome in Gallagher 2001 in which non-osteoporotic women in one arm of the trial received hormone replacement therapy (HRT).
Greenspan 2005 also explored the effect of HRT on falls in women who were calcium and vitamin D replete.
Vellas 1991 studied the effect of administering a vaso-active medication (raubasine-dihydroergocristine) to older people presenting to their medical practitioner with a history of a recent fall.
One study (Meredith 2002) investigated the effect of a medication improvement programme based on reported problems (including falls) relating to medication use. This targeted therapeutic duplication and use of NSAIDs, cardiovascular and psychotropic drugs.
In Pit 2007, the intervention involved general practitioners (an educational intervention to improve prescribing practices) and their patients (self-completed risk assessment tool relating to medication), and subsequent medication review.

Surgery

One trial (Kenny 2001) reported the effectiveness of cardiac pacing in fallers who were found to have cardioinhibitory carotid sinus hypersensitivity following a visit to a hospital emergency department. Two other trials investigated the effect of expedited cataract surgery for the first eye (Harwood 2005) and second affected eye (Foss 2006).

Fluid or nutrition therapy

Gray-Donald 1995 studied the efficacy of a 12-week period of high-energy, nutrient-dense dietary supplementation in older people with low body mass index, or recent weight loss.

Psychological

Participants in one randomised arm in Reinsch 1992 received a cognitive behavioural therapy intervention.

Environment/Assistive technology

This category includes the following environmental interventions (or assessment and recommendations for intervention): adaptations to homes and the provision of aids for personal care and protection and personal mobility; aids for communication, information and signalling e.g. eyeglasses; and body worn aids for personal care and protection.

Ten studies evaluated the efficacy of environmental interventions alone i.e. home safety (Campbell 2005 (severely visually impaired); Cumming 1999; Day 2002; Lannin 2007; Lin 2007; Pardessus 2002; Stevens 2001; Wilder 2001), interventions to improve vision (Cumming 2007; Day 2002), and one trial tested the Yaktrax® walker, a device worn over usual footwear to increase grip in winter outdoor conditions (McKiernan 2005).

Knowledge/education interventions

Two trials evaluated educational interventions designed to increase knowledge relating to fall prevention (Robson 2003; Ryan 1996). In Robson 2003, group sessions were led by lay senior facilitators. Ryan 1996 compared nurse-led fall prevention classes with individual sessions versus a control group in a three arm trial.

Multiple interventions

Multiple interventions consist of a fixed combination of two or more major categories of intervention delivered to all participants. This category contains 10 studies with numerous combinations of intervention. Eight trials included an exercise component combined with various other interventions (vitamin D (Campbell 2005); education and home safety (Clemson 2004); home safety with or without vision assessment (Day 2002); "individualised fall prevention advice" (Hill 2000); education and risk assessment (Shumway-Cook 2007); various combinations of home safety, education and clinical assessment (Steinberg 2000); protein enriched nutritional supplementation and vitamin D and calcium (Swanenburg 2007); home safety (Wilder 2001)). In the two trials that did not contain an exercise component education was combined with free access to a geriatric clinic (Assantachai 2002), and home safety was combined with medication review (Carter 1997).

Multifactorial interventions

Multifactorial interventions consist of more than one main category of intervention, but participants receive different combinations of interventions based on an individual assessment.

This category includes 31 studies (*see* Appendix 2), some with more than one intervention arm. These were complex interventions which differed in the details of the assessment, treatment protocols, and referral.

The initial assessment was usually carried out by one or more health professionals, an intervention was then provided, or recommendations given or referrals made for further action. In Carpenter 1990 and Jitapunkul 1998 the assessment and health surveillance was carried out by a non-health professional who referred participants to a health professional if a change in health status warranted it.

In ten trials participants received an assessment and an active intervention (Close 1999; Coleman 1999; Davison 2005; Hornbrook 1994; Huang 2005; Lord 2005 (extensive intervention group); Salminen 2008; Spice 2009 (secondary care intervention group); Tinetti 1994; Wyman 2005). Two of these trials (Spice 2009; Lord 2005) also compared a weaker intervention involving primarily assessment and referral with a control group. Nikolaus 2003 compared an assessment and active intervention with assessment and referral. Twenty-one trials contained an intervention that consisted predominantly of assessment, and referral or the provision of information (*see* Appendix 2).

Outcomes

Rate of falls were reported in 30 trials, and could be calculated from a further 35 trials. Data on risk of falling (number of fallers) were available in 89 trials. Some trials met our inclusion criteria but did not include any data that could be included in these analyses. Reported results from these trials are presented in the text. Twenty-four trials reported the number of participants sustaining a fracture: five exercise trials (Ashburn 2007; Campbell 1999; Korpelainen 2006; McMurdo 1997; Robertson 2001a), nine vitamin D trials (Bischoff-Ferrari 2006; Gallagher 2001; Grant 2005; Harwood 2004; Pfeifer 2000; Porthouse 2005; Sato 1999; Smith 2007; Trivedi 2003), five trials of other single interventions (Campbell 1999; Cumming 2007; Foss 2006;

Harwood 2005; Kenny 2001), and six multifactorial interventions (Davison 2005; Hogan 2001; Lightbody 2002; Nikolaus 2003; Tinetti 1994; Vetter 1992). The actual fractures included in these analyses vary. Where possible we only included fall-related fractures (hip, wrist, humerus, etc), and not vertebral fracture. The source of data used for calculating outcomes for each trial for generic inverse variance analysis is shown in Appendix 3.

Excluded studies

The Characteristics of excluded studies lists 61 studies. Fourteen studies reporting falls outcomes were excluded because they were not RCTs. Of the identified RCTs, seven reported falls outcomes but did not meet the reviews inclusion criterion for age (i.e. participants were too young and results were not presented by age group). Five trials with falls outcomes were excluded because the majority of participants were not community dwelling. Nine studies were excluded because they did not report falls outcomes; five were excluded because the reported falls were artificially induced in a laboratory e.g. during balance testing; and 13 were excluded because, although they reported falls, the intervention was not designed to reduce falls. Eight other RCTs were excluded for a variety of reasons (Graafmans 1996; Iwamoto 2005; Larsen 2005; Lee 2007; Lehtola 2000; Means 1996; Peterson 2004; Protas 2005).

Ongoing studies

We identified 34 trials that are either ongoing, or completed but unpublished, in which falls appear to be an outcome (*see* Characteristics of ongoing studies for details). Sixteen are investigating single interventions: nine trials of exercises including Tai Chi and exercises for vestibular rehabilitation, and seven investigating other single interventions (enhanced podiatric care, a cognitive behavioural intervention, home safety, surgery for pacemaker insertion, vitamin D supplementation, and two with visual improvement interventions). Four trials contain various multiple combinations of intervention, one of which is in people who have had a hip fracture, and thirteen include a multifactorial intervention, two of which are in people who have had a stroke.

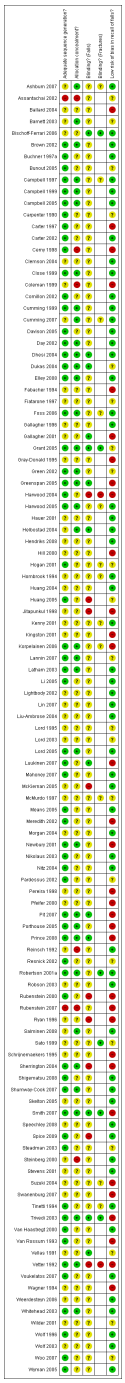
Studies awaiting classification

Six studies are awaiting classification (*see* Characteristics of studies awaiting classification).

Risk of bias in included studies

Details of risk of bias assessment for each trial are shown in the Characteristics of included studies. Summary results are shown in Figure 1.

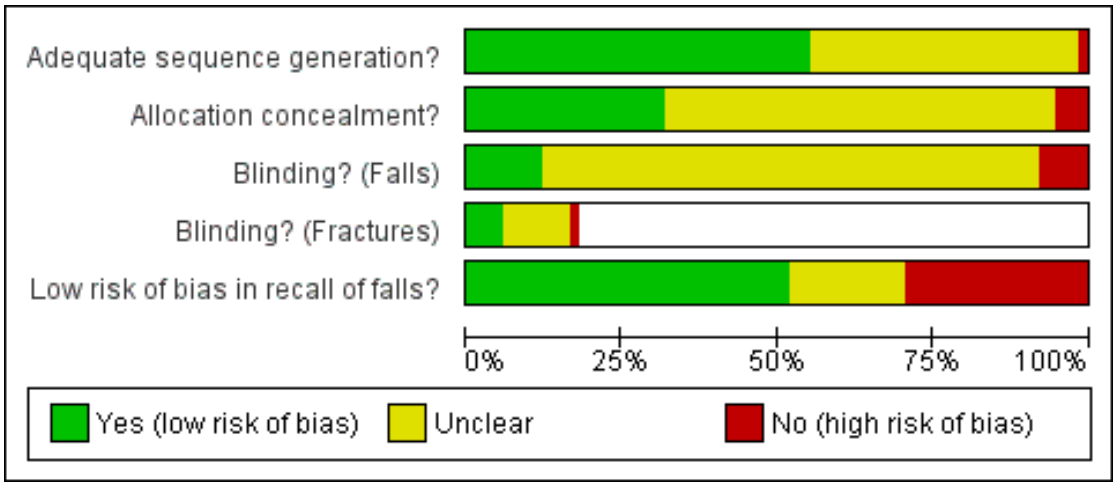
Figure 1. Methodological quality summary: review authors' judgments about each methodological quality item for each included study.



Allocation

We assessed risk of bias in sequence generation as low in 55% of included studies, high in only 2%, but unclear in the remaining studies. Concealment of allocation prior to group assignment was judged to carry low risk of bias in 32% of studies, high in 5%, and to be unclear in the reports of the remaining 63% of studies (*see* Figure 2).

Figure 2. Methodological quality graph: review authors' judgments about each methodological quality item presented as percentages across all included studies.



Blinding

As less than 15% of included studies were placebo controlled, participants would have known their allocation status in most included studies, and falls are self reported. Regular contact is a feature of well-conducted research on fall prevention, and outcome assessors may learn of the participant's group allocation in conversation. It is difficult to assess the impact of that fact on ascertainment bias; one would anticipate that it would be small. We assessed the risk and potential impact of bias as a result of unblinding of participants or outcome assessors to be unclear for fall outcomes in 80% of studies (*see* Figure 2).

Other potential sources of bias

Bias in recall of falls

Fifty per cent of included studies were assessed as being at low risk of bias in the recall of falls i.e. they included active registration of falls outcomes or use of a diary. In 30% of studies there was potential for a high risk of bias in that ascertainment of falling episodes was by participant recall, at intervals during the study or at its conclusion. In 20% of studies the risk of bias was unclear as retrospective recall was for a short period only, or details of ascertainment were not described (*see* Figure 2).

Effects of interventions

Single interventions

Single interventions consist of only one major category of intervention and are delivered to all participants; these have been grouped by type of intervention and data have been pooled within types.

Exercises

The trials were grouped by exercise modality into six categories using the ProFaNE taxonomy (*see* Table 1).

Exercise versus control

Exercise classes containing multiple components (i.e. a combination of two or more categories of exercise), achieved a statistically significant reduction in rate of falls (pooled rate ratio (RaR) 0.78, 95% confidence interval (CI) 0.71 to 0.86; 2364 participants, 14 trials, Analysis 1.1.1) and risk of falling (pooled risk ratio (RR)(random effects) 0.83, 95% CI 0.72 to 0.97; 2492 participants, 17 trials, Analysis 1.2.1). The random-effects model was used to pool data in Analysis 1.2 due to the combination of substantial amount of heterogeneity present in Analysis 1.2.1 (P = 0.006, I^2= 52%) and clinical heterogeneity in the interventions being combined.

We carried out an a priori subgroup analysis of these group exercise trials with multiple components based on falls risk at enrolment, and found there was no difference in pooled estimates between trials with participants at higher risk of falling (history of falling or one or more risk factors for falls at enrolment) versus lower risk (unselected on falls risk at enrolment). The intervention was effective in both subgroups for rate of falls (Analysis 2.1). For risk of falling (Analysis 2.2) the intervention was significant in the higher risk subgroup but not in the subgroup not so selected, however the difference between subgroups was not significant (P = 0.684).

Home-based exercises including more than one exercise category also achieved a statistically significant reduction in rate of falls (RaR 0.66, 95% CI 0.53 to 0.82, 666 participants, 4 trials, Analysis 1.1.2) and in risk of falling (RR (random effects) 0.77, 95% CI 0.61 to 0.97; 566 participants, 3 trials, Analysis 1.2.2). The latter analysis does not contain two trials with home-based interventions: Ashburn 2007 in which all the participants had Parkinson's disease, and Green 2002 in which all participants had mobility problems one year after a stroke. The intervention in Ashburn 2007 consisted of hourly sessions with a physiotherapist for six weeks, which resulted in no significant reduction in the number of people falling (RR 0.94, 95% CI 0.77 to 1.15; 126 participants, Analysis 1.2.3). The intervention in Green 2002 consisted of community physiotherapy compared with usual care, which resulted in a non-significant increase in the number of people falling (RR 1.30, 95% CI 0.83 to 2.04; 170 participants, Analysis 1.2.4).

Although considered to be a single category of exercise intervention, Tai Chi also contains a combination of both strength and balance training. There is evidence that Tai Chi can significantly reduce both rate of falls (RaR 0.63, 95% CI 0.52 to 0.78; 1294 participants, 4 trials, Analysis 1.1.3) and risk of falling (RR (random effects) 0.65, 95% CI 0.51 to 0.82; 1278 participants, 4 trials, Analysis 1.2.5).

In the remaining trials the intervention was within only one of the categories of exercise using the ProFaNE classification. Classes that included just gait, balance or functional training significantly reduced rate of falls (RaR 0.73, 95% CI 0.54 to 0.98; 461 participants, 3 trials, Analysis 1.1.4) but not risk of falling (RR (random effects) 0.77, 95% CI 0.58 to 1.03; 461 participants, 3 trials, Analysis 1.2.6). None of the remaining comparisons achieved a statistically significant reduction in rate of falls or risk of falling. Strength/resistance training delivered in a group setting failed to achieve a significant reduction in rate of falls (64 participants, 1 trial, Analysis 1.1.5) or number of people falling (184 participants, 2 trials, Analysis 1.2.7). The intervention in Fiatarone 1997 also consisted of high intensity progressive resistance training in group sessions, but there were insufficient data to include in the meta-analysis. The authors reported that "no difference between groups was observed in the frequency of falls". Home-based resistance training in Latham 2003 also failed to achieve a statistically significant reduction in rate of falls (222 participants, Analysis 1.1.6) and risk of falling (Analysis 1.2.8). This trial also reported that musculoskeletal injuries were significantly more common in the group participating in resistance exercise training (intervention group 18/112 (16%) versus control group 5/110 (5%), RR 3.54, 95% CI 1.36 to 9.19). Two trials investigated the effect of general physical activity in the form of walking groups (Pereira 1998; Resnick 2002). There was no reduction in risk of falling in Pereira 1998 (Analysis 1.2.9), and Resnick 2002 contained insufficient data to include in an analysis but reported no significant difference in number of falls.

Pooled data for risk of fracture shows a statistically significant reduction from exercise interventions (RR 0.36, 95% CI 0.19 to 0.70; 719 participants, 5 trials, Analysis 1.3). The result remains significant when Ashburn 2007 (in which all the participants had Parkinson's disease) is removed from the analysis. The results are dominated by the data from Korpelainen 2006 in which six women (7%) in the intervention group and 15 (20%) in the control group sustained a fracture.

Exercise versus exercise

Four trials compared different types of exercise, or methods of delivery. There was no significant reduction in rate of falls (Analysis 3.1) or risk of falling (Analysis 3.2) in any of these trials.

Medication (drug target)

Supplementation with vitamin D

Thirteen studies (23,112 enrolled participants) evaluated the efficacy for fall prevention of supplementation with vitamin D or an analogue, either alone or with calcium co-supplementation (Bischoff-Ferrari 2006; Dhesi 2004; Dukas 2004; Gallagher 2001; Grant 2005; Harwood 2004; Latham 2003; Pfeifer 2000;

Porthouse 2005; Prince 2008; Sato 1999; Smith 2007; Trivedi 2003) (*see* Table 2 for reported baseline vitamin D levels).

Table 2. Mean baseline vitamin D levels (25(OH)D) in included trials (nmol/L)

Study	Overall	Intervention	Control	Men	Women	Selection criterion
Bischoff-Ferrari 2006	74.7 (SD 38.3)	N/A	N/A	82.9 (SD 44.9)	66.4 (SD 31.7)	No
Dhesi 2004	(range 23.7 to 28.0)**	26.7 (range 25.5 to 28.0)**	25.0 (range 23.7 to 26.1)**	N/A	N/A	Yes 25(OH)D ≤30**
Dukas 2004	72.6 (SD 27.9)**	74.6 (SD 29.0) **	70.6 (SD 26.7)**	N/A	N/A	No
Gallagher 2001	79.3 (SD 24.7)	78.0 (SD 21.6) ***	80.5 (SD 27.4)	N/A	N/A	No
Grant 2005	38.8 (SD 15.6)*	38.0 (SD 16.3)*	39.5 (SD 14.8)*	N/A	N/A	No
Harwood 2004	29.5 (range 6 to 85)	29 (range 6 to 85)	30 (range 12 to 64)	N/A	29 (range 6 to 85)	No
Latham 2003		37.4 (95% CI 34.9 to 44.9)**	47.4 (95% CI 39.9 to 52.4)**	N/A	N/A	No
Pfeifer 2000	25.2 (SD 12.9)	25.7 (SD 13.6)	24.6 (SD 12.1)	N/A	N/A	Yes 25(OH)D <50
Porthouse 2005	N/A	N/A	N/A	N/A	N/A	No
Prince 2008	44.8 (SD 12.7)	45.2 (SD 12.5)**	44.3 (SD 12.8)**	N/A	N/A	Yes 25(OH)D <59.9**
Sato 1999	28.5 (SD 16.1)	27.5 (SD 14.8)	29.5 (SD 17.3)	N/A	N/A	No (Parkinson's disease)
Smith 2007	N/A	N/A	N/A	N/A	N/A	No
Trivedi 2003	N/A	N/A	N/A	N/A	N/A	No

* Data from two trial centres only (random as stratified by trial centre)
** Converted from ng/mL (ng/mL x 2.496 = nmol/L)
*** Calcitriol alone intervention group
N/A: not available
25(OH)D: 25-hydroxyvitamin D

The overall analysis of vitamin D versus control did not show a statistically significant difference in rate of falls (RaR (random effects) 0.95, 95% CI 0.80 to 1.14; 3929 participants, 5 studies, Analysis 4.1), risk of falling (RR (fixed effect) 0.96, 95% CI 0.92 to 1.01; 21,110 participants, 10 studies, Analysis 4.2), or risk of fracture (RR 0.98, 95% CI 0.89 to 1.07; 21,377 participants, 7 studies, Analysis 4.3). Adverse effects (hypercalcaemia, renal disease, gastrointestinal effects) were reported in three trials but none were statistically significant (Analysis 4.4).

A pre-planned subgroup analysis showed no significant difference in either rate of falling (Analysis 5.1) or risk of falls (Analysis 5.2) in trials recruiting participants with higher falls risk or trials not so doing, and no significant difference in effect size between the subgroups in either analysis (Analysis 5.1 and Analysis 5.2).

We carried out a post hoc subgroup analysis to explore the effect of only enrolling participants with lower vitamin D levels. Data for rate of falls were pooled using the random-effects model as there was substantial heterogeneity in the subgroup of trials not selecting on the basis of vitamin D levels (I^2 = 63%, P = 0.07). The rate of falls (Analysis 6.1) was significantly reduced in trials recruiting participants with lower vitamin D levels (RaR 0.57, 0.37 to 0.89; 260 participants, 2 trials) but not in participants not so selected (RaR 1.02, 95% CI 0.88 to 1.19; 3669 participants, 3 trials). There was a significant difference between these two subgroups with a greater reduction in rate of falls in the subgroup of trials only recruiting participants with lower vitamin D levels (P = 0.01). There was insignificant heterogeneity in the analysis for risk of falling (Analysis 6.2), which was significantly reduced in the lower vitamin D group (RR 0.65, 95% CI 0.46 to 0.91; 562 participants, 3 trials) but not in those not so selected (RR 0.97, 0.92 to 1.02; 20,548 participants, 7 trials). The test for subgroup differences was significant (P = 0.02).

Supplementation with a vitamin D analogue

For vitamin D analogues (calcitriol (1:25 dihydroxy-vitamin D) and alfacalcidol (1-alpha hydroxyl vitamin D)) there was no evidence of effect for alfacalcidol on rate of falls (80 participants, 1 trial, Analysis 7.1.1) or risk of falling (378 participants, 1 trial, Analysis 7.2.1), but a statistically significant reduction in the number of people sustaining a fracture (RR 0.13, 95% CI 0.02 to 0.89; 80 participants, Analysis 7.3). In participants taking calcitriol there was a statistically significant reduction in rate of falls (RaR 0.64, 95% CI 0.49 to 0.82; 213 participants, 1 trial, Analysis 7.1.2), and risk of falling (RR 0.54, 95% CI 0.31 to 0.93; 213 participants, 1 trial, Analysis 7.2.2). There was however, a statistically significant increase in the risk of hypercalcaemia with these analogues (RR 2.33, 95% CI 1.02 to 5.31; 624 participants, 2 trials, Analysis 7.4).

Other medication (drug target) interventions

Gradual withdrawal of psychotropic medication in a placebo-controlled trial significantly reduced rate of falls (RaR 0.34, 95% CI 0.16 to 0.73; 93 participants, 1 trial, Analysis 8.1.1) but not risk of falling (RR 0.61, 95% CI 0.32 to 1.17, Analysis 8.2.1) or risk of fracture (RR 2.83, 95% CI 0.12 to 67.70, Analysis 8.3.1).

There is no evidence to support the use of HRT for reducing rate of falls (212 participants, 1 trial, Analysis 8.1.2) or risk of falling (585 participants, 2 trials, Analysis 8.2.2). An intervention involving medication review and modification was not effective in reducing risk of falls (259 participants, 1 trial, Analysis 8.2.3).

Pit 2007 included an major educational component for family physicians that included academic detailing, feedback on prescribing practices, and financial rewards. This, combined with self-assessment of medication use by their patients and subsequent medication review and modification, resulted in a significantly reduced risk of falling (RR 0.61, 95% CI 0.41 to 0.91; 659 participants, Analysis 8.2.4).

Vellas 1991 (95 participants) reported that participants with a history of a recent fall who received six months of therapy with the vaso-active medication raubasine-dihydroergocristine "showed fewer new falls than the group receiving placebo", however insufficient data were reported to determine whether this was a significant reduction.

Surgery

Cardiac pacemaker insertion

Cardiac pacing in fallers with cardioinhibitory carotid sinus hypersensitivity (Kenny 2001) was associated with a statistically significant reduction in rate of falls (RaR 0.42, 95% CI 0.23 to 0.75; 171 participants, Analysis 9.1.1), but not in number of people sustaining a fracture (Analysis 9.3.1).

Cataract surgery

In Harwood 2005 there was a significant reduction in rate of falls in people receiving expedited cataract surgery for the first eye (RaR 0.66, 0.45 to 0.95; 306 participants, Analysis 9.1.2), but not in risk of falling (RR 0.95, 95% CI 0.68 to 1.33, Analysis 9.2.1), or risk of fracture (Analysis 9.3.2). In participants receiving cataract surgery for a second eye (Foss 2006), there was no evidence of effect on rate of falls (239 participants, Analysis 9.1.3), risk of falling (Analysis 9.2.2), or risk of fracture (Analysis 9.3.3).

Fluid or nutrition therapy

In Gray-Donald 1995 risk of falling was not significantly reduced in frail older women receiving oral nutritional supplementation (46 participants, Analysis 10.1).

Psychological

The cognitive behavioural intervention in Reinsch 1992 did not result in a statistically significant reduction in risk of falling (230 participants, Analysis 11.1).

Environment/Assistive technology

Environment (home safety and aids for personal mobility)

Six studies contributed data on the effectiveness of home hazard modification in participants not selected on the basis of a specific condition (Cumming 1999; Day 2002; Lannin 2007; Lin 2007; Pardessus 2002; Stevens 2001). Home safety interventions did not result in a statistically significant difference in rate of falls (RaR 0.90, 95% CI 0.79 to 1.03; 2367 participants, 3 trials, Analysis 12.1.1) or number of people falling (RR 0.89, 95% CI 0.80 to 1.00; 2610 participants, 5 trials, Analysis 12.2.1). Wilder 2001 did not report any results for the group receiving "simple home modifications" versus control. Data for fractures were not available. In participants with severe visual impairment (visual acuity 6/24 or worse) (Campbell 2005) a home safety programme significantly reduced the rate of falls (RaR 0.59, 95% CI 0.42 to 0.82; 391 participants, Analysis 12.1.2) and number of fallers (RR 0.76, 95% CI 0.62 to 0.95; 391 participants, Analysis 12.2.2).

We carried out a subgroup analysis by falls risk at enrolment to test whether the intervention effect was greater in participants at higher risk of falling i.e. with a history of falling or one or more risk factors. Rate of falling (Analysis 13.1) was significantly reduced in the higher risk subgroup (Campbell 2005; Lin 2007) (RaR 0.56, 95% CI 0.42 to 0.76; 491 participants) but not the lower risk subgroup (Cumming 1999; Stevens 2001) (RaR 0.92, 95% CI 0.80 to 1.06; 2267 participants). There was a statistically significant difference between subgroups, with a greater reduction in rate of falling in the higher risk group (Chi^2 = 8.42, P = 0.004, I^2 = 88.1%). The risk of falling (Analysis 13.2) was also significantly reduced in the higher risk subgroup (Campbell 2005; Pardessus 2002) (RR 0.78, 95% CI 0.64 to 0.95; 451 participants) but not the lower risk subgroup (RR 0.90, 95% CI 0.80 to 1.00; 4 trials, 2550 participants), although, in this case, the test for subgroup differences was not significant (Chi^2 = 1.45, P = 0.23, I^2 = 31.0%).

Environment (aids for communication, information and signalling)

Two trials (Cumming 2007; Day 2002) investigated the effect of interventions to improve vision. In Cumming 2007 this involved vision assessment and eye examination and, if required, the provision of new spectacles, referral for expedited ophthalmology treatment, mobility training and canes. This intervention resulted in a statistically significant increase in both rate of falls (RaR 1.57, 95% CI 1.19 to 2.06; 616 participants, Analysis 12.1.3) and number of participants falling (RR 1.54, 95% CI 1.24 to 1.91; Analysis 12.2.3). There was also an increase in risk of fracture, although this was not statistically significant (RR 1.73, 95% CI 0.96 to 3.12; Analysis 12.3). Day 2002 compared people who received a visual acuity assessment and referral with those who did not. There was no significant reduction in risk of falling (276 participants, Analysis 12.2.4).

Environment (body worn aids for personal care and protection)

McKiernan 2005 tested the effect of wearing a non-slip device (Yaktrax® walker) on outdoor shoes in winter conditions and achieved a statistically significant reduction in rate of outdoor falls (RaR 0.42, 95% CI 0.22 to 0.78; 109 participants, Analysis 12.1.4).

Knowledge/education interventions

Two trials tested interventions designed to reduce falls by increasing knowledge about fall prevention (Robson 2003; Ryan 1996). There was no evidence of reduction in rate of falls (45 participants, 1 trial, Analysis 14.1) or risk of falling (516 participants, 2 trials, Analysis 14.2).

Multiple interventions

Multiple interventions consist of a fixed combination of major categories of intervention delivered to all participants; these have been grouped by combinations of interventions for analysis, and each combination analysed separately.

All trials with rate of falls outcomes (Analysis 15.1) included an exercise component of varying intensity combined with one or more other interventions. Clemson 2004, using a combination of exercise, education and a home safety intervention, achieved a significant reduction in rate of falls (RaR 0.69, 95% CI 0.50 to 0.96; 285 participants, Analysis 15.1.4). Swanenburg 2007 investigated the effect of exercise plus nutritional supplementation in vitamin D and calcium replete women. Although a highly significant reduction in rate of falls was achieved (RaR 0.19, 95% CI 0.05 to 0.68; 20 participants, Analysis 15.1.5) these results should be treated with caution due to the small sample size. None of the remaining comparisons in Analysis 15.1 achieved a significant reduction in rate of falls, including Campbell 2005, in which the intervention consisted of the Otago Exercise Programme and vitamin D in participants with severe visual impairment.

Thirteen different combinations of interventions provided data on risk of falling (Analysis 15.2), of which 11 contained an exercise component. In Day 2002 the risk of falling was significantly reduced in the three arms receiving an exercise component: exercise plus home safety (RR 0.76, 95% CI 0.60 to 0.97; 272 participants, Analysis 15.2.1), exercise plus vision assessment (RR 0.73, 95% CI 0.59 to 0.91; 273 participant, Analysis 15.2.2), and exercise plus vision assessment plus home safety (RR 0.67, 95% CI 0.51 to 0.88; 272 participants, Analysis 15.2.3). In Assantachai 2002 there was a statistically significant reduction in risk of falling in an educational intervention combined with free access to a geriatric clinic in Thailand (RR 0.77, 95% CI 0.63 to 0.94; 815 participants, Analysis 15.2.9), but in the remaining combinations of interventions in Analysis 15.2 there was no significant reduction in

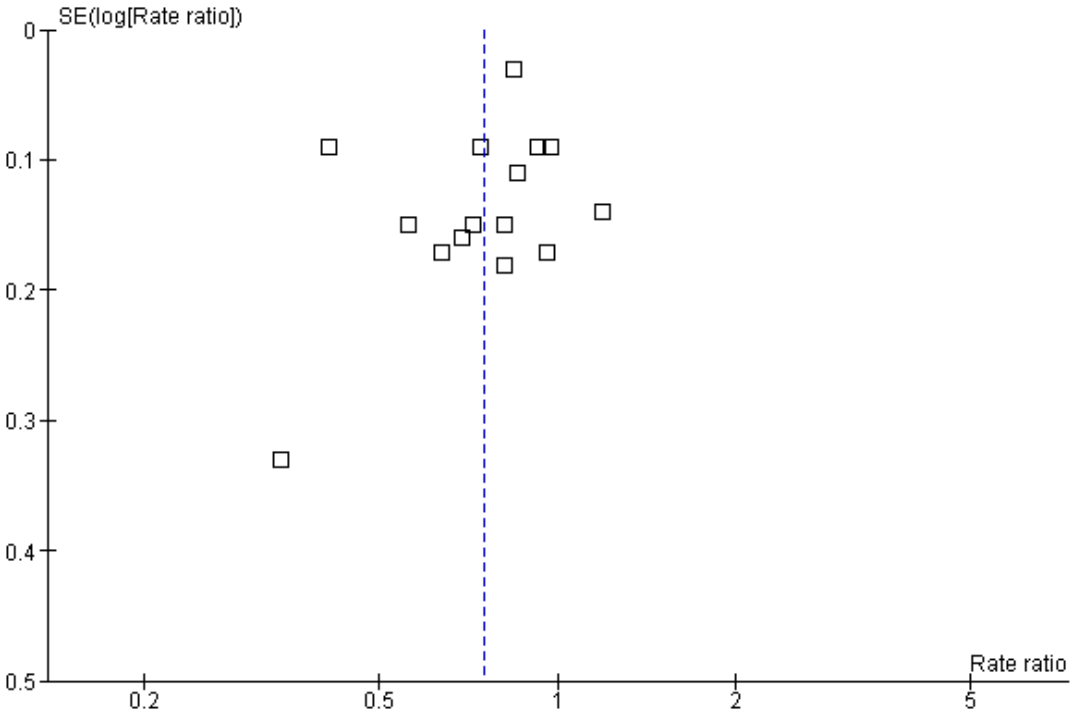
the number of people falling. Wilder 2001 did not contain data but reported "post hoc tests" which showed that the home safety and exercise group was "significantly different from the other two groups" (control group and "simple home modification" group) in number of falls.

Multifactorial interventions

Multifactorial interventions consist of more than one main category of intervention, but participants receive different combinations of interventions based on an individual assessment. These trials have been grouped together as each contains numerous different combinations of intervention based on individual assessment.

Multifactorial interventions significantly reduced the rate of falls (RaR (random effects) 0.75, 95% CI 0.65 to 0.86; 8141 participants, 15 trials, Analysis 16.1), but there is substantial heterogeneity between individual studies in the pooled data (I^2 = 85%, P < 0.00001). Review of the funnel plot (*see* Figure 3) shows two outliers (Carpenter 1990; Close 1999). When both are removed from the analysis heterogeneity is reduced (I^2 = 52%, P = 0.02), but the results remain significant (RaR (random effects) 0.82, 95% CI 0.76 to 0.90). Current evidence does not confirm a significant reduction in risk of falling (RR (random effects) 0.95, 95% CI 0.88 to 1.02; 11,173 participants, 26 trials, Analysis 16.2), or risk of fracture (RR 0.70, 95% CI 0.47 to 1.04; 2195 participants, 7 trials, Analysis 16.3). There were insufficient data in Van Rossum 1993 to include this study in these analyses. The authors reported "no differences between the two groups with respect to these health aspects" which included falls. Vetter 1992 also contained insufficient data for inclusion in these analyses and reported "no difference between groups".

Figure 3. Funnel plot of Analysis 16.1 Multifactorial intervention after assessment vs control: Rate of falls.



The pre-planned subgroup analysis by falls risk at enrolment showed no evidence of difference in treatment effect between subgroups for both rate of falls (Analysis 17.1) and risk of falling (Analysis 17.2).

The pre-planned subgroup analysis by scope and intensity of intervention showed no evidence of difference in treatment effect between subgroups for both rate of falls (Analysis 18.1) and risk of falling (Analysis 18.2).

Economic evaluations

A total of 15 studies included in this review reported the cost effectiveness of the intervention, the cost of delivering the intervention or other healthcare cost items as an outcome measure (*see* Appendix 4 for details). A comprehensive cost effectiveness evaluation with the control group as the comparator was reported in eight studies. A further four studies provided the cost of delivering the intervention, and a total of 12 of the 15 studies reported other healthcare resource cost items.

A cost effectiveness analysis compares the costs and consequences of alternative treatments or approaches with the same clinically relevant outcome (e.g. falls). Cost effectiveness was established for a home safety assessment and modification programme delivered to those with severe vision loss in Campbell 2005 and those recently in hospital in Cumming 1999 (Salkeld 2000), 16 weeks of Tai Chi classes in Voukelatos 2007 (Haas 2006), a multifactorial programme in Tinetti 1994 (Rizzo 1996), the Otago Exercise Programme in Campbell 1997 (Robertson 2001c) and Robertson 2001a, the double blind gradual withdrawal of psychotropic medication in Campbell 1999 (Robertson 2001b), and first eye cataract surgery within one month after randomisation compared with the routine 12-month wait in Harwood 2005 (Sach 2007). The time period for these analyses was the trial duration, but the perspectives taken and the cost items measured and methods for valuing the items varied, so that comparison of incremental cost effectiveness ratios for the interventions (cost per fall prevented) is difficult even for evaluations carried out within similar health systems.

The results from three studies demonstrated the potential for cost savings from delivering the intervention (Cumming 1999; Robertson 2001a; Tinetti 1994). One trial of the Otago Exercise Programme showed savings in the costs of hospital admissions as a result of falls (Robertson 2001a), and the incremental cost effective ratios for particular high risk subgroups of older people was less than zero (indicating cost savings) in two studies (Cumming 1999; Tinetti 1994). The incremental cost effectiveness ratio for falls prevented indicated cost savings for a home safety programme (Cumming 1999) when delivered to the subgroup of participants with a previous fall (Salkeld 2000). A multifactorial intervention (Tinetti 1994) was cost saving for those with four or more of the eight targeted risk factors but not for those with fewer risk factors, both in terms of number of falls prevented and falls resulting in medical treatment prevented (Rizzo 1996).

In addition, a cost utility analysis was reported for the study that tested first eye cataract surgery (Harwood 2005). Cost utility analysis compares outcomes in terms of quality adjusted life years (QALYs) gained. The incremental cost utility ratio was £35,704 (at 2004 prices) which is above a currently accepted UK threshold of willingness to pay per QALY gained of £30,000 (Sach 2007). However, if the time period of the analysis was extended from the 12-month trial period and modelled for the person's expected lifetime, the incremental cost per QALY gained was much lower at £13,172.

DISCUSSION

In this review, through the use of the generic inverse variance method for the analyses, we have been able to include data on both rate of falls and risk of falling, and appropriately adjusted data from cluster randomised studies. We believe that this offers more confidence in the overall results, and thus in the conclusions drawn from them.

In the analyses we used a mix of reported rate ratios (N = 30 trials) and rate ratios we calculated from raw data when these were available (N = 35 trials) (*see* Appendix 3 for details). We did a sensitivity analysis testing the effect of removing calculated rate ratios. Removing these from the analyses did not change the significance of the results (analysis not shown).

Statistical and clinical heterogeneity in our analyses presented some difficulties, particularly for multifactorial interventions, due to variation in populations sampled, and particularly to the details of the nature and context of the intervention studied. In the previous review covering this topic (Gillespie 2003) we noted that "as the number of studies has increased, the picture begins to emerge that interventions which target an unselected group of older people with a health or environmental intervention on the basis of risk factors or age, are less likely to be effective than those which target known fallers". We approached the problem of clinical heterogeneity through planned subgroup analyses, which were conducted in four intervention categories: exercise, the administration of vitamin D, environmental interventions (home safety), and multifactorial interventions.

Summary of main results

Exercises

Overall, multiple-component exercise interventions are effective in reducing rate and risk of falling. Subgroup analysis failed to identify evidence of difference between studies targeting people with known falls risk, or people who were not enrolled on the basis of risk; interventions containing multiple components of exercise were effective in reducing both rate and risk of falls in both subgroups. Within the exercise category there is evidence for the effectiveness of three different approaches in reducing both rate of falls and risk of falling: multiple component group exercise, Tai Chi as a group exercise, and individually prescribed multiple component exercise carried out at home.

Medication (drug target)

Vitamin D supplementation

Despite evaluation in a number of large studies, the effectiveness of vitamin D for reducing falls, with or without calcium, remains

unclear. In the overall analysis, and in the subgroup analysis comparing participant populations with higher and lower falls risk at enrolment, we found that vitamin D did not significantly reduce either rate of falls or risk of falling. However, subgroup analysis showed that when administered to older people selected on the basis of low vitamin D level, supplementation was effective in reducing rate of falls, and risk of falling. This significant finding should be considered provisional until data from additional trials becomes available as the subgroup differences are based on subgroups containing only two (Analysis 6.1.1) and three (Analysis 6.2.1) trials.

Vitamin D analogues (calcitriol (1:25 dihydroxy-vitamin D) and alfacalcidol (1-alpha hydroxyl vitamin D) may be effective but the evidence base is limited, and their use is associated with a significantly raised incidence of reported hypercalcaemia compared with placebo (Dukas 2004; Gallagher 2001).

Other medication interventions

An educational programme for primary care physicians on medication use significantly reduced risk of falling in older people under their care (Pit 2007). Gradual withdrawal of psychotropic medication reduces rate of falls, but not risk of falling (Campbell 1999).

Environment/Assistive technology

Home safety interventions failed to significantly reduce rate of falls or risk of falling, although subgroup analysis by falls risk at enrolment suggests that these interventions may be effective in participants who are at higher risk (Campbell 2005; Lin 2007; Pardessus 2002) compared with those not selected on the basis of risk.

An anti-slip shoe device for icy conditions significantly reduced winter outside falls (McKiernan 2005).

Multifactorial interventions

We found that assessment and multifactorial intervention is effective in reducing rate of falls but does not, overall, have a significant effect on risk of falling. Using subgroup analyses, we explored whether recruitment by falls risk was important, and whether the intensity of the intervention might be important. Heterogeneity between studies in the multifactorial category was high, and we decided that pooling of data using the random-effects model was preferable. This did not confirm significant differences between subgroups for recruitment by risk, or for intensity of intervention.

The effectiveness of multifactorial interventions may be sensitive to differences between health care systems, structures, and networks at local and national level. Hendriks 2008 reported the results of a study which aimed to reproduce, in The Netherlands, the successful integrated multifactorial intervention reported by Close 1999 from the UK. The major differences in the health operational networks in The Netherlands health system compared with those in the UK appear to have made timely direct contact with the appropriate health professionals impossible to achieve (Lord 2008). That risk of falling was not reduced in Hendriks 2008 may be due to these systematic differences, rather than to sample variation, as negative results were also reported by Van Haastregt 2000 and Van Rossum 1993 in the same health-care setting.

Prevention of falling in people with particular health problems

Poor vision

For people with poor vision, home safety intervention appears effective in reducing both rate of falls and risk of falling (Campbell 2005). The effectiveness of other interventions for this group of older people is uncertain. Accelerating first eye cataract surgery for older people on a waiting list significantly reduced rate of falls compared with waiting list controls (Harwood 2005), but the reduction in number of fallers was not significant. Accelerating second eye surgery did not significantly reduce either measure (Foss 2006). Assessment and correction of visual impairment did not reduce falls in two trials (Cumming 2007; Day 2002). Indeed, the intervention in Cumming 2007 resulted in a significant increase in both rate and risk of falling. A number of possible reasons for this are discussed in Cumming 2007 including the fact that new eyeglasses were the most common intervention in this study, and most required major changes in prescription. The trialists suggest that "old, frail people may need a considerable period of time to adjust to new eyeglasses and could be at greater risk of falling during this time".

Cardiovascular disorders

Cardiac pacing in people with carotid sinus hypersensitivity, and a history of syncope and/or falls reduces rate of falls (Kenny 2001).

Neurological disorders

Risk of falling was not significantly reduced by home-based physiotherapy for people with Parkinson's disease (Ashburn 2007), or community physiotherapy for people with stroke-related mobility problems (Green 2002). Vitamin D analogues were not effective in reducing rate of falls in people with Parkinson's disease (Sato 1999).

Post hip fracture

The vitamin D intervention in Harwood 2004 was effective in reducing the number of people who fell after a hip fracture, but neither discharge planning by a specialist gerontological nurse

(Huang 2005), nor physiotherapist prescribed home-based exercises (Sherrington 2004), were effective in reducing the number of people falling.

Economic evaluations

In eight studies the authors had reported a comprehensive economic evaluation which provided an indication of value for money for the interventions being tested, but variations in the methods used makes comparison of the incremental cost-effectiveness ratios across studies difficult. There was some, although limited, evidence that falls prevention strategies can be cost saving during the trial period, and may also be cost effective over the participants' remaining lifetime. The results indicate that, to obtain maximum value for money, effective strategies need to be targeted at particular subgroups of older people.

Overall completeness and applicability of evidence

We sought data for rate of falls, number of people falling, and number of people sustaining a fracture. However, few studies provided fracture data. As the analyses and Appendix 3 demonstrate, some studies provided data for both falls and fallers, but others provided data only for one or other fall outcome. In most interventions, we were able to pool more data on risk of falling than on rate of falls. Since robust statistical methods are now available to deal with comparison of the number of falls occurring in each group of a study, the use of rate of falls has a number of attractions. First, it improves power. In the sense that every fall carries a risk of injury, an intervention which reduces the number of times the fallers fall, even if not the number of fallers, has clinical, public health, and economic relevance. But from a public health perspective, fall prevention lies across the threshold between primary and secondary prevention. Older people who are not yet "fallers", however defined, might wish to know how best to prolong the time until they cross the threshold. For this reason, and because current consensus recommends that both outcomes be collected (Lamb 2005), we have provided meta-analyses for both using generic inverse variance.

This review shows that the effect of exercise programmes in reducing the risk and rate of falling should now be regarded as established. Heterogeneity between studies in this category was not large, given the complex nature of these interventions. However, further research exploring the best combination of components within the exercise category might be justified. Trials need to be large in order to have power to discern any differences.

The place of vitamin D supplementation, with or without calcium in fall prevention remains somewhat unclear. We found no overall evidence of effectiveness in fall prevention in older people living in the community. The evidence for effectiveness in reducing rate of falls in participants selected for study inclusion on the basis of low vitamin D levels, although statistically significant, is limited, being derived from a sub-group analysis comparing data from only 260 participants (selected for study inclusion on the basis of low vitamin D) with 21,100 participants not so selected. The definition of low vitamin D and the level of supplementation differed between studies. The findings of this subgroup analysis indicate that further research appears justified to establish the cost-effectiveness of administration of vitamin D to older people with low serum vitamin D levels.

Assessment with individualised multifactorial intervention programmes overall appear effective in reducing the rate of falls in studies from different health care systems. However, further research appears justified to explore the difference between programmes which provide integration of assessment and intervention by a multidisciplinary team and programmes which provide assessment, but rely on referral to other providers and agencies for the intervention.

As the majority of trials specifically excluded older people who were cognitively impaired, the results of this review may not be generalisable to this important group of people at risk. Research on the impact of management programmes for other risk factors such as cognitive impairment and urinary incontinence on risk and rate of falling appears justified.

Further research appears justified to confirm the emerging evidence of effectiveness of home safety interventions in high-risk groups, and to clarify the impact of strategies to optimise care for people with different visual impairments.

Quality of the evidence

Falls trials are difficult to design, but conduct and methodology could be improved considerably. The fact that the outcome of interest, falling, was not always defined, is a continuing concern. The use of two definitions in Wolf 1996 demonstrated that the definition of falling used can alter the significance of the results. A consensus definition of a fall, such as the one developed by the Prevention of Falls Network Europe (Lamb 2005), needs to be adopted in order to facilitate comparisons of research findings.

The included studies also illustrated the wider problems of variation in the methods of ascertaining, recording, analysing, and reporting falls described in the Hauer 2006 systematic review. Recommendations on how these should be approached are also contained in Lamb 2005.

We included many small studies, and were able, through the use of generic inverse variance, to pool data from cluster randomised and factorial studies. A clearer framework for standards is emerging. Studies evaluating fall prevention should be adequately powered, and use a contemporary standard for definition of a fall, methods of ascertainment, recording, analysis and reporting of data (Lamb 2005).

Design and reporting of trials should meet the contemporary standards of the CONSORT statement (Boutron 2008), including

those for cluster-randomised trials (Campbell 2004).
Where factorial designs are employed, data for each treatment cell should be reported to allow interpretation of possible interactions between different intervention components (McAlister 2003).

Potential biases in the review process

During the preparation of the review we attempted to minimise publication bias, but encountered a number of other potential biases. Although our search was comprehensive and we included studies identified in languages other than English, we cannot rule out the possibility that some studies have been missed. We obtained unpublished falls data from a number of studies, and we included four abstracts which have yet to be published as full papers (Cerny 1998; Fiatarone 1997; Hill 2000; Wilder 2001). We constructed funnel plots from analyses of rate ratio and risk ratio for four larger categories of study. For exercise interventions, asymmetry in the funnel plots is slight. For vitamin D administration, home safety interventions, and multifactorial interventions, the plots are somewhat asymmetric suggesting the possibility of negative publication bias.
Many studies were reported in more than one paper, but in the majority of cases the relevant outcome data were available in a single paper. A small number of studies reported data more than once, sometimes with apparent small discrepancies which required careful interpretation, or communication with authors. Ten excluded trials reported falls as adverse effects, although in some instances the intervention might plausibly have reduced falls. This raises the possibility of a form of outcome reporting bias. Increased publication of protocols in trials registers will make it easier to establish the a priori hypotheses.

Agreements and disagreements with other studies or reviews

Seven relevant systematic reviews published since 2006 were identified through our search for randomised trials for inclusion (Beswick 2008; Campbell 2007; Gates 2008; Goodwin 2008; Jackson 2007; Richy 2008; Sherrington 2008).

Exercise

Two systematic reviews addressed the effectiveness of exercise interventions. Goodwin 2008, in a review of exercise in people with Parkinson's disease, identified two trials with falls outcomes, both identified for this review: Ashburn 2007, was included, and Protas 2005 (with 18 participants) was excluded from this review *(see* Characteristics of excluded studies).
Sherrington 2008 pooled data from 44 trials with 9603 participants, and found a significant reduction in rate of falls (RaR 0.83, 95% CI 0.75 to 0.91). They found greater relative effects in programmes that included exercises which challenged balance, used a higher dose of exercise, or did not include a walking programme. Although their inclusion criteria and methods of analysis differed somewhat from ours, the overall findings are similar.

Multifactorial interventions

We identified three systematic reviews. Beswick 2008 focused on multifactorial interventions and included 12 trials with falls outcomes, all of which are included in this review. They found that risk of falling was reduced (RR 0.92, 95% CI 0.87 to 0.97). This analysis differs from ours, which was based on 26 studies, and found a risk ratio of 0.95, 95% CI 0.88 to 1.02.
Our results for rate of falls were very similar to those of Campbell 2007 (RaR 0.78, 95% CI 0.68 to 0.89) which included six trials that reported a rate ratio.
Gates 2008 included 19 trials of multifactorial interventions, 17 of which are in this review. We excluded Gill 2002 which, although a community-based intervention, reported falls as an adverse event, and Shaw 2003, in which 79% per cent of the participants were not community dwelling but were living in institutions providing intermediate to high level nursing care. Their analysis found that the risk of falling was not reduced (RR 0.91, 95% CI 0.82 to 1.02; 18 trials). Their finding is similar to that of this review for this outcome. Our subgroup analysis by intensity of intervention failed to confirm the finding of Gates 2008, possibly due to differences in the inclusion criteria and the number of completed trials available for inclusion in their review.

Vitamin D

Two systematic reviews explored the evidence for the effect of vitamin D on falls. Jackson 2007 included five studies in a meta-analysis of risk of falling, of which three are included in this review, and two were excluded either because they were not an RCT (Graafmans 1996), or because their participants were older people in institutional care (Bischoff 2003). We agree with their conclusion of a trend towards a reduction in the risk of falling among people treated with vitamin D3 compared with placebo, but the difference is not significant.
Richy 2008 included 11 studies in a meta-analysis of which six were included in this review. The other five did not meet our inclusion criteria, either because they were not RCTs (Graafmans 1996), or because their participants were older people in institutional care (Bischoff 2003; Broe 2007; Chapuy 2002; Flicker 2005). Richy 2008 used indirect comparisons to shape their conclusion that D-hormone analogues prevent falls to a greater extent than their native compound. We agree that this may be the case. However, more data would be needed to confirm this hypothesis in older people living in the community, and we found evidence of an increased risk of adverse effects with these agents.

AUTHORS' CONCLUSIONS

Implications for practice

By June 2008 we found the following evidence of effectiveness for a number of different approaches to fall prevention in the community in older people. Please note that this evidence may not be applicable to older people with dementia as a majority of the included studies specifically excluded them from participation.

Exercise

Overall, exercise is an effective intervention to reduce the risk and rate of falls. Three different approaches to exercise appear to have significant beneficial effects. Multiple-component group exercise reduces rate of falls and risk of falling. Tai Chi as a group exercise reduces rate of falls and risk of falling. Individually prescribed exercise carried out at home reduces rate of falls and risk of falling, but there is no evidence to support this intervention in people with severe visual impairment or mobility problems after a stroke, Parkinson's disease, or after a hip fracture.

Multifactorial interventions

Multifactorial interventions integrating assessment with individualised intervention, usually involving a multi-professional team, are effective in reducing rate of falls but not risk of falling. There is no evidence that assessment and intervention is more effective than assessment and referral, or that multifactorial interventions are more effective in participants selected as being at higher risk of falling.

Environmental assessment and intervention

Overall, home safety interventions do not appear to reduce rate of falls or risk of falling. Although evidence so far published is relatively limited, people at higher risk of falling may benefit. An anti-slip shoe device for icy conditions significantly reduced winter outside falls in one study.

Medication interventions

There is limited evidence for the effectiveness of interventions targeting medications (e.g. withdrawal of psychotropics, educational programmes for family physicians). Overall, vitamin D does not appear to be an effective intervention for preventing falls in older people living in the community, but there is provisional evidence that it may reduce falls risk in people with low vitamin D levels.

Prevention of falling in people with particular health problems

Poor vision

In people who are severely visually impaired, there is evidence from one trial for the effectiveness of a home safety intervention, but not an exercise intervention. The effectiveness of other interventions for visual impairment in older people is uncertain, although accelerating first eye cataract surgery for people on a waiting list significantly reduces rate of falls compared with waiting list controls. Older people may be at increased risk of falling while adjusting to new spectacles or major changes in prescription.

Cardiovascular disorders

Evidence from a single study indicates that cardiac pacing in people with carotid sinus hypersensitivity, and a history of syncope and/or falls reduces rate of falls.

Neurological disorders

Risk of falling was not significantly reduced by home-based physiotherapy for people with Parkinson's disease or community physiotherapy for people with stroke-related mobility problems. Vitamin D analogues were not effective in reducing rate of falls in people with Parkinson's disease.

Implications for research

This review shows that the effect of exercise programmes in reducing the risk and rate of falling should now be regarded as established. Further research exploring the balance of components within the exercise category might be justified, but would need to be large in order to have power to discern any differences.

Assessment and individualised multifactorial intervention programmes appear effective in reducing the rate of falls in studies from different health care systems. Further research appears justified to explore the difference between programmes which provide integration of assessment and intervention by a multidisciplinary team, and programmes which provide assessment but rely on referral to other providers and agencies for the intervention.

Further research appears justified to confirm the emerging evidence of effectiveness of home safety interventions in higher risk groups, and vitamin D in people with lower vitamin D levels, and to clarify the impact of strategies to optimise care for people with different visual impairments.

Research on the impact of management programmes for other risk factors such as cognitive impairment and urinary incontinence on rate and risk of falling appears justified.

Studies evaluating fall prevention should be adequately powered, and use a contemporary standard for definition of a fall, methods of ascertainment, recording, analysis and reporting of data.

Design and reporting of trials should meet the contemporary standards of the CONSORT statement, including those for cluster-randomised trials.

Where factorial designs are employed, data for each treatment cell should be reported to allow interpretation of possible interactions between different intervention components.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Ashburn 2007

Methods	RCT. Losses: 16 of 142 (11%)
Participants	Setting: community, UK. N = 142 Sample: people with Parkinson's disease recruited from a specialist clinical database (39% women) . Age: range 44-91, mean 72.1 (SD 9.2). Inclusion criteria: idiopathic PD; living at home; history of falls in previous year. Exclusion criteria: cognitively impaired.
Interventions	1. Weekly 1 hour home-based exercise session for 6 weeks with physiotherapist (strengthening, flexibility, balance training, and walking); also taught fall prevention strategies. Encouraged to exercise daily. Monthly phone call after 6 weeks. 2. Control: usual care.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomisation was stratified by NHS Trust using blocks of size four".
Allocation concealment?	Yes	Quote: "treating physiotherapist obtained random allocation by telephoning Medical Statistics Group, University of Southampton".
Blinding? Falls	Unclear	Falls recorded by participants who were aware of their group allocation.
Blinding? Fractures	Unclear	Fractures recorded by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls and fractures recorded prospectively by participants using diaries submitted monthly.

Assantachai 2002

Methods	CCT (cluster randomised). Losses: 156 of 1043 (15%)
Participants	Setting: community, Bangkok, Thailand. N = 1043 Sample: people living in 11 selected urban communities (64% women). Age: mean 67.6 (SD 6.2). Inclusion criteria: aged at least 60; living in one of the selected communities.
Interventions	1. Educational leaflet and free access to geriatric clinic. Leaflet about locally identified risk factors for falling (kyphoscoliosis, nutritional status, ADL, hypertension, special sense function, cognitive problems) and ways of preventing, correcting, coping with them. Assessed musculoskeletal deformity, arthralgia, hypertension, ADL, mobility, gait, hearing, vision and presumably any problems addressed at geriatric clinic. 2. Control: no intervention.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	No	Communities drawn from pool of 20 until 1043 subjects recruited. Communities then allocated to intervention (odd number) or control (even number) using enrolment sequence (information provided by author).
Allocation concealment?	No	Alternation.
Blinding? Falls	Unclear	Falls recorded by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls ascertained by postcards every 2 months, and phone call if no card returned.

Ballard 2004

Methods	RCT. Losses: 1 of 40 (2.5%).
Participants	Setting: community, USA. N = 40 Sample: volunteers. Age: mean 72.9 (SD 6). Inclusion criteria: aged 65 and over; ambulatory; community dwelling; history of falling in previous year or fear of future fall; healthy enough to do moderate exercise.

Ballard 2004 (*Continued*)

	Exclusion criteria: cardiovascular disease or extreme vertigo that might prohibit moderate exercise; requiring walker for support.
Interventions	1. Exercise sessions (warm up, low impact aerobics, exercise for strength and balance, cool down) 1 hour x3 per week, for 15 weeks. Plus 6 home safety education classes. 2. Control: exercise sessions as above 1 hour x3 per week, for 2 weeks + videotape so could continue at home. Plus 6 home safety education classes as above.
Outcomes	1. Rate of falls. 2. Number of people falling Falls a secondary outcome of study. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "assigned to exercise and control groups using stratified randomisation".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Falls identified retrospectively during intervention at each home safety class (every two months), and by telephone follow up one year after end of intervention.

Barnett 2003

Methods	RCT. Losses: 17 of 109 (16%).
Participants	Setting: community, Australia. N = 163 Sample: elderly people identified (67% women) as at risk of falling by general practitioner or hospital physiotherapist using assessment tool. Age: mean 74.9 (SD 10.9). Inclusion criteria: age over 65 years; identified as 'at risk' of falling (one or more of the following risk factors: lower limb weakness, poor balance, slow reaction time). Exclusion criteria: cognitive impairment; degenerative conditions e.g. Parkinson's disease or medical condition involving neuromuscular, skeletal or cardiovascular system that precluded taking part in exercise programme.
Interventions	1. Exercise sessions (stretching, and for strength, balance, coordination, aerobic capacity) by accredited exercise instructor, in groups of 6 - 18, 1 hour per week for 4 terms for 1 year (37

Barnett 2003 (*Continued*)

	classes). Home exercise programme based on class content + diaries to record participation. 2. Control: no exercise intervention. Both groups received information on strategies for avoiding falls e.g. hand and foot placement if loss of balance occurred.
Outcomes	1. Rate of falls. 2. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomised in matched blocks" (N = 6)
Allocation concealment?	Yes	Consecutively numbered, opaque envelopes.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls identified by postal survey at the end of each calendar month. Phoned if not returned within 2 weeks.

Bischoff-Ferrari 2006

Methods	RCT. Losses: 56 of 445 (13%).
Participants	Setting: community, Boston, MA, USA. N = 445 Sample: men and women recruited by direct mailings and presentations (sample frame not given) (55% women). Age: mean 71. Inclusion criteria: aged 65 and over. Exclusion criteria: current cancer or hyperparathyroidism; a kidney stone in last 5 years; renal disease; bilateral hip surgery; therapy with a bisphosphonate, calcitonin, oestrogen, tamoxifen, or testosterone in past 6 months, or fluoride in past 2 years; femoral neck bone mineral density more than 2 SD below the mean for subjects of the same age and sex; dietary calcium intake exceeding 1500 mg per day; laboratory evidence of kidney disease.
Interventions	1. Cholecalciferol (700 IU vitamin D) and calcium citrate malate (500 mg elemental calcium) orally, daily at bedtime for 3 years. 2. Control: double placebo tablets.

Bischoff-Ferrari 2006 (*Continued*)

Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. 4. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly assigned", "random group assignment was performed with stratification according to sex, race and decade of age."
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial).
Blinding? Fractures	Yes	Fractures reported at 6 monthly visit (placebo-controlled trial) .
Low risk of bias in recall of falls?	Yes	Asked to send a postcard after any fall. Telephone call to verify circumstances. Subjects reported any additional falls at 6 monthly follow-up visit. Non-vertebral fractures reported at 6 monthly follow-up visit and verified by review of X-ray reports or hospital records.

Brown 2002

Methods	RCT. Individually randomised, but six clusters containing couples at same address. Losses: 41 of 149 (28%)
Participants	Setting: community, Perth, Western Australia. N = 149 Sample: men and women recruited by press releases in 11 newspapers and information brochures distributed to organisations, GPs, etc. (79% women). Age: N = 101 aged 75-84, N = 48 aged 85-94. Inclusion criteria: age 75 and over; community living (house, flat or retirement villa); independent in basic ADL; able to walk 20 meters without personal assistance. Exclusion criteria: cognitive impairment (MMSE $\leq$24); various conditions e.g. angina, claudication, cerebrovascular disease, low or high blood pressure, major systemic disease, mental illness.
Interventions	1. Exercise intervention to improve cardiovascular endurance, general muscle performance, balance, co-ordination and flexibility. 2x per week for 60 minutes, for 16 weeks (32 hours). 2. Social intervention for 13 weeks involving presentations of travel slides and videos by partici-

Brown 2002 (*Continued*)

	pants. 3. Control: no intervention.
Outcomes	1. Number of participants falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "randomised into one of three groups using a table of random numbers".
Allocation concealment?	Yes	Randomised into one of three groups "by a physiotherapist uninvolved in the study."
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Participants provided details of falls in monthly report sheet returned in reply paid addressed envelopes.

Buchner 1997a

Methods	RCT. Losses: 15 of 105 (14%) (14 from intervention groups).
Participants	Setting: community, Seattle, USA. N = 105. Sample: HMO members (FICSIT intervention groups only). Age: mean 75. Inclusion criteria: aged 68 to 85; unable to do 8 step tandem gait test without errors; below 50th percentile in knee extensor strength for height and weight. Exclusion criteria: active cardiovascular, pulmonary, vestibular, and bone disease; positive cardiac stress test; body weight >180% ideal; major psychiatric illness; active metabolic disease; chronic anaemia; amputation; chronic neurological or muscle disease; inability to walk; dependency in eating, dressing, transfer or bathing; terminal illness; inability to speak English or complete written forms.
Interventions	Randomised into 7 groups: 6 intervention groups (3 FICSIT trial, 3 MoveIT trial), and 1 control group. Only FICSIT trial and control groups included in this review. Supervised exercise classes 1 hour x 3 per week for 24-26 weeks followed by unsupervised exercise. 1. Six months endurance training (ET) (stationary cycles) with arms and legs propelling wheel. 2. Six months strength training (ST) classes (using weight machines for resistance exercises for upper and lower body). 3. Six months ST plus ET.

Buchner 1997a (*Continued*)

	4. Control: usual activity levels but 'allowed to exercise after 6 months'. Exercise sessions started with a 10 to 15 minute warm-up and ended with a 5 to 10 minute cool down.
Outcomes	Fall outcomes reported for any exercise (all 3 groups combined) compared with control group (states 'a priori decision'). 1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. 4. Number of people with adverse effects.
Notes	Seattle FICSIT trial [Province 1995] Only 1.3% of original sample randomised. Falls not primary outcome. Other outcomes assessed at end of intervention (6 months) then "control group allowed to exercise after 6 months". 7 out of 30 subjects did.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised "using a variation of randomly permuted blocks."
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls reported immediately by mail, also monthly postcard return; telephone follow up if no postcard received.

Bunout 2005

Methods	RCT. Losses: 57 of 298 (19%).
Participants	Setting: community, Chile. N = 298. Sample: men and women. Age: mean 75 (SD 5). Inclusion criteria: "elderly subjects" consenting to participate; able to reach community centre. Exclusion criteria: severe disabling condition; cognitive impairment (MMSE < 20).
Interventions	1. Exercise class: 1 hour 2x per week for 1 year, moderate-intensity resistance exercise training (functional weight bearing exercises, exercises with TheraBands and walking (see Appendix 2 of supplementary data on journal website for details).

Bunout 2005 (*Continued*)

	2. Control: no intervention.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	Journal website for supplementary data www.ageing.oupjournals.org. Additional data obtained from author.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised using computer generated random number table.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls ascertained at monthly outpatient clinic or by telephone.

Campbell 1997

Methods	RCT. Losses: 20 of 233 (9%).
Participants	Setting: community, Dunedin, New Zealand. N = 233. Sample: women identified from general practice registers. Age: mean 84.1 (SD 3.1). Inclusion criteria: at least 80 years old; community living. Exclusion criteria: cognitive impairment; not ambulatory in own residence; already receiving physiotherapy.
Interventions	Baseline health and physical assessment for both groups. 1. 1 hour visits by physiotherapist x 4 in first two months to prescribe home based individualised exercise and walking programme. Exercise 30 minutes x 3 per week plus walk outside home x 3 per week. Encouraged to continue for 1 year. Regular phone contact to maintain motivation after first 2 months. 2. Control: social visit by research nurse x 4 in first two months. Regular phone contact.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	Otago Exercise Programme manual can be ordered from http://www.acc.co.nz/otagoexerciseprogramme

Campbell 1997 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Allocation schedule developed using computer generated numbers.
Allocation concealment?	Yes	Assignment by independent person off site.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls recorded daily on postcard calendars, mail registration monthly by postcard, telephone follow up.

Campbell 1999

Methods	RCT. Losses: 21 of 93 (23%).
Participants	Setting: community. Dunedin, New Zealand. N = 93 Sample: identified from general practice registers (83% women). Age: mean 74.7 (SD 7.2). Inclusion criteria: at least 65 years old; currently taking a benzodiazepine, any other hypnotic, or any antidepressant or major tranquillizer; ambulatory in own residence; not receiving physiotherapy; thought by GP to benefit from psychotropic medication withdrawal. Exclusion criteria: cognitive impairment.
Interventions	Baseline assessment. 1. Gradual withdrawal of psychotropic medication over 14 week period plus home based exercise programme. 2. Psychotropic medication withdrawal with no exercise programme. 3. No change in psychotropic medication plus exercise programme. 4. No change in psychotropic medication, no exercise programme. Exercise programme: 1 hour physiotherapist visits x 4 in first two months to prescribe home based individualised exercises (muscle strengthening and balance retraining exercises 30 min x 3 per week) and walking x 2 per week. Regular phone contact to maintain motivation. Study capsules created by grinding tablets and packing into gelatin capsules. Capsules containing inert and active ingredients looked and tasted the same.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining an adverse effect.

Campbell 1999 (*Continued*)

Notes	Only 19% randomised. Psychotropic medications recorded one month after completion of study. Eight of the 17 who had taken the placebo for 30 weeks had restarted one month after end of study. Otago Exercise Programme manual can be ordered from http://www.acc.co.nz/otagoexerciseprogramme

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	2 by 2 factorial design. Allocation schedule developed using computer generated numbers.
Allocation concealment?	Yes	Assignment by independent person off site.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls recorded daily on postcard calendars, mail registration monthly by postcard, telephone follow up.

Campbell 2005

Methods	RCT. 2 by 2 factorial design. Losses: 30 of 391 (8%).
Participants	Setting: community, New Zealand. N = 391 Sample: men and women with severe visual impairment (visual acuity 6/24 or worse) identified in blind register, university and hospital outpatient clinics and private ophthalmology practice (68% women). Age: mean (SD) 83.6 (4.8) years; range 75-96. Inclusion criteria: vision worse than 6/24 in better eye; age $\geq$ 75 years. Exclusion criteria: unable to walk around home.
Interventions	1. Home safety programme. 2. Otago Exercise Programme plus vitamin D supplements. 3. Both of the above 4. Control: x2 one-hour social visits during the first 6 months of the trial.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number of people with adverse effects.
Notes	Otago Exercise Programme manual can be ordered from http://www.acc.co.nz/otagoexerciseprogramme

Campbell 2005 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	2 by 2 factorial design. Computer generated random numbers.
Allocation concealment?	Yes	Schedule held by independent person at separate site, telephone access.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Phoned by independent assessor blind to allocation. Person classifying fall events also blind to allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded on daily on monthly pre-paid postcard calendars, telephone follow up.

Carpenter 1990

Methods	RCT (Individually randomised, but small number of clusters as husbands allocated to same group) . Losses: 172 of 539 (32%).
Participants	Setting: community, Andover, United Kingdom. N = 539 Sample: women and men recruited from patient lists of two general medical practices. The sample represents 89.5% of those in the age group in the participating practices (65% women). Age: 75 years or over. 23 men and 49 women were over 85 years. Inclusion criteria: aged 75 and over; living in Andover area. Exclusion criteria: living in residential care.
Interventions	1. Visit by trained volunteers for dependency surveillance using Winchester disability rating scale. The intervention was stratified by degree of disability on the entry evaluation. For those with no disability, the visit was every six months; for those with disability, three months. Scores compared with previous assessment and referral to GP if score increased by 5 or more. 2. Control: no disability surveillance between initial and final evaluation.
Outcomes	1. Rate of falls (in each group in the month before the final interview at 3 years). Other outcomes reported but not included in this review.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**

Carpenter 1990 (*Continued*)

Adequate sequence generation?	Yes	Randomised by random number tables
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Retrospective recall, but over one month period.

Carter 1997

Methods	RCT. Losses: 200 of 658 (30%).
Participants	Setting: community, Hunter Valley, Australia. N = 658. Sample: men and women identified by 37 general practitioners as meeting inclusion criteria. Age: 70 or older. Inclusion criteria: aged 70 and over; able to speak and understand English; living independently at home, in a hostel, or in a retirement village. Exclusion criteria: psychiatric disturbance affecting comprehension of the aims of the study.
Interventions	1. Brief feedback on home safety plus pamphlets on home safety and medication use (low intensity intervention). 2. Action plan for home safety plus medication review (high intensity intervention). 3. Control: no intervention during study period but intervention after the end of the study period.
Outcomes	1. Number of people falling (during previous month at 3, 6 and 12 months).
Notes	Unpublished study.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Random number generator.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Retrospective recall at 3, 6 and 12 months.

Carter 2002

Methods	RCT. Losses: 13 of 93 (14%).
Participants	Setting: community, Vancouver, Canada. N = 93. Subjects: community dwelling osteoporotic women. Age: mean 69 (SD 3). Inclusion criteria: aged 65 to 75 years; residents of greater Vancouver; osteoporotic (based on BMD). Exclusion criteria: < 5 years post menopause; weighed > 130% ideal body weight; other contraindications to exercising; already doing > 8 hours/week moderate to hard exercise; planning to be out of city > 4 weeks during 20 week programme.
Interventions	1. Exercise class (Osteofit) for 40 minutes, 2 x per week, for 20 weeks in community centres. Classes of 12 per instructor. 8 to 16 strengthening and stretching exercises using Theraband elastic bands and small free weights. Bimonthly social seminar. 2. Control: usual routine activities and bimonthly social seminar separate from intervention group.
Outcomes	1. Rate of falls. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised by computer generated programme.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls recorded in falls calendars returned monthly.

Cerny 1998

Methods	RCT. Losses: none described.
Participants	Setting: community, California, USA. N = 28 Sample: community dwelling "well elderly" . Age: mean 71 (SD 4). Inclusion criteria: none described. Exclusion criteria: none described.

Cerny 1998 (*Continued*)

Interventions	1. Exercise programme of progressive resistance, stretching, aerobic and balance exercises and brisk walking over various terrains for 1 and a half hours, 3 x weekly, for 6 months. 2. Control: no intervention.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review. Falls a secondary outcome.
Notes	Contact with lead author but no full paper or report prepared.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised by coin toss. Individually randomised but some clusters e.g. couples or two ladies where one was dependent on the other for transport (information from author).
Allocation concealment?	No	Coin toss on site.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Assume retrospective recall and 3 and 6 months assessment.

Clemson 2004

Methods	RCT. Randomised in blocks of four stratified by sex and number of falls in previous 12 months. Losses: none described.
Participants	Setting: community, Sydney, Australia. N = 310 Sample: volunteer community dwelling men and women recruited by various strategies (74% women). Age: mean 78 (SD 5). Inclusion criteria: aged 70 and over; community dwelling; fallen in past year or felt themselves to be at risk of falling. Exclusion criteria: dementia (> 3 errors on Short Portable Mental Status Questionnaire); homebound; unable to independently leave home; unable to speak English.
Interventions	Both groups received baseline assessment at home before randomisation. 1. Stepping On programme. Multifaceted small-group (N =12) learning environment to encourage self efficacy, behaviour change and reduce falls using decision making theory and a variety of learning strategies. Facilitated by OT. Two hours weekly for 7 weeks; taught exercises and practiced in classes. OT home visit within 6 weeks of final programme session; booster session 3 months after final session. 2. Control: at least 2 social visits from student OT with no discussion of falls or fall prevention.
Outcomes	1. Rate of falls. 2. Number of people falling.

Clemson 2004 (*Continued*)

Notes	Details of programme in Appendix A of Clemson 2004: risk appraisal, exercise, moving safely, home hazards, community safety, footware, vision and falls, vitamin D, hip protectors, medication management, mobility mastery, review and plan.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "Randomised by researcher not involved in subject screening or assessment". Method not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Monthly falls postcard calendar.

Close 1999

Methods	RCT. Losses: 93 of 397 (23%).
Participants	Setting: community, London, United Kingdom. N = 397 Sample: community dwelling individuals presenting at A&E after a fall. Admitted patients not recruited until discharge. Age: mean 78.2 (SD 7.5). Inclusion criteria: aged 65 and over; history of falling. Exclusion criteria: cognitive impairment (AMT <7) and no regular carer (for informed consent reasons); speaking little or no English; not living locally.
Interventions	1. Medical and occupational therapy assessments and interventions. Medical assessment to identify primary cause of fall and other risk factors present (general examination and visual acuity, balance, cognition, affect, medications). Intervention and referral as required. Home visit by occupational therapist (functional assessment and environmental hazards) . Advice, equipment and referrals as required. 2. Control: usual care only.
Outcomes	1. Rate of falls. 2. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Close 1999 (*Continued*)

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised by random numbers table.
Allocation concealment?	Yes	List held independently of the investigators.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls diary with 12 monthly sheets, collected every 4 months.

Coleman 1999

Methods	RCT. Cluster randomised. Unit of randomisation physician practice. Losses: 56 of 169 (33%).
Participants	Setting: HMO members, Washington, USA. N = 169. Sample: community dwelling men and women in 9 physician practices in an ambulatory clinic. Age: mean 77. Inclusion criteria: aged 65 and over; high risk of being hospitalised or of developing functional decline; community dwelling. Exclusion criteria: living in nursing home; terminal illness; moderate to severe dementia or "too ill" (physician's judgment).
Interventions	1. Half-day Chronic Care Clinics every 3-4 months in 5 practices focusing on planning chronic disease management (physician and nurse); reducing polypharmacy and high risk medications (pharmacist); patient self management/support group. 2. Control: usual care (4 practices).
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomized using simple randomization"
Allocation concealment?	No	Cluster randomised.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.

Coleman 1999 (*Continued*)

Low risk of bias in recall of falls?	No	Falls recorded retrospectively by questionnaire at 12 and 24 months.

Cornillon 2002

Methods	RCT. Losses: 5 of 303 (1.7%).
Participants	Setting: community, St Étienne, France. N = 303. Subjects: community dwelling and independent in ADL (83% women). Age: mean 71. Inclusion criteria: aged over 65; living at home; ADL independent; consented. Exclusion criteria: cognitively impaired (MMSE <20); obvious disorder of walking or balance.
Interventions	1. Information on fall risk, and balance and sensory training in groups of 10-16. One session per week for 8 weeks. Session started with foot and ankle warm-up (walking on tip toe and on heels etc), walking following verbal orders, walking bare foot on different surfaces, standing on one leg with eyes open and shut, practicing getting up from the floor. 2. Control: normal activities.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomised by random number tables.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded on 6 monthly falls calenders.

Cumming 1999

Methods	RCT (randomised consent design) Losses: 142 of 530 (27%).
Participants	Setting: community, Sydney, Australia. N = 530 Sample: community dwelling people recruited in hospital wards, clinics, and day care centres.

Cumming 1999 (*Continued*)

	Age: mean 77 (SD 7.2). Inclusion criteria: aged 65 and over; living in the community and within geographically defined study area. Exclusion criteria: cognitively impaired and not living with someone who could give informed consent and report falls; if OT home visit already planned as part of usual care.
Interventions	1. One home visit by experienced occupational therapist assessing environmental hazards (standardised form) and supervision of home modifications. Telephone follow up after 2 weeks. 2. Control: usual care.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Stratified block randomisation using random numbers table.
Allocation concealment?	Yes	Randomised off site by person not involved in recruitment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls ascertained using monthly falls calendar.

Cumming 2007

Methods	RCT. Losses: 28 of 616 (5%).
Participants	Setting: community, Sydney, Australia. N = 616 Sample: men and women from outpatient aged care services, some volunteers recruited by advertisement (68% women). Age: mean 80.6 (SD 6) years. Inclusion criteria: age 70 and older; living independently in the community; no cataract surgery or new eye glass prescription in previous 3 months; participant or care giver able to complete monthly falls calendar. Exclusion criteria: none noted.
Interventions	1. Vision tests and eye examinations. Dispensing of new spectacles if required. Referral for expedited ophthalmology treatment if appropriate occular pathology identified. Mobility training and canes if required.

Cumming 2007 (*Continued*)

	2. Control: usual care.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Not described.
Allocation concealment?	Yes	Randomised off site by person not involved in recruitment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Blinding? Fractures	Unclear	Fractures reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Monthly falls calendar.

Davison 2005

Methods	RCT. Losses: 31 if 313 (9%)
Participants	Setting: A&E, Newcastle, UK. N = 313 Sample: community-dwelling, cognitively intact, presenting at A&E with a fall or fall-related injury (% women). Age: mean 77 (SD 7) Inclusion criteria: age > 65 years, presenting at A&E with a fall or fall related injury; history of at least one additional fall in previous year. Exclusion criteria: cognitively impaired (MMSE < 24); > 1 previous episode of syncope; immobile; live > 15 miles away from A&E; registered blind; aphasic; clear medical explanation for their fall e.g. acute myocardial infarction, stroke, epilepsy; enrolled in another study.
Interventions	1. Multifactorial post-fall assessment and intervention. Hospital-based medical assessment and intervention: fall history and examination including medications, vision, cardiovascular assessment, laboratory blood tests, ECG. Home-based physiotherapist assessment and intervention: gait, balance, assistive devices, footwear. Home-based OT home hazard assessment and interventions. 2. Control: usual care.
Outcomes	1. Rate of falls. 2. Number of people falling.

Davison 2005 (*Continued*)

Notes	Only one participant in residential/nursing care. More detailed description of intervention on journal website (www.ageing.oupjournals.org)

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised by computer-generated block randomisation.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls data collected using fall diaries returned 4 weekly.

Day 2002

Methods	RCT. Factorial design. Losses: 17 of 1107 (1.5%).
Participants	Setting: community, Melbourne, Australia. N = 1107 Sample: community dwelling men and women identified from electoral roll (59.8% women). Age: mean 76.1 (SD 5.0). Inclusion criteria: aged 70 and over; living in own home or apartment or leasing similar accommodation and able to make modifications. Exclusion criteria: if not expected to remain in area for 2 years (except for short absences); had participated in regular to moderate physical activity with a balance component in previous 2 months; unable to walk 10-20 m without rest or help or having angina; had severe respiratory or cardiac disease; had a psychiatric illness prohibiting participation; had dysphasia; had recent major home modifications; had an education and language adjusted score >4 on the short portable mental status questionnaire; or did not have approval of their general practitioner.
Interventions	1. Exercise: weekly class of 1 hour for 15 weeks plus daily home exercises. Designed by physiotherapist to improve flexibility, leg strength and balance (or less demanding routine depending on subject's capability). 2. Home hazard management: hazards removed or modified by participants or City of Whitehorse's home maintenance programme. Staff visited home, provided quote for work including free labour and materials up to $A 100. 3. Vision improvement: assessed at baseline using dual visual acuity chart. Referred to usual eye care provider, general practitioner or local optometrist if not already receiving treatment for identified impairment. 4. (1) + (2) 5. (1) + (3) 6. (3) + (2)

Day 2002 (*Continued*)

	7. (1) + (2) + (3) 8. No intervention. Received brochure on eye care for over 40 year olds.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised by "adaptive biased coin" technique, to ensure balanced group numbers.
Allocation concealment?	Yes	Computer generated by an independent third party contacted by telephone.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls reported using monthly postcard to record daily falls. Telephone follow-up if calendar not returned within 5 working days of the end of each month, or reporting a fall.

Dhesi 2004

Methods	RCT. Losses: 16 of 139 (12%) (see Notes).
Participants	Setting: community, United Kingdom. N = 140 Sample: patients attending a falls clinic (77% women). Age: mean 76.8 (SD 6.2). Inclusion criteria: aged 65 and over; living in own home; fallen in previous 8 weeks; normal bone chemistry; 25 OHD $\leq$ 12 mcg/litre. Exclusion criteria: AMT < 7/10; taking vitamin D or calcium supplements; history of chronic renal failure, alcohol abuse, conditions or medications likely to impair postural stability or vitamin D metabolism.
Interventions	1. One intramuscular injection (2 ml) of 600,000 IU ergocalciferol. 2. Control: one placebo injection of 2 ml normal saline.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	Flowchart in Figure 1 shows N = 139 randomised with 70 in intervention group, but Table 1 (baseline characteristics) shows N = 138 randomised with 69 in intervention group.

Dhesi 2004 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomised in blocks of 20, by computer programme.
Allocation concealment?	Yes	Randomised independently of the investigators.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial).
Low risk of bias in recall of falls?	Yes	Falls recorded in falls diary which was reviewed at follow-up assessment.

Dukas 2004

Methods	RCT. Losses: 57 of 378 (15%).
Participants	Setting: community, Basel, Switzerland N = 378. Sample: volunteers recruited from long term cohort study, and newspaper advertisements (52% women). Age: mean 75 (SD 4.2). Inclusion criteria: aged over 70; mobile; independent lifestyle. Exclusion criteria: primary hyperparathyroidism; polyarthritis or inability to walk; calcium supplementation > 500 mg/d; vitamin D intake > 200 IU/day, active kidney stone disease; history of hypercalcuria, cancer or other incurable diseases; dementia, elective surgery planned within next 3 months; severe renal insufficiency; fracture or stroke within last 3 months.
Interventions	1. Alfacalcidol (Alpha D3 TEVA) 1 mcg per day for 36 weeks. 2. Placebo daily for 36 weeks.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomised using "numbered containers"; numbered and blinded by independent statistical group.

Dukas 2004 (*Continued*)

Allocation concealment?	Yes	Numbered and blinded by independent statistical group.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial).
Low risk of bias in recall of falls?	Unclear	Questionnaire about incidence of falls at clinic visits (4 weeks, 12 weeks, and every 12 weeks subsequently to 36 weeks). Subjects asked to record falls in a diary and to telephone within 48 hours of a fall.

Elley 2008

Methods	RCT. Losses: 32 of 312 (10%).
Participants	Setting: Hutt Valley, New Zealand. N = 312. Sample: patients from 19 primary care practices (69% women). Age: mean 80.8 (SD 5). Inclusion criteria: aged 75 and over (> 50 years for Maori and Pacific people), fallen in last year, living independently. Exclusion criteria: unable to understand study information and consent processes, unstable or progressive medical condition, severe physical disability, dementia (< 7 on Abbreviated Mental Test Score).
Interventions	1. Community-based nurse assessment of falls and fracture risk factors, home hazards, referral to appropriate community interventions, and strength and balance exercise programme. 2. Control: usual care and social visits.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "computer randomisation".
Allocation concealment?	Yes	Quote: "independent researcher at a distant site".
Blinding? Falls	Unclear	Participants not blind to allocation. Assessors blind to allocation.
Low risk of bias in recall of falls?	Yes	Quote: "Postcard calendars completed daily and posted monthly".

Fabacher 1994

Methods	RCT. Losses: 59 of 254 (23%).
Participants	Setting: community, California, USA. N = 254. Sample: men and women aged over 70 years and eligible for veterans medical care. Identified from voter registration lists and membership lists of service organisations (2% women). Age: mean 73 years. Inclusion criteria: aged 70 and over; not receiving health care at Veterans Administration Medical Centre. Exclusion criteria: known terminal disease, dementia.
Interventions	1. Home visit by health professional to screen for medical, functional, and psychosocial problems, followed by a letter for participants to show to their personal physician. Targeted recommendations for individual disease states, preventive health practices. 2. Control: follow-up telephone calls for outcome data only.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly assigned .... using randomly generated assignment cards in sealed envelopes". Judged to be unclear.
Allocation concealment?	Unclear	Quote: "randomly assigned .... using randomly generated assignment cards in sealed envelopes". Judged to be unclear.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Falls identified at 4 monthly intervals, by structured interview for active arm and by telephone for controls.

Fiatarone 1997

Methods	RCT. Losses: 4 of 34 (11%).
Participants	Setting: community, USA. N = 34. Sample: frail older people (94% women). Age: mean 82 (SD 1). Inclusion criteria: community dwelling older people; moderate to severe functional impairment. Exclusion criteria: none given.

Fiatarone 1997 (*Continued*)

Interventions	1. High intensity progressive resistance training exercises in own home. Two weeks of instruction and then weekly phone calls. 11 different upper and lower limb exercises with arm and leg weights, 3 days per week for 16 weeks. 2. Control: wait list control. Weekly phone calls.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	Abstract only.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls identified weekly by phone call.

Foss 2006

Methods	RCT. Losses: 21 of 239 (9%).
Participants	Setting: community, Nottingham, United Kingdom. N = 239 Sample: referred to ophthalmology outpatient clinic (100% women). Age: mean 79.5 (range 70 to 92). Inclusion criteria: over 70 years of age; following successful cataract operation and with operable second cataract. Exclusion criteria: having complex cataracts; visual field defects or severe comorbid eye disease affecting visual acuity; memory problems preventing completion of questionnaires or reliable recall of falls.
Interventions	1. Small incision cataract surgery with insertion of intraocular lens under local anaesthetic. 2. Control: waiting list.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	

Foss 2006 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "lists prepared from random numbers in variably sized permuted blocks to maintain approximate equality in the size of the groups".
Allocation concealment?	Yes	Sequentially numbered, opaque envelopes.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Blinding? Fractures	Unclear	Fractures reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded on daily diary. Data collected by phone at 3 and 9 months, and by interview at 6 and 12 months.

Gallagher 1996

Methods	RCT. Losses: none described.
Participants	Setting: community, Victoria, British Columbia, Canada. N = 100. Sample: community dwelling volunteers (80% women). Age: mean 74.6. Inclusion criteria: aged 60 and over; fallen in previous 3 months. Exclusion criteria: none described.
Interventions	1. Two risk assessment interviews of 45 minutes each. One counselling interview of 60 minutes showing video and booklet and results of risk assessment. 2. Control: baseline interview and follow up only. No intervention.
Outcomes	1. Rate of falls. Other outcomes reported but not included in this review.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Method of randomisation not described.

Gallagher 1996 (*Continued*)

Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Calendar postcards completed and returned every two weeks for six months. Telephone follow up of reported falls.

Gallagher 2001

Methods	RCT. Losses: 73 of 489 (15%)
Participants	Setting: presumed community, Omaha, USA. N = 489. Sample: mailing lists used to contact women aged 65-77 years in Omaha and surrounding district (100% women). Age: range 65-77, mean 71 (SD 4). Inclusion criteria: 65 - 77 years; not osteoporotic (femoral neck density in normal range for age). Exclusion criteria: severe chronic illness; primary hyperparathyroidism or active renal stone disease; on certain medications in last 6 months e.g. bisphosphonates, anticonvulsants, estrogen, fluoride, thiazide diuretics.
Interventions	1. Calcitriol (Rocaltrol) 0.25 mcg twice daily for 3 years. 2. HRT/ERT (conjugate estrogens (Premarin) 0.625 mg daily + medroxyprogesterone (Provera) 2.5 mg daily. 3. Calcitriol plus HRT/ERT as above. 4. Control: placebo. (ERT given to hysterectomised women N = 290 i.e. not given progestin). All groups advised to increase dietary calcium if daily intake < 500 mg/d and to decrease dietary calcium if intake > 1000 mg/d.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	"Simple randomisation" stratified on presence or absence of uterus. No further details.
Allocation concealment?	Unclear	Quote: "randomly assigned". No methods described.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial).

Gallagher 2001 (*Continued*)

Low risk of bias in recall of falls?	No	Falls retrospectively monitored by interview questionnaire at 6 weeks, 12 weeks, and 6 monthly thereafter.

Grant 2005

Methods	RCT (multicentre). 2x2 factorial design. Losses:
Participants	Setting: United Kingdom. N = 5292. Sample: 21 centres in England and Scotland (85% women). Age: mean 77 (SD 6). Inclusion criteria: aged 70 and over; recent previous osteoporotic fracture (defined as caused by a fall). Exclusion criteria: bed or chair bound prior to fracture; abbreviated mental test score 6 or less; cancer likely to metastasise to bone within previous 10 years; fracture associated with pre-existing bone abnormality; known hypercalcaemia; renal stone in last 10 years; life expectancy < 6 m; known to be leaving the UK; taking > 200 IU (5 mcg) vitamin D or > 500 mg calcium supplements daily; had fluoride, calcitonin, tibolone. HRT, selective estrogen receptor modulators or any vitamin D metabolite (such as calcitriol) in the last 5 years; vitamin D by injection in preceding year.
Interventions	Two tablets daily with meals for two years. Tablets delivered every four months by post. Randomised to tablets containing a total of either: 1. 800 IU (20 mcg) vitamin D3 plus placebo calcium 2. 800 IU vitamin D3 + 1000 mg calcium 3. 1000 mg elemental calcium (calcium carbonate) plus placebo vitamin D 4. Double placebo.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture. 3. Number of people with adverse effects.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Computer-generated, centralised randomisation, stratified by centre.
Allocation concealment?	Yes	Centralised randomisation.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial) .

Grant 2005 (*Continued*)

Blinding? Fractures	Yes	Fractures reported by participants who were blind to their group allocation, and identified from other sources (placebo-controlled trial).
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls ascertained in 4 monthly postal questionnaire ("Have you fallen during the last week") with telephone follow up if required, also from hospital and GP staff annotating notes.

Gray-Donald 1995

Methods	RCT. Losses: 4 of 50 (8%).
Participants	Setting: community, Quebec, Canada. N = 50. Subjects: men and women recruited from those receiving long term home help services (71% women). Age: mean 77.5 (SD 8). Inclusion criteria: aged over 60; requiring community services; elevated risk of under-nutrition (excessive weight loss or BMI <24 kg/m2). Exclusion criteria: alcoholic; terminal illness.
Interventions	1. 12 week intervention of high energy nutrient dense supplements provided by dietitian. Two 235 ml cans per day (1045-1480 kj per can) for 12 weeks. 2. Control: visits only (encouragement and suggestions about improving diets).
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Method of randomisation not described. Stratified by gender and nutritional risk criteria.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Retrospectively monitored at 6 and 12 weeks.

Green 2002

Methods	RCT. Losses: 24 of 170 (14%)
Participants	Setting: Bradford, United Kingdom. N = 170 Sample: patients on hospital and community therapy stroke registers (44% women) Age: mean 72.5 (SD 8.5) years. Inclusion criteria: > 50 years old; stroke at least 1 year previously; persisting stroke-related mobility problems. Exclusion criteria: dementia; severe comorbidity; confined to bed; physiotherapy treatment within previous 6 months.
Interventions	1. Community physiotherapy programme at home or in outpatient rehabilitation centres. Maximum contact period usually 13 weeks, with a minimum of three contacts per patient. 2. Control: usual care.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"Random number tables and used four length permuted blocks".
Allocation concealment?	Yes	Numbered, sealed, opaque envelopes.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Retrospective interval recall at 3 monthly assessments.

Greenspan 2005

Methods	RCT. 2x2 factorial design. Losses: 36 of 373 (10%).
Participants	Setting: community, Boston, USA. N = 373 Sample: identified from newspaper advertisements, targeted mailings, presentations to seniors groups, and physician referrals (100% women). Age: mean 71.3 (SD 5.2). Inclusion criteria: community-dwelling women including women with hysterectomy; aged 65 and older. Exclusion criteria: illness that could affect bone mineral metabolism; current use of medications known to alter bone mineral metabolism; known contraindication to HRT use.

Greenspan 2005 (*Continued*)

Interventions	1. HRT/ERT plus placebo alendronate 2. HRT/ERT plus alendronate 3. Alendronate plus placebo HRT/ERT 4. Placebo HRT/ERT plus placebo alendronate All participants received calcium and vitamin D supplementation throughout the study. (ERT given to hysterectomised women i.e. not given progestin)
Outcomes	1. Number of people falling. Falls a secondary outcome of study. Other outcomes reported but not included in this review.
Notes	In the 2005 report the data presented are for all women receiving HRT. This includes women who received HRT + alendronate. Although there is no evidence of an interaction between these agents which might plausibly affect falls, this cannot be absolutely ruled out. Therefore in this review we have taken a conservative approach, and not used data the group who received HRT + alendronate.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Computer random number generation.
Allocation concealment?	Yes	Sequentially numbered, opaque, sealed envelopes.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial) .
Low risk of bias in recall of falls?	No	Interval recall, but at six months and one year.

Harwood 2004

Methods	RCT. Losses: 31 of 150 (21%).
Participants	Setting: Nottingham, UK. N = 150. Sample: women admitted to orthogeriatric rehabilitation ward within 7 days of surgery for hip fracture (100% women). Age: mean 81.2 (range 67-92) years. Inclusion criteria: recent surgery for hip fracture; previous community residence; previous independence in ADL. Exclusion criteria: previously institutionalised; disease or medication known to affect bone metabolism; < 7 on 10 point mental state score.

Harwood 2004 (*Continued*)

Interventions	1. Single injection of vitamin D2 (ergocalciferol) 300,000 units. 2. Single injection of vitamin D2 (ergocalciferol) 300,000 units plus oral calcium carbonate (calcichew) 1 tablet x 2 per day (1 g elemental calcium daily). 3. Oral vitamin D3 + calcium carbonate (Calceos) 1 tablet x 2 per day (cholecalciferol 800 units/day + calcium 1 g/day). 4. Control: no treatment.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture. 3. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	Recruited in hospital but meets the inclusion criteria as participants were all community-dwelling and intervention was designed to prevent falls in the community.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomised to four groups by computer generated random number lists.
Allocation concealment?	Unclear	Quote: "using sealed, opaque, envelopes".
Blinding? Falls	No	Falls reported by participants to researchers who were aware of their group allocation.
Blinding? Fractures	No	Fractures reported by participants to researchers who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Falls not recorded in diaries. Presume falls and fractures ascertained at dedicated clinic at 3, 6 and 12 months.

Harwood 2005

Methods	RCT Losses: 10 of 301 (3%).
Participants	Setting: Nottingham, UK. N = 306. Sample: women referred to one of three consultant ophthalmologists (or to an optometrist-led cataract clinic). Age: median 78.5 (range 70 - 95) years. Inclusion criteria: women; aged > 70 years; with cataract; no previous ocular surgery. Exclusion criteria: cataract not suitable for surgery by phacoemulsification; severe refraction error in 2nd eye; visual field deficits; severe co-morbid eye disease affecting visual acuity; registrable partially sighted as a result of cataract; memory problems.

Harwood 2005 (*Continued*)

Interventions	1. Expedited cataract surgery (target within 1 month). 2. Routine waiting list for surgery (within 13 months) plus up-to-date spectacle prescription.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. 4. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Random numbers in variably sized permuted blocks: "Block randomised consecutively to groups."
Allocation concealment?	Yes	Sequentially numbered, opaque, sealed envelopes.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Unclear whether the assessors were aware of group allocation.
Blinding? Fractures	Unclear	Presume fractures reported by participants who were aware of their group allocation. Unclear whether the assessors were aware of group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded in diaries, telephoned at 3 and 9 months, interviewed at 6 and 12 months for data.

Hauer 2001

Methods	RCT. Losses: 12 of 57 (21%).
Participants	Setting: community, Germany. N = 57 Sample: recruited at the end of ward rehabilitation from a geriatric hospital (100% women). Age: mean 82 (SD 4.8) range 75-90 years. Inclusion criteria: ≥75 years; fall(s) as reason for admission to hospital or recent history of injurious fall leading to medical treatment; residing within study community. Exclusion criteria: acute neurological impairment; severe cardiovascular disease; unstable chronic or terminal illness; major depression; severe cognitive impairment; musculoskeletal impairment preventing participation in training regimen; falls known to be due to a single, identifiable disease e.g. stroke or hypoglycaemia.

Hauer 2001 (*Continued*)

Interventions	1. Exercise: group resistance training and progressive functional balance training, x3 days per week for 12 weeks. 2. Control: "motor placebo" i.e. flexibility, calisthenics, ball games and memory tasks while seated x3 days per week.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Stratified randomisation.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Daily diaries collected every two weeks.

Helbostad 2004

Methods	RCT. Losses: 24 of 77 (31%).
Participants	Setting: 6 local districts in Trondheim, Norway. N = 77. Sample: volunteers recruited by announcement in local newspapers and invitations distributed by local health workers (81% women). Age: mean 81 (SD 4.5). Inclusion criteria: aged 75 and over; one or more falls in last year; using walking aid indoor or outdoor. Exclusion criteria: exercising one or more times weekly; terminal illness; cognitive impairment (MMSE <22); stroke during previous 6 months; geriatric assessment showed not able to tolerate exercise.
Interventions	1. Combined training: home visit by physical therapist for assessment; group classes, 5-8 people (individually tailored progressive resistance exercises, functional balance training) 1 hour 2x per week for 12 weeks + home exercises as below (2). 2. Home training: four non-progressive exercises (functional balance and strength exercises) 2x daily for 12 weeks + 3 group meetings.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Helbostad 2004 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Quote: "randomised into one of two exercise programs"
Allocation concealment?	Yes	Randomised by independent research office using sealed envelopes.
Blinding? Falls	Yes	Falls reported by participants. Both groups received an exercise intervention. Assessors blind to subjects' assignment.
Low risk of bias in recall of falls?	Yes	Monthly falls diary (pre-paid post card), telephone call if no response or fall reported.

Hendriks 2008

Methods	RCT with economic evaluation. Losses: 83 of 333 (25%)
Participants	Setting: Maastricht, The Netherlands. N = 333. Sample: people aged who have visited an A&E department or a GP because of a fall (70% women) . Age: mean 74.8 (SD 6.4) years. Inclusion criteria: community-dwelling; ≥ 65 years; history of a fall requiring visit to A&E or GP; living in Maastricht area. Exclusion criteria: not able to speak or understand Dutch; not able to complete questionnaires or interviews by telephone; cognitive impairment (< 4 on AMT4); long-term admission to hospital or other institution (> 4 weeks from date of inclusion); permanently bedridden; fully dependent on a wheelchair.
Interventions	1. Multifactorial intervention: detailed assessment by geriatrician, rehabilitation physician, geriatric nurse; recommendations and indications for referral sent to participants' GPs. GPs could then take action if they agreed with the recommendations and/or referrals. Home assessment by OT; recommendations sent to participants and their GPs, and direct referral to social or community services for provision of technical aids and adaptations or additional support. 2. Control: usual care.
Outcomes	1. Number of people falling.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**

Hendriks 2008 (*Continued*)

Adequate sequence generation?	Unclear	Quote: "Randomisation was achieved by means of computerised alternative allocation and performed by an external agency".
Allocation concealment?	Unclear	Quote: "Randomisation was achieved by means of computerised alternative allocation and performed by an external agency".
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Quote: "To ensure blinding during data collection, measurements by phone were contracted out to an independent call centre (....), whose operators were unaware of group allocation."
Low risk of bias in recall of falls?	Yes	Quote: "Participants recorded their falls continuously on a fall calendar during twelve months after baseline. They were contacted monthly by telephone by an independent call centre (MEMIC) to report the falls noted on the calendar".

Hill 2000

Methods	RCT. Losses: 22 of 100 (22%)
Participants	Setting: community, Staffordshire, United Kingdom. N = 100 Sample: people referred to falls assessment clinic (73% women). Age: mean 78.5 years. Inclusion criteria: history of recurrent falls referred to falls clinic. Exclusion criteria: cognitive impairment.
Interventions	1. Daily exercise, twice weekly supervised group balance exercise and individualised fall prevention advice. 2. Control: standard fall prevention advice.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. 4. Number of people with adverse effects.
Notes	

Risk of bias

Item	Authors' judgement	Description

Hill 2000 (*Continued*)

Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Unclear whether assessors collecting data did.
Low risk of bias in recall of falls?	No	Recall at end of study period (6 months).

Hogan 2001

Methods	RCT. Losses: 24 of 163 (15%).
Participants	Setting: community, Calgary, Canada. N = 163. Sample: high risk community dwelling men and women (71% women). Age: mean 77.6 (SD 6.8). Inclusion criteria: aged 65 and over; fall in previous 3 months; living in the community; ambulatory (with or without aid); mentally intact (able to give consent). Exclusion criteria: qualifying fall resulted in lower extremity fracture, resulted from vigorous or high-risk activities, because of syncope or acute stroke, or while undergoing active treatment in hospital.
Interventions	1. One in-home assessment by a geriatric specialist (doctor, nurse, physiotherapist or OT) lasting 1-2 hours. Intrinsic and environmental risk factors assessed. Multidisciplinary case conference (20 minutes). Recommendations sent to patients and patients' doctor for implementation. Subjects referred to exercise class if problems with balance or gait and not already attending an exercise programme. Given instructions about exercises to do at home. 2. Control: one home visit by recreational therapist.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Computer generated. Stratified by number of falls in previous year: 1 or >1.
Allocation concealment?	Unclear	Sequence concealed in locked cabinet prior to randomisation.

Hogan 2001 (*Continued*)

Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. "The RA (research assistant) remained blinded throughout the study as to each subject's group assignment."
Blinding? Fractures	Unclear	Unclear if self-reported first. Research assistant collecting data remained blinded throughout the study as to each participant's group assignment.
Low risk of bias in recall of falls?	Unclear	Falls recorded on monthly calenders (47.8% returned). Also retrospective recall at 3, 6 months (at visit) and 12 months (by phone).

Hornbrook 1994

Methods	RCT (cluster randomised by household). Losses: 156 of 3182 (5%) in the intervention group.
Participants	Setting: community, USA. N = 3182 (N = 2509 households). Sample: independently living members of HMO recruited by mail (38% women). Age: mean 73 (SD 6). Inclusion criteria: aged over 65; ambulatory; living within 20 miles of investigation site; consenting. Exclusion criteria: blind; deaf; institutionalised; housebound; non-English speaking; severely mentally ill; terminally ill; unwilling to travel to research centre.
Interventions	1. Home visit, safety inspection (prior to randomisation), hazards booklet, repair advice, fall prevention classes (addressing environmental, behavioural, and physical risk factors), financial and technical assistance. 2. Control: home visit, safety inspection (prior to randomisation), hazards booklet.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly assigned".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.

Hornbrook 1994 (*Continued*)

Blinding? Fractures	Unclear	Fractures reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Returned a postcard after each fall. Also recorded falls on monthly diaries, and received quarterly mail/telephone contacts.

Huang 2004

Methods	RCT. Losses: 7 of 120 (6%)
Participants	Setting: community, Hsin-Chu County, Northwest Taiwan. N = 120. Sample: persons in registered households (46% women). Age: mean 72 (SD 5.7). Inclusion criteria: aged 65 and over; community living; cognitively intact. Exclusion criteria: none stated.
Interventions	1. 3 home visits over 4 months (HV1, HV2 and HV3) by nurse? HV1: risk assessment (medications and environmental hazards). HV2: two months later. Standard fall prevention brochure plus individualised verbal teaching and brochure relating to fall risk factors identified at HV1. HV3: assessment and collection of falls data. 2. Control: HV1: risk assessment. HV2: standard fall prevention brochure. HV3: assessment and collection of falls data.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Method of randomisation not described. Quote: "In applying cluster sampling, half of the sample was randomly assigned to the experimental group, and the other half as the comparison group".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.

Low risk of bias in recall of falls?	Yes	Prospective. Self reported falls recorded on a calender in a Falls Record Checklist for the two months after the intervention visit.

Huang 2005

Methods	RCT. Losses: 15 of 141 (11%).
Participants	Setting: hospital, northern Taiwan. N = 141 Sample: people in hospital with a fall-related hip fracture (69% women). Age: mean 77 (SD 7.6) years. Inclusion criteria: in hospital with hip fracture resulting from a fall; aged 65 and over; discharged within medical centre catchment area. Exclusion criteria: cognitively impaired; too ill (comorbidities, unable to communicate or in intensive care unit).
Interventions	1. Discharge planning intervention by masters-level gerontological nurse, from hospital admission until 3 month after discharge (first visit within 48 hours of admission, seen every 48 hours while in hospital, one home visit 3-7 days after discharge, available by phone 8am - 8pm seven days a week, phoned participant or care-giver once a week). Nurse created individualised discharge plan and facilitated set up of home care services etc. Participants provided with brochures on self-care for hip fracture patients and fall prevention (environmental safety and medication issues). Nurse provided direct care and education on correct use of assistive devices, and assessed rehabilitation needs. Collaborated with physicians to modify therapies. 2. Control: usual discharge planning also by nurses but not specialists. No brochures, written discharge summaries, home visits, phone calls.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	Majority were community-dwelling as states "the majority of older people with hip fracture who are discharged from hospital are at home..." Intervention included a home visit. 91% living with family."

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomly assigned using a computer generated table.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. Research assistant did assigning to groups and assessments (not blind).

Low risk of bias in recall of falls?	Unclear	Falls data collected using falls diary. Appear to have been interviewed at 2 weeks and 3 months. No mention of diaries being returned by post.

Jitapunkul 1998

Methods	RCT. Losses: 44 of 160 (28%).
Participants	Setting: community, Thailand. N = 160. Sample: community dwelling men and women recruited from a sample for a previous study (66% women). Age: mean 75.6 (SD 5.8). Inclusion criteria: aged 70 and over; living at home. Exclusion criteria: none stated.
Interventions	1. Home visit from non health professional with structured questionnaire. 3 monthly visits for 3 years. Referred to nurse/geriatrician (community based) if Barthel ADL index and/or Chula ADL index declined 2 or more points, or subject fell more than once during previous 3 months. Nurse/geriatrician would visit, assess, educate, prescribe drugs/aids, provide rehabilitation programme, make referrals to social services, and other agencies. 2. Control: no intervention. Visit at the end of 3 years.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. Possible bias. Intervention group provided falls data every three months for three years, but control group received no other visits in which falls data were collected.
Low risk of bias in recall of falls?	No	Retrospective. Falls data for preceding three months collected at exit assessment at 3 years.

Kenny 2001

Methods	RCT. Losses: 16 of 175 (9%).
Participants	Setting: Cardiovascular Investigation Unit, Newcastle, UK. N = 175. Sample: individuals presenting at A&E with non-accidental fall (60% women). Age: mean 73 (SD 10). Inclusion criteria: aged 50 and over; history of a non-accidental fall; diagnosed as having cardioinhibitory CSH by carotid sinus massage. Exclusion criteria: cognitive impairment; medical explanation of fall within 10 days of presentation; an accidental fall; blind; lived >15 miles from A&E; had contraindication to CSM; receiving medications known to cause a hypersensitive response to CSM.
Interventions	1. Pacemaker (rate drop response physiologic dual-chamber pacemaker: Thera RDR, Medtronic, Minneapolis, Minnesota). 2. Control: no pacemaker.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. Other outcomes reported but not included in this review.
Notes	Out of 3384 A&E attendees with non-accidental falls, 257 were diagnosed as having carotid sinus hypersensitivity. 175 of these were randomised i.e. 5% of non-accidental falls.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: " Randomised....by block randomisation; in blocks of eight". Method of sequence generation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Blinding? Fractures	Unclear	Presume fractures reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded daily on self-completion diary cards which were returned at the end of each week for one year.

Kingston 2001

Methods	RCT. Losses: 17 of 109 (16%).
Participants	Setting: A&E, Staffordshire, UK. N = 109. Sample: community-dwelling women attending A&E with a fall. Age: mean 71.9. Inclusion criteria: female; aged 65-79; history of a fall; discharged directly to own home. Exclusion criteria: admitted from A&E to hospital or any form of institutional care.
Interventions	1. Rapid Health Visitor intervention within 5 working days of index fall: pain control and medication, how to get up after a fall, education about risk factors (environmental and drugs, alcohol etc), advice on diet and exercise to strengthen muscles and joints. Also care managed on individual basis for 12 months post index fall. 2. Control: usual post fall treatment i.e. letter to GP from A&E detailing the clinical event, any interventions carried out in hospital and recommendations about follow up.
Outcomes	1. Number of people falling. Falls not primary outcome of study. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly allocated".
Allocation concealment?	Unclear	Quote: "randomly allocated". Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Quote: "Falls were recorded at week twelve assessment" (information from author).

Korpelainen 2006

Methods	RCT. Losses: 24 of 160 (15%).
Participants	Setting: community, Oulu, Finland. N = 160. Sample: birth cohort of women. Age: mean 73 (SD 1.2) years. Inclusion criteria: hip BMD > 2 less than the reference value. Exclusion criteria: "medical reasons"; use of a walking aid other than a stick; bilateral total hip

Korpelainen 2006 (*Continued*)

	joint replacement; unstable chronic illness; malignancy; medication known to affect bone density; severe cognitive impairment; involvement in other interventions.
Interventions	1. Supervised exercise programme (physiotherapist led). Mixed home and supervised group programme plus twice yearly seminars on nutrition, health, medical treatment and fall prevention. 2. Control: twice yearly seminars on nutrition, health, medical treatment and fall prevention.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "Each participant received sequentially, according to the original identification numbers, the next random assignment in the computer list".
Allocation concealment?	Yes	The randomisation was "provided by a technical assistant not involved in the conduction of the trial."
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessors blind to allocation.
Blinding? Fractures	Unclear	Fractures reported by participants who were aware of their group allocation. Assessors blind to allocation.
Low risk of bias in recall of falls?	No	Three monthly retrospective recall.

Lannin 2007

Methods	RCT. Losses: 2 of 10 (20%).
Participants	Setting: community, Sydney, Australia. N = 10 Sample: patients admitted to a rehabilitation facility and referred to OT (80% women). Age: mean 81 (SD 7). Inclusion criteria: mild or no cognitive impairment; community dwelling (non institutional); aged 65 or older; no medical contraindications that would require strict adherence to equipment recommendations. Exclusion criteria: none.
Interventions	1. Best practice occupational therapy home visit intervention. 2. Control: standard practice in-hospital assessment and education.

Lannin 2007 (*Continued*)

Outcomes	1. Number of people falling.	
Notes	Pilot study.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Allocation schedule computer generated.
Allocation concealment?	Yes	Quote: "Concealed in opaque, consecutively numbered envelopes by a person not involved in the study."
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessor blind to group allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls ascertained by assessor at home visit at 2 weeks, and one, two and three months after discharge.

Latham 2003

Methods	RCT (factorial design). Losses: none described.
Participants	Setting: Five hospitals in Auckland, New Zealand and Sydney, Australia. N = 243. Sample: frail older people recently discharged from hospital (53% women). Age: mean 79 years. Inclusion criteria: aged 65 and over, considered frail (one or more health problems e.g. dependency in an ADL, prolonged bed rest, impaired mobility, or a recent fall); no clear indication or contraindication to either of the study treatments. Exclusion criteria: poor prognosis and unlikely to survive 6 months; severe cognitive impairment; physical limitations that would limit adherence to exercise programme; unstable cardiac status; large ulcers around ankles that would preclude use of ankle weights; living outside hospitals' geographical zone; not fluent in English.
Interventions	1. Exercise: quadriceps exercises using adjustable ankle cuff weights 3 x per week for 10 weeks. First 2 sessions in hospital, remainder at home. Monitored weekly by physiotherapist: alternating home visit with telephone calls. 2. Exercise control: frequency matched telephone calls and home visits from research physical therapist including general enquiry about recovery, general advice on problems, support. 3. Vitamin D: single oral dose of six 1.25 mg calciferol (300,000 IU). 4. Vitamin D control: placebo tablets.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number of people with adverse effects.

Latham 2003 (*Continued*)

	Other outcomes reported but not included in this review.
Notes	Detailed description of exercise regimen given in paper.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Study biostatistician generated random sequence. Block randomisation technique.
Allocation concealment?	Yes	Computerised centralised randomisation scheme.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessors blind to allocation group.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded in fall diary with weekly reminders for first 10 weeks. Nurses examined fall diaries and sought further details about each fall at 3 and 6 month visits. Reminder phone call between visits.

Li 2005

Methods	RCT. Losses: 81 of 256 (32%).
Participants	Setting: community, Legacy Health System, Portland, Oregon, USA. N = 256 Sample: enrolled in health maintenance organisation recruited from (70% women). Age: mean 77.5 (SD 5), range 70 - 92 years. Inclusion criteria: age $\geq$ 70; physician clearance to participate; inactive (no moderate to strenuous activity in last 3 months); walks independently. Exclusion criteria: chronic medical problems that would limit participation; cognitive impairment.
Interventions	1. Exercise intervention: Tai Chi 1 hour x3 per week for 26 weeks. 2. Control: low level stretching 1 hour x3 per week for 26 weeks.
Outcomes	1. Rate of falls. 2. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Li 2005 (*Continued*)

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Computer generated random numbers.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Daily fall calendar.

Lightbody 2002

Methods	RCT. Cluster randomised. Randomisation of 16 treating physicians, matched in 4 groups of 4, 2 control and 2 intervention in each group; enrolled subjects assigned to same group as their physician.. Losses: 10 of 301 (3%).
Participants	Setting: hospital, Liverpool, UK. N = 348. Subjects: consecutive patients attending A&E with a fall (74% women). Age: median 75, IQR 70-81. Inclusion criteria: aged > 65, patients attending A&E with a fall. Exclusion criteria: admitted to hospital as result of index fall, living in institutional care, refused or unable to consent, lived out of the area.
Interventions	1. Multifactorial assessment by falls nurse at one home visit (medication, ECG, blood pressure, cognition, visual acuity, hearing, vestibular dysfunction, balance, mobility, feet and footwear, environmental assessment). Referral for specialist assessment or further action (relatives, community therapy services, social services, primary care team. No referrals to day hospital or hospital outpatients). Advice and education about home safety and simple modifications e.g. mat removal. 2. Control: usual care.
Outcomes	1. Rate of falls. 2. Number of people falling. Other outcomes reported but not included in this review.
Notes	Assessment of risk factors: medication, ECG, blood pressure, cognition, visual acuity, hearing, vestibular dysfunction, balance, mobility, feet and footwear. Environmental assessment. Falls reported in diary and by questionnaire different.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information to permit judgment.

Lightbody 2002 (*Continued*)

Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls, injury and treatment recorded in diary. Postal questionnaire at 6 months to collect data. GP records and hospital databases searched.

Lin 2007

Methods	RCT. Losses: 25 of 150 (17%).
Participants	Setting: community, Taiwan. N = 150 Sample: residents of rural agricultural area (% women not known). Age: mean 76.5 years. Inclusion criteria: medical attention for a fall in previous 4 weeks, ≥ 65 years. Exclusion criteria: none described.
Interventions	1. Home-based exercise training. 2. Home safety assessment and modification. 3. Control: "education". 1 social visit 30-40 minutes every 2 weeks for 4 months with fall prevention pamphlets provided.
Outcomes	1. Rate of falls. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Block randomised. Insufficient information to permit judgment.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Reported falls by telephone or postcard when they occurred. Phoned every 2 weeks to ascertain occurrence of falls.

Liu-Ambrose 2004

Methods	RCT. Losses: 6 of 104 (6%)
Participants	Setting: community, British Colombia, Canada. N = 104. Sample: all women residents of greater Vancouver aged 75-85 with osteoporosis or osteopenia diagnosed at British Colombia Women's Hospital and Health Centre. Also list of individuals with low bone mass provided by Osteoporosis Society of Canada, British Colombia section and newspaper, radio and poster advertisements (100% women). Age: mean 79 (SD 3); range 75-85. Inclusion criteria: women aged 75-85; osteoporosis or osteopenia (BMD total hip or spine T score at least 1 SD below young normal sex matched area BMD of the Lunar reference database). Exclusion criteria: living in care facility; non-Caucasian race; regularly exercising 2 x weekly or more; history of illness or a condition affecting balance (stroke, Parkinson's disease); unable to safely participate in exercise programme; MMSE 23 or less.
Interventions	1. High intensity resistance training 50 minutes 2x weekly for 25 weeks using Keiser Pressurized Air system and free weights. Instructor:participant ratio 1:2. 2. Agility training 50 minutes 2x weekly for 25 weeks. Training (ball games, relay races, dance movements, obstacle courses wearing hip protectors) designed to challenge hand-eye and foot-eye coordination, and dynamic, standing and leaning balance, and reaction time. Instructor: participant ratio 1:3. 3. Control: sham exercises 50 minutes 2x weekly for 25 weeks. Stretching, deep breathing, relaxation, general posture. Instructor:participant ratio 1:4.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Method of randomisation not described but stratified by baseline performance in postural sway.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. "Falls documented using monthly falls calendars."

Lord 1995

Methods	RCT. Pre-randomisation prior to consent, from a schedule of participants in a previous study. Losses: 19 of 194 (10%), all from intervention group.
Participants	Setting: community, Australia. N = 194. Sample: women, recruited from a schedule from a previous epidemiologic study. Fitness level not defined. Age: mean 71.6 (SD 5.4); range 60-85. Inclusion criteria: living independently in the community. Exclusion criteria: unable to use English.
Interventions	1. Twice weekly exercise classes (warm-up, conditioning, stretching, relaxation) lasting 1 hour, over a 12 month period. 2. Control: no intervention.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly assigned".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessors not blind to treatment status.
Low risk of bias in recall of falls?	Unclear	Interval recall. Fall ascertainment questionnaires sent out every 2 months. Telephone call if questionnaire not returned.

Lord 2003

Methods	RCT. Cluster randomised by village. Stratified by accommodation (self care or intermediate care) and by cluster size (<75 or at least 75 residents). Losses: 47 of 551 (9%)
Participants	Setting: retirement villages, Sydney, Australia N = 551 (N = 20 clusters). Sample: recruited from self-care apartment villages (78%) and intermediate-care hostels (22%) (86% women). Age: mean 79.5 (SD 6.4); range 62-95. Inclusion criteria: resident in one of 20 retirement villages. Exclusion criteria: MMSE < 20; already attending exercise classes of equivalent intensity; medical

Lord 2003 (*Continued*)

	conditions that precluded participation as determined by nurse or physician (neuromuscular, skeletal, cardiovascular); in hospital or away at recruitment time.
Interventions	1. Group exercise classes for 1 hour 2.x weekly for 1 year. Designed to improve strength, speed, coordination, balance and gait, and to improve performance in ADLs (turning and reaching, rising from chair, stair climbing, standing and walking balance). 35-40 minute conditioning period. Aerobic exercises, strengthening exercises, activities for balance and hand-eye and foot-eye coordination, and flexibility (mostly weight bearing). 2. Control: seated flexibility and relaxation activities by yoga instructors (4 village sites) 1 hour 2x weekly for 1 year. 3. Control: no group activity.
Outcomes	1. Rate of falls.
Notes	Detailed description of exercise interventions in Lord 2004.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Falls ascertained by monthly questionnaires and follow-up phone calls or home visit for none responders. Nurses recorded falls in falls record book in intermediate-care hostels.

Lord 2005

Methods	RCT. Losses: 42 of 620 (7%).
Participants	Setting: community, Sydney, Australia. N = 620 Sample: health insurance membership database (66% women). Age: mean 80.4 (SD 4.5) years. Inclusion criteria: low score on PPA test; community dwelling; ≥ 75 years. Exclusion criteria: minimal English language skills; blind; PD; cognitive impairment.
Interventions	1. Extensive intervention comprising individualised exercise intervention (2x per week for 12 months), visual intervention, peripheral sensation counselling intervention. 2. Minimal intervention. Participants received a report outlining their falls risk, a profile of their test results, and specific recommendations on preventing falls based on their test performances.

Lord 2005 (*Continued*)

	3. Control: no intervention (received minimal intervention after 12 month follow up).
Outcomes	1. Rate of falls. 2. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "randomised in matched blocks N = 20 .. using concealed allocation (drawing lots)".
Allocation concealment?	Yes	Quote: "concealed allocation".
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Monthly fall calendars. Telephoned at end of month if not returned.

Luukinen 2007

Methods	RCT. Losses: 128 of 486 (26%).
Participants	Setting: community, Oulu, Finland. N = 486 Sample: identified from population and geriatric registers of Oulu (79% women). Age: mean 88 (SD 3). Inclusion criteria: age ≥ 85; home dwelling; ≥ 1 risk factor for falling (≥2 falls in previous year, loneliness, poor self-rated health, poor visual acuity/hearing, depression, poor cognition, impaired balance, chair rise, slow walking speed, difficulty with at least 1 ADL, able to walk outdoors, up or down stairs). Exclusion criteria: none described.
Interventions	1. Intervention plans developed by OT and physiotherapist at home visit, based on nurse's assessment pre-randomisation. Feasibility of plan assessed by GP. Plan included home exercise or group exercise, walking exercises, self-care exercises (duration and frequency not described). Interventions carried out by OT and/or physiotherapist. 2. Control: asked to visit GP without written intervention form.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Luukinen 2007 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "Randomization was done by the study statistician using a random numbers table".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Yes	Falls reported by participants who might not have been aware of their group allocation. "Falls recorded ....by a research nurse unaware of randomisation or the intervention."
Low risk of bias in recall of falls?	No	Interval recall. Quote: "Falls recorded every second month by telephone by a research nurse unaware of randomisation or the intervention."

Mahoney 2007

Methods	RCT. Losses: 5 of 349 (1%) but all included in analysis.
Participants	Setting: community, USA. N = 349 Sample: recruited from seniors centres, meal sites, senior apartment buildings, other senior congregate sites, by referral from caseworkers and healthcare providers (79% women). Age: mean 80 (SD 7.5). Inclusion criteria: aged 65 and over; living independently; 2 or more falls in previous year or 1 injurious fall in previous 2 years or gait and balance problems. Exclusion criteria: unable to give informed consent and no related caregiver; in hospice or assisted-living facility; expected to move away from area.
Interventions	1. Fall risk assessment by nurse or physiotherapist (two home visits) followed by recommendations and referrals to primary physician, physiotherapist, OT, ophthalmologist, podiatrist etc. All participants given exercise plan for long-term exercise (walking programme, standing balance exercises in group setting etc), monthly exercise calendar and 11 monthly phone calls to promote adherence to exercises and other recommendations. 2. Control: one in-home assessment by OT "limited to home safety recommendations and advice to see their doctor about falls".
Outcomes	1. Rate of falls.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**

Mahoney 2007 (*Continued*)

Adequate sequence generation?	Yes	Randomised using computer-generated randomisation table.
Allocation concealment?	Unclear	Sealed envelopes used but no mention of numbering or how they were used.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls ascertained using monthly calendars, telephone call if calendar not returned or if fall reported.

McKiernan 2005

Methods	RCT. Losses: 4 of 113 (4%).
Participants	Setting: community, Wisconsin, USA. N = 113 Sample: (60% women). Age: mean 74.2, range 65-96. Inclusion criteria: aged ≥ 65 years; community dwelling; ≥1 falls in previous year; independently ambulatory. Exclusion criteria: not capable of applying Yaktrax walker correctly or discerning correct outdoor conditions to wear them.
Interventions	1. Yaktrax walker (netting applied over usual footwear with wire coils to increase grip in winter outdoor conditions). 2. Control: usual winter footwear.
Outcomes	1. Rate of falls.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Quote: "randomized".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. 20% of control group had also used this or a similar intervention because they were not blinded. This might have influenced the outcome.

McKiernan 2005 (*Continued*)

Low risk of bias in recall of falls?	Yes	Prospective. Fall diary returned by post.

McMurdo 1997

Methods	RCT. Losses: 26 of 118 (22%) over 2 years.
Participants	Setting: community, Dundee, United Kingdom. N = 118. Sample: community dwelling post menopausal women recruited by advertisement. Age: mean 64.5; range 60-73. Exclusion criteria: conditions or drug treatment likely to affect bone.
Interventions	1. Exercise programme of weight bearing exercise to music, 45 minutes, 3 x weekly, 30 weeks per year, over 2 years, plus 1000 mg calcium carbonate daily. 2. Control: 1000 mg calcium carbonate daily.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Blinding? Fractures	Unclear	No description about ascertainment.
Low risk of bias in recall of falls?	Unclear	No description about ascertainment.

Means 2005

Methods	RCT. Losses: 100 (for falls data) of 338 (30%).
Participants	Setting: community, Arkansaw, USA. N = 338 Sample: from 17 senior citizen's centres (57% women). Age: mean 73.5 years. Inclusion criteria: aged ≥ 65 years; able to walk at least 30 feet without assistance from others; able to follow instructions and give consent. Exclusion criteria: resident in a nursing home; acute medical problems; cognitive impairment.
Interventions	1. Balance rehabilitation intervention. Active stretching, postural control, endurance walking, and repetitive muscle coordination exercises. Group sessions 90 minutes, x3 per week, for 6 weeks. 2. Control: group seminars on non health-related topics of interest to senior citizens. Same time and frequency as intervention group.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised by coin flip.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessors blind to allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Recorded on pre-printed postcards weekly with telephone calls to non correspondents to optimise compliance.

Meredith 2002

Methods	RCT. Losses: 58 of 317 (18%)
Participants	Setting: community, New York and Los Angeles, USA. N = 317 Sample: participants enrolled from home health care agencies client lists if agency office agreed to participate (75% women). Age: mean 80 (SD 8). Inclusion criteria: Medicare patients; aged 65 and older; registered with home health care offices in defined period for medical or surgical services; having one of four study medication problems;

Meredith 2002 (*Continued*)

	having an identifiable physician; expected home health care for at least 4 weeks; Exclusion criteria: not expected to survive through follow up; unable to understand spoken English; resident in an unsafe area that requires an escort for visits.
Interventions	1. Medication review by pharmacist and participant's nurse based on reported problems (including falls) relating to medication use. Targetted therapeutic duplication, cardiovascular, psychotropic and NSAID use. Plan to reduce medication problem presented to physician in person by nurse or pharmacist. Nurse assisted participant with the medication changes and monitored effect. 2. Control: usual care, which might include review of medications and adverse effects if relevant.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Assigment generated by computer random number generator (SAS v 6.10). Balanced block randomisation, stratified by the two areas.
Allocation concealment?	Unclear	Randomised off site but insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	No description of how falls ascertained; presumably retrospectively at follow up interview.

Morgan 2004

Methods	RCT. Losses: 65 of 294 (22%).
Participants	Setting: community and assisted-living facilities Florida, USA. N = 294. Sample: men and women recruited from Miami Department of Veterans Affairs Medical Centre, 9 assisted-living facilities, private physical therapy clinic (71% women). Age: mean 80.5 (SD 7.5). Inclusion criteria: aged 60 and over; hospital admission or bedrest for 2 or more days in previous month. Exclusion criteria: medical conditions precluding exercise programme (angina, severe osteoporosis etc); MMSE <23 (unable to follow instructions); using oxygen therapy at home; planned inpatient treatment or evaluation in 2 months following recruitment; requiring human assistance, wheelchair or artificial limbs to walk.

Morgan 2004 (*Continued*)

Interventions	1. Low-intensity group exercise: seated and standing exercises to improve muscle strength, joint flexibility, balance and gait, 5 people per group. 45 minutes 3 x per week for 8 weeks. 2. Control: usual activities.
Outcomes	1. Number of people falling.
Notes	SAFE-GRIP (Study to Assess Falls among Elderly Geriatric Rehabilitation Intensive Program).

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Randomisation stratified by sex, age (<75 and 75 and over), falls history in previous month (fall/no fall). Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Pre-dated postcard diaries returned every 2 weeks.

Newbury 2001

Methods	RCT. Losses: 11 of 100 (11%).
Participants	Setting: community, Adelaide, Australia. N = 100. Sample: every 20th name in an age-sex register of community dwelling patients registered with 6 general practices (63% women). Age: range 75 - 91 years; median age in intervention group 78.5, control group 80 years. Inclusion criteria: aged 75 and over; living independently in the community. Exclusion criteria: none.
Interventions	1. Health assessment of people aged 75 years or older by nurse (75+HA). Problems identified were counted and reported to patient's GP. No reminders or other intervention for 12 months. 2. No 75+HA until 12 months.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	75+HA introduced in Australia November 1999 as part of Enhanced Primary Care package. Similar to "health check" for patients in this age group in the United Kingdom.

Risk of bias

Newbury 2001 (*Continued*)

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomisation by random numbers.
Allocation concealment?	Yes	Sequentially numbered sealed envelopes.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Falls identified retrospectively at follow up visit at 1 year.

Nikolaus 2003

Methods	RCT. Losses: 81 of 360 (23%).
Participants	Setting: enrolled in hospital but community based intervention, Germany. N = 360. Sample: frail "older people" admitted to a geriatric clinic who normally lived at home (73.3% female). Age: mean 81.5 (SD 6.4). Inclusion criteria: lived at home before admission and able to be discharged home; with at least two chronic conditions (e.g. osteoarthritis or chronic cardiac failure, stroke, hip fracture, parkinsonism, chronic pain, urinary incontinence, malnutrition) or functional decline (unable to reach normal range on at least one assessment test of ADL or mobility). Exclusion criteria: terminal illness; severe cognitive decline; living >15 km from clinic.
Interventions	1. Comprehensive geriatric assessment + at least 2 home visits (from interdisciplinary home intervention team (HIT). One home visit prior to discharge to identify home hazards and prescribe technical aids if necessary. At least one more visit (mean 2.6, range 1-8) to inform about possible fall risks in home, advice on changes to home environment, facilitate changes, and teach use of technical and mobility aids. 2. Control: comprehensive geriatric assessment + recommendations alone. No home visit until final assessment at one year. Usual post discharge management by GPs.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	Home intervention team consisted of 3 nurses, physiotherapist, occupational therapist, social worker and secretary. Usually two members at first home visit (OT + nurse or OT + physiotherapist depending on anticipated needs and functional limitations). Methods paper described a third arm receiving usual hospital and home care.

Risk of bias

Item	Authors' judgement	Description

Nikolaus 2003 (*Continued*)

Adequate sequence generation?	Yes	Quote: "sealed envelopes containing group assignments using a random number sequence".
Allocation concealment?	Unclear	Quote: "sealed envelopes containing group assignments".
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls recorded in falls diary and by monthly telephone calls.

Nitz 2004

Methods	RCT. Losses: 41 of 73 (56%).
Participants	Setting: community, Queensland, Australia. N = 73. Sample: volunteers recruited through newspaper adverts, fliers sent to medical practitioners, seniors groups and physiotherapists in local community (92% women). Age: mean 75.8 (SD 7.8). Inclusion criteria: aged over 60; living independently in the community; at least 1 fall in previous year. Exclusion criteria: unstable cardiac condition, living too far from exercise class site, unable to guarantee regular attendance.
Interventions	1. Balance training in small groups using workstation (circuit training) format, 1 hour per week for 10 weeks. Up to 6 people per group, with physiotherapist instructor. 2. Control: gentle exercise and stretching, 1 hour per week for 10 weeks.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Computer generated random numbers.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls ascertained by marked calendar returned monthly.

Pardessus 2002

Methods	RCT. Losses: 9 of 60 (15%).
Participants	Setting: recruited in hospital, community dwelling, France. N = 60. Sample: individuals hospitalised for a fall. Age: mean 83.2 (SD 7.7). Inclusion criteria: aged 65 and over, hospitalised for falling; able to return home; able to give consent. Exclusion criteria: cognitive impairment (MMSE <24); falls due to cardiac, neurologic, vascular or therapeutic problems; without a phone; lived > 30 km from hospital.
Interventions	1. Comprehensive 2 hour home visit prior to discharge with 'physical medicine and rehabilitation doctor' and OT. Assessment of ADLs, IADLs, transfers, mobility inside and outside, use of stairs. Environmental hazards identified and modified where possible. If not, advice given. Discussion of social support. Referrals for social assistance. 2. Control: usual care.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised using random numbers table.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall, but short interval. Falls identified by monthly telephone calls.

Pereira 1998

Methods	RCT in 1982-85. Reporting 10 year follow up. Losses: 31 of 229 (14%).
Participants	Setting: community, Pittsburgh, USA. N = 229 randomised, 198 available for 10 year follow up. Sample: healthy post-menopausal women (volunteers). Age: at randomisation mean 57; at follow up mean 70 (SD 4). Inclusion criteria: 1 year post menopause; aged 50 and 65. Exclusion criteria: on HRT; unable to walk.

Pereira 1998 (*Continued*)

Interventions	1. 8 week training period with organised group walking scheme 2 x weekly. Also encouraged to walk once weekly on their own. Building up to 7 miles per week total. 2. Control: no intervention
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Falls in the previous 12 months ascertained by telephone interview.

Pfeifer 2000

Methods	RCT. Losses: 11 of 148 (7%).
Participants	Setting: community, Germany. N = 148. Sample: healthy ambulatory community living women recruited through advertisement. Age: 70 years or older. Inclusion criterion: 25-hydroxycholecalciferol serum level below 50 nmol/litre. Exclusion criteria: hypercalcaemia, primary hyperparathyroidism, osteoporotic extremity fracture, treatment with bisphosphonate, calcitonin, vitamin D or metabolites, oestrogen, tamoxifen in past 6 months; fluoride in last 2 years; anticonvulsants or medications possibly interfering with postural stability or balance; intolerance to vitamin D or calcium; chronic renal failure; drug, alcohol, caffeine, or nicotine abuse; diabetes mellitus; holiday at different latitude.
Interventions	An 8 week supplementation at the end of winter. 1. 400 IU vitamin D plus 600 mg elemental calcium (calcium carbonate). 2. Control: 600 mg calcium carbonate.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. Other outcomes reported but not included in this review.

Pfeifer 2000 (*Continued*)

Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly assigned".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were unlikely to be aware of their group allocation, although the study was not placebo controlled. Blinding of assessor not described.
Low risk of bias in recall of falls?	No	Retrospective. Falls and fractures monitored retrospectively by questionnaire at 1 year.

Pit 2007

Methods	RCT. Cluster randomised by general practice. Losses: one GP and 190 of 849 (22%) participants.
Participants	Setting: general practices in Hunter Region, New South Wales, Australia. N = 849 participants (17 practices, 23 GPs). Sample: 59% women. Age: 65 and over. No distribution given. Inclusion criteria: GPs: based at their current practice for at least 12 months; working 10 or more hours per week; member of a randomly selected network of practices. Patients: aged 65 and over; living in the community. Exclusion criterion: confused patients not accompanied by a caregiver.
Interventions	1. GPs: education (academic detailing (x2 visits from pharmacist), provision of prescribing information and feedback); completion of medication review checklist; financial rewards. Patients: completed medication risk assessment form. 2. Control: GPs: no academic detailing but received feedback on number of medication reviews completed and medication risk factors. Patients: completed medication risk assessment form but not passed on to GP for action.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description

Pit 2007 (*Continued*)

Adequate sequence generation?	Yes	Assignment undertaken "using computer-generated random number allocation in SAS software".
Allocation concealment?	Yes	Randomisation carried out by off-site statistician.
Blinding? Falls	Yes	Falls reported by participants who were unaware of their group allocation. Data collectors also blind to allocation.
Low risk of bias in recall of falls?	No	Retrospecitive interval recall. Falls ascertained by phone at 4 and 12 months.

Porthouse 2005

Methods	RCT (multicentre). Losses: 312 of 3314 (9%)
Participants	Setting: community, United Kingdom. N = 3314. Sample: community-dwelling women registered with 107 general practices in England. Age: mean 76.9 (SD 5.1). Inclusion criteria: aged 70 and over; female, community-dwelling; one or more risk factors for fracture (prior fracture, body weight 58 kg or less, smoker, family history of hip fracture, poor or fair health). Exclusion criteria: cognitive impairment; life expectancy < 6 months; unable to give written consent; taking more than 500 mg calcium supplementation per day; past history of kidney or bladder stones, renal failure or hypercalcaemia.
Interventions	1. Oral vitamin D3 800 IU (Calcichew D3 Forte) + oral 1000 mg calcium (calcium carbonate) daily for 6 months plus session with practice nurse, life-style advice on how to reduce risk of fracture + leaflet on dietary sources of vitamin D. 2. Control: sent same leaflet as intervention group received.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. Falls are a secondary outcome in this study. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description

Porthouse 2005 (*Continued*)

Adequate sequence generation?	Yes	Randomised (stratified by GP practice), by computer. Initially 2:1 ratio in favour of the control group to achieve most statistical power within budget. Changed to 1:1 towards end of study after re-analysis of trial's cost profile.
Allocation concealment?	Yes	Quote: "Randomised at the York Trials Unit, by an independent person who had no knowledge of the baseline characteristics of participants."
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Retrospective. Falls reported in six monthly postal questionnaires.

Prince 2008

Methods	RCT. Losses: 27 of 302 (9%)
Participants	Setting: Perth, Australia. N = 302. Sample: women attending A&E, receiving home nursing management of falls, electoral role. Age: mean 77.2 (SD 3.6). Inclusion criteria: aged 70 - 90 years; history of falling in last 12 months; plasma 25OHD < 24 ng/mL. Exclusion criteria: current consumption of vitamin D or bone or mineral active agents other than calcium; BMD z score at total hip site < -2.0; medical conditions or disorders affecting bone metabolism; fracture in last 6 months; MMSE < 24; neurological conditions affecting balance e.g. stroke or Parkinson's disease.
Interventions	1. 1000 IU/d ergocalciferol (vitamin D2) with evening meal + 1000 mg/d calcium citrate (250mg tablets x2 with breakfast and evening meal) for 1 year. 2. Control: placebo + 1000 mg/d calcium citrate (250 mg tablets x2 with breakfast and evening meal) for 1 year.
Outcomes	1. Number of people falling. 2. Number of people with adverse effects.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Used random number generator with block size of 10 to randomise in a ratio of 1:1.

Prince 2008 (*Continued*)

Allocation concealment?	Yes	Randomisation schedule generated by "independent research scientist". Schedule kept in pharmacy department of hospital where bottles were labelled and dispensed to participants.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial).
Low risk of bias in recall of falls?	No	Retrospective. Interviewed by study staff every 6 weeks by phone or at a clinic visit.

Reinsch 1992

Methods	RCT. 2x2 factorial design. Cluster randomised by senior centre rather than by individual participant. Losses: 46 of 230 (20%).
Participants	Setting: community, Los Angeles County and Orange County, California, USA. N = 230. Sample: men and women recruited from 16 senior centres (% women). Age: mean 74.2 (SD 6.0). Inclusion criteria: aged over 60. Exclusion criteria: none listed.
Interventions	1. "Stand up/step up" exercise programme, with preliminary stretching exercise. 1 hour, x 3 days per week, for 1 year. 2. Cognitive-behavioural intervention consisting of relaxation training, reaction time training and health and safety curriculum. 1 hour, x 1 day per week, for 1 year. 3. Exercise (2 meetings per week) and cognitive intervention (x 1 meeting per week) for 1 year. 4. Discussion control group. 1 hour, x 1 day per week, for 1 year.
Outcomes	1. Number of people falling.
Notes	MacRae paper includes a subset of results for only two arms of the study, in Los Angeles county only.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Quote: "randomly assigned to treatments".
Allocation concealment?	No	Cluster randomised.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Blinding of research assistant not described.

Reinsch 1992 (*Continued*)

Low risk of bias in recall of falls?	Yes	Prospective. Monthly diaries plus weekly phone calls or visits.

Resnick 2002

Methods	RCT. Losses: 3 of 20 (15%).
Participants	Setting: community, Baltimore, Maryland, USA. N = 20 Sample: women in a continuing care retirement community. Age: mean 88 (SD 3.7) years. Inclusion criteria: able to walk 50 feet with or without assistive device; sedentary lifestyle. Exclusion criteria: cognitive impairment (MMSE >20); terminal illness; medical condition precluding participation in aerobic exercise.
Interventions	1. WALK intervention: walk (join group or walk alone 20 min per week); address pain fear fatigue during exercise; learn about exercise; cue by self modelling. 2. Control: no intervention.
Outcomes	1. Number of falls (mean), but not rate. Insufficient data to include in analysis.
Notes	Participants lived independently in apartments, and could ambulate independently. (Personal correspondence). Pilot study with no usable data.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomised by coin flip (personal communication).
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Quote: "based on self-report". No additional information.

Robertson 2001a

Methods	RCT. Losses: 29 of 240 (12%)
Participants	Setting: community, West Auckland, New Zealand. N = 240. Sample: men and women living at home (68% women), identified from computerised registers at 17 general practices (30 doctors).

Robertson 2001a (*Continued*)

	Age: mean 80.9 (SD 4.2); range 75-95. Inclusion criteria: aged 75 and over. Exclusion criteria: inability to walk around own residence; receiving physiotherapy at the time of recruitment; not able to understand trial requirements.
Interventions	1. Home exercise programme, individually prescribed by district nurse in conjunction with her district nursing duties (see Notes). Visit from nurse at 1 week (1 hour) and at 2, 4 and 8 weeks and 6 months (half hour) plus monthly telephone call to maintain motivation. Progressively difficult strength and balance retraining exercises plus walking plan. Participants expected to exercise 3 x weekly and walk 2 x weekly for 1 year. 2. Control: usual care
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. 4. Number of people with adverse effects.
Notes	District nurse had no previous experience in exercise prescription. Received 1 weeks' training from research group's physiotherapist, who also made site visits and phone calls to monitor quality. Otago Exercise Programme manual can be ordered from http://www.acc.co.nz/otagoexerciseprogramme

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised using allocation schedule developed using computer generated numbers.
Allocation concealment?	Yes	Assignment by independent person off site.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Phoned by independent assessor blind to allocation. Person classifying fall events also blind to allocation.
Blinding? Fractures	Yes	Injuries reported by participants who were aware of their group allocation. Phoned by independent assessor blind to allocation. Person classifying fall events also blind to allocation.
Low risk of bias in recall of falls?	Yes	Active fall registration with daily postcard calendars returned monthly + telephone calls.

Robson 2003

Methods	RCT. Losses: 189 of 660 (29%).
Participants	Setting: community, Alberta, Canada. N = 660. Sample: healthy volunteers living in Edmonton area and two rural communities in Alberta. Recruited by newspaper adverts, radio, public notices and word of mouth (81% women). Age: mean 73.0 (SD 6.7). Inclusion criteria: able to walk unassisted for 20 minutes; to get down and up off the floor unassisted. Exclusion criteria: dizzy spells or "other health problems that made it difficult for them to function".
Interventions	1. Two 90 minute group sessions one month apart taken by lay senior facilitators. Session 1) Given Client Handbook (self assessed risk and risk reduction strategies relating to balance, strength, shoes, vision, medications, environmental hazards, paying attention). Instructed to complete assessment and implement strategies to reduce risk by session 2. Given fitness video (Tai Chi movements for balance and leg strength). Used video in Session 1 and instructed to use daily for 20 minutes or get involved in community exercise programme for 45 minutes 3x per week. Asked to identify and report community hazards. Session 2) no details of this session provided in paper. 2. Control: received no intervention until after 4 months.
Outcomes	1. Number of people falling.
Notes	SAYGO (Steady As You Go) program.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "Randomly assigned by phone". Insufficient information to permit judgment.
Allocation concealment?	Unclear	Quote: "Randomly assigned by phone". Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Unclear whether people phoning were blind to allocation.
Low risk of bias in recall of falls?	Yes	Falls ascertained by mail-in calendars returned monthly with telephone follow up.

Rubenstein 2000

Methods	RCT. Losses: 4 of 59 (7%).
Participants	Setting: community, California, USA. N = 59. Sample: men recruited from Veterans Administration ambulatory care centre (volunteers). Age: mean 74. Inclusion criteria: aged 70 and over; ambulatory; with at least 1 fall risk factor: lower limb weakness, impaired gait, impaired balance, more than 1 fall in previous 6 months. Exclusion criteria: exercised regularly; severe cardiac or pulmonary disease; terminal illness; severe joint pain; dementia; medically unresponsive depression; progressive neurological disease.
Interventions	1. Exercise sessions (strength, endurance and balance training) in groups of 16-20, 3 x 90 minute sessions per week for 12 weeks. 2. Control: usual activities
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomised in blocks of 16-20 at 3-6 month intervals, using randomly generated sequence cards in sealed envelopes.
Allocation concealment?	Unclear	Cards in sealed envelopes.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. Person ascertaining falls was aware of group allocation.
Low risk of bias in recall of falls?	No	No active fall registration. Fall ascertainment for intervention group at weekly classes. Controls phoned every 2 weeks.

Rubenstein 2007

Methods	CCT. Cluster randomised. Participants "previously" randomised to one of three primary care practice groups using last two digits of Social Security number. Two practice groups then randomised to intervention or control. Third group not included as used in prior pilot study. (personal communication) Losses at one year: 98 of 792 (12%)
Participants	Setting: Sepulveda Ambulatory Care Center (Veterans Affairs Greater Los Angeles Health Care System), California (USA). N = 792 Sample: all patients receiving care at ambulatory care centre (only 3% women).

Rubenstein 2007 (*Continued*)

	Age: mean 74.5 (SD 6) Inclusion criteria: aged 65 and over; previously randomised to either of the two practice groups involved in the trial; having had at least one clinic visit in previous 18 months; scoring 4 or more on GPSS. Exclusion criteria: living over 30 miles from care centre; already enrolled in outpatient geriatric services at care centre; living in long-term care facility; scoring less than 4 GPSS.
Interventions	1. Structured risk and needs assessment and referral algorithm implemented by case manager (physician assistant). Targetting five geriatric conditions including falls. Assessment followed by referrals and recommendations for further assessment or treatment. 3 monthly telephone contact with case manager. 2. Control: usual care.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	No	Participants "previously" randomised to one of three primary care practice groups using last two digits of Social Security number. Two practice groups then randomised to intervention or control. Third group not included as used in prior pilot study. (personal communication)
Allocation concealment?	No	Two groups therefore alternation.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessment research staff blind blind to allocation.
Low risk of bias in recall of falls?	No	Retrospective recall. Annual telephone follow up each year for 3 years. Text states participants asked "about incidence of falls in the previous year" but table 2 reports one or more falls in the preceding 3 months.

Ryan 1996

Methods	RCT. Losses: none described.
Participants	Setting: community, Baltimore, Maryland, USA. N = 45. Sample: rural and urban dwelling women. Volunteers from senior meal sites.

Ryan 1996 (*Continued*)

	Age: mean 78; range 67-90. Inclusion criteria: aged 65 and over; living alone in own home; ambulatory with or without assistive devices; with telephone for follow up.
Interventions	Interview and physical assessment by nurse prior to randomisation. 1. 1 hour fall prevention education programme discussing personal (intrinsic) and environmental (extrinsic) risk modification in small groups of 7-8 women (nurse led). 2. Same educational programme but individual sessions with nurse. 3. Controls received health promotion presentation (no fall prevention component) in small groups of 7-8.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	Pilot research. Primarily to test methodology of a fall prevention education programme and resulting changes in fall prevention behaviour.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. Telephone contact was not blinded (both groups asked about falls but intervention groups asked about recollection of intervention).
Low risk of bias in recall of falls?	No	Retrospective recall by monthly phone call for 3 months.

Salminen 2008

Methods	RCT. Losses: 2 of 591 (0%)
Participants	Setting: community, Pori, Finland N = 591 Sample: recruited through local newspapers, pharmacies, Pori Health Cente, Satakunta Central Hospital, private clinics, and written invitation from health professionals (84% women) Age: 62% aged 65 - 74, 38% aged ≥ 75. Inclusion criteria: aged ≥65 years; fallen in last year; MMSE ≥ 17; able to walk 10 meters independently; living at home or sheltered housing. Exclusion criteria: none described.

Salminen 2008 (*Continued*)

Interventions	1. Intervention: geriatric assessment, individually tailored intervention targeting muscle strength and balance (advised to carry out physical exercises x3 per week at home), exercise in groups (three levels according to physical performance), vision (referral), nutritional guidance or referral, medications, depression, treatment and prevention of osteoporosis, home hazard modification. All received calcium and vitamin D. 2. Control: counselling and guidance after comprehensive assessments
Outcomes	1. Rate of falls. 2. Number of fallers.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "Randomized". No description of sequence generation.
Allocation concealment?	Yes	Quote: "using consecutively numbered, sealed envelopes"
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Quote: "recorded by fall diaries that subjects were asked to mail to the research assistants monthly."

Sato 1999

Methods	RCT. Losses: none described.
Participants	Setting: community dwelling, Japan. N = 86. Sample: elderly people with Parkinson's disease (mean Hoehn and Yahr Stage 3) (59% women). Age: mean 70.6; range 65-88. Inclusion criteria: aged 65 or over. Exclusion criteria: history of previous non-vertebral fracture; non-ambulatory (Hoehn and Yahr Stage 5 disease); hyperparathyroidism, renal osteodystrophy, impaired renal, cardiac or thyroid function; therapy with corticosteroids, estrogens, calcitonin, etidronate, calcium, or vitamin D for 3 months or longer during the previous 18 months, or at any time in the previous 2 months.
Interventions	1. 1 alpha (OH) Vitamin D3 1.0 mcg daily for 18 months. 2. Control: identical placebo.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. Other outcomes reported but not included in this review.

Sato 1999 (*Continued*)

Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Randomisation by computer generated random numbers.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were blind to their group allocation (placebo-controlled trial). "Followed up every two weeks, at which times clinical status was assessed and non-vertebral fractures were recorded". Unclear whether data collectors were blind to allocation.
Blinding? Fractures	Yes	Fractures reported by participants who were blind to their group allocation (placebo-controlled trial). "Followed up every two weeks, at which times clinical status was assessed and non-vertebral fractures were recorded". Unclear whether data collectors were blind to allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Quote: "Followed up every two weeks, at which times clinical status was assessed and non-vertebral fractures were recorded". Number of falls per subject "recorded" during 18 months. Presume every two weeks.

Schrijnemaekers 1995

Methods	RCT. Losses: 40 of 222 (18%)
Participants	Setting: Sittard, The Netherlands N = 222 Sample: men and women living at home (N = 146) or in residential homes (N = 76) (70% women). Age: At least 75 years. 70% aged 77-84, 30% ≥85 Inclusion criteria: aged 75 and over; living at home or in one of two residential homes; having problems with one or more of the following: IADL, ADL, toileting, mobility or fallen in last 6 months, serious agitation or confusion; informed consent from participant and their GP. Exclusion criteria: living in nursing home; received outpatient or inpatient care from geriatric unit in previous 2 years.
Interventions	1. Comprehensive assessment in outpatient geriatric unit (geriatrician, psychologist, social worker) ; advice to participant and GP about treatment and support. 2. Control: usual care.

Schrijnemaekers 1995 (*Continued*)

Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	Included in this review as the majority of participants were living at home (N = 146).

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Stratified by living condition (home vs home for the elderly) then "randomly allocated" by researcher in blocks of ten.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Unclear whether data collectors were blind to allocation.
Low risk of bias in recall of falls?	No	Retrospective recall. Falls ascertained retrospectively at interview. Presume asked about falls in previous 6 months.

Sherrington 2004

Methods	RCT. Losses: 12 of 120 (10%).
Participants	Setting: community, Sydney, Australia. N = 120 Sample: identified through 6 hospitals in Sydney following hip fracture (80% women). Age: mean 79 (SD 9), 57-95 years. Inclusion criteria: community dwelling; recent hip fracture. Exclusion criteria: severe cognitive impairment; medical conditions; complications from fracture resulting in delayed healing.
Interventions	1. Weight-bearing home exercise group. 2. Non weight-bearing home exercise group. 3. Control: no intervention.
Outcomes	1. Number of people falling.
Notes	Data obtained from authors.

Risk of bias

Item	Authors' judgement	Description

Sherrington 2004 (*Continued*)

Adequate sequence generation?	Yes	Quote: "the randomisation schedule was produced with a random numbers table in blocks of six".
Allocation concealment?	Yes	Quote: "Sealed in opaque envelopes". Comment: probably done as research group has described "concealed allocation" in previous study.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. Assessors not blind to group allocation.
Low risk of bias in recall of falls?	No	Retrospective recall. Falls data collected at home visits at 1 and 4 months.

Shigematsu 2008

Methods	RCT. Losses: 5 of 68 (7%).
Participants	Setting: Kawage, Mie, Japan. N = 68 Sample: people aged 65-74 living in Kawage (63% women). Age: mean 69 (SD 3) years. Inclusion criteria: 65-74 years old; community dwelling; Exclusion criteria: severe neurological or cardiovascular disease; mobility-limiting orthopaedic conditions.
Interventions	1. Exercise intervention: square-stepping exercises (forward, backward, lateral and oblique steps on a marked mat 250 cm long); supervised group sessions 70 minutes (30 warm up and cool down) x2 per week for 12 weeks. Group "further divided" at end of 12 weeks, and half (N = 16) continued with sessions "from December 2004 through February 2005" i.e. a further 12 weeks. 2. Exercise intervention: outdoor supervised walking session 40 minutes x1 per week for 12 weeks. As above, half (N = 18) continued walking for a further 12 weeks.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number of people with adverse effects. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "Randomly allocated.. by a public health nurse who used a computerized random number generation program in which the numbers 0 and 1 corresponded to the two groups, respectively".

Shigematsu 2008 (*Continued*)

Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessors not blind to group allocation.
Low risk of bias in recall of falls?	Yes	Quote: "All the persons received a pre-paid postcard at the beginning of each month, which they returned at the beginning of the next month". Instructed to record falls on a daily basis. Phoned if falls reported.

Shumway-Cook 2007

Methods	RCT. Losses: none for falls analysis.
Participants	Setting: community, USA. N = 453 Sample: volunteers recruited by press releases and advertising, seniors newsletters, cable television etc. (77% women). Age: mean 75.6 (SD 6.3); range 65-96. Inclusion criteria: aged 65 and over, community dwelling, able to speak English, have a primary care physician they had seen in last 3 years, able to ambulate independently (with or without cane or walker), willing to attend exercise classes for at least 6 months, have access to transportation. Exclusion criteria: more than minimal hearing or visual problems, regular exercise in previous 3 months, unable to complete 10 ft 'Timed up and Go' test in <30 seconds, five or more errors on Pfeiffer Short Portable Mental Status Questionnaire.
Interventions	Both groups completed health history questionnaire at randomisation. 1. Group exercise class 1 hr 3x per week for up to 12 months, 6 hours of fall prevention classes, fall assessment summary (based on initial questionnaire) sent to participants' primary care physician plus copy of fall prevention guideline (AGS/BGS 2001). 2. Control: usual care plus two fall prevention brochures.
Outcomes	1. Rate of falls. 2. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Computer random number generator used to generate sequence.

Allocation concealment?	Yes	Randomised using centralised randomisation scheme, accessed by telephone.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falling ascertained by 12 monthly calendars with telephone follow up.

Skelton 2005

Methods	RCT. Losses: 30 of 100 (30%).
Participants	Setting: community, . N = 100 Sample: women recruited using posters, newspapers and radio stations. Age: mean 72.8 (SD 5.9). Inclusion criteria: aged ≥ 65; living independently in own home; ≥3 falls in previous year. Exclusion criteria: acute rheumatoid arthritis; uncontrolled heart failure or hypertension; significant cognitive impairment; significant neurological disease or impairment; previously diagnosed osteoporosis.
Interventions	1. FAME exercise class 1 hour x1 per week for 36 weeks plus home exercises 30 min x2 per week. 2. Control: no exercise class. Home-based seated exercises x2 per week.
Outcomes	1. Rate of falls.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Quote: "randomly allocated (blind)".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Daily diaries returned every two weeks.

Smith 2007

Methods	RCT. Losses: 4870 of 9440 (52%)
Participants	Setting: Wessex, England. N = 9440 Sample: men and women recruited from age sex registers of 111 participating general practice sites (54% women). Mainly community dwelling (98%). Age: mean 79.1 (IQR 76.9 to 82.6) Inclusion criteria: men and women aged 75 and over. Exclusion criteria: current cancer; any history of treated osteoporosis; bilateral total hip replacement; renal failure; renal stones; hypercalcaemia; sarcoidosis; taking at least 400 IU of vitamin D supplements already.
Interventions	1. 300,000 IU ergocalciferol (vitamin D2) by intramuscular injection every autumn for 3 years. 2. Placebo.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture. Falls a secondary outcome of the study. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Individual randomisation within blocks at each practice by allocation of consecutively numbered ampoules.
Allocation concealment?	Yes	Individual randomisation within blocks at each practice by allocation of consecutively numbered ampoules.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial).
Blinding? Fractures	Yes	Fractures reported by participants who were blind to their group allocation (placebo-controlled trial).
Low risk of bias in recall of falls?	No	Retrospective. "Information on falls.... was obtained at annual review (12, 24 and 36 months) by the practice nurse and on incident fractures by postal questionnaire at 6, 12, 18, 24, 30 and 36 months."

Speechley 2008

Methods	RCT. Losses: 29 of 241 (12%)
Participants	Setting: community, Ontario, Canada. N = 241 Sample: male Canadian veterans of WWII and Korean War living in south-west Ontario. Age: mean (SD) 81 (3.8) years. Inclusion criteria: living independently in the community; able to understand and respond to questionnaire; at least one modifiable risk factor for falling identified by initial screening questionnaire.
Interventions	Initial postal risk factor screening questionnaire to all potential participants. 1. Specialised geriatric services group: comprehensive geriatric assessment with individual recommendations for fall risk factor reduction. 2. Family physician group: participants sent letter summarising risk factors reported in questionnaire. Similar letter sent to participant's family physician. Treatment left to discretion of family physician.
Outcomes	1. Number of fallers.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "Randomized". No description of sequence generation.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Monthly falls calendars returned for one year. Telephone follow up if calendar not returned or falls reported.

Spice 2009

Methods	RCT (cluster randomised, 18 general practices).
Participants	Setting: community, Winchester, UK N = 516 (proportion of women not stated) Sample: patients in 18 general practices. Age: mean age 82 years. Inclusion criteria: community-dwelling men and women; aged over 64 years; history of at least two falls in previous year. Exclusion criteria: none described.

Spice 2009 (*Continued*)

Interventions	1. Secondary care intervention: multidisciplinary day hospital assessment by physician, OT and physiotherapist. 2. Primary care intervention: health visitor/practice nurse falls risk assessment /referral. 3. Control: usual care.
Outcomes	1. Number of fallers.
Notes	Published as an abstract only. Data from authors.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Cluster randomised. Quote: "Practices were stratified into urban (three) and rural (fifteen) and randomly allocated to the three arms, in blocks of three, using a random number generator on a Hewlett Packard 21S pocket calculator".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. "Blinding to the intervention group of those collecting and analysing data was impractical."
Low risk of bias in recall of falls?	Yes	Follow up monthly using postcards, with a phone call if a card not returned.

Steadman 2003

Methods	RCT. Losses: 65 of 198 (33%).
Participants	Setting: community, London, United Kingdom. N = 198 Sample: attendees at a multidisciplinary falls clinic, district general hospital (% women not reported). Age: mean 82.7 (SD 5.6). Inclusion criteria: $\geq$ 60 years; Berg Balance Scale <45 after "adequate management of potential risk factors". Exclusion criteria: amputation; unable to walk 10 metres; recent stroke; progressive neurological disorder; unstable medical condition; severe cognitive impairment.
Interventions	1. Enhanced balance training. Conventional physiotherapy plus balance training 45 minutes, x2 per week for 6 weeks. 1. Control: conventional physiotherapy alone.

Steadman 2003 (*Continued*)

Outcomes	1. Rate of falls. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "computer generated random numbers"
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Data collector theoretically blind to allocation.
Low risk of bias in recall of falls?	Unclear	Interval recall. Falls data collected for previous month at 6 weeks, 12 weeks and 24 weeks.

Steinberg 2000

Methods	RCT. Cluster randomised. Four groups with approximately equal numbers formed from 2 or 3 National Seniors Branches. Groups randomly allocated to 1 of 4 interventions. Losses: 9 of 252 (4%).
Participants	Setting: community, Brisbane, Queensland, Australia. N = 252. Sample: volunteers from branches of National Seniors Association clubs. Age: mean 69; range 51-87. Inclusion criteria: aged 50 and over; National Seniors Club member; with capacity to understand and comply with the project. Exclusion criteria: none stated.
Interventions	Cumulative intervention 1. Control: oral presentation; video on home safety; pamphlet on fall risk factors and prevention. 2. Intervention 1. plus exercise classes designed to improve strength and balance, 1 hour per month, for 17 months; exercise handouts; gentle exercise video to encourage exercise between classes. 3. Intervention 2. plus home safety assessment and financial and practical assistance to make modifications. 4. Intervention 3. plus clinical assessment and advice on medical risk factors for falls.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	Younger, healthier and more active sample than elderly population as a whole.

Steinberg 2000 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Quote: "Groups were randomly allocated to receive the four interventions".
Allocation concealment?	No	Cluster randomised. Possibility of participants joining group after randomisation.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Quote: "Falls were monitored prospectively using a daily calendar diary to minimise bias." Diary returned monthly. Telephone follow up of reported falls and no monthly returns.

Stevens 2001

Methods	RCT. Some clusters. Study population divided into four strata defined by age (<80 years and > 80 years) and sex. Within these strata index recruits allocated in 2:1 ratio to control or intervention. Coinhabitants assigned to same group as index recruit. Losses: 264 of 1879 (14%)
Participants	Setting: community, Perth, Australia. N = 1737. Sample: aged 70 and over, living independently and listed on State Electoral Roll and the White Pages telephone directory. Assigned numbers and recruited by random selection (53% women). Age: mean 76. Inclusion criteria: aged 70 and over; living independently; able to follow study protocol (cognitively intact and able to speak and write in English); anticipated living at home for at least 10 out of 12 coming months; could make changes to the environment inside the home; had not modified home by fitting of ramps and grab rails. Exclusion criteria: if living with more than 2 other older people.
Interventions	1. One home visit by nurse to confirm consent, educate about how to recognise a fall, and complete the daily calendar. Sent information on the intervention and fall reduction strategies to be offered. Intervention: home hazard assessment, installation of free safety devices, and an educational strategy to empower seniors to remove and modify home hazards (see 'Notes'). 2. Control: one home visit by nurse to confirm consent, educate about how to recognise a fall, and complete the daily calendar.
Outcomes	1. Rate of falls. 2. Number of people falling.

Notes	Hazard list designed with OT input to include factors identified from literature and existing check lists. Eleven hazards included. All identified hazards discussed with subjects but only the three most conspicuous or remediable selected to give specific advice on their removal or modification. Safety devices offered at no cost, and installed by tradesman within 2 weeks of visit.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Study population divided into four strata defined by age (< 80 years and > 80 years) and sex. Within these strata index recruits allocated in 2:1 ratio to control or intervention. Coinhabitants assigned to same group as index recruit.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls recorded on daily calendar.

Suzuki 2004

Methods	RCT. Losses: 8 of 52 (15%)
Participants	Setting: community, Tokyo, Japan. N = 52. Age: mean 78 (SD 3.9); range 73-90. Sample and inclusion criteria: participants in the Tokyo Metropolitan Institute of Gerontology Longitudinal Interdisciplinary Study on Aging attending a comprehensive geriatric health examination; living at home (100% women). Exclusion criteria: unable to measure muscle strength, poor mobility due to hemiplegia, poorly controlled blood pressure, communication difficulties due to impaired hearing.
Interventions	1. Exercise-centered fall-prevention programme + home-based exercise programme aimed at enhancing muscle strength, balance and walking ability. Ten one-hour classes (every 2 weeks for 6 months) plus individual home-based exercises for 30 minutes x3 per week. 2. Pamphlet and advice on prevention of falls.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture. Other outcomes reported but not included in this review.
Notes	

Suzuki 2004 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	"Randomized" but method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Does not state whether outcome assessors were blind to allocation.
Blinding? Fractures	Unclear	Fractures reported by participants who were aware of their group allocation. Does not state whether outcome assessors were blind to allocation.
Low risk of bias in recall of falls?	No	Retrospective recall. Falls and fractures recorded retrospectively at interview at 8 months and 20 months (falls in previous year).

Swanenburg 2007

Methods	RCT. Losses: 4 of 24 (17%)
Participants	Setting: Zurich, Switzerland. N = 24 Sample: unclear. Probably patients in Center for Osteoporosis of the Department of Rheumatology (100 % women). Age: mean 71.2 (SD 6.8). Inclusion criteria: aged ≥ 65; living independently; with osteoporosis or osteopenia. Exclusion criteria: severe peripheral or central neurological disease known to influence gait, balance or muscle strength; medical contraindications for exercise.
Interventions	1. Intervention: vitamin 400-800 IU cholecalciferol and calcium 500-1000 mg per day according to physician assessment at baseline plus 12 week training programme to improve balance and a daily nutritional supplement enriched with proteins 3 months. 2. Control: vitamin 400-800 IU cholecalciferol and calcium 500-1000 mg per day according to physician assessment at baseline plus leaflet on home exercises.
Outcomes	1. Rate of falls. Other outcomes reported but not included in this review.
Notes	Pilot study.

Risk of bias		
Item	**Authors' judgement**	**Description**

Swanenburg 2007 (*Continued*)

Adequate sequence generation?	Unclear	Quote: "Random assignment ..... with a stratified randomisation procedure."
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Outcome assessors were blind to allocation.
Low risk of bias in recall of falls?	No	Quote: "Falls were assessed by interview at each assessment" post intervention, 6, 9 and 12 months. Interval recall of 3 month period.

Tinetti 1994

Methods	RCT. Cluster randomised with randomisation of 16 treating physicians, matched in 4 groups of 4, into 2 control and 2 intervention in each group; enrolled subjects assigned to same group as their physician. Losses: 10 of 301 (3%).
Participants	Setting: community, Southern Connecticut, USA. N = 301. Sample: independently ambulant community dwelling individuals (69% women). Age: mean 77.9 (SD 5.3). Inclusion criteria: aged over 70; independently ambulant; at least one targeted risk factor for falling (postural hypotension, sedative/hypnotic use, use of > 4 medications, inability to transfer, gait impairment, strength or range of motion loss, domestic environmental hazards). Exclusion criteria: enrolment in another study; MMSE < 20; current (within last month) participation in vigorous activity.
Interventions	1. Interventions targeted to individual risk factors, according to decision rules and priority lists. 3 month programme duration. 2. Control: visits by social work students over same period.
Outcomes	1. Rate of falls. 2. Number of people falling. 3. Number sustaining a fracture.
Notes	Yale (New Haven) FICSIT trial. Risk factors screened for included postural hypotension; sedative/hypnotic drugs e.g. benzodiazepine; 4 or more medications; impaired transfer skills; environmental hazards for falls; impaired gait, leg/arm muscle strength, range of movement.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "Computerised randomization program"

Tinetti 1994 (*Continued*)

Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Outcome assessors blinded to assignment.
Blinding? Fractures	Unclear	Fractures reported by participants who were aware of their group allocation. Outcome assessors blinded to assignment.
Low risk of bias in recall of falls?	Yes	Prospective. Falls "Recorded on a calendar that subjects mailed to the research staff monthly." followed by personal or telephone contact if no calendar returned of a fall reported.

Trivedi 2003

Methods	RCT. Stratified by age and sex. Losses: 648 of 2686 (24%).
Participants	Setting: community, UK. N = 2686. Sample: mailed letter and information sheet to people from the British doctors study and general practice register in Suffolk (24% women). Age: mean 75 (SD 5); range 65-85. Inclusion criteria: aged 65-85 years. Exclusion criteria: already taking vitamin D supplements; conditions with contraindications for vitamin D supplementation e.g. renal stones, sarcoidosis, or malignancy.
Interventions	1. Oral vitamin D3 supplementation (100,000 IU cholecalciferol) 1 capsule every 4 months for 5 years. 2. Control: matching placebo 1 capsule every 4 months for 5 years.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture. Other outcomes reported but not included in this review.
Notes	Although fracture and major illness data collected every four months after capsules sent out, falls data not collected until end of study. Falls not mentioned in statistical analysis section of methods.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "randomised after stratification by age and sex". Comment: probably done since earlier reports

Trivedi 2003 (*Continued*)

		from the same investigators clearly describe use of random sequences.
Allocation concealment?	Yes	"Ipswich pharmacy revealed the coding" at the end of the study. So assume randomised centrally.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial) .
Blinding? Fractures	Yes	Fractures reported by participants who were blind to their group allocation (placebo-controlled trial).
Low risk of bias in recall of falls?	No	Retrospecive recall over 12 month period.

Van Haastregt 2000

Methods	RCT. Losses 81 of 316 (26%).
Participants	Setting: community, Hoensbroek, The Netherlands. N = 316. Sample: community dwelling men and women registered with 6 general medical practices (66% women). Age: mean 77.2 (SD 5.1). Inclusion criteria: aged 70 and over; living in the community; 2 or more falls in previous 6 months or score 3 or more on mobility scale of Sickness Impact Profile. Exclusion criteria: bed ridden; fully wheelchair dependent; terminally ill; awaiting nursing home placement; receiving regular care from community nurse.
Interventions	1. Five home visits from community nurse over 1 year. Screened for medical, environmental and behavioural risk factors for falls and mobility impairment; advice, referrals and "other actions". 2. Control: usual care.
Outcomes	1. Number of people falling.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomisation by computer generated random numbers.
Allocation concealment?	Unclear	Insufficient information to permit judgment.

Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls recorded in weekly diary.

Van Rossum 1993

Methods	RCT. Some clusters as people living together allocated to same group. Losses 102 of 580 (18%).
Participants	Setting: community, Weert, The Netherlands. N = 580. Sample: general population sampled, not volunteers (58% women). Age: range 75-84 years. Inclusion criteria: aged 75 to 84; living at home. Exclusion criteria: subject or partner already receiving regular home nursing care.
Interventions	1. Preventive home visits by public health nurse x 4 per year for 3 years. Extra visits/telephone contact as required. Check list of health topics to discuss. Advice given and referrals to other services. 2. Control: no home visits.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Stratified by sex, self-rated health, composition of household and social class then randomised by computer generated random numbers. Participants in intervention group then randomised to nurses.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Retrospecitve. Follow up at 1½ years and 3 years by postal survey and interview. Falls in previous 6 months recorded.

Vellas 1991

Methods	RCT. Randomised 7 days after a fall. Losses: 6 out of 95 (6%).
Participants	Setting: community, Toulouse, France N = 95. Sample: community dwelling men and women presenting to their general medical practitioner with a history of a fall (66% women). Age: mean 78 years. Inclusion criteria: no biological cause for the fall; fallen less than 7 days previously. Exclusion criteria: hospitalised for more than 7 days after the fall; demented; sustaining major trauma e.g. hip fracture or other fracture; unable to mobilise or be evaluated within 7 days of the fall.
Interventions	1. Iskédyl® (combination of raubasine and dihydroergocristine) 2 droppers morning and evening for 180 days. 2. Control: placebo for 180 days.
Outcomes	1. Rate of falls.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "Randomised". Method of randomisation not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Yes	Falls reported by participants who were blind to their group allocation (placebo-controlled trial) . "Double blind" so assessors also blind to group allocation.
Low risk of bias in recall of falls?	Unclear	Retrospective recall at 30, 60, 120, 180 days.

Vetter 1992

Methods	RCT. Cluster randomised by household. Losses: 224 of 674 (33%).
Participants	Setting: community, Wales, UK. N = 674. Sample: men and women aged over 70 years on the list of a general practice in a market town (% women not described). Age: over 70 years. No exclusion criteria listed.

Vetter 1992 (*Continued*)

Interventions	1. Health visitor visits, minimum yearly, for 4 years, with advice on nutrition, environmental modification, concomitant medical conditions, and availability of physiotherapy classes if desired. 2. Control: usual care.
Outcomes	1. Number of people falling. 2. Number sustaining a fracture.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Cluster randomised by household "using random number tables with subjects' study numbers and without direct contact with the subjects".
Allocation concealment?	Yes	Randomised "using random number tables with subjects' study numbers and without direct contact with the subjects". Introduction of bias unlikely.
Blinding? Falls	No	Falls reported by participants who were aware of their group allocation. Control group had no contact between baseline assessment and end of study (4 years).
Blinding? Fractures	No	Fractures reported by participants who were aware of their group allocation. Control group had no contact between baseline assessment and end of study (4 years).
Low risk of bias in recall of falls?	No	Falling status and fractures ascertained by interview at end of study period.

Voukelatos 2007

Methods	RCT. Losses: 18 of 702 (3%)
Participants	Setting: community, Sydney, Australia. N = 702. Sample: men and women recruited through advertisements in local papers (84% women) Age: mean 69 (SD 6.5), range 69-70 years. Inclusion criteria: aged over 60; community dwelling. Exclusion criteria: degenerative neurological disease; severely debilitating stroke; metastatic cancer; severe arthritis; unable to walk across a room independently; unable to use English.

Interventions	1. Tai chi classes for 1 hour per week for 16 weeks (8 to 15 participants per class) at 24 community venues. Style of tai chi differed between classes: majority (83%) involved Sun style, two classes (3%) Yang style, remainder (14%) involved a mixture of styles. 2. Control: placed on 24 week waiting list, then offered tai chi programme.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "Randomization list .... was prepared for each venue using randomly permuted blocks of four or six".
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Quote: "Participants were given falls calendars and were instructed to record on the calendar each day for 24 weeks whether they had had a fall." Pre-paid postage calendars returned at the end of each month, with telephone call if not returned within 2 weeks.

Wagner 1994

Methods	RCT. Losses: 89 of 1559 (6%).
Participants	Setting: community, Seattle, USA. N = 1559. Sample: 'healthy elderly' men and women, HMO enrollees (59% women). Age: mean 72 years. Inclusion criteria: aged 65 and over; HMO members; ambulatory and independent. Exclusion criteria: too ill to participate as defined by primary care physician.
Interventions	1. 60-90 minute interview with nurse, including review of risk factors, audiometry and blood pressure measurement, development of tailored intervention, motivation to increase physical and social activity. 2. Chronic disease prevention nurse visit. 3. Control: usual care

Wagner 1994 (*Continued*)

Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	Risk factors identified: inadequate exercise, high risk alcohol use, environmental hazards if increased fall risk, high risk prescription drug use, impaired vision, impaired hearing.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "Randomized into three groups in a ratio of 2:1:2."
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	No	Falls retrospectively measured at 1 and 2 years by mailed questionnaire. Interviewed by phone if questionnaire not returned. Data supplemented by computerised hospital discharge files.

Weerdesteyn 2006

Methods	RCT. Losses: none for falls data.
Participants	Setting: community, Nijmegan, The Netherlands. N = 58 Sample: recruited using newspaper advertisements (72% women). Age: mean 74 (SD 6). Inclusion criteria: ≥ 65 years; community dwelling; ≥1 fall in previous year; able to walk 15 minutes without a walking aid. Exclusion criteria: severe cardiac, pulmonary, or musculoskeletal disorders; pathologies associated with increased falls risk e.g. PD; osteoporosis; using psychotropic drugs.
Interventions	Three arms described, but one not randomised. 1. Low-intensity exercise programme: 1.5 hours x2 per week for 5 weeks. First weekly session included gait, balance and coordination training including obstacle avoidance. Second session, walking exercises with changes of speed and direction, and practice of fall techniques derived from martial arts 2. Control: no training.
Outcomes	1. Number of people falling. Other outcomes reported but not included in this review.
Notes	

Weerdesteyn 2006 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Quote: "Block randomization (3 blocks of 20) with gender stratification with equal probability for either exercise or control group assignment."
Allocation concealment?	Unclear	Quote: "The group allocation sequence was concealed (to both researchers and participants) until assignment of interventions". "We had participants draw a sealed envelope with group allocation ticket from a box containing all remaining envelopes in the block" (personal communication).
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Person coding the registration cards not blind to group allocation.
Low risk of bias in recall of falls?	Yes	Quote: "Falls were monitored monthly using pre-addressed, reply-paid fall registration cards." Asked asked whether a fall had occurred in the past month. Sent a reminder if no registration card received.

Whitehead 2003

Methods	RCT. Losses: none reported after randomisation
Participants	Setting: community or low care residential care (hostel accommodation), Adelaide, Australia. N = 140. Sample: patients presenting with a fall to the ED over 22 week period (71% women). Age: mean 77.8 (SD 7.0). Inclusion criteria: aged 65 and over; fall-related attendance at ED; community dwelling or in low care residential care (hostel accommodation). Exclusion criteria: resident in nursing home; presenting fall related to stroke, seizure, cardiac or respiratory arrest, major infection, haemorrhage, motor vehicle accident, being knocked to the ground by another person; MMSE <25; no resident carer; not English speaking; living out of catchment area; terminal illness.
Interventions	1. Home visit and questionnaire. "Fall risk profile" developed and participant given written care plan itemising elements of intervention. Letter to GP informing him of participant's fall, inviting them to review participant, highlighting identified risk factors, suggesting possible strategies (evidence based). GP also given one page evidence summary . 2. Home visit. No intervention. Standard medical care from GP.
Outcomes	1. Number of people falling. Primary outcome was uptake of prevention strategies, rather than falls.

Whitehead 2003 (*Continued*)

Notes	Potential strategies: review of medication use especially psychotropic drugs, home assessment.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Randomisation and allocation schedules created by a researcher external to the trial.
Allocation concealment?	Yes	Randomised by a researcher external to the trial using numbered, sealed, opaque envelopes.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Falls ascertained by falls diary and phone calls monthly to encourage use of the diary.

Wilder 2001

Methods	RCT. Losses: none described
Participants	Setting: community, Wisconsin, USA. N = 60 Sample: "frail elderly", no other description. Age: no description. Inclusion criteria: aged ≥ 75 years, living at home, using home services (i.e. Meals on Wheels, Telecare or Lifeline). Exclusion criteria: none described.
Interventions	1. Home modifications plus home exercise programme monitored by a "trained volunteer buddy". 2. Simple home modifications. 3. Control: no intervention
Outcomes	1. "Number of falls" but no data.
Notes	Abstract only.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Quote: "randomly assigned" to three arms. Method not described.
Allocation concealment?	Unclear	Insufficient information to permit judgment.

Wilder 2001 (*Continued*)

Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Unclear whether data collector was blind to group allocation.
Low risk of bias in recall of falls?	Unclear	Falls monitored by weekly telephone calls. Interval recall over a short period.

Wolf 1996

Methods	RCT. Losses: 40 of 200 (20%).
Participants	Setting: community, Atlanta, USA. N = 200. Sample: men and women residing in an independent living facility, recruited by local advertisements and direct contact (81% women). Age: mean 76.2 (SD 4.7). Inclusion criteria: aged over 70; ambulatory; living in unsupervised environment; agreeing to participate on a weekly basis for 15 weeks with 4 month follow up. Exclusion criteria: debilitating conditions e.g. cognitive impairment, metastatic cancer, crippling arthritis, Parkinson's disease, major stroke, profound visual defects.
Interventions	Three arms: 1. Tai Chi Quan (balance enhancing exercise). Group sessions twice weekly, for 15 weeks. (Individual contact with instructor approximately 45 minutes per week.) 2. Computerised balance training. Individual sessions once weekly, for 15 weeks. (Individual contact with instructor approximately 45 minutes per week.) 3. Control: group discussions of topics of interest to older people with gerontological nurse, 1 hour once weekly for 15 weeks.
Outcomes	Used modified definition of a fall rather than agreed definition for FICSIT trials described in Buchner 1993. 1. Rate of falls. 2. Number of people falling.
Notes	Atlanta FICSIT trial [Province 1995]. 1997 paper included under this Study ID reports on a subgroup of the trial, reporting on outcomes other than falls.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Randomised using "computer-generated fixed randomization procedure".
Allocation concealment?	Unclear	Insufficient information to permit judgment.

Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Blinding of assessors not described.
Low risk of bias in recall of falls?	Yes	Falls ascertained by monthly calendar, or by monthly phone call from project staff.

Wolf 2003

Methods	RCT. Cluster randomised. Losses: 93 of 311 (30%).
Participants	Setting: community, Atlanta, USA. N = 311 (N = 20 clusters). Sample: congregate living facilities (independent living facilities) recruited in pairs by whether Housing and Urban Development (N = 14) or private (N = 6) sites with at least 15 participants recruited per site (94% women). Age: mean 80.9 (SD 6.2); range 70-97 years. Inclusion criteria: aged 70 and over; one or more falls in previous year; transitioning to frailty. Exclusion criteria: frail or vigorous elderly; major cardiopulmonary disease; cognitive impairment (MMSE <24); contraindications for exercise e.g. major orthopaedic conditions; mobility restricted to wheelchair; terminal cancer; evidence of other progressive or unstable neurological or medical conditions.
Interventions	1. Intense Tai Chi (TC): 6 out of 24 simplified TC forms. 60 minute session progressing to 90 minutes 2x per week (10-50 minutes of TC) for 48 weeks. Progressing from using upright support to 2 minutes of TC without support. 2. Wellness education programme: 1 hour per week for 48 weeks. Instruction on fall prevention, exercise and balance, diet and nutrition, pharmacological management, legal issues, changes in body function, mental health issues. Interactive material provided but no formal instruction in exercise.
Outcomes	1. Rate of falls. 2. Number of people falling.
Notes	"Transitioning to frailty" if not vigorous or frail; based on age, gait/balance, walking activity for exercise, other physical activity for exercise, depression, use of sedatives, vision, muscle strength, lower extremity disability (Speechley M et al. J Am Geriatr Soc 1991;39:46-52).

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Facilities stratified by socioeconomic status and randomised in pairs. Quote: "First site in the pair was randomized to an intervention. The second site received the other intervention."

Allocation concealment?	Unclear	Insufficient information to permit judgment, although allocation of second site in the pair could be predicted after the first site was randomised.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation. Assessors blind to group allocation.
Low risk of bias in recall of falls?	Yes	Prospective. Falls recorded on forms and submitted to instructor weekly + phone call.

Woo 2007

Methods	RCT. Losses: 4 of 180 (2%).
Participants	Setting: community, Hong Kong, China. N =180 Sample: recruited by notices posted in four community centres in in Shatin township (50% women). Age: mean 69 (SD 2.6),range 65-74 years. Inclusion criteria: able to walk >8 meters without assistance. Exclusion criteria: neurological disease which impaired mobility; shortness of breath or angina on walking up one flight of stairs; dementia; already performing Tai Chi or resistance training exercise.
Interventions	1. Tai Chi using Hang style with 24 forms. x3 per week, for 12 months. 2. Resistance training exercises x3 per week using a Theraband, for 12 months. 3. Control: no exercise prescribed.
Outcomes	1. Number of people falling. Falls a secondary outcome of this study. Other outcomes reported but not included in this review.
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Quote: "Computer generated blocked randomisation."
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Unclear	Methods used to ascertain falls not described.

Wyman 2005

Methods	RCT. Losses: of 272 (%).
Participants	Setting: community, Minnesota, USA. N = 272 Sample: randomised sample of Medicare beneficiaries in Twin Cities Metropolitan Area (100% women). Age: mean 79 (SD 6), range 70 to 99 years. Inclusion criteria: >70 years; community dwelling; mentally intact; ambulatory; ≥2 risk factors for falls; medically stable. Exclusion criteria: currently involved in regular exercise.
Interventions	1. Multifactorial intervention: comprehensive fall risk assessment by nurse practitioner, exercise (walking with weighted balance and coordination exercises), fall prevention education, provision of two night lights, individualised risk reduction counselling for 12 weeks, followed by tapered 16 week computerised telephone monitoring and support. 2. Control: health education on topics other than fall prevention. In-home intervention for 12 weeks, followed by tapered 16 week computerised telephone monitoring and support.
Outcomes	1. Rate of falls.
Notes	

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Quote: "Participants were stratified according to age group... and randomized using a permutated block design with varying block sizes of four and six to assure that the number of participants was balanced in each treatment group."
Allocation concealment?	Unclear	Insufficient information to permit judgment.
Blinding? Falls	Unclear	Falls reported by participants who were aware of their group allocation.
Low risk of bias in recall of falls?	Yes	Quote: "Falls were measured daily on a calendar that was mailed in monthly."

A&E: accident and emergency department
ADL: activities of daily living
AMT: abbreviated mental test
BMD: bone mineral density
BMI: body mass index
CCT: controlled clinical trial (quasi-randomised)
CHF: congestive heart failure
CSH: carotid sinus hypersensitivity
CSM: carotid sinus massage
ECG: electrocardiogram
ERT: estrogen replacement therapy
d: day
ED: emergency department
FICSIT: frailty and injuries: cooperative studies of intervention techniques
GP: general practitioner
GPSS: Geriatric Postal Screening Survey
HMO: health maintenance organisation
HRT: hormone replacement therapy
IADL: instrumental activities of daily living. More complex than ADL e.g. handling personal finances, preparing meals, shopping, housekeeping, travelling, using the telephone
iPTH: intact parathyroid hormone
IQR: interquartile range
m: meters
mcg: microgram
MMSE: mini mental state examination
NSAID: nonsteroidal anti-inflammatory drugs
ng: nanogram (multiply by 2.496 to convert to nanomoles/L)
nmol: nanomole
OT: occupational therapist
PD: Parkinson's disease
PTH: parathyroid hormone
RCT: randomised controlled trial
SD: standard deviation
SF36: medical outcomes study 36-item short form questionnaire, a standard measure of health related quality of life
SF12: a validated abbreviated form of the above quality of life assessment tool
x: times
25(OH)D: 25-hydroxy-vitamin D
<: less than
>: more than

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Alexander 2003	Controlled trial. Not strictly randomised. Intervention: multifactorial fall risk assessment in day care centres. Falls outcomes.
Alp 2007	RCT. Intervention: self-management classes for osteoporotic women (post-menopausal or idiopathic osteoporosis). Not just older women: mean 66 (SD 12), mean minus 1SD <60. Falls outcomes for outdoor

(*Continued*)

	falls only.
Armstrong 1996	RCT. Intervention: hormone replacement therapy in post menopausal women. Not just older women: range 45-70, mean 60.9 (SD 5.8), mean minus 1SD <60. Falls outcomes.
Barr 2005	Controlled trial. 171 non responders added to intervention group after randomisation. Intervention: screening for fracture risk and GPs advised to prescribe calcium and vitamin D. Falls outcomes.
Bogaerts 2007	RCT. Intervention: whole body vibration training for one year. Falls recorded in laboratory setting during dynamic computerized posturography testing.
Buchner 1997b	RCT. Intervention: endurance training (MoveIT study). No falls outcomes. Same control group as included FICSIT study (Buchner 1997a).
Byles 2004	RCT. Intervention: home-based health assessment. No falls outcomes. Mackenzie 2002 and 2006 report an epidemiological sub-study of Byles 2004 using a stratified sample of 264 randomly selected participants.
Chapuy 2002	RCT. Intervention: vitamin D plus calcium. Falls outcomes. Not community; participants described as "583 ambulatory institutionalized women" in "55 apartment homes for elderly people". Administration of vitamin D or placebo supervised by nurses at mealtimes i.e. intermediate level nursing care facilities. Included in institutional falls review (Cameron 2005) after discussion with review authors.
Cheng 2001	RCT. Intervention: symmetrical standing training and repetitive sit-to-stand training for stroke patients. Not just older people: mean 62.7 (SD 7.9), mean minus 1SD < 60. Falls outcomes.
Crotty 2002	RCT. Intervention: accelerated discharge and home based rehabilitation after hip fracture. Not intervention to prevent falls; falls recorded as adverse events.
De Deyn 2005	RCT. Intervention: antipsychotic (aripiprazole) versus placebo in patients with Alzheimer's disease. Not intervention to prevent falls: only reported falls considered to be caused by the medication (adverse events) .
Ebrahim 1997	RCT. Intervention: brisk walking in post menopausal women. Not just older women: mean 68.1 (SD 8.8) , mean minus 1SD = <60.
Elley 2003	RCT (clustered). Intervention: activity counselling and Green Prescription to increase physical activity in older people. Outcomes: activity levels and quality of life. Falls reported as adverse events.
Faber 2006	RCT. Intervention 1: functional walking. Intervention 2: in balance (Tai Chi). Control: usual activities. Falls outcomes. Excluded from this review as participants in 15 long-term care centres including self-care and nursing care facilities. Included in institutional falls review (Cameron 2005) after correspondence with author.
Freiberger 2007	Reported as an RCT but control group not randomised.
Gill 2002	RCT. Intervention: home-based intervention including physical therapy to prevent functional decline. Falls reported as adverse events.

(*Continued*)

Graafmans 1996	An epidemiological study of risk factors for falls in a self-selected subgroup of 368 subjects from an RCT of daily vitamin D versus placebo with 2578 participants. Of 458 eligible subjects only 368 agreed to enrol in this study (80.1%). Percentage who fell in intervention and control groups are reported but it was felt that this paper should be excluded as the sample was a self-selected subgroup and the number in intervention and control groups were not provided. There was no statistically significant difference in percentage of fallers with or without vitamin D (OR 1.0, 95% CI 0.6 to 1.5).
Hirsch 2003	RCT. Intervention: balance and resistance training versus balance. Parkinson's disease. Outcome: balance (ability to balance under progressively more difficult conditions i.e. artificially induced falls).
Hu 1994	RCT. Not fall prevention. Falls artificially induced. Balance parameters measured.
Inokuchi 2007	Not RCT. Was to have been an RCT but study design changed. Potential participants and controls selected from different sites. Intervention: nurse-led community exercise programme. Falls outcomes.
Iwamoto 2005	RCT. Intervention: whole body vibration (WBV) plus alendronate versus alendronate. Aim to investigate whether WBV enhanced effect of alendronate on BMD, bone turnover and chronic back pain in people with osteoporosis (age 55-88). Falls reported but only one person fell during year follow up in intervention group versus two in control group.
Kempton 2000	Not RCT. Evaluation of non-randomised community fall prevention programme targeting eight risk factors. Geographical control.
Kerschan-Schindl 2000	Not RCT. Sample selected from controlled trial of home exercise programme. Falls outcomes.
Larsen 2005	RCT. Three intervention arms: vitamin D plus calcium versus same plus home safety versus home safety alone versus no intervention. Outcome: only 'severe' falls leading to acute hospital admission. No significant difference in number of 'severe' falls for any group.
Lee 2007	RCT. Intervention: personal emergency response system (portable alarm and speaker microphone). Outcome: anxiety and fear of falling. Falls monitored as reason for using alarms. Not designed to reduce falls.
Lehtola 2000	RCT. Intervention: exercise. Translated from Finnish. Excluded because of apparent discrepancies in reporting of data. Clarification sought from authors but no response.
Lin 2006	Not RCT. Intervention: Tai Chi. Controlled trial with two intervention villages (selected because they had the largest older populations) versus four control villages. Outcome: injurious falls that required medical care.
Linnebur 2007	Baseline data from ongoing RCT. Intervention not described. Falls not collected at follow up.
Mansfield 2007	RCT. Intervention: perturbation-based balance training programme. "Falls" monitored during perturbation by pressure on safety harness.
Marigold 2005	RCT. Intervention: exercise for people with chronic stroke. Falls outcomes. Not just older people; excluded as mean - 1SD <60.

(*Continued*)

Mead 2007	RCT. Intervention: endurance and resistance training versus relaxation for people who have had a stroke. Outcomes: functional measures. Falls reported as adverse events.
Means 1996	RCT nested within a pre-test post-test experimental design. Both groups received the same exercise intervention, randomisation was to test whether repeated exposure to the functional obstacle course used as a performance measure in the study resulted in an improvement in performance in that test. Previously included in Cochrane review as falls data was presented by group; this was a pilot study for a larger trial which has been included in this review (Means 2005).
Ondo 2006	Random order bilateral ventralis intermedius nuclei deep brain stimulation in patients with Parkinson's disease or essential tremor. Falls monitored during balance assessment with patients wearing a harness.
Peterson 2004	RCT. Intervention: motivational video, educational booklet, supporting peer counselling, and high intensity muscle strength training in hip fracture patients post discharge. Outcome: functional outcome (SF36) . Trialists planned to include falls outcomes but insufficient falls data to carry out reliable analysis.
Poulstrup 2000	Not RCT. Community-based fall prevention intervention with non-randomised control communities. Outcome: fall related fractures.
Protas 2005	RCT. Eighteen participants with Parkinson's disease. Analysed as pre-post intervention, and not all participants included in analysis. No data or results for inclusion in the review.
Resnick 2007	RCT. Intervention: self-efficacy intervention alone, exercise plus self-efficacy, exercise alone (three arms) versus routine care in older women after hip fracture. Author states falls were not an outcome (personal communication).
Robertson 2001b	Not RCT. Controlled trial in multiple centres. Intervention: home based exercise in over 80 year olds. Same programme as in Campbell 1997, Campbell 1999, and Robertson 2001a. Outcome: falls, injuries resulting from falls, and cost effectiveness.
Rosie 2007	RCT. Intervention: functional home exercise (repeated sit-to-stands versus low-intensity progressive resistance training). Outcomes: multiple gait, balance, and falls efficacy assessments. Falls reported as adverse events.
Rucker 2006	Not RCT. Non-randomised "on-off" time series scheme. Intervention: educational intervention in community-dwelling people aged ≥50 with history of wrist fracture. Outcome: falls and fear of falling.
Sakamoto 2006	RCT. Intervention: unipedal standing balance exercise. Information from author, institutional setting (special nursing homes for the aged and nursing care facilities). Included in institutional falls review (Cameron 2005) after correspondence with author.
Sato 2002	RCT. Intervention: menatetrenone (vitamin K) for treating osteoporosis and preventing fractures in women with Parkinson's disease and vitamin D deficiency. Control: no intervention. Not a fall-prevention intervention. Report number of falls per subject (erratum published) but because of interaction with osteoporosis in risk of fracture.
Sato 2005a	RCT. Intervention: risedronate and ergocalciferol (vitamin D2) and calcium for preventing fractures in women with dementia and probable Alzheimer's disease. Control: placebo risedronate and ergocalciferol

(*Continued*)

	(vitamin D2) and calcium. Not a comparison of fall-prevention interventions as both groups received vitamin D. Reports change in number of fallers pre-post intervention in both groups.
Sato 2006	RCT. Intervention: alendronate plus vitamin D for prevention of fractures in people with Parkinson's disease. Control: placebo plus vitamin D. Not a comparison of fall-prevention interventions as both groups received vitamin D. Reports change in number of fallers pre-post intervention in both groups.
Schwab 1999	Not RCT. 1999 letter appeared to describe an RCT, but not confirmed by subsequent publications or correspondence with authors.
Shaw 2003	RCT with falls outcomes. All had MMSE < 24. Not community as 79% of participants lived in high and intermediate nursing care facilities. Included in institutional falls review (Cameron 2005) after correspondence with author.
Shimada 2003	RCT. Not community: institutional setting (geriatric health services facility in Japan). Included in institutional falls review (Cameron 2005) after correspondence with author.
Singh 2005	RCT. Intervention: high versus low-intensity weight training versus GP care for depression in older people. Falls reported as adverse events i.e. the hypothesis is that the intervention might increase falls, not reduce them.
Sohng 2003	RCT. Intervention: community-based "fall prevention exercise programme" with no falls outcome. Outcome: muscle strength, ankle flexibility, balance, IADL, depression.
Sumukadas 2007	RCT. Intervention: perindopril (ACE inhibitor) versus placebo. Falls reported as adverse events.
Tennstedt 1998	RCT. Intervention: to reduce fear of falling and increase activity levels. Not fall prevention. Falls reported as possible adverse effect.
Thompson 1996	Not RCT. Pre-post intervention. Environmental risk factor modification. Falls outcomes.
Tideiksaar 1992	Not RCT. Community based survey and falls prevention programme. Qualitative evaluation only. Falls outcomes.
Tinetti 1999	RCT. Intervention: home based multiple component rehabilitation after hip fracture. Not intervention to prevent falls; falls recorded but as adverse events.
Von Koch 2001	RCT. Intervention: rehabilitation at home after a stroke. Not intervention to prevent falls; falls recorded as adverse events.
Ward 2004	RCT. Intervention to prevent skin sores and falls in people with progressive neurological conditions. Not just older people; age range 22-89 years, median 65. Excluded as not prevention of falls in older people and results not reported by age.
Wolf-Klein 1988	Not RCT. Pre-post intervention (multidisciplinary falls clinic). Falls outcomes.
Wolfson 1996	RCT. Intervention: exercise. Outcome: balance, strength and gait velocity. No falls outcome. FICSIT trial.

(*Continued*)

Yardley 2007	RCT. Intervention: Internet provision of tailored advice on falls prevention activities for older people. No falls outcomes.
Yates 2001	RCT. Multifactorial intervention to reduce fall risk. Outcome: decrease in selected fall risk factors. No falls outcomes.
Ytterstad 1996	Not RCT. Quasi experimental, with non-randomised controls. Pre-post intervention design. Outcomes include falling.

A&E: accident and emergency
BMD: bone mineral density
GP: general practitioner (family physician)
RCT: randomised controlled trial
IADL: instrumental activities of daily living

Characteristics of studies awaiting assessment *[ordered by study ID]*

Beyer 2007

Methods	Randomised controlled trial.
Participants	Setting: Copenhagen, Denmark. N = 65. Sample: women with a history of a fall identified from hospital records. Age: 70-90 years Inclusion criteria: home-dwelling; aged 70 to 90 years; history of a fall requiring treatment in hospital emergency department, but not hospitalisation; able to come to training facility. Exclusion criteria: lower limb fracture in last 6 months; neurological diseases, unable to understand Danish; cognitively impaired (MMSE <24).
Interventions	Supervised group exercise programme (flexibility, lower limb resistance exercise, balance training, stretching). 60 minutes 2x per week for 6 months.
Outcomes	Primary outcomes measures of muscle strength and function. Falls a secondary outcome recorded for one year using calendar.
Notes	Not yet assessed.

Di Monaco 2008

Methods	Quasi-randomised trial (alternation).
Participants	N = 95. Sample: women in hospital after a fall-related hip fracture. Inclusion criteria: history of hip fracture; community-dwelling; aged ≥60 years.

Di Monaco 2008 (*Continued*)

Interventions	Intervention: multidisciplinary fall prevention programme during hospital stay plus single home visit by occupational therapist after discharge. Control: as above but no home visit.
Outcomes	Falls recorded retrospectively at 6 months follow up.
Notes	Intervention commences in hospital but designed to prevent falls in the community. Not yet assessed.

Madureira 2007

Methods	"Randomized consecutively into two groups".
Participants	66 women with osteoporosis attending an outpatient clinic. Unclear whether community-dwelling. Brazil. Inclusion criteria: osteoporosis. Exclusion criteria: secondary osteoporosis, visual deficiency, hearing deficiency, vestibular alteration, unable to walk more than 10 meters independently, contraindications for exercise training.
Interventions	Intervention: balance training programme for 1 hour a week for 40 weeks. Control: no intervention.
Outcomes	Falls a secondary outcome. Primary outcomes are functional balance, static balance and get up and go test.
Notes	No raw data usable summary statistics available. Additional information required.

Pfeifer 2004

Methods	One-year randomised controlled trial.
Participants	242 men and women aged over 70 years, in Germany.
Interventions	800 IU vitamin D3 and 1000 mg calcium or 1000 mg daily.
Outcomes	Falls and muscle power.
Notes	Published abstracts only. Not yet assessed.

Sato 2005b

Methods	Randomised controlled trial.
Participants	Two hundred ambulatory women with dementia and probable Alzheimer's disease, aged 70 years and over.
Interventions	Intervention: menatetrenone (vitamin K) and vitamin D2 and calcium. Control: no treatment.
Outcomes	Fractures and number of falls per participant.

Sato 2005b (*Continued*)

Notes	

Weber 2008

Methods	Cluster randomised by clinic site.
Participants	N = 620 people. Inclusion criteria: aged over 70; community-dwelling; at risk of falls based on age and medication use.
Interventions	Electronic medical record (EMR) system to identify at-risk patients and reduce medication use. Standardised medication review and recommendations to physician via EMR system.
Outcomes	Falls, medication use and psychoactive medication use. Falls self-reported at three month intervals for 15 months.
Notes	

Characteristics of ongoing studies *[ordered by study ID]*

Behrman

Trial name or title	Prediction and prevention of falls in the elderly
Methods	Randomised controlled trial
Participants	500 individuals aged over 75 years at high risk of developing disabilities, from each general practice in Maidenhead.
Interventions	1. Intervention: full geriatric assessment at day hospital and course of group exercises. 2. Control: usual care.
Outcomes	Changes in Barthel score, mental depression score, change in residential status, mortality. Falls not mentioned in list of outcomes, but title and research question describe prevention of falls and disability.
Starting date	April 1997 (completed, data analysis ongoing)
Contact information	Dr R Behrman Geriatric Dept St Mark's Hospital Maidenhead SL6 6DU Berks UK Telephone: +44 1753 638532

Behrman (*Continued*)

Notes	? falls outcomes

Blalock

Trial name or title	Preventing falls through enhanced pharmaceutical care
Methods	Randomised controlled trial, single blind (outcomes assessor)
Participants	200 men and women, aged ≥65 Inclusion criteria: taking ≥ 4 prescription medications; taking ≥ 1 high risk medication; ≥ 1 falls during 12 month period before study entry; able to speak and read English. Exclusion criteria: resident of long term care facility; cognitive impairment; housebound.
Interventions	1. Pharmacist intervention: participants receive written information about falls prevention and a personal consultation from a community pharmacist concerning their medication regimen (identifying side effects etc) . Pharmacist follow up, as required, with participants' physicians to coordinate any recommended medication changes. 2. Control: written fall prevention information only
Outcomes	Time to first fall and proportion of individuals who fall during the one-year follow-up period
Starting date	August 2004 to September 2009
Contact information	Dr S Blalock Injury Prevention Research Center University of North Carolina Chapel Hill, North Carolina USA 27599-7505
Notes	

Ciaschini

Trial name or title	FORCE (Falls, Fracture, and Osteoporosis Risk Control Evaluation) study
Methods	Randomised controlled trial. Cross over at 6 months.
Participants	Community-dwelling, Canada; aged 55 years and over; able to give consent; at risk of falls or fracture. Excluded if already receiving appropriate osteoporosis therapy.
Interventions	Osteoporosis risk assessment and evidence-based management. Falls risk assessment, intervention, and occupational therapy or physiotherapy referral.
Outcomes	Primary outcomes are appropriate osteoporosis management and falls assessment by 6 months. Secondary outcomes number of falls and fractures recorded in monthly diaries.
Starting date	March 2003 to January 2006

Ciaschini (*Continued*)

Contact information	Dr M. Ciaschini, MD, FRCPC Group Health Centre Sault St. Marie Ontario Canada
Notes	Protocol published 2008 but study completed in 2006.

Cryer

Trial name or title	A primary care based fall prevention programme: evaluation of the Canterbury fall prevention programme
Methods	Randomised controlled trial
Participants	One general practice, Canterbury, UK. Fallers referred by GP staff and identified in A&E. Inclusion criteria: falling in previous 2 weeks; aged at least 65 years; living independently in the community; registered with target general practice; able to communicate well enough to participate. Exclusion criteria: unable to speak English; too mentally confused; medical reason for falling; terminally ill; sudden onset of paralysis; moved out of area.
Interventions	1. Intervention: home interview and assessment including medication review and referral to other agencies; group intervention 2 x per week for 6 months for seated exercise, practice getting up from floor, group discussion re health and emotional needs 2. Control: usual care. Intervention carried out by East Kent Health Promotion Service and nurses employed by the general practice
Outcomes	Follow up at 6, 12 and 18 months. Falls.
Starting date	August 1996 (completed)
Contact information	Dr Colin Cryer Centre for Health Services Studies George Allen Wing University of Kent Canterbury Kent CT2 7NF UK
Notes	Methods reported in Allen A, Simpson JM, Physiotherapy Theory and Practice (1999);15:121-133.

Donaldson

Trial name or title	Action seniors! A 12-month randomised controlled trial of a home-based strength and balance-retraining programme in reducing falls
Methods	Randomised controlled trial
Participants	People aged 70 or over seen at Falls Clinic due to presenting at A&E or to GP with fall or fall related injury. Stratified by sex and Falls Clinic physician.
Interventions	1. Twelve-month home-based strength and balance-retraining programme (Otago Exercise Programme) 2. Control: semi-structured interview about their presenting fall and their experience seeking care for the fall at A&E.
Outcomes	Fall rates, injury rates, time to first fall. Also changes in risk factors. Falls recorded in monthly diaries.
Starting date	October 2004
Contact information	MG Donaldson PhD Candidate Health Care and Epidemiology, Faculty of Medicine, University of British Columbia, 5804 Fairview Avenue, Vancouver, British Columbia, CANADA V6T 1Z3 Telephone: +1 604 875 4111 extension: 62470 Email: meghangd@interchange.ubc.ca Alternative contact: Prof Karim Khan Family Practice University of British Columbia Email: khan@interchange.ubc.ca
Notes	Interim paper published (Liu-Ambrose et al 2008) reporting executive functioning outcomes.

Edwards

Trial name or title	Randomised controlled trial of falls clinic and follow up home intervention
Methods	Randomised controlled trial
Participants	Volunteer community living seniors residing in apartments.
Interventions	1. On site ”falls clinic“ assessment to identify those at high risk of falls, followed by intensive in-home comprehensive assessment and tailored intervention programme. Control: low intensity educational session.
Outcomes	Incidence and risk of falls

Edwards (*Continued*)

Starting date	(completed)
Contact information	Prof Nancy Edwards Career Scientist School of Nursing University of Ottawa Canada Email: nedwards@uottawa.ca
Notes	Ongoing trial described in Edwards N, Cere M, Leblond D. A community-based intervention to prevent falls among seniors. Family and Community Health 1993; 15(4):57-65.

Grove

Trial name or title	Effects of Tai Chi training on general wellbeing and motor performance in patients with Parkinson's disease
Methods	Randomised crossover trial.
Participants	20 patients with Parkinson's disease recruited from a Parkinson's disease clinic.
Interventions	Tai Chi training
Outcomes	Get up and go test, "log book of falls"
Starting date	March 2000
Contact information	Dr M Grove Royal Cornwall Hospitals NHS Trust Treliske Truro TR1 3LJ UK
Notes	

Haines

Trial name or title	Assessment and prevention of falls, functional decline and hospital re-admission in older adults post-hospitalisation
Methods	Randomised controlled trial. Allocation via sequential opening of opaque envelopes containing computer generated random number sequence.
Participants	Target sample size 156 Inclusion criteria: aged $\geq$ 65, using a gait aid to mobilise, discharged from hospital to a community dwelling, not referred for post-discharge community rehabilitation services. Control: unstable severe cardiac disease, cognitive impairment, aggressive behaviour, restricted weight-bearing

Haines (*Continued*)

	status.
Interventions	1. Intervention: self-progressed home exercise program in DVD and booklet format, to be completed 3 to 7 times per week. Active encouragement for 8, then 18 weeks without active encouragement. 2. Control: usual daily activities
Outcomes	Number of falls (self recorded for 6 m, then by monthly phone calls for 6 m.
Starting date	April 2007
Contact information	Dr T Haines Physiotherapy Department Geriatric Assessment and Rehabilitation Unit (GARU) Princess Alexandra Hospital Ipswich Rd Woolloongabba Queensland 4102 Australia Email: Terrence˙Haines@health.qld.gov.au
Notes	

Hill a

Trial name or title	RCT to evaluate the effectiveness of a targeted and personalised multifactorial program to reduce further falls and injuries for community-dwelling older fallers presenting to and being discharged directly from an emergency department
Methods	Randomised controlled trial
Participants	Aproximately 800 people aged 60 and over, presenting to A&E (Melbourne, Australia) because of a fall and discharged directly home. Inclusion criteria: living in the community or a retirement village; able to provide informed consent or has consent provided by a third party; able to comply with simple instructions; able to walk independently indoors with or without a gait aid.
Interventions	1. Intervention: usual care put in place by A&E plus comprehensive falls risk assessment within one week of being discharged home from A&E and again twelve month later. 2. Control: usual care.
Outcomes	Falls and fall related injuries monitored for twelve months through a falls diary.
Starting date	December 2003 to December 2006
Contact information	Irene Blackberry MB PhD National Ageing Research Institute Melbourne Victoria 3052 Australia

Hill a (*Continued*)

	Email: i.blackberry@nari.unimelb.edu.au
Notes	

Hill b

Trial name or title	Falls prevention for stroke patients following discharge home: A randomised trial evaluating a multifactorial falls prevention program (FLASSH)
Methods	Randomised controlled trial. Allocation sequence generated by computer. Allocated using sealed envelopes.
Participants	214 participants Inclusion criteria: stroke patients (men and women aged $\geq$ 50) discharged home, at risk of falls due to previous fall or balance impairment. Exclusion criteria: discharged to residential care facilities; patients and carers without basic English.
Interventions	1. Multifactorial individualised falls prevention program based on falls risk factors: 12 month home exercise program; falls education (1 session); referral to address identified risk factors; plus usual care i.e. therapy prescribed by the discharging facility. 2. Usual care: therapy prescribed by discharging facility (variable but approximately 3 months).
Outcomes	Falls: time to first fall, fall rate. Falls data collected prospectively via monthly fall calendars for 12 months.
Starting date	June 2006
Contact information	Prof K Hill National Ageing Research Institute 34-54 Poplar Rd Parkville Victoria 3052 Australia Email: k.hill@nari.unimelb.edu.au
Notes	May not be included. Depends on distribution of ages as recruiting people aged 50 or more.

Jee

Trial name or title	Incorporating vision and hearing tests into aged care assessment
Methods	Randomised controlled trial
Participants	Target sample size: 1400
Interventions	2 X 2 factorial design Four groups. All receive standardized questionnaire plus vision tests, hearing tests, vision and hearing tests, or no additional tests.

Jee (*Continued*)

Outcomes	One year follow up. Falls, quality of life, physical and cognitive function, use of health and community aged care services, admission to nursing home.
Starting date	2005
Contact information	Dr JJ Wang Senior Research Fellow Centre for Vision Research Westmead Millennium Institute University of Sydney C24 Westmead Hospital Sydney NSW Australia Email: jiejin˙wang@wmi.usyd.edu.au
Notes	

Johnson

Trial name or title	Community care and hospital based collaborative falls prevention project
Methods	Randomised controlled trial
Participants	Target sample size 200. Inclusion criteria: male or female, aged ≥65, presenting to A&E or falls clinic, community dwelling in Perth north. Exclusion criteria: functional cognitive impairment, unable to speak or read English.
Interventions	1. Intervention: community follow up by support worker (8 hours over 2-3 weeks) to review risk factors in the home, strategies to reduce risk factors, assistance to implement Falls Action Plan provided by A&E or clinic (see ANZCTR website for further details). 2. Control: no community follow up after discharge.
Outcomes	Number of falls (falls calendar)
Starting date	April 2007
Contact information	J Johnson Perth Home Care Services 30 Hasler Road PO Box 1597 Osborne Park Western Australia 6017 Australia Email: jayej@phcs.org.au

Johnson (*Continued*)

Notes	

Kenny

Trial name or title	SAFE PACE 2. Syncope and falls in the elderly - pacing and carotid sinus evaluation: a randomised controlled trial of cardiac pacing in older patients with falls and carotid sinus hypersensitivity.
Methods	Randomised controlled trial
Participants	226 patients with carotid sinus hypersensitivity in over 30 centres across the UK, Europe and North America. Patients screened in A&E, geriatric medicine, general medicine, and orthopaedic facilities. Inclusion criteria: >50 years old, 2 or more unexplained falls in previous 12 months, cardioinhibitory response (>3 seconds asystole) to carotid sinus massage. Exclusion criteria: cognitive impairment (MMSE <20), atrial fibrillation.
Interventions	1. Intervention: Medtronic Kappa 700 (Europe) or Kappa 400 (North America) pacemaker 2. Control: implantable loop recorder (Medtronic Reveal)
Outcomes	Weekly fall diaries. Number of fallers in 24 months after intervention. Secondary outcomes: Number of falls, frequency of dizzy symptoms, injury rates, the use of primary, secondary, and tertiary care facilities, cognitive function. Resource use and cost data collected.
Starting date	May 1999 (completed)
Contact information	Prof RA Kenny Dept of Medical Gerontology Trinity College Dublin Dublin
Notes	International multicentre trial

Klaber Moffett

Trial name or title	PREFICS - Prevention of Falls and Injuries in a Community Sample: effectiveness of a supervised exercise program for falls prevention
Methods	Randomised controlled trial
Participants	1. Women aged over 60 years. 2. One fall or more in the year. 3. Independently mobile with or without a walking aid. 4. Able to follow simple instructions. 5. Resident in Hull and district.

Klaber Moffett (*Continued*)

Interventions	1. Intervention: supervised exercise class aimed at improving balance and strength. 2. Control: home exercise sheets provided.
Outcomes	Number of falls Fall related injuries Fear of falling Quality of life Physical data (balance etc) Follow up for 12 months using 'falls diaries'. The use of health care resources will be recorded for use in a health economic evaluation.
Starting date	April 2005 (completed)
Contact information	Prof J Klaber Moffett Professor of Rehabilitation and Therapies Deputy Director Institute of Rehabilitation University of Hull 215 Anlaby Road Hull HU3 2PG UK Telephone: +44 1482 675639 Email: j.k.moffett@hull.ac.uk
Notes	

Lesser

Trial name or title	Vestibular rehabilitation in prevention of falls due to vestibular disorders in adults
Methods	Randomised controlled trial
Participants	Adults with vestibular disorders.
Interventions	Vestibular rehabilitation (no further details available)
Outcomes	Falls and quality of life
Starting date	August 2000 (completed)
Contact information	Mr THJ Lesser Otolaryngology University Hospital Aintree Longmoor Lane Liverpool L9 7AL UK

Lesser (*Continued*)

	Telephone: +44 151 529 4035 Fax: +44 151 529 5263
Notes	

Lips

Trial name or title	Prevention of fall incidents in patients with a high risk of falling
Methods	Randomised controlled trial
Participants	200 people. Inclusion criteria: aged 65 and over, high risk of falling, living independently or in residential home, living near University Medical Center, history of recent fall. Exclusion criteria: unable sign informed consent or provide a fall history, fall due to traffic or occupational accident, living in nursing home, acute pathology requiring long-term rehabilitation e.g. stroke.
Interventions	1. Intervention: multidisciplinary assessment in geriatric outpatient clinic and individually tailored treatment regimen in collaboration with patient's GP e.g. withdrawal of psychotropic drugs, balance and strength exercises, home hazard reduction, referral to specialists. 2. Control: usual care.
Outcomes	One year follow up using fall calendar. Time to first and second fall. Secondary outcomes: ADL, quality of life, physical performance, adherence, medication use. Economic evaluation.
Starting date	April 2005 to July 2008
Contact information	Prof P Lips Department of Endocrinology VU University Medical Center P.O. Box 7057 Amsterdam The Netherlands Email: p.lips@vumc.nl or g.peeters@vumc.nl
Notes	

Lord

Trial name or title	VISIBLE study (Visual Intervention Strategy Incorporating Bifocal and Long-Distance Eyeware)
Methods	Randomised controlled trial
Participants	580 people. Inclusion criteria: using multifocal glasses outdoors 3 or more times per week, community-dwelling, aged 65+ years with a recent fall OR aged 80+ years regardless of falls history, Folstein Mini Mental score of 24+,

Lord (*Continued*)

	and adequate visual contrast sensitivity (Melbourne Edge Test score of 16+dB).
Interventions	Assessor-blinded trial. All participants will receive an optometry assessment and updated multifocal glasses (if required) at baseline. 1. Intervention: subjects will receive a pair of plain distance glasses and counselling for their use in predominantly outdoor situations. 2. Control: use their multifocal glasses in their usual manner.
Outcomes	Falls rates and compliance using monthly falls diaries. Secondary outcomes: Quality of life (SF-36), Instrumental Activities of Daily Living, Adelaide Activities Index
Starting date	June 2005 to March 2008
Contact information	Prof SR Lord Prince of Wales Medical Research Institute University of New South Wales Randwick Sydney New South Wales 2031 Australia Email:s.lord@unsw.edu.au
Notes	

Maki

Trial name or title	Evaluation of a balance-recovery specific falls prevention exercise program
Methods	Randomised controlled trial
Participants	Inclusion criteria: aged 65-80; community dwelling; history of falls (at least 1 fall in the past 12 months) or poor balance; functional mobility (no dependence on mobility aids). Exclusion criteria: neurological or musculoskeletal disorder; cognitive disorder (e.g. dementia); osteoporosis.
Interventions	A training program involving perturbation-evoked reactions will be evaluated.
Outcomes	Primary outcome: ability to recover balance by stepping and grasping. Secondary outcome: fall frequency; clinical measures related to balance and fall risk (e.g. FallScreen, Community Balance and Mobility Scale, balance confidence).
Starting date	November 2005 to March 2008
Contact information	Brian Maki Principal Investigator Sunnybrook & Women's College Health Sciences Centre University of Toronto Toronto

Maki (*Continued*)

	Ontario Canada
Notes	Possibly laboratory induced falls while assessing balance rather than self-reported falls.

Masud

Trial name or title	Multifactorial day hospital intervention to reduce falls in high risk older people in primary care: a multi-centre randomised controlled trial
Methods	Randomised controlled trial
Participants	400 people aged over 70 not resident in nursing or residential homes, identified as being at high risk of falling by a postal screening questionnaire, registered with the participating general practices in Nottinghamshire and Derbyshire (UK).
Interventions	1. Intervention: screening questionnaire, information leaflet, leaflet on falls prevention and invitation to attend the day hospital for assessment and any subsequent intervention. 2. Control: screening questionnaire, information leaflet, leaflet on falls prevention and usual care from primary care service until outcome data collected, then offer of day hospital intervention.
Outcomes	Proportion falling during one year follow up.
Starting date	September 2004 to May 2006
Contact information	Prof T Masud Department of Rehabilitation and the Clinical Gerontology Research Unit Nottingham City Hospital NHS Trust Nottingham NG5 1PB UK. Telephone: +44 (0)115 969 1169 x47193 Email: tm@nchhce.demon.co.uk
Notes	

Menz

Trial name or title	Podiatry treatment to improve balance and prevent falls in older people
Methods	Randomised controlled trial. Simple randomisation by external telephone randomisation service
Participants	Target sample size 300 Inclusion criteria: aged ≥65; independently community dwelling; ≥1 falls in past year; self-reported disabling foot pain; able to walk household distances without a walking aid; able to read and speak basic English. Exclusion criteria: lower limb amputation (including partial foot amputation); Parkinson's disease; active plantar ulceration; cognitive impairment.

Menz (*Continued*)

Interventions	1. Intervention: assessment and if required: footwear (assistance in purchasing more appropriate footwear) , orthoses (customised insoles to accommodate plantar lesions), home-based exercise instructions (ankle stretching, 1st metatarsophalangeal joint stretching, toe strengthening 3x per week for 6 months), plus all participants receive instructions on general foot exercises, plus "usual care", and booklet as for controls. 2. Control: "usual care" - general podiatric care i.e. nail trimming, callus and corn reduction every 8 weeks for 1 year; booklet on falls.
Outcomes	Monthly falls calendar and phone calls. Proportion of fallers and multiple fallers 12 month after baseline assessment; rate of falls per person.
Starting date	June 2008
Contact information	Dr H Menz La Trobe University Kinsbury Drive Bundoora Victoria 3086 Australia Email: h.menz@latrobe.edu.au
Notes	

Miller

Trial name or title	Individual nutrition therapy and exercise regime: A controlled trial of injured, vulnerable elderly (INTERACTIVE trial)
Methods	Randomised controlled trial
Participants	460 participants Inclusion criteria: community-dwelling, aged > 70, in hospital after a proximal femoral fracture, MMSE $\geq$ 18/30, body mass index between 18.5 kg/m^2 and 35 kg/m^2. Exclusion criteria: pathological fracture, unable to give consent, medically unstable 14 days after surgery.
Interventions	1. Intervention: six-month individualised exercise and nutrition program commencing within 14 days post-surgery. Weekly home visits. 2. Attention control. Weekly social visits.
Outcomes	Falls monitored at weekly visit for 6 months. 12 month follow up in the community
Starting date	June 2007 to September 2009
Contact information	Michelle D Miller Department of Nutrition and Dietetics Flinders University Adelaide South Australia Australia

Miller (*Continued*)

	Email: michelle.miller@flinders.edu.au
Notes	

Olde Rikkert

Trial name or title	Randomized controlled trial to reduce falls incidence rate in frail elderly (CP)
Methods	Randomised controlled trial
Participants	160 patients referred to a geriatric outpatient clinic, history of falling at least once in the last 6 months, and their primary caregivers
Interventions	A multifaceted fall prevention program for frail elders with physical and cognitive components, and training program for caregivers.
Outcomes	Follow up for 6 months after intervention. Falls incidence rate. Also numerous other secondary outcomes including fear of falling
Starting date	January 2008 to July 2010
Contact information	Dr Maria C Faes Radboud University Nijmegen Medical Centre Nijmegen, Gelderland Netherlands, 6500 HB Email: m.faes@ger.umcn.nl
Notes	Principal investigator: Prof dr M Olde Rikkert

Palvanen

Trial name or title	The Chaos Clinic for prevention of falls and related injuries: a randomised, controlled trial
Methods	Pragmatic randomised controlled trial
Participants	Target sample size: 3200 Inclusion criteria: Home-dwelling; aged ≥70; high-risk for falling and fall-induced injuries and fractures.
Interventions	1. Intervention: baseline assessment and general injury prevention brochure plus individual preventive measures by Chaos Clinic staff based on baseline assessment: physical activity prescription, nutritional advice, individually tailored or group exercises, treatment of conditions, medication review, alcohol reduction, smoking cessation, hip protectors, osteoporosis treatment, home hazard assessment and modification. 2. Control: baseline assessment and general injury prevention brochure alone.
Outcomes	Falls and fall-related injuries, especially fractures. Measured by phone calls at 3 and 9 months, and on follow-up visits at 6 and 12 months from the beginning.

Palvanen (*Continued*)

Starting date	January 2005 to December 2010
Contact information	Dr M Palvanen The Urho Kaleva Kekkonen (UKK) Institute for Health Promotion Research PO Box 30 Tampere FIN-33501 Finland
Notes	

Pighills

Trial name or title	Environmental assessment and modification to prevent falls in older people
Methods	Randomised controlled trial
Participants	246 people recruited from 13 general practice lists in the catchment of Airedale NHS Trust (UK). Inclusion criteria: aged 70 and over, with a history of at least one fall in the previous 12 months, not currently receiving OT and not having had an OT environmental assessment for falls in the previous 12 months.
Interventions	Environmental assessment to reduce fall hazards provided by either occupational therapists or non professionally qualified domiciliary support workers. Half of the participants receiving the environmental assessment will additionally receive follow through to support them in implementing recommendations.
Outcomes	Number of falls. Time to first fall. Falls efficacy scale - International version (FES-I). SF-12 York version. Euroqol (EQ-5D). Modified Barthel Index.
Starting date	January 2006 to July 2007 (completed)
Contact information	Alison Pighills Room 228, Post Graduate Area HYMS Building University of York York YO10 5DD UK Telephone: +44 1535 292706 Email: acp500@york.ac.uk
Notes	

Press

Trial name or title	Comprehensive interventions for falls prevention in the elderly
Methods	Randomised controlled trial
Participants	200 people living in Beer-Sheva and Ofakim (Israel). Inclusion criteria: men and women aged 65 and over; or more falls in past 12 month (self-reported); belonging to Clalit HMO; living in Beer Sheva or Ofakim, Israel; mobile outdoors without wheelchair. Exclusion criteria: seriously ill patients - as dyspnoea with light exercise, unstable heart disease; MMSE < 18.
Interventions	1. Intervention: multidisciplinary assessment by geriatrician, physiotherapist and OT (home hazard assessment) plus at least one of the following: recommend medication adjustment or referral to optometrist or ophthalmologist to family physician; exercise sessions with physiotherapist; OT advice to change unsafe home hazards. 2. Control: usual care.
Outcomes	Participants to contact research assistant by phone soon after a fall. Appear to be collecting fall data from Clalit and Medical Centre databases. Primary outcome: fall rates. Secondary outcomes: safety, cost of health care utilization and rate of hospitalisation.
Starting date	January 2008
Contact information	Dr Yan Press Ben-Gurion University of the Negev, Israel Email: yanp@zahav.net.il
Notes	

Sanders

Trial name or title	Vital D: Primary care prevention of falls and fractures in the elderly by annual vitamin D supplementation
Methods	Randomised controlled trial
Participants	1500 ambulant women aged 70+ years on entry; need to score at least 5 on algorithm (higher risk of hip fracture or low vitamin D status). Score 5 if osteoporotic, fracture since the age of 50 years or 'frequent faller'. Exclusion criteria: hypercalcaemia; vit D supplement >400 IU/day; HRT and SERM; calcitriol; renal disease (creatinine >150 umol/L); sarcoidosis, TB or lymphoma.
Interventions	1. Intervention: annual oral dose of 500,000 IU cholecalciferol every autumn for 5 years. 2. Control: annual oral placebo dose.
Outcomes	Fall rate (monthly falls diary and phone calls), "time to falls", fractures (all sites; radiologically confirmed), total healthcare utilisation and mental health (depression).
Starting date	2003 to 2008

Sanders (*Continued*)

Contact information	Dr Kerrie Sanders Clinical Research Unit Department Clinical and Biomedical Sciences; Barwon Health The University of Melbourne Geelong Hospital PO Box 281 Geelong 3220 Victoria Australia Telephone: +61 3 52267834 Email: kerrie@BarwonHealth.org.au
Notes	

Schumacher

Trial name or title	Fall prevention by Alfacalcidol and training
Methods	Randomised controlled trial
Participants	484 men and women with chronic renal failure. Inclusion criteria: aged 65 and over; history of at least one movement-related, non-syncopal fall, either within the past year or earlier with increased fall risk identified by screening examination; creatinine clearance of 30 to 60 ml/min (i.e. moderately impaired kidney function). Exclusion criteria: multiple exclusion criteria including being in an institution; hypercalcaemia, taking vitamin D; dementia; fracture or stroke in preceding 3 months etc (see ClinicalTrials.gov for details).
Interventions	1. Intervention: 1µg Alfacalcidol and 500mg calcium daily; mobility program (strength, balance and gait training twice a week for one hour); patient education (single meeting with teaching lessons on risk factors for falling and modes of fall prevention followed by an evaluation of the individual fall risk and corresponding recommendations to reduce it). 2. Control: usual care.
Outcomes	Follow up for one year. Number of fallers, number of falls, number of fractures, fear of falling, balance performance, hypercalcaemia
Starting date	June 2007 to September 2009
Contact information	Dr J Schumacher Klinik für Altersmedizin und Frührehabilitation, Marienhospital, Ruhr-Universität Bochum, Herne, NRW, Germany, 44627 Telephone: +49 2323 499 0 ext 5918 Email: jochen.schumacher@rub.de
Notes	Open label trial sponsored by Teva Pharmaceutical Industries

Snooks

Trial name or title	An evaluation of the Primary Care falls prevention services for older fallers presenting to the ambulance service
Methods	Randomised controlled trial
Participants	320 people aged over 65 who call for an ambulance after a fall and are not taken to hospital, or are taken to hospital but not admitted. People receiving a falls prevention services (in geriatric day hospitals or hospital out-patient departments), will be excluded.
Interventions	1. Intervention: assessment by falls prevention service and interventions delivered as appropriate (six sessions including physiotherapy and occupational therapy. Balance training, muscle strengthening, reduction of environmental hazards, education about how to get off the floor and provision of equipment. If medical assessment required for medication check or visual problems, refer to GP in first instance and then to the community geriatrician if necessary. 2. Control: no intervention by falls prevention service
Outcomes	One year follow up. Falls diaries returned monthly plus telephone prompts. Postal assessment at 6 and 12 months (activity levels, fear of falling, quality of life), service utilisation. Economic evaluation.
Starting date	1 September 2005 to 31 December 2007
Contact information	Dr P Logan B98 Division of Rehabilitation and Ageing Medical School QMC Nottingham NG7 2UH UK Telephone: +44 115 8230232 Email: pip.logan@nottingham.ac.uk
Notes	

Stuck

Trial name or title	The PRO-AGE (PRevention in Older people-Assessment in GEneralists' practices) study
Methods	Randomised controlled trial
Participants	GPs in London (UK), Hamburg (Germany) and Solothurn (Switzerland) trained in risk identification, health promotion, and prevention in older people. Their consenting older patients (>60 or 65 depending on site) randomised to intervention or control. Additional GPs at each site did not receive the training, and their eligible patients invited to participate as a concurrent comparison group. Exclusion criteria: needing human assistance with basic ADL, living in a nursing/residential home, cognitive impairment, terminal disease, inability to speak the regional language.

Stuck (*Continued*)

Interventions	1. Intervention: Health Risk Appraisal for Older Persons (HRA-O) instrument, feedback and site-specific intervention. 2. Control: usual care.
Outcomes	Follow up at 1 year. Sent questionnaire (HRA-O, health care use and self-efficacy questions). Asked if fallen in previous year (yes/no), multiple falls (yes/no).
Starting date	November 2000
Contact information	Prof A Stuck Geriatrische Universitätsklinik Spital Netz Bern Ziegler Morillonstr. 75-91 CH-3001 Bern Switzerland Telephone: +41 31 970 73 36 Email: andreas.stuck@spitalnetzbern.ch
Notes	International multi-centre study.

Taylor

Trial name or title	An evaluation of the Accident Compensation Corporation (ACC) Tai Chi programme in older adults: does it reduce falls
Methods	RCT. Central randomisation using specialist computer program (see: http://www.randomization.com/), stratified by site and blocked to ensure balanced numbers over the three interventions.
Participants	Inclusion criteria: men and women; over 65 years (55 years if Maori or Pacific Islander); history of at least one fall in the previous 12 months or have a falls risk factor according to the Falls Risk Assessment Tool (FRAT). Exclusion criteria: unable to walk independently (with or without walking aid), chronic medical condition that would limit participation in low-moderate exercise, severe cognitive limitations (telephone Mini mental state examination score <20), currently participating in an organised exercise programme of equivalent intensity as the study intervention.
Interventions	All training sessions are of 1 hour duration for a 20 week period. 1. Intervention: Tai Chi training 1x week 2. Intervention: Tai Chi training 2X week 3. Control: flexibility training 1x week
Outcomes	Falls at 20 weeks, 6 months and 12 months
Starting date	30 August 2006
Contact information	Dr Denise Taylor Physical Rehabilitation Research Centre School of Physiotherapy Auckland University of Technology (AUT)

Taylor (*Continued*)

	Akoranga Campus Northcote Auckland Telephone: +64 9 9219680 Email: denise.taylor@aut.ac.nz
Notes	

Tousignant

Trial name or title	Falls prevention for frail older adults: Cost-efficacy analysis of balance training based on Tai Chi
Methods	Randomised controlled trial and economic evaluation
Participants	122 community-dwelling people, aged ≥ 65, history of a fall in previous 6 m, scoring <49/56 at the Berg test, cognitively intact (scoring >65 at the 3MS test), able to exercise based on medical assessment.
Interventions	1. Intervention: Tai Chi: two sessions of one hour per day for 15 weeks in groups of 4 to 6 subjects. 2. Control: conventional physiotherapy balance training for two sessions of one hour per day for 15 weeks.
Outcomes	1 year follow up. 1. Falls per person year 2. Time to first fall 3. Cost-effectiveness
Starting date	01/10/2002 to 30/06/2007 (Completed)
Contact information	Dr Michel Tousignant Centre de recherche sur le vieillissement I.U.G.S. - Pavillon D'Youville 1036, rue Belvédère Sud Sherbrooke J1H 4C4 Canada Telephone: +1 819-821-1170 (2351) Email: Michel.Tousignant@USherbrooke.ca
Notes	

Vind

Trial name or title	Examination and treatment after a fall
Methods	Randomised controlled trial
Participants	400 people over 65 years, treated in the emergency room, or admitted to hospital after a fall.

Vind (*Continued*)

Interventions	Assessment by doctor, nurse and physical therapist, followed by multifactorial intervention.
Outcomes	Primary: falls and injurious falls. Secondary: function, health related quality of life, balance confidence.
Starting date	September 2005 to March 2008
Contact information	Dr AB Vind Dept of Geriatrics Amtssygehuset i Glostrup Glostrup 2600 Denmark Telephone: +45 4323 4543 Email: anbovi01@glostruphosp.kbhamt.dk
Notes	Anticipated completion date March 2008

Zeeuwe

Trial name or title	The effect of Tai Chi Chuan in reducing falls among elderly people
Methods	Randomised controlled trial
Participants	270 community dwelling people age 70 and over identified from GPs' files as having fallen in previous year and suffering from two of the following risk factors: disturbed balance, mobility problems, dizziness, or the use of benzodiazepines or diuretics.
Interventions	1. Intervention: Tai Chi Chuan (13 weeks, twice a week). 2. Control: no treatment.
Outcomes	Primary: falls recorded in diaries. Secondary: balance, fear of falling, blood pressure, heart rate, lung function parameters, physical activity, functional status, quality of life, mental health, use of walking devices, medication, use of health care services, adjustments to the house, severity of fall incidents and subsequent injuries. Cost-effectiveness analysis. Follow up at 3, 6 and 12 months after randomisation.
Starting date	February 2004 through 2006
Contact information	Petra EM Zeeuwe Department of General Practice Erasmus MC University Medical Centre Rotterdam P.O. Box 1738 3000 DR Rotterdam The Netherlands Email: p.zeeuwe@erasmusmc.nl

Zeeuwe (*Continued*)

Notes	

Zijlstra

Trial name or title	Evaluating an intervention to reduce fear of falling and associated activity restriction
Methods	Randomised controlled trial
Participants	360 people, aged 70 and over, community dwelling, reporting some fear of falling and some associated avoidance of activity.
Interventions	1. Intervention: cognitive behavioural group intervention designed to promote view that falls and fear of falling are controllable, set realistic goals for increasing activity, modifying environment to reduce risk, promote exercise to increase strength and balance. 2. Control: no intervention.
Outcomes	Primary: fear of falling, activity avoidance, daily activity. Secondary: falls (falls calendar), general health, satisfaction, ADL, anxiety, depression, social support, loneliness, perceived consequences of falling and risk of falling.
Starting date	January 2003
Contact information	GAR Zijlstra Maastricht University Faculty of Health, Medicine and Life Sciences Department of Health Care Studies 6200 MD Maastricht Netherlands Email: R.Zijlstra@zw.unimaas.nl
Notes	

ABBREVIATIONS AND ACRONYMS:
A&E: accident and emergency department
ADL: activities of daily living
GP: general practitioner
IADL: instrumental activities of daily living - e.g. use of telephone, shopping, housework, managing finances
MMSE: mini-mental state examination (cognitive assessment)
OT: occupational therapy

DATA AND ANALYSES

Comparison 1. Exercise vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	26		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Group exercise: multiple components vs control	14	2364	Rate ratio (Fixed, 95% CI)	0.78 [0.71, 0.86]
1.2 Individual exercise at home: multiple components vs control	4	666	Rate ratio (Fixed, 95% CI)	0.66 [0.53, 0.82]
1.3 Group exercise: tai chi vs control	4	1294	Rate ratio (Fixed, 95% CI)	0.63 [0.52, 0.78]
1.4 Group exercise: gait, balance or functional training vs control	3	461	Rate ratio (Fixed, 95% CI)	0.73 [0.54, 0.98]
1.5 Group exercise: strength/ resistance training vs control	1	64	Rate ratio (Fixed, 95% CI)	0.56 [0.19, 1.65]
1.6 Individual exercise at home: resistance training vs control	1	222	Rate ratio (Fixed, 95% CI)	0.95 [0.77, 1.18]
1.7 Individual exercise: balance training vs control	1	128	Rate ratio (Fixed, 95% CI)	1.19 [0.77, 1.82]
2 Number of fallers	31		Risk ratio (Random, 95% CI)	Subtotals only
2.1 Group exercise: multiple categories of exercise vs control	17	2492	Risk ratio (Random, 95% CI)	0.83 [0.72, 0.97]
2.2 Individual exercise at home: multiple categories of exercise vs control	3	566	Risk ratio (Random, 95% CI)	0.77 [0.61, 0.97]
2.3 Individual exercise at home: multiple categories vs usual care (Parkinson's disease)	1	126	Risk ratio (Random, 95% CI)	0.94 [0.77, 1.15]
2.4 Individual exercise: community physiotherapy vs control (stroke)	1	170	Risk ratio (Random, 95% CI)	1.30 [0.83, 2.04]
2.5 Group exercise: tai chi vs control	4	1278	Risk ratio (Random, 95% CI)	0.65 [0.51, 0.82]
2.6 Group exercise: gait, balance or functional training vs control	3	461	Risk ratio (Random, 95% CI)	0.77 [0.58, 1.03]
2.7 Group exercise: strength/ resistance training vs control	2	184	Risk ratio (Random, 95% CI)	0.75 [0.52, 1.08]
2.8 Individual exercise at home: resistance vs control	1	222	Risk ratio (Random, 95% CI)	0.97 [0.68, 1.38]
2.9 Individual exercise: walking vs control	1	196	Risk ratio (Random, 95% CI)	0.82 [0.53, 1.26]

3 Number of people sustaining a fracture	5	719	Risk ratio (Fixed, 95% CI)	0.36 [0.19, 0.70]

Comparison 2. Group exercise: multiple components vs control: subgroup analysis by falls risk at baseline

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	14		Rate Ratio (Random, 95% CI)	Subtotals only
1.1 Selected for higher risk of falling	8	1093	Rate Ratio (Random, 95% CI)	0.75 [0.62, 0.89]
1.2 Not selected for higher risk of falling	6	1271	Rate Ratio (Random, 95% CI)	0.69 [0.51, 0.95]
2 Number of fallers	17		Risk Ratio (Random, 95% CI)	Subtotals only
2.1 Selected for higher risk of falling	9	1139	Risk Ratio (Random, 95% CI)	0.88 [0.78, 0.99]
2.2 Not selected for higher risk of falling	8	2171	Risk Ratio (Random, 95% CI)	0.83 [0.62, 1.11]

Comparison 3. Exercise vs exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	4		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Group exercise: square stepping vs walking	1	68	Rate ratio (Fixed, 95% CI)	0.70 [0.23, 2.13]
1.2 Group exercise: enhanced balance therapy vs conventional physiotherapy post hip fracture	1	133	Rate ratio (Fixed, 95% CI)	1.0 [0.64, 1.57]
1.3 Group exercise: balance training in workstations vs 'conventional' fall-prevention exercise class	1	45	Rate ratio (Fixed, 95% CI)	0.81 [0.37, 1.78]
1.4 Group exercise + home exercise vs home exercise	1	68	Rate ratio (Fixed, 95% CI)	1.09 [0.74, 1.62]
2 Number of fallers	2		Risk ratio (Fixed, 95% CI)	Subtotals only
2.1 Square stepping vs walking	1	68	Risk ratio (Fixed, 95% CI)	0.64 [0.21, 1.95]
2.2 Group exercise + home exercise vs home exercise: multiple components	1	68	Risk ratio (Fixed, 95% CI)	1.11 [0.72, 1.70]

Comparison 4. Vitamin D (with or without calcium) vs control/placebo/calcium

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	5	3929	Rate Ratio (Random, 95% CI)	0.95 [0.80, 1.14]
1.1 Vitamin D3 (by mouth) vs control or placebo	1	222	Rate Ratio (Random, 95% CI)	1.12 [0.90, 1.38]
1.2 Vitamin D3 (by mouth) + calcium vs control or placebo	2	3447	Rate Ratio (Random, 95% CI)	1.00 [0.82, 1.21]
1.3 Vitamin D3 (by mouth) + calcium vs calcium	1	137	Rate Ratio (Random, 95% CI)	0.54 [0.30, 0.98]
1.4 Vitamin D2 (by injection) vs control/placebo	1	123	Rate Ratio (Random, 95% CI)	0.61 [0.32, 1.17]
2 Number of fallers	10	21110	Risk Ratio (Fixed, 95% CI)	0.96 [0.92, 1.01]
2.1 Vitamin D3 (by mouth) vs control or placebo	2	2260	Risk Ratio (Fixed, 95% CI)	0.98 [0.82, 1.16]
2.2 Vitamin D3 (by mouth) + calcium vs control or placebo	2	3437	Risk Ratio (Fixed, 95% CI)	0.93 [0.77, 1.13]
2.3 Vitamin D3 (by mouth) + calcium vs calcium	1	137	Risk Ratio (Fixed, 95% CI)	0.55 [0.28, 1.07]
2.4 Vitamin D2 (by mouth) + calcium vs calcium + placebo	1	302	Risk Ratio (Fixed, 95% CI)	0.66 [0.41, 1.05]
2.5 Vitamin D2 (by injection) vs control/placebo	2	9563	Risk Ratio (Fixed, 95% CI)	0.98 [0.92, 1.04]
2.6 Vitamin D (oral or IM) with or without calcium vs control: studies with multiple arms combined	2	5411	Risk Ratio (Fixed, 95% CI)	0.94 [0.82, 1.07]
3 Number of people sustaining a fracture	7	21377	Risk Ratio (Fixed, 95% CI)	0.98 [0.89, 1.07]
3.1 Vitamin D3 (by mouth) vs control or placebo	1	2686	Risk Ratio (Fixed, 95% CI)	0.78 [0.62, 0.99]
3.2 Vitamin D3 (by mouth) + calcium vs control or placebo	2	3703	Risk Ratio (Fixed, 95% CI)	0.86 [0.63, 1.17]
3.3 Vitamin D3 (by mouth) + calcium vs calcium	1	137	Risk Ratio (Fixed, 95% CI)	0.48 [0.12, 1.90]
3.4 Vitamin D2 (by injection) vs control/placebo	1	9440	Risk Ratio (Fixed, 95% CI)	1.09 [0.94, 1.28]
3.5 Vitamin D (oral or IM) with or without calcium vs control: studies with multiple arms combined	2	5411	Risk Ratio (Fixed, 95% CI)	1.01 [0.86, 1.18]
4 Number of people sustaining adverse effects	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Hypercalcaemia	3	5744	Risk Ratio (M-H, Fixed, 95% CI)	1.70 [0.73, 3.96]
4.2 Renal disease (renal stones and renal insufficiency)	1	5292	Risk Ratio (M-H, Fixed, 95% CI)	0.57 [0.17, 1.95]
4.3 Gastrointestinal effects	2	5594	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.75, 1.10]

Comparison 5. Vitamin D (with or without calcium) vs control: subgroup analysis by falls risk at baseline

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	5		Rate Ratio (Random, 95% CI)	Subtotals only
1.1 Selected for higher risk of falling	2	3125	Rate Ratio (Random, 95% CI)	0.87 [0.58, 1.30]
1.2 Not selected for higher risk of falling	3	804	Rate Ratio (Random, 95% CI)	1.01 [0.78, 1.30]
2 Number of fallers	10		Risk Ratio (Fixed, 95% CI)	Subtotals only
2.1 Selected for higher risk of falling	5	8838	Risk Ratio (Fixed, 95% CI)	0.93 [0.83, 1.03]
2.2 Not selected for higher risk of falling	5	12272	Risk Ratio (Fixed, 95% CI)	0.97 [0.92, 1.03]

Comparison 6. Vitamin D (with or without calcium) vs control: subgroup analysis by vitamin D level at baseline

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	5		Rate Ratio (Random, 95% CI)	Subtotals only
1.1 Selected for low vitamin D level	2	260	Rate Ratio (Random, 95% CI)	0.57 [0.37, 0.89]
1.2 Not selected for low vitamin D level	3	3669	Rate Ratio (Random, 95% CI)	1.02 [0.88, 1.19]
2 Number of fallers	10		Risk Ratio (Fixed, 95% CI)	Subtotals only
2.1 Selected for low vitamin D level	3	562	Risk Ratio (Fixed, 95% CI)	0.65 [0.46, 0.91]
2.2 Not selected for low vitamin D level	7	20548	Risk Ratio (Fixed, 95% CI)	0.97 [0.92, 1.02]

Comparison 7. Any vitamin D analogue vs control/placebo

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	2		Rate Ratio (Fixed, 95% CI)	Subtotals only
1.1 Alfacalcidol (vitamin D analogue) vs placebo	1	80	Rate Ratio (Fixed, 95% CI)	1.08 [0.75, 1.57]
1.2 Calcitriol (vitamin D analogue) vs placebo	1	213	Rate Ratio (Fixed, 95% CI)	0.64 [0.49, 0.82]
2 Number of fallers	2		Risk Ratio (Fixed, 95% CI)	Subtotals only
2.1 Alfacalcidol (vitamin D analogue) vs placebo	1	378	Risk Ratio (Fixed, 95% CI)	0.69 [0.41, 1.17]

2.2 Calcitriol (vitamin D analogue) vs placebo	1	213	Risk Ratio (Fixed, 95% CI)	0.54 [0.31, 0.93]
3 Number of people sustaining a fracture	2		Risk Ratio (Fixed, 95% CI)	Subtotals only
3.1 Alfacalcidol (vitamin D analogue) vs placebo	1	80	Risk Ratio (Fixed, 95% CI)	0.13 [0.02, 0.89]
3.2 Calcitriol (vitamin D analogue) vs placebo	1	246	Risk Ratio (Fixed, 95% CI)	0.60 [0.28, 1.29]
4 Number of people sustaining adverse effects	2		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Hypercalcaemia	2	624	Risk Ratio (M-H, Fixed, 95% CI)	2.33 [1.02, 5.31]
4.2 Renal disease (kidney stone)	1	246	Risk Ratio (M-H, Fixed, 95% CI)	0.33 [0.01, 8.10]
4.3 Gastrointestinal effects	1	246	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.52, 1.58]

Comparison 8. Medication (drug target) other than vitamin D vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	2		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Psychotropic medication withdrawal vs control	1	93	Rate ratio (Fixed, 95% CI)	0.34 [0.16, 0.73]
1.2 Hormone replacement therapy vs placebo	1	212	Rate ratio (Fixed, 95% CI)	0.88 [0.65, 1.18]
2 Number of fallers	5		Risk ratio (Fixed, 95% CI)	Subtotals only
2.1 Psychotropic medication withdrawal vs control	1	93	Risk ratio (Fixed, 95% CI)	0.61 [0.32, 1.17]
2.2 Hormone replacement therapy vs control/placebo	2	585	Risk ratio (Fixed, 95% CI)	0.94 [0.81, 1.08]
2.3 Medication review and modification vs usual care	1	259	Risk ratio (Fixed, 95% CI)	1.12 [0.58, 2.13]
2.4 GP educational programme and medication review and modification vs control	1	659	Risk ratio (Fixed, 95% CI)	0.61 [0.41, 0.91]
3 Number of people sustaining a fracture	1		Risk Ratio (Fixed, 95% CI)	Subtotals only
3.1 Psychotropic medication withdrawal vs control	1	93	Risk Ratio (Fixed, 95% CI)	2.83 [0.12, 67.70]

Comparison 9. Surgery vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	3		Rate Ratio (Fixed, 95% CI)	Subtotals only
1.1 Cardiac pacing vs control	1	171	Rate Ratio (Fixed, 95% CI)	0.42 [0.23, 0.75]
1.2 Cataract surgery (1st eye) vs control	1	306	Rate Ratio (Fixed, 95% CI)	0.66 [0.45, 0.95]
1.3 Cataract surgery (2nd eye) vs control	1	239	Rate Ratio (Fixed, 95% CI)	0.68 [0.39, 1.17]
2 Number of fallers	2		Risk Ratio (Fixed, 95% CI)	Subtotals only
2.1 Cataract surgery (1st eye) vs control	1	306	Risk Ratio (Fixed, 95% CI)	0.95 [0.68, 1.33]
2.2 Cataract surgery (2nd eye) vs control	1	239	Risk Ratio (Fixed, 95% CI)	1.06 [0.69, 1.63]
3 Number of people sustaining a fracture	3		Risk Ratio (Fixed, 95% CI)	Subtotals only
3.1 Cardiac pacing vs control	1	171	Risk Ratio (Fixed, 95% CI)	0.78 [0.18, 3.39]
3.2 Cataract surgery (1st eye) vs control	1	306	Risk Ratio (Fixed, 95% CI)	0.33 [0.10, 1.05]
3.3 Cataract surgery (2nd eye) vs control	1	239	Risk Ratio (Fixed, 95% CI)	2.51 [0.50, 12.52]

Comparison 10. Fluid or nutrition therapy vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of fallers	1		Risk ratio (Fixed, 95% CI)	Subtotals only
1.1 Nutritional supplementation vs control	1	46	Risk ratio (Fixed, 95% CI)	0.10 [0.01, 1.31]

Comparison 11. Psychological interventions vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of fallers	1		Risk ratio (Fixed, 95% CI)	Subtotals only
1.1 Cognitive behavioural intervention vs control	1	230	Risk ratio (Fixed, 95% CI)	1.13 [0.79, 1.60]

Comparison 12. Environment/assistive technology interventions vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	6		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Home safety intervention vs control	3	2367	Rate ratio (Fixed, 95% CI)	0.90 [0.79, 1.03]
1.2 Home safety intervention vs no home safety (severe visual impairment)	1	391	Rate ratio (Fixed, 95% CI)	0.59 [0.42, 0.82]
1.3 Vision assessment and eye examination + intervention (with or without referral) vs control	1	616	Rate ratio (Fixed, 95% CI)	1.57 [1.19, 2.06]
1.4 Anti-slip shoe device for icy conditions vs control	1	109	Rate ratio (Fixed, 95% CI)	0.42 [0.22, 0.78]
2 Number of fallers	7		Risk Ratio (Fixed, 95% CI)	Subtotals only
2.1 Home safety intervention vs control	5	2610	Risk Ratio (Fixed, 95% CI)	0.89 [0.80, 1.00]
2.2 Home safety intervention vs no home safety (severe visual impairment)	1	391	Risk Ratio (Fixed, 95% CI)	0.76 [0.62, 0.95]
2.3 Vision assessment and eye examination + intervention (with or without referral) vs control	1	616	Risk Ratio (Fixed, 95% CI)	1.54 [1.24, 1.91]
2.4 Visual acuity assessment and referral vs control	1	276	Risk Ratio (Fixed, 95% CI)	0.89 [0.76, 1.04]
3 Number of people sustaining a fracture	1		Risk Ratio (Fixed, 95% CI)	Subtotals only
3.1 Vision assessment and eye examination + intervention (with or without referral) vs control	1	616	Risk Ratio (Fixed, 95% CI)	1.73 [0.96, 3.12]

Comparison 13. Environment/assistive technology interventions vs control: subgroup analysis by risk of falling at baseline

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	4		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Selected for higher risk of falling	2	491	Rate ratio (Fixed, 95% CI)	0.56 [0.42, 0.76]
1.2 Not selected for higher risk of falling	2	2267	Rate ratio (Fixed, 95% CI)	0.92 [0.80, 1.06]
2 Number of fallers	6		Risk Ratio (Fixed, 95% CI)	Subtotals only

2.1 Selected for higher risk of falling	2	451	Risk Ratio (Fixed, 95% CI)	0.78 [0.64, 0.95]
2.2 Not selected for higher risk of falling	4	2550	Risk Ratio (Fixed, 95% CI)	0.90 [0.80, 1.00]

Comparison 14. Knowledge/education interventions vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	1		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Education interventions vs control	1	45	Rate ratio (Fixed, 95% CI)	0.33 [0.09, 1.20]
2 Number of fallers	2		Risk ratio (Fixed, 95% CI)	Subtotals only
2.1 Education interventions vs control	2	516	Risk ratio (Fixed, 95% CI)	0.73 [0.52, 1.03]

Comparison 15. Multiple interventions

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	6		Rate ratio (Fixed, 95% CI)	Subtotals only
1.1 Exercise + vitamin D vs no exercise/no vitamin D (severe visual impairment)	1	391	Rate ratio (Fixed, 95% CI)	1.15 [0.82, 1.61]
1.2 Exercise + "individualised fall prevention advice" vs control	1	78	Rate ratio (Fixed, 95% CI)	0.89 [0.71, 1.10]
1.3 Exercise + education + risk assessment vs control	1	453	Rate ratio (Fixed, 95% CI)	0.75 [0.52, 1.09]
1.4 Exercise + education + home safety vs control	1	285	Rate ratio (Fixed, 95% CI)	0.69 [0.50, 0.96]
1.5 Exercise + nutrition + calcium + vit D vs calcium + vit D	1	20	Rate ratio (Fixed, 95% CI)	0.19 [0.05, 0.68]
1.6 Exercise + education vs education	1	132	Rate ratio (Fixed, 95% CI)	0.90 [0.61, 1.33]
1.7 Exercise + home safety + education vs education	1	124	Rate ratio (Fixed, 95% CI)	0.93 [0.61, 1.44]
1.8 Exercise + home safety + education + clinical assessment vs education	1	122	Rate ratio (Fixed, 95% CI)	0.89 [0.58, 1.37]
2 Number of fallers	7		Risk Ratio (Fixed, 95% CI)	Subtotals only
2.1 Exercise + home safety vs control	1	272	Risk Ratio (Fixed, 95% CI)	0.76 [0.60, 0.97]

2.2 Exercise + vision assessment vs control	1	273	Risk Ratio (Fixed, 95% CI)	0.73 [0.59, 0.91]
2.3 Exercise + vision assessment + home safety vs control	1	272	Risk Ratio (Fixed, 95% CI)	0.67 [0.51, 0.88]
2.4 Exercise + education + risk assessment vs control	1	453	Risk Ratio (Fixed, 95% CI)	0.96 [0.82, 1.12]
2.5 Education + exercise + home safety vs control	1	310	Risk Ratio (Fixed, 95% CI)	0.90 [0.74, 1.09]
2.6 Exercise + vitamin D vs no exercise/no vitamin D	1	391	Risk Ratio (Fixed, 95% CI)	0.99 [0.81, 1.20]
2.7 Home safety + medication review vs control	1	294	Risk Ratio (Fixed, 95% CI)	0.79 [0.46, 1.34]
2.8 Home safety + vision assessment vs control	1	274	Risk Ratio (Fixed, 95% CI)	0.81 [0.65, 1.01]
2.9 Education + free access to geriatric clinic vs control	1	815	Risk Ratio (Fixed, 95% CI)	0.77 [0.63, 0.94]
2.10 Exercise + education vs education	1	132	Risk Ratio (Fixed, 95% CI)	0.84 [0.59, 1.20]
2.11 Exercise + home safety + education vs education	1	124	Risk Ratio (Fixed, 95% CI)	0.87 [0.61, 1.24]
2.12 Exercise + home safety + education + clinical assessment vs education	1	122	Risk Ratio (Fixed, 95% CI)	0.83 [0.57, 1.20]

Comparison 16. Multifactorial intervention after assessment vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	15	8141	Rate ratio (Random, 95% CI)	0.75 [0.65, 0.86]
2 Number of fallers	26	11173	Risk ratio (Random, 95% CI)	0.95 [0.88, 1.02]
3 Number of people sustaining a fracture	7	2195	Risk Ratio (Fixed, 95% CI)	0.70 [0.47, 1.04]

Comparison 17. Multifactorial intervention after assessment vs control: subgroup analysis by falls risk at baseline

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	15		Rate ratio (Random, 95% CI)	Subtotals only
1.1 Selected for higher risk of falling	13	4592	Rate ratio (Random, 95% CI)	0.76 [0.64, 0.91]
1.2 Not selected for higher risk of falling	2	3549	Rate ratio (Random, 95% CI)	0.57 [0.23, 1.38]
2 Number of fallers	26		Risk ratio (Fixed, 95% CI)	Subtotals only

2.1 Selected for higher risk of falling	18	5644	Risk ratio (Fixed, 95% CI)	0.98 [0.93, 1.04]
2.2 Not selected for higher risk of falling	8	5529	Risk ratio (Fixed, 95% CI)	0.88 [0.82, 0.94]

Comparison 18. Multifactorial intervention after assessment vs control: subgroup analysis by intensity of intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Rate of falls	14		Rate ratio (Random, 95% CI)	Subtotals only
1.1 Assessment and active intervention	7	5314	Rate ratio (Random, 95% CI)	0.70 [0.55, 0.90]
1.2 Assessment and referral or provision of information	8	2678	Rate ratio (Random, 95% CI)	0.84 [0.72, 0.98]
2 Number of fallers	26		Risk ratio (Random, 95% CI)	Subtotals only
2.1 Assessment and active intervention	10	6040	Risk ratio (Random, 95% CI)	0.93 [0.84, 1.03]
2.2 Assessment and referral or provision of information	17	5259	Risk ratio (Random, 95% CI)	0.98 [0.89, 1.09]
2.3 Unclassifiable	1	0	Risk ratio (Random, 95% CI)	Not estimable

FEEDBACK

Definition of terms, 26 June 2009

Summary

Please could you clarify the definitions of falls risk and rate of falls? How do they differ from one another?

Reply

We are unclear as to whether the question relates to "falls risk" or whether Dr Foley is actually meaning "risk of falling".
In the review the term *falls risk* is used in relation to falls risk at enrolment. In subgroup analyses, we compared trials with participants at higher versus lower falls risk at enrolment (i.e. comparing trials with participants selected for inclusion based on history of falling or other specific risk factors for falling, versus unselected) (*see* Data collection and analysis: 'Subgroup analyses and investigation of heterogeneity').
The review reports two primary outcomes:
1. Rate of falls
This is the number of falls over a period of time: for example, number of falls per person year. The statistic used to report this is the rate ratio which compares the rate of events (falls) in the two groups during the trial, or during a number of trials if the data are pooled. Based on these statistics we report whether an intervention has a significant effect on the *rate of falls*.
2. Number of people falling during follow up
The statistic used to report this is the risk ratio which compares the number of participants in each group with one or more fall events during the trial, or during a number of trials if the data are pooled. Based on these statistics we report whether an intervention has a significant effect on the *risk of falling*.
For further details, please refer to the Methods section in the review: 'Data relating to rate of falls' and 'Data relating to number of fallers or participants with fall-related fractures'.

Contributors

Comment from: Dr Charlotte Foley, UK
Reply from: Mrs Lesley Gillespie, New Zealand

Availability of event rates in latest version of the review, 20 July 2010

Summary

1. We are keen to know why the meta-analyses in the updated Cochrane review do not display the mean event rates of included studies as is common in other Cochrane reviews as well as in earlier versions of this review.
As authors of a consumers' brochure on evidence-based fall prevention we try to apply the principles of evidence-based patient information and risk communication. For this purpose, communication of interventional effects as relative risks or risk ratios is inappropriate. The non-availability of event rates of the original studies analysed in the Cochrane review or of mean event rates for meta-analyses makes it impossible to transform the pooled relative risks into absolute risk reductions, which is the meaningful information that consumers and patients should get.
2. Generally, we wonder if it isn't time to make all raw data accessible which have been collected and archived during the preparation of a Cochrane review at least as electronic supplement to the Cochrane review.

Reply

1. Thank you this is a useful comment. It refers to the raw data on numbers of participants and number of events in experimental and control groups in included studies of Cochrane reviews. These were visible in the analyses in the previous review "Interventions for preventing falls in elderly people", which has now been replaced. In "Interventions for preventing falls in older people living in the community" these data are no longer shown alongside the graphs in the analyses.
This is because they were not entered directly into RevMan to generate the risk ratios used in the meta-analyses. We used the generic inverse variance option in RevMan, which involves entering the natural logarithm of a risk ratio and its standard error, which are then displayed. These were first calculated, as described in the methods section of the review, using Microsoft Excel. We did this because event rates (in this case, number of people falling) are not always available in trial reports, or from the authors of reports. Using the generic inverse variance method allows inclusion in the meta-analyses of studies which report only the trialists' calculation of the risk ratio and a P-value or confidence interval. It also allows inclusion of cluster-randomised studies in which reported event rates have been adjusted for clustering by either the trial authors or review authors.
2. We appreciate that many researchers, health practitioners, and funders might like to use, for example, an Absolute Risk Reduction (ARR), or even, despite its many associated difficulties, Number Needed to Treat (NNT).[1,2] In future updates, we will aim to include

tables showing the data used to calculate estimates of effect and standard errors of studies included in meta-analyses which have been conducted using the Generic inverse variance option.

1. Smeeth L, Haines A, Ebrahim S. Numbers needed to treat derived from meta-analyses--sometimes informative, usually misleading. BMJ 1999;318(7197):1548-51

2. Stang A, Poole C, Bender R. Common problems related to the use of number needed to treat. Journal of Clinical Epidemiology 2010;63(8):820-5.

Contributors

Comment from Gabriele Meyer and Sascha Köpke, Germany
Reply from Lesley Gillespie, Corresponding Author, and Bill Gillespie, Feedback Editor, Cochrane Bone, Joint and Muscle Trauma Group

WHAT'S NEW

Last assessed as up-to-date: 7 October 2008.

Date	Event	Description
25 August 2010	Feedback has been incorporated	Feedback added about the availability of event rates

HISTORY

Protocol first published: Issue 2, 2008

Review first published: Issue 2, 2009

Date	Event	Description
10 August 2009	Feedback has been incorporated	Feedback added to clarify terms used
13 May 2009	Amended	Correction of several typographical errors
27 October 2008	Amended	Converted to new review format.
19 February 2008	Amended	The published review "Interventions for preventing falls in elderly people" (Gillespie 2003) is not being updated. Due to its size and complexity it is being split into two reviews: "Interventions for preventing falls in older people living in the community" and "Interventions for preventing falls in older people in residential care facilities and hospitals".

CONTRIBUTIONS OF AUTHORS

LD Gillespie, the guarantor for this review, conceived, designed, and coordinated the review, developed the search strategy and carried out the searches, screened search results and obtained papers, screened retrieved papers against inclusion criteria, carried out quality assessment and data extraction, entered data into RevMan, and wrote the review.

MC Robertson contributed to the appraisal of quality, extracted data from papers, managed data and carried out statistical calculations, wrote the economic evaluation section and Appendix 4, and commented on drafts of the review. In addition she provided additional data about papers, and a methodological perspective for measurement of outcomes and statistical analyses used in the papers and the economic evaluations.

WJ Gillespie conceived and designed the review, screened retrieved papers against inclusion criteria, carried out quality assessment and data extraction, entered data into RevMan, and wrote the review.

SE Lamb conceived and led the design of the ProFaNE taxonomy that provided the framework for the structure of the review, carried out quality assessment and data extraction, and commented on drafts of the review.

S Gates provided statistical advice, carried out quality assessment and data extraction, and commented on drafts of the review.

RG Cumming and BH Rowe carried out data extraction and quality assessment, and commented on drafts of the review.

DECLARATIONS OF INTEREST

Three reviewers were investigators for eight included studies: RG Cumming (Cumming 1999; Cumming 2007), WJ Gillespie (Carter 1997), and MC Robertson (Campbell 1997; Campbell 1999c; Campbell 2005; Elley 2008; Robertson 2001a). Investigators did not carry out quality assessment on their own studies. No other conflicts are declared.

SOURCES OF SUPPORT

Internal sources

- University of Otago, Dunedin, New Zealand.

Computing, administration and library services (MCR, LDG)

External sources

- Government of Canada, Canada Research Chairs Program, Ottawa, Canada.

Salary (BR)

- Accident Compensation Corporation (ACC), New Zealand.

Salary (MCR)

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Risk of bias assessment

The protocol was completed and submitted for publication prior to the general release of RevMan 5 and the supporting version of the 'Cochrane Handbook for Systematic Reviews of Interventions' (version 5.0) in February 2008. In the protocol we stated that we would assess methodological quality using the 11 item tool used in Gillespie 2003. Rather than use that tool, we made a post hoc decision to convert a number of these items for use in the new Cochrane Collaboration tool for assessing risk of bias (Higgins 2008a), and plan to add additional items in future versions of the review.

NOTES

The published review "Interventions for preventing falls in elderly people" (Gillespie 2003) has been withdrawn from *The Cochrane Library*. Due to its size and complexity it has been split into two reviews: this review and "Interventions for preventing falls in older people in residential care facilities and hospitals" which is nearing completion.

INDEX TERMS

Medical Subject Headings (MeSH)

Accidental Falls [*prevention & control]; Accidents, Home [*prevention & control]; Bone Density Conservation Agents [administration & dosage]; Environment Design; Exercise; Patient Education as Topic; Randomized Controlled Trials as Topic; Tai Ji; Vitamin D [administration & dosage]

MeSH check words

Aged; Humans