

Interventions for preventing falls in elderly people (Review)

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



**THE COCHRANE
COLLABORATION®**

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2003, Issue 4

<http://www.thecochranelibrary.com>

WILEY

TABLE OF CONTENTS

HEADER	1
ABSTRACT	1
PLAIN LANGUAGE SUMMARY	2
BACKGROUND	3
OBJECTIVES	3
METHODS	3
RESULTS	4
DISCUSSION	13
AUTHORS' CONCLUSIONS	15
ACKNOWLEDGEMENTS	16
REFERENCES	16
CHARACTERISTICS OF STUDIES	32
DATA AND ANALYSES	106
Analysis 1.1. Comparison 1 Exercise/physical therapy alone vs control, Outcome 1 Number of participants falling.	113

[Intervention Review]

Interventions for preventing falls in elderly people

Lesley D Gillespie¹, William J Gillespie², M Clare Robertson¹, Sarah E Lamb³, Robert G Cumming⁴, Brian H Rowe⁵

¹Department of Medical and Surgical Sciences, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand. ²Hull York Medical School, University of Hull, Hull, UK. ³Warwick Clinical Trials Unit, Warwick Medical School, University of Warwick, Coventry, UK. ⁴Centre for Education and Research on Ageing, University of Sydney, Concord, Australia. ⁵Department of Emergency Medicine, University of Alberta, Edmonton, Canada

Contact address: Lesley D Gillespie, Department of Medical and Surgical Sciences, Dunedin School of Medicine, University of Otago, PO Box 913, Dunedin, Otago, 9054, New Zealand. lesley.gillespie@otago.ac.nz. lesley.gillespie@yahoo.co.nz.

Editorial group: Cochrane Bone, Joint and Muscle Trauma Group.

Publication status and date: Edited, commented, published in Issue 1, 2009.

Review content assessed as up-to-date: 13 July 2003.

Citation: Gillespie LD, Gillespie WJ, Robertson MC, Lamb SE, Cumming RG, Rowe BH. Interventions for preventing falls in elderly people. *Cochrane Database of Systematic Reviews* 2003, Issue 4. Art. No.: CD000340. DOI: 10.1002/14651858.CD000340.

Copyright © 2009 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

ABSTRACT

Background

Approximately 30 per cent of people over 65 years of age and living in the community fall each year; the number is higher in institutions. Although less than one fall in 10 results in a fracture, a fifth of fall incidents require medical attention.

Objectives

To assess the effects of interventions designed to reduce the incidence of falls in elderly people (living in the community, or in institutional or hospital care).

Search strategy

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (January 2003), Cochrane Central Register of Controlled Trials (*The Cochrane Library*, Issue 1, 2003), MEDLINE (1966 to February 2003), EMBASE (1988 to 2003 Week 19), CINAHL (1982 to April 2003), The National Research Register, Issue 2, 2003, Current Controlled Trials (www.controlled-trials.com accessed 11 July 2003) and reference lists of articles. No language restrictions were applied. Further trials were identified by contact with researchers in the field.

Selection criteria

Randomised trials of interventions designed to minimise the effect of, or exposure to, risk factors for falling in elderly people. Main outcomes of interest were the number of fallers, or falls. Trials reporting only intermediate outcomes were excluded.

Data collection and analysis

Two reviewers independently assessed trial quality and extracted data. Data were pooled using the fixed effect model where appropriate.

Main results

Sixty two trials involving 21,668 people were included.

Interventions likely to be beneficial:

Interventions for preventing falls in elderly people (Review)

Copyright © 2009 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

Multidisciplinary, multifactorial, health/environmental risk factor screening/intervention programmes in the community both for an unselected population of older people (4 trials, 1651 participants, pooled RR 0.73, 95%CI 0.63 to 0.85), and for older people with a history of falling or selected because of known risk factors (5 trials, 1176 participants, pooled RR 0.86, 95%CI 0.76 to 0.98), and in residential care facilities (1 trial, 439 participants, cluster-adjusted incidence rate ratio 0.60, 95%CI 0.50 to 0.73)

A programme of muscle strengthening and balance retraining, individually prescribed at home by a trained health professional (3 trials, 566 participants, pooled relative risk (RR) 0.80, 95% confidence interval (95%CI) 0.66 to 0.98)

Home hazard assessment and modification that is professionally prescribed for older people with a history of falling (3 trials, 374 participants, RR 0.66, 95% CI 0.54 to 0.81)

Withdrawal of psychotropic medication (1 trial, 93 participants, relative hazard 0.34, 95%CI 0.16 to 0.74)

Cardiac pacing for fallers with cardioinhibitory carotid sinus hypersensitivity (1 trial, 175 participants, WMD -5.20, 95%CI -9.40 to -1.00)

A 15 week Tai Chi group exercise intervention (1 trial, 200 participants, risk ratio 0.51, 95%CI 0.36 to 0.73).

Interventions of unknown effectiveness:

Group-delivered exercise interventions (9 trials, 1387 participants)

Individual lower limb strength training (1 trial, 222 participants)

Nutritional supplementation (1 trial, 46 participants)

Vitamin D supplementation, with or without calcium (3 trials, 461 participants)

Home hazard modification in association with advice on optimising medication (1 trial, 658 participants), or in association with an education package on exercise and reducing fall risk (1 trial, 3182 participants)

Pharmacological therapy (raubasine-dihydroergocristine, 1 trial, 95 participants)

Interventions using a cognitive/behavioural approach alone (2 trials, 145 participants)

Home hazard modification for older people without a history of falling (1 trial, 530 participants)

Hormone replacement therapy (1 trial, 116 participants)

Correction of visual deficiency (1 trial, 276 participants).

Interventions unlikely to be beneficial:

Brisk walking in women with an upper limb fracture in the previous two years (1 trial, 165 participants).

Authors' conclusions

Interventions to prevent falls that are likely to be effective are now available; less is known about their effectiveness in preventing fall-related injuries. Costs per fall prevented have been established for four of the interventions and careful economic modelling in the context of the local healthcare system is important. Some potential interventions are of unknown effectiveness and further research is indicated.

PLAIN LANGUAGE SUMMARY

Interventions for preventing falls in elderly people

Approximately 30 per cent of people over 65 years and living in the community fall each year; the number is higher in institutions. A fifth of incidents require medical attention. Multidisciplinary interventions targeting multiple risk factors are effective in reducing the incidence of falls, as is muscle strengthening combined with balance retraining, individually prescribed at home by a trained health professional. Tai Chi may also be effective. Home hazard assessment and modification by a health professional may reduce falls, especially in those with a history of falling. Cardiac pacing for fallers with cardioinhibitory carotid sinus hypersensitivity is likely to be

beneficial, as is withdrawal of psychotropic medication. Individually tailored interventions delivered by a health professional are more effective than standard or group delivered programmes.

BACKGROUND

Fall-associated fractures in older people are a significant source of morbidity (Sattin 1992). A third to one half of people over 65 years old fall each year (Blake 1988; Campbell 1990; Downton 1991; Prudham 1981; Tinetti 1988). 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.

Estimates vary, but studies suggest that about 20 per cent of fall incidents require medical attention (Reinsch 1992a; Tinetti 1994a); less than 10 per cent result in fracture (Berg 1997; Campbell 1990; Gryfe 1977; Tinetti 1988). Therefore, interventions designed to reduce falls would require large effects to have an impact on the incidence of fractures. Interventions which do not target individuals at high risk may be less cost-effective.

The evidence for risk factors for falling in community-dwelling older people is derived from over 60 observational studies; the evidence is conflicting for some intrinsic (health related) and environmental risk factors. Environmental hazards may interact critically with individual behaviour (Connell 1997).

Many preventive intervention programmes based on these risk factors have been established and evaluated. These have included exercise programmes designed to improve strength or balance, education programmes, medication optimisation, environmental modification in homes or institutions, and nutritional or hormonal supplementation. In some studies, interventions designed to reduce the impact of single risk factors have been evaluated; in the majority, however, multiple interventions have been used. Interventions have been offered to older people at varying levels of fall risk either as a "standard package", or individually tailored to target risk factors and impairments. Some programmes, for example the Harstad injury prevention study (Ytterstad 1996a), have extended to the whole elderly population of a town or region.

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. Where similar or identical single interventions are studied, pooling of data from studies should also be informative. The multifactorial nature of risk of falling makes intervention against multiple risk factors conceptually more attractive, but pooling of data presents more difficulties in this situation.

OBJECTIVES

To present the best evidence for effectiveness of programmes designed to reduce the incidence of falls in both community dwelling and institutionalised elderly people.

The following hypotheses were formulated a priori:

- Interventions designed to reduce the incidence of falls are effective.
- Interventions which target multiple risk factors are more effective than those which target single risk factors.
- Interventions of longer duration or higher intensity are more effective than those which are short or low intensity.
- Interventions which are individually tailored to target risk factors and impairments are more effective than those which are applied as a 'standard package'.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials, including those in which the method of allocation to treatment or control group was inadequately concealed (e.g. trials in which patients were allocated using an open random number list or coin toss).

Types of participants

Trials which included elderly individuals, of either sex, living in the community or in institutional care. Participant characteristics of interest included falling status at entry (e.g. non-faller, single faller, multiple faller), residential status (e.g. community, institution), and where appropriate, associated co-morbidity. We included trials of interventions in hospital settings if the patients were elderly. A post hoc decision was taken to exclude trials specifically designed to reduce falls in individuals who had experienced a stroke.

Types of interventions

Subjects randomised to receive an intervention or group of interventions versus usual care to minimise the effect of, or exposure to, any risk factor for falling. Studies comparing two types of interventions were also included.

Types of outcome measures

The main outcomes of interest were the number of fallers or falls, and severity of falls. Severity was assessed by the number of falls resulting in injury, medical attention, or fracture. Information was also sought on complications of the interventions employed, duration of effect of the interventions, and death during the study period.

Trials which focused on intermediate outcomes such as improved balance or strength, and did not report fall rates or number of fallers, were excluded. An improvement in a surrogate outcome does not provide direct evidence that an intervention can impact on the clinical outcome of interest (Gotzsche 1996), in this case falls. Therefore, only trials which reported falls or falling as an outcome were included.

Search methods for identification of studies

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (January 2003), Cochrane Central Register of Controlled Trials (*The Cochrane Library*, Issue 1, 2003), MEDLINE (1966 to February 2003), EMBASE (1988 to 2003 Week 19), CINAHL (1982 to April 2003), The National Research Register, Issue 2, 2003, Current Controlled Trials (www.controlled-trials.com accessed 11 July 2003) and reference lists of articles. We searched PsycLIT and Social Sciences Citation Index to May 1997. No language restrictions were applied. Further trials were identified by contact with researchers in the field.

In MEDLINE (OVID ONLINE), the search terms were combined with the first two sections of the optimal MEDLINE trial search strategy described in the Cochrane Reviewers' Handbook (Clarke 2003a). This search strategy was modified for use in other databases (*see Appendix 1* for search strategies used).

Data collection and analysis

Selecting trials for inclusion

From the title, abstract, or descriptors, two reviewers (LDG, WJG) independently reviewed literature searches to identify potentially relevant trials for full review. Searches of bibliographies and texts were conducted to identify additional studies. From the full text, trials which met the selection criteria were selected for inclusion.

Assessment of methodological quality

Methodological quality was assessed for each study by two reviewers independently, using a pre-determined scoring system. Reviewers were not blinded to author and source institution. Disagreement was resolved by consensus, or third party adjudication.

Level of concealment of allocation at randomisation was assessed using the criteria in the Cochrane Reviewers' Handbook (Clarke 2003b). Studies were graded A if it appeared that the assigned treatment was adequately concealed prior to allocation, B if there was inadequate information to judge concealment, and C if the assigned treatment was clearly not concealed prior to allocation. Methodological quality was scored using eleven items (*see Table 1*).

Methods used to collect data from included trials

Data were independently extracted by pairs of reviewers using a data extraction form which had been designed and tested prior to use. Disagreement was resolved by consensus, or third party adjudication.

Statistical analysis

Statistical analysis of individually randomised studies was carried out using MetaView in Review Manager (RevMan 2003). Raw data from cluster randomised studies were not entered as the units of randomisation and analysis differed. For dichotomous data, the individual and pooled statistics were calculated using the fixed effects model and were reported as relative risk (RR) with 95 per cent confidence intervals (95% CI). For continuous data (reporting mean and standard deviation or standard error of the mean), pooled weighted mean differences (WMD) with 95 per cent confidence intervals were calculated. Heterogeneity between pooled trials was tested using a standard chi-squared test and was considered to be significant when $P < 0.1$.

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#); [Characteristics of ongoing studies](#).

Included studies

Included in this updated review are 62 trials reporting a variety of settings, participants, and interventions. Seventy one percent of the studies are in two categories: 23 trials studied exercise or physical therapy interventions and 21 trials examined multidisciplinary,

multifactorial risk factor screening and intervention. Details are provided in the 'Characteristics of included studies' table, and are briefly summarised below.

Settings

Of the 62 studies, 47 reported the effect of interventions in participants living in the community. Eight studies were set in long term care facilities (including long term care wards in hospital) or nursing homes (Becker 2003; Bischoff 2003; Jensen 2002; McMurdo 2000; Mulrow 1994; Ray 1997; Rubenstein 2000; Schnelle 2003). Four studies were designed to reduce the incidence of falls in elderly patients in rehabilitation or geriatric assessment wards in hospital (Donald 2000; Mayo 1994; Tideiksaar 1993; Vassallo 2001). A further three studies (Kenny 2001; Nowalk 2001; Shaw 2003) included participants with specific conditions from a range of residential settings.

Participants

Sampling frame and inclusion/exclusion criteria for each study are listed in the Characteristics of Included Studies table. In 17 studies, eligibility for inclusion included a history of falling, or of a postulated risk factor other than general frailty, residence in long-term care, or age (Campbell 1999; Close 1999; Hogan 2001; Kenny 2001; Kingston 2001; Lightbody 2002; Mayo 1994; Means 1996; Pardessus 2002; Ray 1997; Rubenstein 1990; Rubenstein 2000; Sato 1999; Shaw 2003; Tinetti 1994; van Haastregt 2000; Vellas 1991). General frailty, residence in long-term care, history of requiring admission to a rehabilitation facility for older people, use of home help services, or age at least 80 years defined eligibility in a further 17 studies (Becker 2003; Bischoff 2003; Buchner 1997a; Campbell 1997; Coleman 1999; Donald 2000; Fiatarone 1997; Gray-Donald 1995; Jensen 2002; Latham 2003; McMurdo 2000; Mulrow 1994; Nikolaus 2003; Nowalk 2001; Schnelle 2003; Tideiksaar 1993; Vassallo 2001). In the remaining 28 studies, participants were recruited from seniors centres, lists of older people, or through advertisement for volunteers. The mean age of participants at enrolment exceeded 80 years in 17 studies (Becker 2003; Bischoff 2003; Campbell 1997; Donald 2000; Fiatarone 1997; Jensen 2002; McMurdo 2000; Nikolaus 2003; Nowalk 2001; Pardessus 2002; Ray 1997; Rubenstein 1990; Robertson 2001a; Schnelle 2003; Shaw 2003; Tideiksaar 1993; Vassallo 2001), and was less than 70 years in Armstrong 1996, McMurdo 1997; Pereira 1998, and Steinberg 2000. In ten studies (Armstrong 1996; Bischoff 2003; Campbell 1997; Carter 2002; Ebrahim 1997; Kingston 2001; Lord 1995; McMurdo 1997; Pfeifer 2000; Ryan 1996) the participants were all women, and in Rubenstein 2000 the participants were all men. The remaining studies recruited men and women in varying proportions; in most, the proportion of women was over 70%.

Interventions

Exercise/physical therapy interventions (23 studies)

Fourteen studies (Buchner 1997a; Campbell 1997; Carter 2002; Cerny 1998; Cornillon 2002; Day 2002; Fiatarone 1997; Lord 1995; McMurdo 1997; Mulrow 1994; Pereira 1998; Robertson 2001a; Rubenstein 2000; Wolf 1996) compared a physical exercise or physical therapy intervention alone, with either a social meeting or visit, education only, or no intervention. In Ebrahim 1997 self paced brisk walking was compared with upper limb exercises, while Means 1996 examined the effect of adding obstacle training to a standard exercise programme. The remaining seven studies in this category examined complex interventions. Campbell 1999 reported the results of an exercise programme, identical to that in Campbell 1997, and a programme of medication withdrawal, in a study with a factorial design. Donald 2000 in a study with a factorial design also comparing types of floor covering, examined the efficacy of enhanced lower limb strengthening exercises compared with a standard rehabilitative physiotherapy programme, Latham 2003 reported a study with a factorial design examining the effect of progressive resistance quadriceps exercises and the administration of oral vitamin D. Nowalk 2001 compared progressive strength training and conditioning with a Tai Chi programme with a cognitive/behavioural component, and a control group. Reinsch 1992 examined the effects of an exercise programme and a cognitive intervention in a factorial design. Schnelle 2003 reported the results of a programme of exercise associated with management of urinary continence, compared with no intervention. Steinberg 2000 compared four interventions - a cognitive/behavioural intervention either alone, or combined with: exercise, exercise and home safety screening, or exercise and home safety screening and medical assessment.

Home hazard modification (9 studies)

Cumming 1999 compared assessment of environmental hazards and supervision of home modifications by an experienced occupational therapist, with no intervention. The study reported in Nikolaus 2003 was similar; participants enrolled while admitted to a rehabilitation unit received home safety assessment and facilitation of elimination of hazards. Pardessus 2002 compared a comprehensive home visit which included assessment and modification of home hazards with "usual care". Stevens 2001 compared the results of no intervention with those of a nurse-led home hazard assessment, free installation of safety devices, and an education programme. Day 2002 using a factorial design, compared a control group with groups receiving exercise, correction of visual deficiency, and home hazard modification, each alone, and in combination.

Three other studies evaluated home hazard modification in combination with other interventions, using a cognitive/behaviour

modification approach (Hornbrook 1994; Carter 1997; Steinberg 2000). These studies included an initial assessment of home safety (this took place before randomisation in Hornbrook 1994). In Hornbrook 1994, the intervention also included weekly group sessions consisting of didactic presentations designed to modify risk taking behaviour and an exercise component. Sessions included individual goal setting, the development of action plans, and subsequent feedback (Stevens 1991). In Carter 1997 both the experimental groups, but not the controls, received an initial home hazard assessment. One experimental group received only brief feedback and pamphlets on home safety and medication use (low intensity), while the second group developed an action plan for the modification of environmental hazards and were encouraged to contact their general practitioners for medication review (high intensity). Home hazard assessment was evaluated in Steinberg 2000 as a component of two of the four intervention packages. Donald 2000, in a cluster randomised study of factorial design, compared the impact of vinyl flooring and carpet on fall rates in a rehabilitation unit.

Cognitive/behavioural interventions (7 studies)

Two studies concentrated on cognitive/behavioural interventions alone. Gallagher 1996 compared two risk assessment interviews and a feedback/counselling interview, with a single baseline assessment interview only. Ryan 1996 compared a one-hour fall prevention education programme delivered to a group, or individually, with a control group receiving only general health promotion information.

The remaining five studies in this category were complex interventions and were also included in the previous two categories. In Carter 1997 and Hornbrook 1994, the cognitive/behavioural intervention was associated with a baseline assessment of home safety and medication optimisation (Carter 1997), or an exercise component (Hornbrook 1994). Reinsch 1992 also combined a cognitive/behavioural intervention with an exercise programme. An information package was the basic intervention in the cumulative comparison of four interventions reported by Steinberg 2000. Nowalk 2001 compared progressive strength training and conditioning with a Tai Chi programme with a cognitive/behavioural component, and a control group.

Medication withdrawal/adjustment (2 studies)

Campbell 1999, in a 2 x 2 factorial design, reported the results of an exercise programme and a placebo-controlled psychotropic medication withdrawal programme. Specific attention to optimisation of medication was also a component, along with home hazard modification, in Carter 1997. Medication withdrawal/adjustment was also included in the majority of the multifactorial interventions listed in sub-section 7 of this section of the review.

Nutritional/vitamin supplementation (6 studies)

Five studies (Bischoff 2003; Dawson-Hughes 1997; Latham 2003; Pfeifer 2000; Sato 1999) were designed to evaluate the efficacy of Vitamin D supplementation, either alone or with calcium co-supplementation, in fracture prevention; each trial reported falls as a secondary outcome measure. 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.

Hormonal and other pharmacological therapies (2 studies)

Armstrong 1996 reported incidence of falls as a secondary outcome after administration of hormone replacement therapy to calcium replete, post-menopausal women. 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.

Referral for correction of visual deficiency (1 study)

Day 2002, using a factorial design, compared a control group with groups receiving exercise, correction of visual deficiency, and home hazard modification, each alone, and in combination.

Cardiac pacemaker insertion for syncope-associated falls (1 study)

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.

Exercise, visual correction and a home safety intervention (1 study)

Day 2002 randomised community dwelling older people to exercise, vision improvement, home hazard modification or no intervention in a factorial design. Although participants were assessed at baseline, allocation to intervention was by randomisation regardless of presence or absence of risk factor.

Multidisciplinary, multifactorial, health/environmental risk factor screening and intervention (21 studies)

These were complex interventions which differed in the details of the assessment, referral, and treatment protocols. In most studies, the initial assessment was made by a health professional (usually a nurse), or other trained person, who assessed the participants, provided advice, and arranged referrals.

In eleven of the studies (Carpenter 1990; Fabacher 1994; Jensen 2002; Jitapunkul 1998; McMurdo 2000; Newbury 2001; Ray

1997; Steinberg 2000; van Rossum 1993; Vetter 1992; Wagner 1994) participants were recruited on the grounds of age or domestic circumstances, but other specific risk factors were not a requirement for admission to the study. In Carpenter 1990 all participants were assessed at onset and the intervention group were visited at regular intervals. Participants developing increasing disability were referred to their family doctor for any interventions required. Fabacher 1994 screened for environmental, medical, functional and psychosocial problems, and gave individual participants in the intervention group feedback, which they were encouraged to discuss with their personal physician. Jensen 2002 in a cluster randomised study conducted in residential care institutions compared 'usual care' with a multi-factorial assessment, staff education, and targeted patient interventions. In Jitapunkul 1998 a non health professional visited participants with a structured questionnaire at three monthly intervals. Participants were referred to a nurse or geriatrician for assessment and interventions if their activities of daily living (ADL) scores declined, or if they fell more than once in the preceding three months. In an institutional care setting, McMurdo 2000 assessed the efficacy of chronic disease assessment, medication review, and seated exercise sessions. Newbury 2001 reported a trial of health assessment of people aged 75 years or older by a nurse, followed by report to the general practitioner, compared with no intervention. Ray 1997 compared a multi-disciplinary assessment by nurse, psychiatrist, and occupational therapist, with usual care in a nursing home setting. There were additional interventions to encourage implementation: team physicians met with patients' physicians, and nursing staff received in-service education sessions. Steinberg 2000 compared four interventions - a cognitive/behavioural intervention either alone, or combined with exercise, exercise and home safety screening, or exercise, home safety screening and clinical assessment. In van Rossum 1993 the intervention consisted of three-monthly home visits by a public health nurse who gave preventive advice, or referral as necessary. Vetter 1992 had a similar design although the visits were less frequent. Wagner 1994 compared an assessment visit with follow-up interventions targeting risk factors with an assessment visit alone, and with usual care.

The participants in the other ten studies were selected on the basis of a history of falling, or possession of putative risk factors for falling. Close 1999 identified older people presenting to a hospital emergency department after a fall, and then provided medical assessment and a home visit by a trained occupational therapist. In Coleman 1999 older people attending an ambulatory clinic, who had risk factors for functional decline, received a chronic disease management plan and a programme to reduce polypharmacy. Hogan 2001 assessed the impact of assessment, referral to family doctors, and exercise classes if relevant, compared with a single home visit by a recreational therapist. Kingston 2001 recruited women with a recent fall presenting to an emergency department and compared usual practice (a letter to the patient's doctor with recommendations for any follow up) with health visi-

tor assessment and advice, and individual care management for 12 months. Lightbody 2002 also recruited participants in an Emergency Department, and compared no intervention with a multifactorial assessment by a nurse at a home visit, with referral for further specialist assessment or other action. In the intervention group in Rubenstein 1990, a secondary prevention study, physical and environmental factors were assessed within seven days of a fall and information and recommendations passed on to the primary physician. Shaw 2003 recruited older people with cognitive impairment or dementia and compared no intervention with multifactorial assessment and intervention for any identified risk factor. Tinetti 1994 identified individuals with at least one of the eight risk factors for falling targeted in the intervention. Those randomised to the intervention group were given a combination of medication adjustment, behavioural instructions, and exercise programmes. The intervention in van Haastregt 2000 was a programme of home visits by a community nurse who screened older community dwelling people with a history of falling, offered advice, and arranged physician referral. In Vassallo 2001 participants had been admitted to a geriatric rehabilitation unit, and following assessment and management of fall risk, had correctable risk factors treated, wrist band identification, and had appropriate modification of their ward environment.

System modifications to prevent falls in high risk hospital patients (3 studies)

Two hospital-based studies evaluated the effectiveness of a bed alarm system (Tideiksaar 1993) and the use of coloured identification bracelets (Mayo 1994) for the prevention of falls in high risk elderly patients. Donald 2000, in a cluster randomised study of factorial design, in a geriatric rehabilitation unit compared the impact of vinyl or carpet floor coverings on fall rates.

Multifaceted interventions in nursing home residents (1 study)

One cluster randomised trial (Becker 2003) assessed the effectiveness of staff and resident education, including advice on environmental adaptations. In addition residents were offered progressive balance and resistance training and hip protectors, and could choose any combination of intervention, for any length of time, or no intervention other than receiving written information on fall prevention. This trial has not been categorised with (j) "multidisciplinary, multifactorial, health/environmental risk factor screening and intervention" because the interventions were not provided individually on the basis of an initial assessment.

Excluded studies

The Characteristics of Excluded Studies table lists 104 studies which fall into two categories. Thirty-seven non-randomised studies reported falls, or fall-related injuries, as an outcome. Sixty-

seven randomised trials originally identified by the search strategy either reported intermediate outcomes of preventive strategies (e.g. balance or muscle strength measures) or did not describe an intervention designed to reduce the risk of falling.

Ongoing studies

We identified 29 references to ongoing trials with falls described as an outcome in the protocol. Some trials may have more than one reference. Six are investigating an exercise or physical therapy intervention ([Allegante](#); [Brown](#); [Grove](#); [Safe-Grip](#); [VIP trial](#); [Voukelatos](#)); in the [VIP trial](#) the subjects are visually impaired. Five are recording falling outcomes in trials of vitamin D supplementation ([Michie](#); [RECORD](#); [Smith](#); [Swift](#); [Wark](#)), and twelve trials are assessing the effectiveness of multifactorial interventions ([Allen](#); [Behrman](#); [Clemson](#); [Dyer](#); [Edwards](#); [Gordon](#); [Haines](#); [Lamb](#); [Lord](#); [SAFER 2](#); [Spice](#); [Torgerson](#)). One study ([Healey](#)) is testing the use of care plans for targeting risk factors in patients at risk of falling in elderly care wards. Specific risk factors are targeted in a number of trials. One trial is evaluating the effect of accelerated treatment of cataracts ([Harwood](#)), and ([Cumming](#)) is evaluating visual improvement (testing followed by appropriate interventions). One trial ([Lesser](#)) is studying the effectiveness of vestibular rehabilitation in people with vestibular dysfunction, and the multicentre [SAFE PACE 2](#) trial is studying the effect of cardiac pacing in older people with carotid sinus hypersensitivity. One trial ([Moxon](#)) is targeting depression in elderly care homes.

Studies awaiting assessment

Fourteen studies are awaiting assessment ([Barnett 2003](#); [Buettner 2002](#); [Crome 2000](#); [Hauer 2001](#); [Helbostad \(in press\)](#); [Kerse \(in press\)](#); [L-Ambrose \(in press\)](#); [Lehtola 2000](#); [Lord \(in press\)](#); [Schoenfelder 2000](#); [Schwab 1999](#); [Steadman 2003](#); [Toulotte 2003](#); [Wolf \(in press\)](#)).

Risk of bias in included studies

Methodological quality assessment scores for each item, for each included study, are given in [Table 2](#).

In 19 studies ([Armstrong 1996](#); [Becker 2003](#); [Campbell 1997](#); [Campbell 1999](#); [Carter 1997](#); [Cumming 1999](#); [Day 2002](#); [Ebrahim 1997](#); [Fabacher 1994](#); [Hogan 2001](#); [Jensen 2002](#); [Latham 2003](#); [Mulrow 1994](#); [Newbury 2001](#); [Robertson 2001a](#); [Rubenstein 1990](#); [Shaw 2003](#); [van Rossum 1993](#); [Vetter 1992](#)) it appeared that the assigned treatment was adequately concealed prior to allocation. In three ([Coleman 1999](#); [Means 1996](#); [Steinberg 2000](#)), the assigned treatment was not concealed prior to allocation (C). In the remaining 40 there was inadequate information to judge concealment (B). Cluster randomisation was used in 13 studies ([Becker 2003](#); [Carpenter 1990](#); [Coleman](#)

[1999](#); [Hornbrook 1994](#); [Jensen 2002](#); [McMurdo 2000](#); [Ray 1997](#); [Reinsch 1992](#); [Steinberg 2000](#); [Stevens 2001](#); [Tinetti 1994](#); [Vassallo 2001](#); [Vetter 1992](#)). In three of these studies ([Becker 2003](#); [Jensen 2002](#); [Stevens 2001](#)) the analysis was adjusted to take account of clustering. In the remaining 10 studies the analysis was not adjusted, or it was unclear whether appropriate adjustment had been conducted.

Losses from groups resulting from withdrawal, death, loss to follow up, or exclusion after randomisation ranged from two per cent to 41 per cent and are described in the Characteristics of Included Studies table. Nine studies did not report any losses ([Becker 2003](#); [Cerny 1998](#); [Gallagher 1996](#); [Mayo 1994](#); [Rubenstein 1990](#); [Ryan 1996](#); [Sato 1999](#); [Tideiksaar 1993](#); [Vassallo 2001](#)).

In trials with community-dwelling subjects the outcome of falling was self-reported and the subjects were often not blind to treatment assignment. Blinding was possible, by using placebos or identical tablets, when the intervention involved the administration of drugs ([Bischoff 2003](#); [Campbell 1999](#); [Latham 2003](#); [Vellas 1991](#)).

A number of studies did not define a fall, and a variety of definitions were used in those that did. A fall was most frequently defined as 'unintentionally coming to rest on the ground, floor or other lower level; excludes coming to rest against furniture, wall, or other structure' ([Becker 2003](#); [Bischoff 2003](#); [Buchner 1997a](#); [Campbell 1997](#); [Campbell 1999](#); [Hornbrook 1994](#); [Nowalk 2001](#); [Mulrow 1994](#); [Robertson 2001a](#); [Stevens 2001](#); [Tinetti 1994](#); [Wolf 1996](#)). This is the definition used in the FICSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques) studies ([Buchner 1993](#)).

Active registration of falling outcomes, or use of a diary, was clearly indicated in 35 studies ([Becker 2003](#); [Bischoff 2003](#); [Buchner 1997a](#); [Campbell 1997](#); [Campbell 1999](#); [Carter 2002](#); [Close 1999](#); [Cornillon 2002](#); [Cumming 1999](#); [Dawson-Hughes 1997](#); [Day 2002](#); [Donald 2000](#); [Gallagher 1996](#); [Hogan 2001](#); [Hornbrook 1994](#); [Jensen 2002](#); [Kenny 2001](#); [Latham 2003](#); [Lightbody 2002](#); [Mayo 1994](#); [McMurdo 2000](#); [Mulrow 1994](#); [Nikolaus 2003](#); [Nowalk 2001](#); [Robertson 2001a](#); [Rubenstein 1990](#); [Schnelle 2003](#); [Shaw 2003](#); [Steinberg 2000](#); [Stevens 2001](#); [Tideiksaar 1993](#); [Tinetti 1994](#); [van Haastregt 2000](#); [Vassallo 2001](#); [Wolf 1996](#)). In the remaining 27 studies ascertainment of falling episodes was by participant recall, at intervals during the study or at its conclusion, or was not described.

Duration of follow up varied both between and within studies. It was for a minimum of one year in 38 studies, and for duration of stay in the hospital studies ([Donald 2000](#); [Mayo 1994](#); [Tideiksaar 1993](#); [Vassallo 2001](#)). In the remaining studies follow up was for three months ([Bischoff 2003](#); [Gray-Donald 1995](#); [Kingston 2001](#); [Rubenstein 2000](#); [Ryan 1996](#)), four months ([Fiatarone 1997](#); [Mulrow 1994](#); [Wolf 1996](#)), five months ([Carter 2002](#)), six months ([Cerny 1998](#); [Gallagher 1996](#); [Latham 2003](#); [Lightbody 2002](#); [Means 1996](#); [Vellas 1991](#)), eight months ([Schnelle 2003](#)), 44 weeks ([Campbell 1999](#)) and 48 weeks ([Armstrong 1996](#)). fol-

low up was for two years in [Campbell 1997](#); [Coleman 1999](#); [Ebrahim 1997](#); [McMurdo 1997](#), three years in [Jitapunkul 1998](#) and [Carpenter 1990](#), four years in [Vetter 1992](#), and for 10 years in [Pereira 1998](#).

The period for which falls were recorded differed markedly between studies, and was not necessarily the same as the total period of follow up described above. Falls were recorded for a minimum of one year in 37 studies, and in the remaining studies, falls were recorded for shorter periods of time (see Characteristics of Included Studies table for details). In some studies, fall monitoring varied from the overall length of follow up: in [Carpenter 1990](#) participants were asked about falls in the month prior to the final interview; in [McMurdo 2000](#) falls were monitored for six months after the intervention; in [Mulrow 1994](#) falls were reported at four months; in [van Rossum 1993](#) participants were asked about falls in the last six months of a three year intervention; and 10 years after randomisation the participants in [Pereira 1998](#) were asked to recall the number of falls in the previous year.

Effects of interventions

Exercise/physical therapy interventions (Comparisons 01 to 03)

Exercise/physical therapy alone versus control (untargeted, community dwelling)

Eleven studies, involving a total of 1480 participants, reported the results of exercise interventions offered to groups of older community-dwelling people where exercise interventions were not individually prescribed. Pooled data from nine studies ([Buchner 1997a](#); [Cerny 1998](#); [Cornillon 2002](#); [Day 2002](#); [Ebrahim 1997](#); [Lord 1995](#); [McMurdo 1997](#); [Pereira 1998](#); [Rubenstein 2000](#)) does not confirm the effectiveness of untargeted exercise interventions in community dwelling older people based on number of fallers (pooled RR 0.89, 95%CI 0.78 to 1.01). Data from [Wolf 1996](#) were reported as adjusted estimates from a Cox proportional hazards analysis, and raw data to allow pooling were unavailable. Using the FICSIT definition of falling ([Buchner 1993](#)), participants exposed to the 15 week Tai Chi intervention had a lower rate of falling than controls (risk ratio 0.51, 95%CI 0.36 to 0.73). When unadjusted for potential baseline risk factors, the reported risk ratio was 0.63, 95%CI 0.45 to 0.89. Using a narrower definition of falling, which discounted minor events such as stumbling, the reported unadjusted risk ratio was no longer statistically significant (risk ratio 0.67, 95%CI 0.41 to 1.09). The computerised balance training intervention was ineffective regardless of which fall definition was used. Falls were monitored for different periods for different patient cohorts; the range was 7 to 20 months. [Carter 2002](#), in a comparison of a twice weekly exercise class with no

intervention reported no difference between groups in the number of people falling. [Means 1996](#) recruited 65 participants with a history of falling who all underwent six weeks supervised low to moderate intensity programme designed to improve balance and mobility. Thirty one participants practiced on an obstacle course in addition to the exercise intervention, and 34 did not. No statistically significant difference in the mean number of falls was reported.

Exercise/physical therapy alone versus control (individually targeted, community dwelling)

Pooled data from three studies, with a total of 566 participants ([Campbell 1997](#); [Campbell 1999](#); [Robertson 2001a](#)), using the same individually tailored programme of progressive muscle strengthening, balance retraining exercises and a walking plan, indicated that this intervention significantly reduced the number of individuals sustaining a fall over a one year period (pooled RR 0.80, 95%CI 0.66 to 0.98). The number of people sustaining a fall resulting in injury was also significantly reduced (pooled RR 0.67, 95%CI 0.51 to 0.89). Seventy-four per cent of participants in the control group and 69 per cent in the exercise group in [Campbell 1997](#) continued for a second year. After two years, the rate of falls remained significantly lower in the exercise group ([Campbell 1999a](#)). The relative hazard for all falls in the exercise group was reported to be 0.69 (95%CI 0.47 to 0.97); the relative hazard for a fall resulting in a moderate or severe injury was 0.63 (95%CI 0.42 to 0.95).

[Latham 2003](#) reported the effect of a programme of progressive resistance training of the quadriceps muscle in 222 frail older people. There was no evidence of effectiveness of this intervention alone (RR 0.92, 95%CI 0.73 to 1.16). However, musculoskeletal injuries were more common in the progressive resistance exercise group (RR 3.54, 95% CI 1.36 to 9.19). [Fiatarone 1997](#) reported in abstract a comparison between high intensity progressive resistance training and no intervention in 34 functionally impaired older people. No difference between groups was observed in the frequency of falls in this study.

Exercise/physical therapy alone versus control (untargeted, institutional care)

In a study in long term care facilities (ranging from independent living to skilled nursing care) [Nowalk 2001](#) reported no significant difference in number of falls between a control group and two exercise groups (resistance endurance training or tai chi).

Exercise/physical therapy alone versus control (individually targeted, institutional care)

From two studies evaluating 248 participants ([Donald 2000](#); [Mulrow 1994](#)) an enhanced physiotherapy programme showed

no evidence of effectiveness (RR 1.02, 95%CI 0.74 to 1.41) compared to those receiving the control intervention.

Complex interventions including exercise/physical therapy versus control (untargeted, community dwelling)

There were three complex intervention studies which included exercise. In a factorial design, [Day 2002](#) compared group-based exercise, home hazard modification and management of reduced vision. Although group-based exercise alone (see comparison 01.01) was the most potent single intervention in this study, falls were also reduced when exercise was combined with home hazard management, or reduced vision management, or both of these (see comparison 14).

The remaining two trials were cluster randomised; their data could not be pooled. One ([Reinsch 1992](#)) evaluated the effectiveness of classes teaching exercise, relaxation and health and safety topics relating to fall prevention, and classes without the exercise component. Results did not demonstrate a statistically significant reduction in number of fallers for either intervention. The other ([Steinberg 2000](#)) using a cumulative intervention in which three out of four groups received a monthly one hour exercise class and encouragement to exercise between classes, reported that the intervention strategies could achieve an 18 to 40 per cent reduction in the incidence of falling, but the hazard ratios were not significant.

Complex interventions including exercise/physical therapy versus control (targeted, institutional care)

[Schnelle 2003](#) compared a low intensity functionally oriented exercise and incontinence care programme with usual care in 190 incontinent nursing home residents. There was no significant reduction in the number of fallers between the groups in this study (RR 0.62, 95%CI 0.37 to 1.06); however, there was a trend suggesting benefit.

Home safety intervention alone versus control (individually targeted interventions) (Comparison 04)

Five studies evaluated home safety interventions alone ([Cumming 1999](#); [Day 2002](#); [Nikolaus 2003](#); [Pardessus 2002](#); [Stevens 2001](#)). Raw data for the number of participants falling were available from four ([Cumming 1999](#); [Day 2002](#); [Nikolaus 2003](#); [Pardessus 2002](#)).

Amongst those participants with a history of falling in the year prior to randomisation, there was a significant reduction in the number of participants sustaining two or more falls during the study period (RR 0.66, 95%CI 0.54 to 0.81). An overall analysis including all participants, fallers and non-fallers prior to randomisation, showed a significant, but smaller, effect (RR 0.85, 95%CI 0.74 to 0.96). In those without a history of falls in the previous year ([Cumming 1999](#)) there was no evidence for the effectiveness of home hazard modification (RR 1.03, 95%CI 0.75 to 1.41). In

[Cumming 1999](#) the rate of falls away from home was reduced by a similar extent to the reduction in falls at home.

In a cluster randomised study of individual households in a population with mixed fall status, [Stevens 2001](#) was unable to identify a difference in the rate of falls (overall, and falls at home), the rate of fall injuries, or the proportion of fallers in the intervention group compared with the control group after 1 year.

Cognitive behavioural intervention (Comparisons 05 and 06)

Cognitive behavioural intervention alone versus control

In [Gallagher 1996](#) (100 participants), comparison of the two risk assessment interviews and a feedback/counselling interview, with a single baseline assessment interview, showed that the intervention had no statistically significant impact on the main outcome measures. In [Ryan 1996](#) (45 participants), analysis of the number of fallers at three months showed no evidence that individual education sessions provided by a trained nurse were more effective than the one hour group discussion of intrinsic and environmental risk factors.

Complex interventions including cognitive/behavioural intervention versus control

[Carter 1997](#) (658 participants) and [Hornbrook 1994](#) (3182 participants) used a behavioural approach after carrying out an environmental safety assessment. Data have not been pooled from these studies as [Hornbrook 1994](#) is cluster randomised (by household). Both also reported co-interventions; [Hornbrook 1994](#) included group sessions designed to modify risk taking behaviour and an exercise component, and reported survival analyses for sustaining any fall, injury fall, medical care fall, fracture fall, and fall causing hospitalisation. Unadjusted rates for all falls (trialists' analysis) were significantly lower among intervention participants; for other categories of fall (injury falls, medical care falls) there were no statistically significant differences between groups. In [Carter 1997](#) advice on optimising medication was given to the two intervention groups; a low intensity intervention in which advice alone was given on home safety, and a high intensity intervention which included professional formulation of an action plan. There was no evidence of a difference in the number of individuals falling between the control group and either intervention group. However, both interventions were associated with a significant reduction in the number sustaining two or more falls (low intensity intervention RR 0.27, 95%CI 0.08 to 0.95; high intensity intervention RR 0.22, 95%CI 0.05 to 0.98). In a cluster randomised trial, [Reinsch 1992](#) evaluated the effectiveness of classes teaching exercise, relaxation and health and safety topics relating to fall prevention, and classes without the exercise component. The trial did not identify a statistically significant reduction in number of fallers. In another

cluster randomised trial (Steinberg 2000), a cumulative intervention in which three out of four groups received encouragement to exercise and a monthly one hour exercise class, the intervention strategies achieved an 18 to 40 per cent reduction in the incidence of falling, but the hazard ratios were not significant in any group.

Medication withdrawal versus control (Comparison 07)

Campbell 1999 reported the results of a study of factorial design in which the interventions were an individually tailored exercise programme of progressive muscle strengthening and balance retraining, and a walking plan (also used in Campbell 1997 and Robertson 2001a), and a placebo-controlled medication withdrawal programme. Although the analysis of the effect of medication withdrawal on the number of fallers (Comparisons 02 and 06) does not show significant difference between treatment and control groups, the analysis reported by the investigators, using a Cox proportional hazard regression model, showed that the overall risk of falls was lower for the medication withdrawal group (relative hazard 0.34, 95%CI 0.16 to 0.74).

Nutritional/vitamin supplementation

Nutritional supplementation versus control (Comparison 08)

There is no evidence from one small trial involving 50 participants (Gray-Donald 1995), for the effectiveness of a programme of oral nutritional supplementation in preventing falls in a group of frail elderly women.

Vitamin D versus control (Comparison 09)

Five studies (Bischoff 2003; Dawson-Hughes 1997; Latham 2003; Pfeifer 2000; Sato 1999) evaluated the effect of vitamin D on falling.

Data were pooled from three (Bischoff 2003; Pfeifer 2000; Latham 2003) involving 461 participants. In these studies both intervention and control groups received calcium supplementation; the intervention group in each received oral vitamin D supplementation. There is currently no evidence of the effectiveness of vitamin D supplementation in reducing the number of people who fall amongst community dwelling or hospitalised older people (RR 0.87, 95%CI 0.70 to 1.08). In Pfeifer 2000 the reduction in the number of falls resulting in fracture was not statistically significant (RR 0.48, 95%CI 0.02 to 11.84).

In the two studies that could not be pooled, Sato 1999 (86 participants) administered 1-alpha-hydroxyvitamin D alone to people with Parkinson's disease (Hoehn and Yahr Stage <5) and significantly reduced the number of fracture falls (RR 0.13, 95%CI 0.02

to 0.95), but did not reduce the mean number of falls in the intervention group (WMD 0.10, 95%CI -0.71 to 0.91). In a placebo-controlled trial of administration of vitamin D and calcium supplementation to community dwelling men and women over 65 years, Dawson-Hughes 1997 (445 participants) reported that the number of participants falling did not differ significantly between intervention and control groups. Data were not presented.

Hormonal and other pharmacological therapies

HRT and calcium versus calcium (Comparison 10)

In calcium replete post-menopausal women (Armstrong 1996, 116 participants), there was no evidence of a protective effect of hormone replacement therapy against falling on at least one occasion during the study period (RR 1.56; 95%CI 0.94 to 2.59).

Pharmacological therapy versus control (Comparison 11)

Vellas 1991 (95 participants) reported that administration of the vaso-active medication raubasine-dihydroergocristine to older people presenting to their medical practitioner with a history of a recent fall, significantly reduced the number of members of the intervention group who reported falls in the six months of therapy (RR 0.48, 95%CI 0.29 to 0.78).

Referral for correction of visual deficiency versus control (Comparison 12)

In Day 2002 there was no evidence that referral for correction of vision in community dwelling older people was effective in reducing the number of people falling (RR 0.95, 95%CI 0.79 to 1.14).

Cardiac pacemaker insertion versus control (Comparison 13)

Cardiac pacing in fallers with cardioinhibitory carotid sinus hypersensitivity (Kenny 2001) was associated with a statistically significant reduction in the number of participants sustaining syncope (RR 0.48, 95%CI 0.32 to 0.73) and in the mean number of falls in twelve months in the intervention group (WMD -5.2, 95%CI -1.0 to -9.4).

Exercise, visual correction, and home safety intervention (Comparison 14)

In a study using factorial design, Day 2002 examined the effect of exercise, visual correction and a home safety intervention. The impact of these three interventions combined was a significant reduction in the number of participants falling (RR 0.76, 95%CI 0.61 to 0.94). Comparison 14 also shows our analyses of the data

for exercise plus vision correction (RR 0.76, 95%CI 0.62 to 0.95), and for exercise plus home hazard management (RR 0.84, 95%CI 0.69 to 1.03). These analyses are somewhat less favourable than the adjusted analyses presented by the authors in their original report.

Multidisciplinary, multifactorial, health/environmental risk factor screening and intervention versus control (Comparison 15)

Community dwelling, unselected (fallers and non-fallers in the population studied)

Of the eight studies which evaluated a multifactorial screening and intervention programme in community dwelling older people who were recruited on the grounds of age and domestic circumstances, without a requirement for the presence of known risk factors, data have been pooled from four trials (Fabacher 1994; Jitapunkul 1998; Newbury 2001; Wagner 1994) involving 1651 participants. The pooled data are homogeneous and show that the interventions are effective in reducing the proportion of fallers in the intervention group (pooled RR 0.73, 95%CI 0.63 to 0.85). Data were not pooled from the other four studies in this category. In Carpenter 1990 (539 participants), which was cluster randomised by household, the intervention involved an assessment by trained lay volunteers using a disability rating scale; an increase in disability score at a repeat visit was reported to the family medical practitioner. The trialists reported significantly fewer falls in the experimental group during the month before the final interview, but insufficient data were available to calculate an effect size. The fourth of the incremental interventions in Steinberg 2000, also cluster randomised, had a medical screen, home hazard assessment, and exercise. There was no significant difference in the incidence of falling between this group (59 participants) and the control group (63 participants) who received an information package alone. van Rossum 1993 (580 participants) found no difference in the incidence of falls between the intervention and control groups, but no data were provided. In Vetter 1992 (674 participants, cluster randomised by household) 95 of 350 in the intervention group and 65 of 324 in the control group fell.

Community dwelling, targeted (population studied are known fallers or have identified risk factors prior to enrolment)

Data were pooled from five studies (Close 1999; Hogan 2001; Kingston 2001; Lightbody 2002; van Haastregt 2000) involving 1176 participants. The pooled data show a significant reduction in the proportion of fallers in the intervention groups (pooled RR 0.86, 95%CI 0.76 to 0.98). Data from two other (cluster randomised) studies in this category were not pooled as the unit of analysis differed from the unit of randomisation. Coleman 1999

(169 participants) reported that screening and intervention in a chronic care clinic provided no improvement in the incidence of falls at 12 or 24 months. Tinetti 1994 (301 participants) reported a significant reduction in the number of fallers in the intervention group, adjusting for age, sex, previous falls, and number of risk factors (adjusted incidence rate ratio 0.69, 95%CI 0.52 to 0.90), but in this study the units of randomisation and analysis appear to have been different, which may have resulted in a narrower confidence interval.

Institutional care

Five trials were identified in this comparison group; however, none could be pooled due to cluster randomisation. Overall, the results of these papers fail to provide a clear indication of the effectiveness of multi-disciplinary care within institutions. In Jensen 2002, an appropriately analysed cluster randomised trial of an 11 week multidisciplinary programme including general and resident-specific tailored strategies, reported a reduced incidence of falls in the intervention group (adjusted incidence rate ratio 0.60, 95%CI 0.50 to 0.73). McMurdo 2000 (133 participants), also a cluster randomised study in an institutional setting, reported no difference between intervention and control groups in the percentage of participants falling in the six month period after completion of the intervention. Ray 1997 (482 participants) was also cluster randomised. Data were reported on recurrent falls and injurious falls. The reporting of the data provides insufficient detail to confirm whether the reduction in recurrent falls experienced in the intervention group was significant. Rubenstein 1990 (160 participants) found no benefit from nurse practitioner assessment and physician referral within seven days of a fall (RR 0.97, 95%CI 0.84 to 1.11). Vassallo 2001 evaluated a multidisciplinary fall assessment in a cluster randomised trial in a geriatric rehabilitation setting, and reported fewer fallers (39/275) in the intervention group, compared with 111/550 in the control group.

Cognitively impaired (any residence)

Shaw 2003 in a comparison of multifactorial assessment and intervention in older people with cognitive impairment or dementia could not confirm the effectiveness of this intervention in reducing the number of participants falling in one year (RR 0.92, 95%CI 0.81 to 1.05).

System modification to prevent falls in high risk hospital patients versus control (Comparison 16 and 17)

Donald 2000 studied the incidence of falls in older people randomised to rooms with vinyl or carpet floor coverings in a rehabilitation hospital setting. The number of participants falling was greater in those assigned to a carpet floor covering. Due to the small size of the study the result was not statistically significant

(RR 0.15, 95%CI 0.02 to 1.17). Neither of the two small trials (Tideiksaar 1993; Mayo 1994), examining strategies to prevent falls in hospital patients, showed evidence of benefit of the intervention used. Tideiksaar 1993, assessing the value of bed alarms, gave only the total number of falls in control and treated groups, and reported that there was no significant difference in the number of bed falls between groups. Results for Mayo 1994, presented in our analyses, showed no difference between the two groups.

Multifaceted intervention in nursing home residents

Becker 2003 in a cluster randomised trial (N = 6) involving 981 long stay residents of community nursing homes reported that the number of fallers was less in the intervention group (RR 0.75, 95%CI 0.57 to 0.98, trialists' analysis). The incidence density rate of falls per 1000 resident years was also reduced in the intervention group (RR 0.55, 95%CI 0.41 to 0.73, trialists' analysis).

Economic evaluations

Five of the included studies incorporated a comprehensive economic evaluation in the study design and established the cost effectiveness of the intervention (Campbell 1997; Campbell 1999; Cumming 1999; Robertson 2001a; Tinetti 1994). The incremental cost per fall prevented for implementing the home programme of muscle strengthening and balance retraining delivered in a research setting by a physiotherapist (Campbell 1997) was NZ\$314 after one year and NZ\$265 after two years (at 1995 prices, programme implementation costs only, Robertson 2001c). In Robertson 2001a a district nurse delivered the same exercise programme in a usual healthcare setting and the incremental cost per fall prevented was NZ\$1803 (at 1998 prices, programme implementation costs only). When statistically significant hospital admission cost savings as a result of a fall in the exercise group compared with the control group during this trial were incorporated into a cost effectiveness ratio, the cost per fall prevented was NZ\$155 (at 1998 prices).

The incremental cost of implementing the psychotropic medication withdrawal programme in a research setting (Campbell 1999) was NZ\$538 per fall prevented (at 1996 prices, programme implementation costs only, Robertson 2001b). In an economic evaluation of the home safety intervention of Cumming 1999, the mean cost per fall prevented for those with a fall in the previous year was Australian \$3980 (at 1997 prices, incorporating total healthcare resource use for 12 months from randomisation, Salkeld 2000). Rizzo 1996 reported an evaluation of the targeted multifactorial intervention of Tinetti 1994 and concluded that the mean cost per fall prevented was US\$1772 (at 1993 prices, incorporating programme development and implementation costs only).

DISCUSSION

Overview of results

This review has attempted to identify, grade and synthesise the available trials evaluating interventions designed to prevent falls. New evidence continues to accumulate at a rapid rate, with 22 additional trials being added in this update. Most of the 62 included studies involve older people either included on the basis of age or residence, or because they have sustained a recent fall. As a group, therefore, their results allow some tentative generalisation. 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. Even amongst known fallers the risk reductions are small; even where these are statistically significant, the clinical significance and cost effectiveness remain less clear than we would wish. Interventions which target multiple risk factors are marginally effective, but so also are targeted exercise interventions, home hazard modification, and reducing psychotropic medication. Where important individual fall risk factors can be corrected, focused interventions may be more clearly effective. For example, cardiac pacing appears to be clearly effective in older fallers with demonstrated carotid sinus hypersensitivity (CSH). However, to identify 257 potential participants with CSH for the study, Kenny 2001 screened 24,251 people with episodes of a fall or syncope presenting to emergency departments.

There is some evidence that interventions with an apparently limited intention may have an unintended multifactorial component (Cumming 1999). There is limited evidence that interventions which are individually tailored to target risk factors and impairments are more effective than those which are applied as a 'standard package'. However, to date, there is no robust evidence regarding the optimum duration or intensity of interventions, although the effectiveness of the moderate intensity exercise programme used in Campbell 1997, Campbell 1999 and Robertson 2001a, has been replicated in a non-randomised controlled study excluded from this review (Robertson 2001c).

Few studies reported an increase in adverse events or increased falls. There were higher number of falls in the brisk walking group in Ebrahim 1997; all the women in this study had a history of an upper limb fracture in the previous two years. Given this result, brisk walking should not be recommended as a fall prevention intervention in women with a history of falling. Progressive resistance exercises in frailer old people may be associated with increased fatigue, or with muscle injuries requiring medical attention or resulting in temporary limitation in activities of daily living (Latham 2003).

Methodological quality

We used the standard template of the Cochrane Bone, Joint and Muscle Trauma Group, specifically modified for this review, to

record methodological quality of the included studies, which varied widely. Individual item scores were entered, but no attempt was made to create an overall score; some of the items relating to blinding are of marginal relevance for many of the studies. 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 needs to be adopted in order to facilitate comparisons of research findings on falls. This is being addressed currently by workpackage 1 of the Prevention of Falls Network Europe ([PROFANE](#)).

Methods used for recording falls also varied widely, with active registration of falls as they occurred clearly indicated in only 35 studies. Poor recall may be a problem in the remaining studies, which relied on participant recall at intervals during the study or at its conclusion ([Cummings 1988](#)). Both [Cummings 1988](#), and another more recent study, [Hale 1993](#), compared recall with active registration using postcards. Both demonstrated, unexpectedly, that recall was better for the preceding 12 months than for three or six months. In [Hale 1993](#), at three months, six months and one year, retrospectively, only 31 per cent, 44 per cent, and 89 per cent of participants who had reported a fall recalled at least one fall. Sixty-eight per cent of participants who had reported an injury recalled one at the year's end. This empirical evidence supports the possibility of poor recall in the included trials where the follow-up period was short and information about falls was collected retrospectively.

Categorisation of studies

The reported evidence for the effectiveness of fall/injury prevention strategies is derived from 62 included studies which have a variety of settings, participants, interventions, outcome measures, and methods of analysis. We have grouped these strategies into categories by intervention, and by the status of the study participants, but recognise that the distinctions between categories are not always clear; in that sense they should be considered to be provisional, or exploratory. [Cumming 1999](#), discussing the finding that "an occupational therapy home visit seemed to be equally effective in reducing the risk of falling at home and away from home" hypothesised that "occupational therapists... take into account the characteristics of the person living with the hazard, such as limited mobility and poor vision, when they assess a home for hazards... A home visit by an occupational therapist is also likely to have the effect of raising general awareness of falls and their prevention." The same could be said for the interventions carried out by the physiotherapist in [Campbell 1997](#), or the district nurse in [Robertson 2001a](#). Thus, what appears to be a single and specific intervention targeting only a single risk factor, may, in part, be a 'multifactorial' intervention by a trained health professional. Similarly, we continue to have some difficulty in deciding how best to categorise studies according to the way in which interven-

tions were offered to study participants. Some interventions, for example educational packages and exercise training, may be offered individually or in groups. In some studies where the nature of the intervention was an individual assessment followed by a targeted intervention package, the sampling frame was defined on the basis of age, or membership of an organisation of older people; such a participant group would contain individuals at high risk of falling and others whose risk was lower. In other studies, only people already identified as at high risk of falling were included; in these, the absolute risk of falling in the control group would be expected to be higher. We found some evidence suggestive of this (see comparison 15.01). In some environmental modification, and assessment and targeted intervention studies, the intervention was confined to referral to other agencies; therefore, the potential effect may have been weakened by the recommended intervention not being completed.

Pooling of data

In the first version of this review, data from a number of cluster randomised studies were pooled with individually randomised studies. Cluster randomised trials analysed by individual produce inappropriately narrow 95% confidence intervals, and standard deviations and standard errors that are too small. If these are then included in the pooled outcome the pooled 95% confidence interval will be too narrow. The majority of cluster randomised studies in this review had not been analysed appropriately and in this version results of cluster randomised studies have been reported in the text but do not appear in the analyses.

Exercise interventions

The evidence for effectiveness of group exercise interventions remains limited, apart from the Tai Chi intervention of [Wolf 1996](#). The study of [Latham 2003](#) found no evidence for any effect of lower limb progressive muscle strengthening alone. On the other hand, the three trials from New Zealand ([Campbell 1997](#); [Campbell 1999](#); [Robertson 2001a](#)) using an individually tailored exercise programme of progressive muscle strengthening, balance retraining and a walking plan, reported a reduction in falls, number of participants falling, and fall-related injuries. Both the interventions which were effective in reducing falls included balance retraining, indicating that these exercises may be an important component of successful falls prevention programmes.

Modification of home hazards

The association of domestic hazards with falls in the home has been controversial, despite its face validity ([Clemson 1996](#); [Gill 2000](#); [McLean 1996](#); [Northridge 1995](#); [Parker 1996](#); [Sattin 1998](#)). However, six trials with a substantial home hazard modification

component (Carter 1997; Cumming 1999; Day 2002; Hornbrook 1994; Nikolaus 2003; Pardessus 2002) have now reported data which support its effectiveness, particularly in those with a history of previous falls. Cumming 1999 warned that “this effect is unlikely to be caused by home modifications alone” since the reduction in falls was not confined to falls inside the home. This is true also of the reduction in the number of participants reporting two or more falls in Carter 1997, where falls in the yard/garden associated with the dwelling were also eligible. Hornbrook 1994 also used a complex intervention. While the evidence supports interventions designed to reduce home hazards, the exact mechanism of the effect remains unclear.

Cognitive/behavioural interventions

While cognitive/behavioural components have been included in effective complex interventions, we found no evidence that cognitive/behavioural interventions alone are effective in reducing the frequency of falls in elderly people.

Medication withdrawal

Campbell 1999 appears to be the only placebo-controlled trial of medication withdrawal for fall prevention so far published. Gradual withdrawal of psychotropic medication significantly reduced risk of falling, but participants in this study were reluctant to comply permanently, and the authors suggest that a much larger trial with sufficient power to investigate the effects of withdrawal of different psychotropic drug types would be justified.

Multidisciplinary, multifactorial, health/environmental risk factor screening and intervention

There is now considerable evidence in support of the effectiveness of these complex programmes, although the effect is not large; however, some heterogeneity in results remains, which is not easy to explain. One author, van Haastregt 2000, found that the multifactorial home visit approach appeared ineffective in the Dutch healthcare setting, and noted that the evidence for effectiveness came mostly from studies in the United States. Although there is an obvious overall similarity in approaches among the individual studies in this category, it may be that details of the status of the participants, the context of the intervention, and details of content and presentation are critical. A number of ongoing studies in this category, (Allen; Behrman; Dyer; Edwards; Gordon; Lamb; SAFER 2; Spice; Torgerson), may help to resolve these uncertainties in the future.

Other interventions

The reported effects of vitamin D supplementation (Bischoff 2003; Dawson-Hughes 1997; Latham 2003; Pfeifer 2000; Sato 1999), although not demonstrating significant evidence of effectiveness, continue to be compatible with the possibility that vitamin D deficiency may itself be a remediable risk factor for falling. Further trials are in progress examining that possibility (Michie; RECORD; Smith; Swift; Wark).

AUTHORS' CONCLUSIONS

Implications for practice

Healthcare purchasers and providers contemplating fall prevention programmes should consider interventions which target both intrinsic and environmental risk factors of individual patients.

The following interventions are likely to be beneficial:

- A programme of muscle strengthening and balance retraining, individually prescribed at home by a trained health professional (3 trials, 566 participants)
- A 15 week Tai Chi group exercise intervention (1 trial, 200 participants)
- Home hazard assessment and modification that is professionally prescribed for older people with a history of falling (3 trials, 374 participants)
- Withdrawal of psychotropic medication (1 trial, 93 participants)
- Cardiac pacing for fallers with cardioinhibitory carotid sinus hypersensitivity (1 trial, 171 participants)
- Multidisciplinary, multifactorial, health/environmental risk factor screening/intervention programmes, in the community both for unselected population of older people (4 trials, 1651 participants), and for older people with a history of falling, or selected because of known risk factors (5 trials, 1176 participants)
- Multidisciplinary assessment and intervention programme in residential care facilities (1 trial, 439 participants).

Interventions of unknown effectiveness:

- Group-delivered exercise interventions (9 trials, 1387 participants)
- Individual lower limb strength training (1 trial, 222 participants)
- Nutritional supplementation (1 trial, 46 participants)

- Vitamin D supplementation, with or without calcium (3 trials, 461 participants)
- Home hazard modification in association with advice on optimising medication (1 trial, 658 participants), or in association with an education package on exercise and reducing fall risk (1 trial, 3182 participants)
- Pharmacological therapy (raubasine-dihydroergocristine, 1 trial, 95 participants)
- Interventions using a cognitive/behavioural approach alone (2 trials, 145 participants)
- Home hazard modification for older people without a history of falling (1 trial, 530 participants)
- Hormone replacement therapy (1 trial, 116 participants)
- Correction of visual deficiency (1 trial, 276 participants).

Interventions unlikely to be beneficial:

- Brisk walking in women with a history of upper limb fracture in the previous two years.

As the benefits in terms of the numbers of falls causing injury or requiring medical care may be quite small, careful prior economic modelling in the context of the local healthcare system is important. In view of the relatively small protective effects which may be present and the limited nature of the evidence, new intervention programmes should continue to receive methodologically robust evaluation.

Implications for research

The individual trials reviewed differed considerably in detail of intervention, and in the health and social status of the participants. Outcome measures and duration of follow up varied.

Future research should consider these results and provide clear justification for further exploration. In particular:

- Trials should be large enough to be meaningful, i.e. there should be an a priori calculation of sample size.
- The unit of analysis should be the same as the unit of randomisation.
- The evaluation of fall prevention strategies would be enhanced by the development of a consensus document which contains a taxonomy of interventions and outcomes, and which establishes a standard for conduct and reporting of trials. This is now being addressed by the European PROFANE initiative ([PROFANE](#)).
- More data are required to confirm whether strategies apparently effective in significantly reducing the numbers of individuals falling are also effective in reducing more serious sequelae of falls, such as fractures.
- Apparently effective interventions may require re-evaluation in different healthcare systems.
- More randomised controlled trials are required to evaluate the effectiveness of falls prevention programmes in institutions such as nursing homes and hospitals.
- Economic evaluation of interventions should be encouraged.

ACKNOWLEDGEMENTS

The reviewers would like to thank Kate Rowntree for her support at the editorial base, and Dr Helen Handoll and Leeann Morton for their assistance with the editorial process for earlier versions of the review. We would also like to thank Dr Geoff Murray for his assistance with data extraction and quality assessment. We thank the following for their useful and constructive comments at editorial review: Peter Herbison, Prof Rajan Madhok, Dr Peter Overstall, Dr Jed Rowe, Prof Marc Swiontkowski, and Dr Janet Wale. We are grateful to N. Freeman for her translation of Vellas 1991.

REFERENCES

References to studies included in this review

Armstrong 1996 *{published data only}*

Armstrong AL. *Hormone replacement therapy - effects on strength, balance, and bone density [MD Thesis]*. Nottingham: University of Nottingham, 1996.

* Armstrong AL, Osborne J, Coupland CAC, Macpherson MB, Bassey EJ, Wallace WA. Effects of hormone replacement therapy on muscle performance and balance in post-menopausal women. *Clinical Science* 1996;**91**:685–90. [MEDLINE: 97131151]

Becker 2003 *{published and unpublished data}*

* Becker C, Kron M, Lindemann U, Sturm E, Eichner B, Walter-Jung B, et al. Effectiveness of a multifaceted intervention on falls in nursing home residents. *Journal of the American Geriatrics Society* 2003;**51**(3):306–13.

Becker C, Lindemann U, Nikolaus T. Multifactorial intervention on falls and fractures in nursing homes [abstract]. *Age and Ageing* 2000;**29** Suppl 2:18.

Becker C, Walter-Jung B, Nikolaus T. The other side of hip protectors [letter]. *Age and Ageing* 2000;**29**(2):186.

Bischoff 2003 *{published data only}*

Bischoff HA, Stahelin HB, Dick W, Akos R, Knecht M, Salis C, et al. Effects of vitamin D and calcium supplementation on falls: A randomized controlled trial. *Journal of Bone & Mineral Research* 2003;**18**(2):343–51.

Buchner 1997a *{published data only}*

* Buchner DM, Cress ME, de Lateur BJ, Esselman PC, Margherita AJ, Price R, et al. The effect of strength and endurance training on gait, balance, fall risk, and health services use in community-living older adults. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 1997;**52**(4):M218–24. [MEDLINE: 97367730]

Buchner DM, Cress ME, Wagner EH, de Lateur BJ. The role of exercise in fall prevention: Developing targeting criteria for exercise programs. In: Vellas B, Toupet M, Rubenstein L, Albareda JL, Christen Y editor(s). *Falls, balance and gait disorders in the elderly*. Amsterdam: Elsevier, 1992:55–68.

Buchner DM, Cress ME, Wagner EH, de Lateur BJ, Price R, Abrass IB. The Seattle FICSIT/MoveIt study: the effect of exercise on gait and balance in older adults. *Journal of the American Geriatrics Society* 1993;**41**:321–5. [MEDLINE: 93179671]

Campbell 1997 *{published and unpublished data}*

Campbell AJ, Robertson MC, Gardner MM, Norton RN, Buchner DM. Falls prevention over 2 years: a randomized controlled trial in women 80 years and older. *Age and Ageing* 1999;**28**:513–8. [MEDLINE: 20067990]

* Campbell AJ, Robertson MC, Gardner MM, Norton RN, Tilyard MW, Buchner DM. Randomised controlled trial of a general practice programme of home based exercise to prevent falls in elderly women. *BMJ* 1997;**315**:1065–9. [MEDLINE: 98033532]

Gardner M. Home-based exercises to prevent falls in elderly women. *New Zealand Journal of Physiotherapy* 1998;**26**(3): 6. [CINAHL 1999044632]

Robertson MC. *Development of a falls prevention programme for elderly people: evaluation of efficacy, effectiveness, and efficiency [PhD thesis]*. Dunedin, New Zealand: University of Otago, 2001.

Robertson MC, Campbell AJ, Gardner MM, Devlin N. Preventing injuries in older people by preventing falls: a meta-analysis of individual-level data. *Journal of the American Geriatrics Society* 2002;**50**:905–11.

Robertson MC, Devlin N, Scuffham P, Gardner MM, Buchner DM, Campbell AJ. Economic evaluation of a community based exercise programme to prevent falls. *Journal of Epidemiology and Community Health* 2001;**55**(8): 600–6.

Campbell 1999 *{published and unpublished data}*

* Campbell AJ, Robertson MC, Gardner MM, Norton RN, Buchner DM. Psychotropic medication withdrawal and a home-based exercise program to prevent falls: a randomized, controlled trial. *Journal of the American Geriatrics Society* 1999;**47**(7):850–3. [MEDLINE: 99331816]

Robertson MC. *Development of a falls prevention programme for elderly people: evaluation of efficacy, effectiveness, and*

efficiency [PhD thesis]. Dunedin, New Zealand: University of Otago, 2001.

Robertson MC, Campbell AJ, Gardner MM, Devlin N. Preventing injuries in older people by preventing falls: a meta-analysis of individual-level data. *Journal of the American Geriatrics Society* 2002;**50**:905–11.

Carpenter 1990 *{published data only}*

Carpenter GI, Demopoulos GR. Screening the elderly in the community: controlled trial of dependency surveillance using a questionnaire administered by volunteers. *BMJ* 1990;**300**:1253–6. [MEDLINE: 90283608]

Carter 1997 *{unpublished data only}*

Carter S, Campbell E, Sanson-Fisher R, Tiller K, Gillespie WJ. A randomised controlled trial of two strategies aimed at reducing falls and other unintentional events through home modification and medication review. Unpublished.

Carter 2002 *{published data only}*

* Carter ND, Khan KM, McKay HA, Petit MA, Waterman C, Heinonen A, et al. Community-based exercise program reduces risk factors for falls in 65- to 75-year-old women with osteoporosis: Randomized controlled trial. *CMAJ: Canadian Medical Association Journal* 2002;**167**(9): 997–1004.

Carter ND, Khan KM, Petit MA, Heinonen A, Waterman C, Donaldson MG, et al. Results of a 10 week community based strength and balance training programme to reduce fall risk factors: a randomised controlled trial in 65-75 year old women with osteoporosis. *British Journal of Sports Medicine* 2001;**35**(5):348–51.

Cerny 1998 *{published and unpublished data}*

Cerny K, Blanks R, Mohamed O, Schwab D, Robinson B, Russo A, Zizz C. The effect of a multidimensional exercise program on strength, range of motion, balance and gait in the well elderly [abstract]. *Gait & Posture* 1998;**7**(2):185–6.

Close 1999 *{published data only}*

Close J. Can the incidence of falls in the elderly be reduced by a secondary prevention protocol?. In: National Research Register, Oxford: Update Software; 2003, Issue 2.

* Close J, Ellis M, Hooper R, Glucksman E, Jackson S, Swift C. Prevention of falls in the elderly trial (PROFET): a randomised controlled trial. *Lancet* 1999;**353**(9147):93–7. [MEDLINE: 99146498]

Close J, Hooper R, Glucksman E, Jackson S, Swift C. Predictors of falls in a high risk population - results from the prevention of falls in the elderly trial (PROFET) [abstract]. *Journal of the American Geriatrics Society* 2000;**48**(8):S79.

Close JCT, Patel A, Hooper R, Glucksman E, Jackson SHD, Swift CG. PROFET - Improved clinical outcomes at no additional cost [abstract]. *Age and Ageing* 2000;**29**(Suppl 1):48.

Coleman 1999 *{published data only}*

Coleman EA, Grothaus LC, Sandhu N, Wagner EH. Chronic care clinics: a randomized controlled trial of a new model of primary care for frail older adults. *Journal of the American Geriatrics Society* 1999;**47**(7):775–83. [MEDLINE: 99331805]

Cornillon 2002 *{published data only}*

Cornillon E, Blanchon MA, Ramboatisetraina P, Braize C, Beaucher O, Dubost V, et al. Effectiveness of falls prevention strategies for elderly subjects who live in the community with performance assessment of physical activities (before-after). [French]. *Annales de Readaptation et de Medecine Physique* 2002;**45**(9):493–504.

Cumming 1999 *{published data only}*

Cumming RG, Thomas M, Szonyi G, Frampton G, Salkeld G, Clemson L. Adherence to occupational therapist recommendations for home modifications for falls prevention. *The American Journal of Occupational Therapy* 2001;**55**(6):641–8.

* Cumming RG, Thomas M, Szonyi G, Salkeld G, O'Neill E, Westbury C, et al. Home visits by an occupational therapist for assessment and modification of environmental hazards: a randomized trial of falls prevention. *Journal of the American Geriatrics Society* 1999;**47**(12):1397–1402. [MEDLINE: 20057188]

Salkeld G, Cumming RG, O'Neill E, Thomas M, Szonyi G, Westbury C. The cost effectiveness of a home hazard reduction program to reduce falls among older persons. *Australian & New Zealand Journal of Public Health* 2000;**24**(3):265–71. [MEDLINE: 20393108]

Dawson-Hughes 1997 *{published data only}*

Dawson-Hughes B, Harris SS, Krall EA, Dallal GE. Effect of calcium and vitamin D supplementation on bone density in men and women 65 years of age or older. *New England Journal of Medicine* 1997;**337**(10):670–6. [MEDLINE: 97407843]

Day 2002 *{published and unpublished data}*

Day L, Fildes B, Gordon I, Fitzharris M, Flamer H, Lord S. Randomised factorial trial of falls prevention among older people living in their own homes. *BMJ* 2002;**325**(7356):128–31.

Donald 2000 *{published data only}*

Donald IP, Pitt K, Armstrong E, Shuttleworth H. Preventing falls on an elderly care rehabilitation ward. *Clinical Rehabilitation* 2000;**14**(2):178–85.

Ebrahim 1997 *{published data only}*

Ebrahim S, Thompson PW, Baskaran V, Evans K. Randomized placebo-controlled trial of brisk walking in the prevention of postmenopausal osteoporosis. *Age and Ageing* 1997;**26**(4):253–60. [MEDLINE: 97415488]

Fabacher 1994 *{published data only}*

Fabacher D, Josephson K, Pietruszka F, Linderborn K, Morley JE, Rubenstein LZ. An in-home preventive assessment program for independent older adults: a randomized controlled trial. *Journal of the American Geriatrics Society* 1994;**42**(6):630–8. [MEDLINE: 94259993]

Fiatarone 1997 *{published data only}*

Fiatarone MA, O'Neill EF, Doyle RN, Clements K. Efficacy of home-based resistance training in frail elders. Abstracts of the 16th Congress of the International Association

of Gerontology. Bedford Park, South Australia: World Congress of Gerontology Inc, 1997:323 Abstract 985.

Gallagher 1996 *{published data only}*

Gallagher EM, Brunt H. Head over heels: impact of a health promotion program to reduce falls in the elderly. *Canadian Journal on Aging* 1996;**15**(1):84–96. [EMBASE 1996164172]

Gray-Donald 1995 *{published data only}*

Gray-Donald K, Payette H, Boutier V. Randomized clinical trial of nutritional supplementation shows little effect on functional status among free-living frail elderly. *Journal of Nutrition* 1995;**125**(12):2965–71. [MEDLINE: 96101687]

Hogan 2001 *{published data only}*

Hogan DB, MacDonald FA, Betts J, Bricker S, Eby EM, Delarue B, et al. A randomized controlled trial of a community-based consultation service to prevent falls. *CMAJ: Canadian Medical Association Journal* 2001;**165**(5):537–43.

Hornbrook 1994 *{published data only}*

* Hornbrook MC, Stevens VJ, Wingfield DJ, Hollis JF, Greenlick MR, Ory MG. Preventing falls among community-dwelling older persons: results from a randomized trial. *Gerontologist* 1994;**34**(1):16–23. [MEDLINE: 94200619]

Stevens VJ, Hornbrook MC, Wingfield DJ, Hollis JF, Greenlick MR, Ory MG. Design and implementation of a falls prevention intervention for community-dwelling older persons. *Behavior, Health, and Aging* 1991/92;**2**(1):57–73.

Jensen 2002 *{published and unpublished data}*

Jensen J, Lundin-Olsson L, Nyberg L, Gustafson Y. Fall and injury prevention in older people living in residential care facilities: A cluster randomized trial. *Annals of Internal Medicine* 2002;**136**(10):733–41.

Jitapunkul 1998 *{published data only}*

Jitapunkul S. A randomised controlled trial of regular surveillance in Thai elderly using a simple questionnaire administered by non-professional personnel. *Journal of the Medical Association of Thailand* 1998;**81**(5):352–6. [MEDLINE: 98286238]

Kenny 2001 *{published data only}*

Kenny RA. Cardiac pacing for the prevention of recurrent falls in carotid sinus hypersensitivity. In: NHS Executive - Northern and Yorkshire, Research and Development Directorate <http://www.doh.gov.uk/nth&york/id7.htm> (accessed 11/09/00).

Kenny RA, Richardson DA. Carotid sinus syndrome and falls in older adults. *American Journal of Geriatric Cardiology* 2001;**10**(2):97–9.

* Kenny RA, Richardson DA, Steen N, Bexton RS, Shaw FE, Bond J. Carotid sinus syndrome: a modifiable risk factor for nonaccidental falls in older adults (SAFE PACE). *Journal of the American College of Cardiology* 2001;**38**(5):1491–6.

Kenny RA, Seifer CM. SAFE PACE - 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. *American Journal of Geriatric Cardiology* 1999;**8**(2):87–90.
- Richardson DA, Steen N, Bond J, Bexton R, Kenny RA. Cardiac pacing reduces falls in carotid sinus hypersensitivity [abstract]. *Age and Ageing* 2000;**29**(Suppl 1):46.
- Kingston 2001** *{published data only}*
- Kingston P. Elderly people and accidents: a prospective analysis of accidental causation among elderly populations and their post discharge requirements. In: National Research Register, Oxford: Update Software; 2000, issue 2.
- Kingston P, Jones M, Crome P. A RCT of health visitor (HV) intervention in falls [abstract]. *Age & Ageing* 2001;**30** (Suppl 1):40.
- * Kingston P, Jones M, Lally F, Crome P. Older people and falls: A randomized controlled trial of a health visitor (HV) intervention. *Reviews in Clinical Gerontology* 2001;**11**(3): 209–14.
- Latham 2003** *{published data only}*
- Latham NK, Anderson CS, Lee A, Bennett DA, Moseley A, Cameron ID. A randomized, controlled trial of quadriceps resistance exercise and vitamin D in frail older people: The Frailty Interventions Trial in Elderly Subjects (FITNESS). *Journal of the American Geriatrics Society* 2003;**51**:291–9.
- Lightbody 2002** *{published data only}*
- Leathley M. Fallers attending casualty. In: National Research Register, Oxford: Update Software; 2001, Issue 1.
- * Lightbody E, Watkins C, Leathley M, Sharma A, Lye M. Evaluation of a nurse-led falls prevention programme versus usual care: a randomized controlled trial. *Age & Ageing* 2002;**31**(3):203–10.
- Lord 1995** *{published data only}*
- * Lord SR, Ward JA, Williams P, Strudwick M. The effect of a 12-month exercise trial on balance, strength, and falls in older women: a randomized controlled trial. *Journal of the American Geriatrics Society* 1995;**43**:1198–206. [MEDLINE: 96046713]
- Lord SR, Ward JA, Williams P, Zivanovic E. The effects of a community exercise program on fracture risk factors in older women. *Osteoporosis International* 1996;**6**(5):361–7. [MEDLINE: 97084696]
- Mayo 1994** *{published data only}*
- Mayo NE, Gloutney L, Levy AR. A randomized trial of identification bracelets to prevent falls among patients in a rehabilitation hospital. *Archives of Physical Medicine and Rehabilitation* 1994;**75**:1302–8. [MEDLINE: 95085380]
- McMurdo 1997** *{published data only}*
- McMurdo ME, Mole PA, Paterson CR. Controlled trial of weight bearing exercise in older women in relation to bone density and falls. *BMJ* 1997;**314**:596. [MEDLINE: 97208774]
- McMurdo 2000** *{published data only}*
- * McMurdo ME, Millar AM, Daly F. A randomized controlled trial of fall prevention strategies in old peoples' homes. *Gerontology* 2000;**46**(2):83–7. [MEDLINE: 20138046]
- Millar AM, McMurdo MET. A trial of falls prevention. *Age and Ageing* 1999;**28** Suppl 1:15.
- Means 1996** *{published data only}*
- Means KM, Rodell DE, O'Sullivan PS, Cranford LA. Rehabilitation of elderly fallers: pilot study of a low to moderate intensity exercise program. *Archives of Physical Medicine and Rehabilitation* 1996;**77**:1030–6. [MEDLINE: 97010849]
- Mulrow 1994** *{published data only}*
- * Mulrow CD, Gerety MB, Kanten D, Cornell JE, DeNino LA, Chiodo L, et al. A randomized trial of physical rehabilitation for very frail nursing home residents. *JAMA* 1994;**271**(7):519–24. [MEDLINE: 94133363]
- Mulrow CD, Gerety MB, Kanten DN. Effects of physical therapy on functional status of nursing home residents. *Journal of the American Geriatrics Society* 1993;**41**(3):326–8. [MEDLINE: 94133363]
- Newbury 2001** *{published data only}*
- Newbury J, Marley J. Preventive home visits to elderly people in the community. Visits are most useful for people aged >75 [letter]. *BMJ* 2000;**321**(7529):512.
- * Newbury JW, Marley JE, Beilby J. A randomised controlled trial of the outcome of health assessment of people aged 75 years and over. *MJA* 2001;**175**:104–7.
- Nikolaus 2003** *{published data only}*
- Nikolaus T, Bach M. Preventing falls in community-dwelling frail older people using a home intervention team (HIT): Results from the randomized falls-HIT trial. *Journal of the American Geriatrics Society* 2003;**51**:300–5.
- Nowalk 2001** *{published data only}*
- Nowalk MP, Prendergast JM, Bayles CM, D'Amico FJ, Colvin GC. A randomized trial of exercise programs among older individuals living in two long-term care facilities: the FallsFREE program. *Journal of the American Geriatrics Society* 2001;**49**(7):859–65.
- Pardessus 2002** *{published data only}*
- Pardessus V, Puisieux F, Di P, Gaudefroy C, Thevenon A, Dewailly P. Benefits of home visits for falls and autonomy in the elderly: A randomized trial study. *American Journal of Physical Medicine & Rehabilitation* 2002;**81**(4):247–52.
- Pereira 1998** *{published data only}*
- Kriska AM, Bayles C, Cauley JA, LaPorte RE, Sandler RB, Pambianco G. A randomized exercise trial in older women: increased activity over two years and the factors associated with compliance. *Medicine and Science in Sports and Exercise* 1986;**18**(5):557–62.
- Pereira MA. *Ten year follow-up of a randomized exercise trial in post-menopausal women [PhD thesis]*. University of Pittsburgh, 1996. [Proquest Digital Dissertations Publication Number AAT 97 16627]
- * Pereira MA, Kriska AM, Day RD, Cauley JA, LaPorte RE, Kuller LH. A randomized walking trial in postmenopausal women: effects on physical activity and health 10 years later.

- Archives of Internal Medicine* 1998;**158**(15):1695–701. [MEDLINE: 98364834]
- Pfeifer 2000** *{published data only}*
Pfeifer M, Begerow B, Minne HW, Abrams C, Nachtigall D, Hansen C. Effects of a short-term vitamin D and calcium supplementation on body sway and secondary hyperparathyroidism in elderly women. *Journal of Bone and Mineral Research* 2000;**15**(6):1113–8. [MEDLINE: 20297874]
- Ray 1997** *{published data only}*
Ray WA, Taylor JA, Meador KG, Thapa PB, Brown AK, Kajihara HK, et al. A randomized trial of a consultation service to reduce falls in nursing homes. *JAMA* 1997;**278**(7):557–62. [MEDLINE: 97412163]
- Reinsch 1992** *{published data only}*
El-Faizy M, Reinsch S. Home safety intervention for the prevention of falls. *Physical & Occupational Therapy in Geriatrics* 1994;**12**(3):33–49. [EMBASE 1994365778]
MacRae PG, Feltner ME, Reinsch S. A 1-year exercise program for older women: effects on falls, injuries, and physical performance. *Journal of Aging and Physical Activity* 1994;**2**:127–42.
* Reinsch S, MacRae P, Lachenbruch PA, Tobis JS. Attempts to prevent falls and injury: a prospective community study. *Gerontologist* 1992;**32**:450–6. [MEDLINE: 93051520]
Tobis J, Reinsch S, McRae P, Lachenbruch T. Experimental intervention at senior centres for the prevention of falls [abstract]. *Journal of the American Geriatrics Society* 1990;**38**(8):A28.
- Robertson 2001a** *{published and unpublished data}*
Robertson MC. *Development of a falls prevention programme for elderly people: evaluation of efficacy, effectiveness, and efficiency [PhD thesis]*. Dunedin, New Zealand: University of Otago, 2001.
Robertson MC, Campbell AJ, Gardner MM, Devlin N. Preventing injuries in older people by preventing falls: a meta-analysis of individual-level data. *Journal of the American Geriatrics Society* 2002;**50**(5):905–11.
* Robertson MC, Devlin N, Gardner MM, Campbell AJ. Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. *BMJ* 2001;**322**(7288): 697–701. [MEDLINE: 21164961]
- Rubenstein 1990** *{published data only}*
Rubenstein LZ, Robbins AS, Josephson KR, Schulman BL, Osterweil D. The value of assessing falls in an elderly population. A randomized clinical trial. *Annals of Internal Medicine* 1990;**113**:308–16. [MEDLINE: 90328562]
- Rubenstein 2000** *{published data only}*
Rubenstein LZ, Josephson KR, Trueblood PR, Loy S, Harker JO, Pietruszka FM, et al. Effects of a group exercise program on strength, mobility, and falls among fall-prone elderly men. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 2000;**55**(6):M317–21. [MEDLINE: 20300337]
- Ryan 1996** *{published data only}*
Ryan JW, Spellbring AM. Implementing strategies to decrease risk of falls in older women. *Journal of Gerontological Nursing* 1996;**22**(12):25–31. [MEDLINE: 97213715]
- Sato 1999** *{published data only}*
Sato Y, Manabe S, Kuno H, Oizumi K. Amelioration of osteopenia and hypovitaminosis D by 1alpha-hydroxyvitamin D3 in elderly patients with Parkinson's disease. *Journal of Neurology, Neurosurgery and Psychiatry* 1999;**66**(1):64–8. [MEDLINE: 99101545]
- Schnelle 2003** *{published data only}*
Effects of functional incidental training in VA NHCU. In: ClinicalTrials.gov.
Schnelle JF, Alessi CA, Simmons SF. Translating clinical records into practice. A randomized controlled trial of exercise and incontinence care with nursing home residents. *Journal of the American Geriatrics Society* 2002;**50**:1476–83.
* Schnelle JF, Kapur K, Alessi C, Osterweil D, Beck JG, Al Samarrai NR, et al. Does an exercise and incontinence intervention save healthcare costs in a nursing home population?. *Journal of the American Geriatrics Society* 2003;**51**(2):161–8.
- Shaw 2003** *{published data only}*
Dawson P, Chapman KL, Shaw FE, Kenny RA. Measuring the outcome of physiotherapy in cognitively impaired elderly patients who fall. *Physiotherapy* 1997;**83**(7):352.
Shaw F. Physiotherapy intervention for cognitively impaired elderly fallers attending casualty. In: National Research Register, Oxford: Update Software; 2003, Issue 2.
Shaw F. Risk modification of falls in cognitively impaired elderly patients attending a casualty department. A randomised controlled explanatory study. In: National Research Register, Oxford: Update Software; 2003, Issue 2.
* Shaw FE, Bond J, Richardson DA, Dawson P, Steen IN, McKeith IG, et al. Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial. *BMJ* 2003;**326**(7380):73–5.
Shaw FE, Richardson DA, Dawson P, Steen IN, McKeith IG, Bond J, et al. Can multidisciplinary intervention prevent falls in patients with cognitive impairment and dementia attending a casualty department [abstract]. *Age & Ageing* 2000;**29**(Suppl 1):47.
- Steinberg 2000** *{published data only}*
Peel N, Steinberg M, Williams G. Home safety assessment in the prevention of falls among older people. *Australian and New Zealand Journal of Public Health* 2000;**24**(5): 536–9. [MEDLINE: 20561929]
* Steinberg M, Cartwright C, Peel N, Williams G. A sustainable programme to prevent falls and near falls in community dwelling older people: results of a randomised trial. *Journal of Epidemiology & Community Health* 2000;**54**(3):227–32. [MEDLINE: 20210213]
- Stevens 2001** *{published data only}*
Stevens M, Holman CD, Bennett N. Preventing falls in older people: Impact of an intervention to reduce

- environmental hazards in the home. *Journal of the American Geriatrics Society* 2001;**49**(11):1442–7.
- * Stevens M, Holman CD, Bennett N, De Klerk N. Preventing falls in older people: Outcome evaluation of a randomized controlled trial. *Journal of the American Geriatrics Society* 2001;**49**(11):1448–55.
- Tideiksaar 1993** *{published data only}*
Tideiksaar R, Feiner CF, Maby J. Falls prevention: the efficacy of a bed alarm system in an acute-care setting. *Mount Sinai Journal of Medicine* 1993;**60**(6):522–7. [MEDLINE: 94166787]
- Tinetti 1994** *{published data only}*
King MB, Tinetti ME. A multifactorial approach to reducing injurious falls. *Clinics in Geriatric Medicine* 1996; **12**(4):745–59. [MEDLINE: 97050676]
Koch M, Gottschalk M, Baker DI, Palumbo S, Tinetti ME. An impairment and disability assessment and treatment protocol for community-living elderly persons. *Physical Therapy* 1994;**74**:286–94; discussion 295–8. [MEDLINE: 94188401]
Rizzo JA, Baker DI, McAvay G, Tinetti ME. The cost-effectiveness of a multifactorial targeted prevention program for falls among community elderly persons. *Medical Care* 1996;**34**(9):954–69. [MEDLINE: 96384923]
Tinetti ME. Prevention of falls and fall injuries in elderly persons: a research agenda. *Preventive Medicine* 1994;**23**: 756–62. [MEDLINE: 95148513]
Tinetti ME, Baker DI, Garrett PA, Gottschalk M, Koch ML, Horwitz RI. Yale FICSIT: risk factor abatement strategy for fall prevention. *Journal of the American Geriatrics Society* 1993;**41**:315–20. [MEDLINE: 93179670]
* Tinetti ME, Baker DI, McAvay G, Claus EB, Garrett P, Gottschalk M, et al. A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *New England Journal of Medicine* 1994;**331** (13):821–7. [MEDLINE: 94359542]
Tinetti ME, McAvay G, Claus E. Does multiple risk factor reduction explain the reduction in fall rate in the Yale FICSIT Trial? Frailty and Injuries Cooperative Studies of Intervention Techniques. *American Journal of Epidemiology* 1996;**144**(4):389–99. [MEDLINE: 96316784]
- van Haastregt 2000** *{published data only}*
van Haastregt JC, Diederiks JP, van Rossum E, de Witte LP, Voorhoeve PM, Crebolder HF. Effects of a programme of multifactorial home visits on falls and mobility impairments in elderly people at risk: randomised controlled trial. *BMJ* 2000;**321**(7267):994–8. [MEDLINE: 20495087]
- van Rossum 1993** *{published data only}*
van Rossum E, Frederiks CM, Philipsen H, Portengen K, Wiskerke J, Knipschild P. Effects of preventive home visits to elderly people. *BMJ* 1993;**307**(6895):27–32. [MEDLINE: 93344660]
- Vassallo 2001** *{published data only}*
Vassallo M, Vignaraja R, Sharma JC, Briggs RS, Allen SC. Can intervention prevent falls and injury in geriatric wards? Hospital injury prevention (HIP) study [abstract]. *Age Ageing* 2001;**30**(Suppl 2):15.
- Vellas 1991** *{published data only}*
Vellas B, Albaredo JL. A randomized clinical trial on the value of raubasine-dihydroergocristine (Iskedyl(TM)) in the prevention of post fall syndrome [Effet de l'association raubasine-dihydroergocristine (Iskedyl(TM)) sur le syndrome post-chute et sur la prevention de la chute chez le sujet age]. *Psychologie Medicale* 1991;**23**(7):831–9. [EMBASE 1991275391]
- Vetter 1992** *{published data only}*
Vetter NJ, Lewis PA, Ford D. Can health visitors prevent fractures in elderly people?. *BMJ* 1992;**304**:888–90. [MEDLINE: 93006043]
- Wagner 1994** *{published data only}*
Wagner EH, LaCroix AZ, Grothaus L, Leveille SG, Hecht JA, Artz K, et al. Preventing disability and falls in older adults: a population-based randomized trial. *American Journal of Public Health* 1994;**84**:1800–6. [MEDLINE: 95068562]
- Wolf 1996** *{published data only}*
McNeely E, Clements SD, Wolf SL. A program to reduce frailty in the elderly. In: Funk SG, Tornquist EM, Champagne MT, Weise RA editor(s). *Key aspects of elder care: managing falls, incontinence, and cognitive impairment*. New York: Springer, 1992:89–96.
Wolf SL, Barnhart HX, Ellison GL, Coogler CE, Horak FB. The effect of Tai Chi Quan and computerized balance training on postural stability in older subjects. *Physical Therapy* 1997;**77**(4):371–84.
* Wolf SL, Barnhart HX, Kutner NG, McNeely E, Coogler C, Xu T. Reducing frailty and falls in older persons: an investigation of Tai Chi and computerized balance training. *Journal of the American Geriatrics Society* 1996;**44**:489–97. [MEDLINE: 96208898]
Wolf SL, Kutner NG, Green RC, McNeely E. The Atlanta FICSIT study: two exercise interventions to reduce frailty in elders. *Journal of the American Geriatrics Society* 1993;**41** (3):329–32. [MEDLINE: 93179673]

References to studies excluded from this review

- Abreu 1998** *{published data only}*
Abreu N, Hutchins J, Matson J, Polizzi N, Seymour CJ. Effect of group versus home visit safety education and prevention strategies for falling in community-dwelling elderly persons. *Home Health Care Management & Practice* 1998;**10**(4):57–65.
- Ades 1996** *{published data only}*
Ades PA, Ballor DL, Ashikaga T, Utton JL, Nair KS. Weight training improves walking endurance in healthy elderly persons. *Annals of Internal Medicine* 1996;**124**:568–72.
- Allen 1986** *{published data only}*
Allen CM, Becker PM, McVey LJ, Saltz C, Feussner JR, Cohen HJ. A randomized, controlled clinical trial of a geriatric consultation team. Compliance with recommendations. *JAMA* 1986;**255**:2617–21.

Bean 2002 *{published data only}*

* Bean J, Herman S, Kiely DK, Callahan D, Mizer K, Frontera WR, et al. Weighted stair climbing in mobility-limited older people: a pilot study. *Journal of the American Geriatrics Society* 2002;**50**(4):663–70.
Bean JF, Kiely DK, Herman S, Leveille SG, Mizer K, Frontera WR, et al. The relationship between leg power and physical performance in mobility-limited older people. *Journal of the American Geriatrics Society* 2002;**50**(3):461–7.

Binder 1995 *{published data only}*

Binder EF. Implementing a structured exercise program for frail nursing home residents with dementia: issues and challenges. *Journal of Aging and Physical Activity* 1995;**3**:383–95.
* Binder EF, Brown M, Craft S, Schechtman KB, Birge SJ. Effects of a group exercise program on risk factors for falls in frail older adults. *Journal of Aging and Physical Activity* 1994;**2**:25–37.

Bowling 1992 *{published data only}*

Bowling A, Formby J. Accidents in elderly care: a randomised controlled trial (Part 1). *Nursing Standard* 1992;**6**(29):28–30.
Bowling A, Formby J, Grant K. Accidents in elderly care: a randomised controlled trial (Part 2). *Nursing Standard* 1992;**6**:28–31.
Bowling A, Formby J, Grant K. Accidents in elderly care: a randomised controlled trial (Part 3). *Nursing Standard* 1992;**6**:25–7.

Buchner 1997b *{published data only}*

Buchner DM, Cress ME, de Lateur BJ, Esselman PC, Margherita AJ, Price R, et al. A comparison of the effects of three types of endurance training on balance and other fall risk factors in older adults. *Aging-Clinical & Experimental Research* 1997;**9**(1-2):112–9.

Caplan 1999 *{published data only}*

Caplan GA, Ward JA, Brennan NJ, Coconis J, Board N, Brown A. Hospital in the home: a randomised controlled trial. *Medical Journal of Australia* 1999;**170**(4):156–60.

Charette 1991 *{published data only}*

Charette SL, McEvoy L, Pyka G, Snow Harter C, Guido D, Wiswell RA, et al. Muscle hypertrophy response to resistance training in older women. *Journal of Applied Physiology* 1991;**70**(5):1912–6.

Cheng 2001 *{published data only}*

Cheng P-T, Wu S-H, Liaw M-Y, Wong A.M, Tang F-T. Symmetrical body-weight distribution training in stroke patients and its effect on fall prevention. *Archives of Physical Medicine and Rehabilitation* 2001;**82**:1650–4.

Chin A Paw 2001 *{published data only}*

Chin A Paw MJ, de Jong N, Schouten EG, Hiddink GJ, Kok FJ. Physical exercise and/or enriched foods for functional improvement in frail, independently living elderly: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 2001;**82**:811–7.

Clark 1975 *{published data only}*

Clark BA, Wade MG, Massey BH, Van Dyke R. Response of institutionalized geriatric mental patients to a twelve-week program of regular physical activity. *Journals of Gerontology* 1975;**30**:565–73.

Crilly 1989 *{published data only}*

Crilly RG, Willems DA, Trenholm KJ, Hayes KC, Delaquerriere Richardson LF. Effect of exercise on postural sway in the elderly. *Gerontology* 1989;**35**:137–43.

Crotty 2002 *{published data only}*

Crotty M, Kittel A, Hayball N. Home rehabilitation for older adults with fractured hips: how many will take part?. *Journal of Quality in Clinical Practice* 2000;**20**(2-3):65–8.
* Crotty M, Whitehead CH, Gray S, Finucane PM. Early discharge and home rehabilitation after hip fracture achieves functional improvements: a randomised controlled trial. *Clinical Rehabilitation* 2002;**16**(4):406–13.

Deery 2000 *{published data only}*

Deery HA, Day LM, Fildes BN. An impact evaluation of a falls prevention program among older people. *Accident Analysis and Prevention* 2000;**32**(3):427–33.

Earles 2001 *{published data only}*

Earles DR, Judge JO, Gunnarsson OT. Velocity training induces power-specific adaptations in highly functioning older adults. *Archives of Physical Medicine & Rehabilitation* 2001;**82**(7):872–8.

Fiatarone 1994 *{published data only}*

Fiatarone MA, O'Neill EF, Doyle N, Clements KM, Roberts SB, Kehajias JJ, et al. The Boston FICSIT study: the effects of resistance training and nutritional supplementation on physical frailty in the oldest old. *Journal of the American Geriatrics Society* 1993;**41**(3):333–7.
* Fiatarone MA, O'Neill EF, Ryan ND, Clements KM, Solares GR, Nelson ME, et al. Exercise training and nutritional supplementation for physical frailty in very elderly people. *New England Journal of Medicine* 1994;**330**:1769–75.

Galindo-Ciocon 1995 *{published data only}*

Galindo-Ciocon DJ, Ciocon JO, Galindo DJ. Gait training and falls in the elderly. *Journal of Gerontological Nursing* 1995;**21**(6):10–7,54–5.

Geiger 2001 *{published data only}*

Geiger RA, Allen JB, O'Keefe J, Hicks RR. Balance and mobility following stroke: effects of physical therapy interventions with and without biofeedback/forceplate training. *Physical Therapy* 2001;**81**(4):995–1005.

Gerson 2001 *{published and unpublished data}*

* Gerson W, Blanda M, Janakiram M. A randomized trial of three strategies for primary prevention of falls in elders [abstract]. *Academic Emergency Medicine* 2001;**8**(5):530.

Graafmans 1996 *{published data only}*

* Graafmans WE, Ooms ME, Hofstee HMA, Bezemer PD, Bouter LM, Lips P. Falls in the elderly: a prospective

- study of risk factors and risk profiles. *American Journal of Epidemiology* 1996;**143**(11):1129–36.
- Lips P, Graafmans WS, Ooms ME, Bezemer PD, Bouter LM. Vitamin D supplementation and fracture incidence in elderly persons. *Annals of Internal Medicine* 1996;**124**:400–6.
- Green 2002** *{published data only}*
Green J, Forster A, Bogle S, Young J. Physiotherapy for patients with mobility problems more than 1 year after stroke: a randomised controlled trial. *Lancet* 2002;**359** (9302):199–203.
- Greendale 2000** *{published data only}*
Greendale GA, Salem GJ, Young JT, Damesyn M, Marion M, Wang MY, et al. A randomized trial of weighted vest use in ambulatory older adults: strength, performance, and quality of life outcomes. *Journal of the American Geriatrics Society* 2000;**48**(3):305–11.
- Hagberg 1989** *{published data only}*
Hagberg JM, Graves JE, Limacher M, Woods DR, Leggett SH, Cononie C, et al. Cardiovascular responses of 70 to 79 yr old men and women to exercise training. *Journal of Applied Physiology* 1989;**66**(6):2589–94.
- Hall 1992** *{published data only}*
Hall N, De Beck P, Johnson D, Mackinnon K, Gutman G, Glick N. Randomized trial of a health promotion program for frail elders. *Canadian Journal of Aging* 1992;**11**:72–91.
- Hansen 1992** *{published data only}*
Hansen FR, Spedtsberg K, Schroll M. Geriatric follow-up by home visits after discharge from hospital. A randomized controlled trial. *Age and Ageing* 1992;**21**:445–50.
- Hebert 2001** *{published data only}*
Hébert R, Robichaud L, Roy PM, Bravo G, Voyer L. Efficacy of a nurse-led multidimensional preventive programme for older people at risk of functional decline. A randomized controlled trial. [see comments.]. *Age and Ageing* 2001;**30**(2):147–53.
- Hendrich 1988** *{published data only}*
Hendrich A. An effective unit-based fall prevention plan. *Journal of Nursing Quality Assurance* 1988;**3**(1):28–36.
- Hendriksen 1984** *{published data only}*
Hendriksen C, Lund E, Stromgard E. Consequences of assessment and intervention among elderly people: a three-year randomised controlled trial. *BMJ* 1984;**289**:1522–4.
- Hendriksen 1989** *{published data only}*
Hendriksen C, Lund E, Stromgard E. Hospitalization of elderly people. A 3-year controlled trial. *Journal of the American Geriatrics Society* 1989;**37**:117–22. [MEDLINE: 89093685]
- Hofmeyer 2002** *{published data only}*
Hofmeyer MR, Alexander NB, Nyquist LV, Medell JL, Koreishi A. Floor-rise strategy training in older adults. *Journal of the American Geriatrics Society* 2002;**50**(10):1702–6.
- Holmqvist 1998** *{published data only}*
* Holmqvist LW, von Koch L, Kostulas V, Holm M, Widsell G, et al. A randomized controlled trial of rehabilitation at home after stroke in southwest Stockholm. *Stroke* 1998;**29**:591–7.
von Koch L, Pedro-Cuesta J, Kostulas V, Almazan J, Widen HL. Randomized controlled trial of rehabilitation at home after stroke: one-year follow-up of patient outcome, resource use and cost. *Cerebrovascular Diseases* 2001;**12**(2):131–8.
von Koch L, Widen HL, Kostulas V, Almazan J, Pedro-Cuesta J. A randomized controlled trial of rehabilitation at home after stroke in Southwest Stockholm: outcome at six months. *Scandinavian Journal of Rehabilitation Medicine* 2000;**32**(2):80–6.
- Hopman-Rock 1999** *{published data only}*
Hopman-Rock M, Staats PGM, Tak ECPM, Droes RM. The effects of a psychomotor activation programme for use in groups of cognitively impaired people in homes for the elderly. *International Journal of Geriatric Psychiatry* 1999;**14** (8):633–42. [MEDLINE: 99419500]
- Hu 1994** *{published data only}*
Hu MH, Woollacott MH. Multisensory training of standing balance in older adults: I. Postural stability and one-leg stance balance. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 1994;**49**:M52–61. [MEDLINE: 94172212]
Hu MH, Woollacott MH. Multisensory training of standing balance in older adults: II. Kinematic and electromyographic postural responses. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 1994;**49**:M62–71. [MEDLINE: 94172213]
- Judge 1993** *{published data only}*
Judge JO, Lindsey C, Underwood M, Winsemius D. Balance improvements in older women: effects of exercise training. *Physical Therapy* 1993;**73**:254–62.
Judge JO, Underwood M, Gennosa T. Exercise to improve gait velocity in older persons. *Archives of Physical Medicine and Rehabilitation* 1993;**74**(4):400–6.
- Kelly 2002** *{published data only}*
Kelly KE, Phillips CL, Cain K, Polissar NL, Kelly PB. Evaluation of a nonintrusive monitor to reduce falls in nursing home patients. *Journal of the American Medical Directors Association* 2002;**3**(6):377–82.
- Kempton 2000** *{published data only}*
Hahn A, van Beurden E, Kempton A, Sladden T, Garner E. Meeting the challenge of falls prevention at the population level: a community-based intervention with older people in Australia. *Health Promotion International* 1996;**11**(3):203–11. [EMBASE 1996287598]
* Kempton A, van Beurden E, Sladden T, Garner E, Beard J. Older people can stay on their feet: Final results of a community-based falls prevention programme. *Health Promotion International* 2000;**15**(1):27–33. [EMBASE 2000091472]
van Beurden E, Kempton A, Sladden T, Garner E. Designing an evaluation for a multiple-strategy community

- intervention: the North Coast Stay on Your Feet program. *Australian and New Zealand Journal of Public Health* 1998;**22**(1):115–9. [MEDLINE: 98262596]
- Kerschman-Schindl 2000** *{published data only}*
Kerschman-Schindl K, Uher E, Kainberger F, Kaider A, Ghanem AH, Preisinger E. Long-term home exercise program: Effect in women at high risk of fracture. *Archives of Physical Medicine and Rehabilitation* 2000;**81**(3):319–23.
- Kilpack 1991** *{published data only}*
Kilpack V, Boehm J, Smith N, Mudge B. Using research-based interventions to decrease patient falls. *Applied Nursing Research* 1991;**4**:50–6.
- Krishna 1983** *{published data only}*
Krishna KM, Vancleave RJ. Decrease in the incidence of patient falls in a geriatric hospital after educational programs [letter]. *Journal of the American Geriatrics Society* 1983;**31**(3):187.
- Kuipers 1993** *{published data only}*
Kuipers HMM, Hoefnagels WHL, Van Lier HJJ. [Reduction of falling of hospitalised patients by using a risk index and taking preventive measures] Dutch. *Nederlands Tijdschrift voor Geneeskunde* 1993;**137**(40):2043–8. [EMBASE 1993308648]
- Kustaborder 1983** *{published data only}*
Kustaborder MJ, Rigney M. Interventions for safety. *Journal of Gerontological Nursing* 1983;**9**(3):158–62,173,182.
- Lamoureux 2003** *{published data only}*
Lamoureux EL, Murphy A, Sparrow A, Newton RU. The effects of progressive resistance training on obstructed-gait tasks in community-living older adults. *Journal of Aging & Physical Activity* 2003;**11**(1):98–110.
- Latham 2001** *{published data only}*
Latham NK, Stretton C, Ronald M. Progressive resistance strength training in hospitalised older people: a preliminary investigation. *New Zealand Journal of Physiotherapy* 2001;**29**(2):41–8.
- Lauritzen 1993** *{published data only}*
Lauritzen JB, Petersen MM, Lund B. Effect of external hip protectors on hip fractures. *Lancet* 1993;**341**:11–3.
Lauritzen JB, Petersen MM, Lund B. External hip protectors against hip fractures. A randomized study in a nursing home [Virknningen af eksterne hoftebeskyttere mod hoftebrud. En randomiseret plejehjemundersogelse]. *Ugeskrift for Laeger* 1993;**155**:1523–6.
- Lawrence 1992** *{published data only}*
Lawrence JJ, Maher PL. An interdisciplinary falls consult team: a collaborative approach to patient falls. *Journal of Nursing Care Quality* 1992;**6**:21–9.
- Li 2001** *{published data only}*
Li FZ, Harmer P, McAuley E, Duncan TE, Duncan SC, Chaumeton N, et al. An evaluation of the effects of Tai Chi exercise on physical function among older persons: A randomized controlled trial. *Annals of Behavioral Medicine* 2001;**23**(2):139–46.
* Li FZ, McAuley E, Harmer P, Duncan TE, Chaumeton NR. Tai Chi enhances self-efficacy and exercise behavior in older adults. *Journal of Aging & Physical Activity* 2001;**9**(2):161–71.
- Lichtenstein 1989** *{published data only}*
Lichtenstein MJ, Shields SL, Shiavi RG, Burger MC. Exercise and balance in aged women: a pilot controlled clinical trial. *Archives of Physical Medicine and Rehabilitation* 1989;**70**:138–43.
- Lord 1996a** *{published data only}*
Lord SR, Lloyd DL, Nirui M, Raymond J, Williams P, Stewart RA. The effect of exercise on gait patterns in older women: a randomized controlled trial. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 1996;**51A**(2):M64–70.
- Lord 1996b** *{published data only}*
Lord SR, Ward JA, Williams P. Exercise effect on dynamic stability in older women: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 1996;**77**:232–6.
- MacRae 1996** *{published data only}*
MacRae PG, Asplund LA, Schnelle JF, Ouslander JG, Abrahamse A, Morris C. A walking program for nursing home residents: effects on walk endurance, physical activity, mobility, and quality of life. *Journal of the American Geriatrics Society* 1996;**44**(2):175–80.
- McCabe 1985** *{published data only}*
McCabe F. Mind you don't fall. *Nursing Mirror* 1985;**160**(26):S2–6.
- McEwan 1990** *{published data only}*
McEwan RT, Davison N, Forster DP, Pearson P, Stirling E. Screening elderly people in primary care: a randomized controlled trial. *British Journal of General Practice* 1990;**40**:94–7.
- McMurdo 1993** *{published data only}*
McMurdo MET, Rennie L. A controlled trial of exercise by residents of old peoples homes. *Age and Ageing* 1993;**22**(1):11–5.
- Mills 1994** *{published data only}*
Mills EM. The effect of low intensity aerobic exercise on muscle strength, flexibility, and balance among sedentary elderly persons. *Nursing Research* 1994;**43**(4):207–11.
- Mohide 1988** *{published data only}*
Mohide EA, Tugwell PX, Caulfield PA, Chambers LW, Dunnett CW, Baptiste S, et al. A randomized trial of quality assurance in nursing homes. *Medical Care* 1988;**26**:554–65.
- Morganti 1995** *{published data only}*
Morganti CM, Nelson ME, Fiatarone MA, Dallal GE, Economos CD, Crawford BM, et al. Strength improvements with 1 year of progressive resistance training in older women. *Medicine and Science in Sports and Exercise* 1995;**27**(6):906–12.
- Morton 1989** *{published data only}*
Morton D. Five years of fewer falls. *American Journal of Nursing* 1989;**89**:204–5.
- Naso 1990** *{published data only}*
Naso F, Carner E, Blankfort Doyle W, Coughney K. Endurance training in the elderly nursing home patient.

- Archives of Physical Medicine and Rehabilitation* 1990;**71**(3): 241–3.
- Nichols 1993** *{published data only}*
Nichols JF, Omizo DK, Peterson KK, Nelson KP. Efficacy of heavy resistance training for active women over 60 -muscular strength, body composition, and program adherence. *Journal of the American Geriatrics Society* 1993; **41**(3):205–10.
- Obonyo 1983** *{published data only}*
Obonyo T, Drummond M, Isaacs B. Domiciliary physiotherapy for old people who have fallen. *International Rehabilitation Medicine* 1983;**5**:157–60. [MEDLINE: 84110737]
- Pathy 1992** *{published data only}*
Pathy MSJ, Bayer A, Harding K, Dibble A. Randomised trial of case finding and surveillance of elderly people at home. *Lancet* 1992;**340**:890–3.
- Plautz 1996** *{published data only}*
Plautz B, Selmar C, Beck DE, Radetsky M. Modifying the environment: a community-based injury-reduction program for elderly residents. *American Journal of Preventive Medicine* 1996;**12**(Suppl 4):33–8. [MEDLINE: 97028689]
- Ploeg 1994** *{published data only}*
Ploeg J, Black ME, Hutchison BG, Walter SD, Scott EAF, Chambers LW. Personal, home and community safety promotion with community-dwelling elderly persons: response to a public health nurse intervention. *Canadian Journal of Public Health* 1994;**85**(3):188–91.
- Pomeroy 1999** *{published data only}*
Pomeroy VM, Warren CM, Honeycombe C, Briggs RS, Wilkinson DG, Pickering RM, et al. Mobility and dementia: is physiotherapy treatment during respite care effective? . *International Journal of Geriatric Psychiatry* 1999;**14**(5): 389–97.
- Posner 1990** *{published data only}*
Posner JD, Gorman KM, Gitlin LN, Sands LP, Kleban M, Windsor L, et al. Effects of exercise training in the elderly on the occurrence and time to onset of cardiovascular disease. *Journal of the American Geriatrics Society* 1990;**38** (3):205–10.
- Poulstrup 2000** *{published data only}*
Poulstrup A, Jeune B. Prevention of fall injuries requiring hospital treatment among community-dwelling elderly. *European Journal of Public Health* 2000;**10**(1):45–50.
- Pujiula 2001** *{published data only}*
Pujiula Blanch M, APOC ABS Salt. Effectiveness of a multifactorial intervention to prevent falls in elderly people [Efectividad de una intervencion multifactorial para la prevencion de las caidas en ancianos de una comunidad]. *Atencion Primaria* 2001;**28**(6):431–6.
- Rainville 1984** *{published data only}*
Rainville NG. Effect of an implemented fall prevention program on the frequency of falls. *Qrb. Quality Review Bulletin* 1984;**10**:287–91.
- Rantz 2001** *{published data only}*
Rantz MJ, Popejoy L, Petroski GF, Madsen RW, Mehr DR, Zwygart-Stauffacher M, et al. Randomized clinical trial of a quality improvement intervention in nursing homes. *Gerontologist* 2001;**41**(4):525–38.
- Reuben 1995** *{published data only}*
* Reuben DB, Borok GM, Woldetsadik G, Ershoff DH, Fishman LK, Ambrosini VL, et al. A randomized trial of comprehensive geriatric assessment in the care of hospitalized patients. *New England Journal of Medicine* 1995;**332**:1345–50.
Sattin RW. Preventing injurious falls. *Lancet* 1997;**349**:150.
- Robbins 1992** *{published data only}*
Robbins S, Gouw GJ, McClaran J. Shoe sole thickness and hardness influence balance in older men. *Journal of the American Geriatrics Society* 1992;**40**:1089–94.
- Robertson 2001c** *{published data only}*
Gardner MM, Robertson MC, McGee R, Campbell AJ. Application of a falls prevention program for older people to primary health care practice. *Preventive Medicine* 2002; **34**:546–53.
* Robertson MC, Gardner MM, Devlin N, McGee R, Campbell AJ. Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 2: Controlled trial in multiple centres. *BMJ* 2001;**322** (7288):701–4.
- Robinson 2002** *{published data only}*
Robinson B, Gordon J, Wallentine S. Effectiveness of physical therapy intervention in decreasing the risk for falls in a community-dwelling aging population. *Orthopaedic Nursing* 2002;**21**(1):55–69.
- Sauvage 1992** *{published data only}*
Sauvage LR, Myklebust BM, Crowpan J, Novak S, Millington P, Hoffman MD, et al. A clinical trial of strengthening and aerobic exercise to improve gait and balance in elderly male nursing home residents. *American Journal of Physical Medicine and Rehabilitation* 1992;**71**(6): 333–42.
- Schlicht 2001** *{published data only}*
Schlicht J, Camaione DN, Owen SV. Effect of intense strength training on standing balance, walking speed, and sit-to-stand performance in older adults. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences* 2001;**56**(5):M281–6.
- Schmid 1990** *{published data only}*
Schmid NA. Reducing patient falls: a research-based comprehensive fall prevention program. *Military Medicine* 1990;**155**:202–7.
- Schnelle 1996** *{published data only}*
Schnelle JF, MacRae PG, Giacobassi K, MacRae HSH, Simmons SF, Ouslander JG. Exercise with physically restrained nursing home residents: maximising benefits of restraint reduction. *Journal of the American Geriatrics Society* 1996;**44**:507–12.

- Sherrington 1997** *{published data only}*
Sherrington C, Lord S. Home exercise to improve strength and walking velocity after hip fracture: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 1997;**78**:208–12.
- Shigematsu 2002** *{published data only}*
Shigematsu R, Chang M, Yabushita N, Sakai T, Nakagaichi M, Nho H, et al. Dance-based aerobic exercise may improve indices of falling risk in older women. *Age & Ageing* 2002; **31**(4):261–6.
- Shumway-Cook 1997** *{published data only}*
Shumway-Cook A, Gruber W, Baldwin M, Liao S. The effect of multidimensional exercises on balance, mobility, and fall risk in community-dwelling older people. *Physical Therapy* 1997;**77**(1):46–57.
- Simmons 1996** *{published data only}*
Simmons D, Hansen PD. Effectiveness of water exercise on postural mobility in the well elderly: an experimental study on balance enhancement. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 1996;**51A**:M233–8.
- Sinaki 2002** *{published data only}*
Sinaki M, Lynn SG. Reducing the risk of falls through proprioceptive dynamic posture training in osteoporotic women with kyphotic posturing: a randomized pilot study. *American Journal of Physical Medicine & Rehabilitation* 2002;**81**(4):241–6.
- Skelton 1999** *{published data only}*
Skelton DA, Dinan SM. Exercise for falls management: Rationale for an exercise programme aimed at reducing postural instability. *Physiotherapy Theory and Practice* 1999; **15**:105–20. [EMBASE 1999232161]
- Speltz 1987** *{published data only}*
Speltz DE, McCausland M, Neumann C, McDonald PE. A risk/falls program. *Health Matrix* 1987;**5**:34–9.
- Svanstrom 1996** *{published data only}*
Svanstrom L, Ader M, Schelp L, Lindstrom A. Preventing femoral fractures among elderly: the community safety approach. *Safety Science* 1996;**21**(3):239–46.
- Sweeting 1994** *{published data only}*
Sweeting HL. Patient fall prevention - a structured approach. *Journal of Nursing Management* 1994;**2**:187–92.
- Tennstedt 1998** *{published data only}*
Tennstedt S, Howland J, Lachman M, Peterson E, Kasten L, Jette A. A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 1998;**53**(6): P384–92.
- Thompson 1988** *{published data only}*
Thompson RF, Crist DM, Marsh M, Rosenthal M. Effects of physical exercise for elderly patients with physical impairments. *Journal of the American Geriatrics Society* 1988;**36**(2):130–5.
- Thompson 1996** *{published data only}*
Cameron I, Kurrle S, Cumming R. Preventing falls in the elderly at home: a community- based program [comment on: Med J Aust 1996;164:530-2]. *Medical Journal of Australia* 1996;**165**:459–60.
* Thompson PG. Preventing falls in the elderly at home: a community-based program. *Medical Journal of Australia* 1996;**164**:530–2.
- Tideiksaar 1990** *{published data only}*
Tideiksaar R. Slips, stumbles, and falls: pedestrian footwear and surfaces. In: Everett Gray B editor(s). *The biomedical and environmental characteristics of slips, stumbles, and falls in the elderly*. Philadelphia: American Society for Testing Materials, 1990:17–27.
- Tideiksaar 1992** *{published data only}*
Tideiksaar R. Falls among the elderly: a community prevention program. *American Journal of Public Health* 1992;**82**:892–3.
- Tinetti 1992** *{published data only}*
Tinetti ME, Liu WL, Ginter SF. Mechanical restraint use and fall-related injuries among residents of skilled nursing facilities. *Annals of Internal Medicine* 1992;**116**(5):369–74. [MEDLINE: 92143394]
- Tinetti 1999** *{published data only}*
Tinetti ME, Baker DL, Gottschalk M, Williams CS, Pollack D, Garrett P, et al. Home-based multicomponent rehabilitation program for older persons after hip fracture: a randomized trial. *Archives of Physical Medicine and Rehabilitation* 1999;**80**:916–22.
- Topp 1993** *{published data only}*
Topp R, Mikesky A, Wigglesworth J, Holt W, Edwards JE. The effect of a 12-week dynamic resistance strength training program on gait velocity and balance in older adults. *Gerontologist* 1993;**33**(4):501–6.
- Topp 1996** *{published data only}*
Topp R, Mikesky A, Dayhoff NE, Holt W. Effect of resistance training on strength, postural control, and gait velocity among older adults. *Clinical Nursing Research* 1996; **5**(4):407–27.
- Tynan 1987** *{published data only}*
Tynan C, Cardea JM. Home health hazard assessment. *Journal of Gerontological Nursing* 1987;**13**:25–8.
- Urton 1991** *{published data only}*
Urton MM. A community home inspection approach to preventing falls among the elderly. *Public Health Reports* 1991;**106**(2):192–5.
- von Koch 2000** *{published data only}*
* von Koch L, Pedro-Cuesta J, Kostulas V, Almazan J, Widen HL. Randomized controlled trial of rehabilitation at home after stroke: one-year follow-up of patient outcome, resource use and cost. *Cerebrovascular Diseases* 2001;**12**(2): 131–8.
von Koch L, Widen HL, Kostulas V, Almazan J, Pedro-Cuesta J. A randomized controlled trial of rehabilitation at home after stroke in Southwest Stockholm: outcome at six

months. *Scandinavian Journal of Rehabilitation Medicine* 2000;**32**(2):80–6.

White 1991 {published data only}

White D. Old age is not a reason to fall. *Nursing Standard* 1991;**6**:20–1.

Wolf-Klein 1988 {published data only}

Wolf-Klein GP, Silverstone FA, Basavaraju N, Foley CJ, Pascaru A, Ma PH. Prevention of falls in the elderly population. *Archives of Physical Medicine and Rehabilitation* 1988;**69**:689–91. [MEDLINE: 88339560]

Wolfson 1996 {published data only}

Judge JO, Whipple RH, Wolfson LI. Effects of resistive and balance exercises on isokinetic strength in older persons. *Journal of the American Geriatrics Society* 1994;**42**(9):937–46. [MEDLINE: 94342689]

Pacala JT, Judge JO, Boulton C. Factors affecting sample selection in a randomized trial of balance enhancement: The FICSIT study. *Journal of the American Geriatrics Society* 1996;**44**(4):377–82.

* Wolfson L, Whipple R, Derby C, Judge J, King M, Amerman P, et al. Balance and strength training in older adults: intervention gains and Tai Chi maintenance. *Journal of the American Geriatrics Society* 1996;**44**:498–506. [MEDLINE: 96208899]

Wolfson L, Whipple R, Judge J, Amerman P, Derby C, King M. Training balance and strength in the elderly to improve function. *Journal of the American Geriatrics Society* 1993;**41**:341–3.

Yates 2001 {published data only}

Yates SM, Dunnagan TA. Evaluating the effectiveness of a home-based fall risk reduction program for rural community-dwelling older adults. *Journals of Gerontology Series A, Biological Sciences and Medical Sciences* 2001;**56**(4):M226–30.

Ytterstad 1996 {published data only}

Sattin RW. Preventing injurious falls [comment on: J Epidemiol Commun Health 1996;50:551-8]. *Lancet* 1997;**349**:150.

* Ytterstad B. The Harstad injury prevention study: community based prevention of fall-fractures in the elderly evaluated by means of a hospital based injury recording system in Norway. *Journal of Epidemiology and Community Health* 1996;**50**(5):551–8. [MEDLINE: 97100303]

References to studies awaiting assessment

Barnett 2003 {published data only}

Barnett A, Smith B, Lord SR, Williams M, Bauman A. Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial. *Age and Ageing* 2003;**32**(4):407–14.

Buettner 2002 {published data only}

Buettner LL. Focus on caregiving. Falls prevention in dementia populations: following a trial program of recreation therapy, falls were reduced by 164 percent. *Provider* 2002;**28**(2):41–3.

Crome 2000 {published data only}

* Crome P, Hill S, Mossman J, Stockdale P. A randomised controlled trial of a nurse led falls prevention clinic [abstract]. *Journal of the American Geriatrics Society* 2000;**48**(8):S78.

Hill S, Mossman J, Stockdale P, Crome P. A randomised controlled trial of a nurse-led falls prevention clinic [abstract]. *Age & Ageing* 2000;**29**(Suppl 2):20.

Hauer 2001 {published data only}

Hauer K. Intensive physical training in geriatric patients after severe falls and hip surgery. *Age and Ageing* 2002;**31**(1):49–57.

* Hauer K, Rost B, Rutschle K, Opitz H, Specht N, Bartsch P, et al. Exercise training for rehabilitation and secondary prevention of falls in geriatric patients with a history of injurious falls. *Journal of the American Geriatrics Society* 2001;**49**(1):10–20.

Hauer K, Specht N, Schuler M, Bartsch P, Oster P. Intensive physical training in geriatric patients after severe falls and hip surgery. *Age and Ageing* 2002;**31**:49–57.

Oster P, Hauer K, Specht N, Rost B, Baertsch P, Schlierf G. Strength and coordination training for prevention of falls in the elderly [Kraft- und Koordinationstraining zur Sturzprävention im Alter]. *Zeitschrift für Gerontologie und Geriatrie* 1997;**30**(4):289–92.

Helbostad (in press) {unpublished data only}

Helbostad JL, Moe-Nilssen R, Sletvold O. Comparison of two types of exercise regimes on selected functional abilities for community-dwelling elderly at risk of falling [abstract]. XVI Conference of the International Society for Postural Gait Research; 2003 March 23–27; Sydney (Australia). <http://www.powmri.unsw.edu.au/isp2003/> (accessed 24/07/03).

* Helbostad JL, Sletvold O, Moe-Nilssen R. Effects of home exercises and group training on functional abilities in home-dwelling older persons with mobility and balance problems. A randomized trial. *Aging - Clinical and Experimental Research* in press.

Kerse (in press) {unpublished data only}

Kerse N. Falls and injury prevention pilot study (FIPPS). personal communication July 27 2003.

Kerse N, Butler M, Robinson E, Todd M. Falls prevention in residential care: a cluster randomized controlled trial. *Journal of the American Geriatrics Society* in press.

L-Ambrose (in press) {unpublished data only}

Lui-Ambrose T, Khan KM, Eng JJ, Janssen PA, Lord SR, McKay HA. Both resistance and agility training reduce fall risk in 75–85 year old women with low bone mass: a six-month randomized controlled trial. *JAMA* in press.

Lehtola 2000 {published data only}

Lehtola S, Hanninen L, Paatalo M. The incidence of falls during a six-month exercise trial and four-month followup among home dwelling persons aged 70–75 years [Kaatumistapaturmien ilmaantuvuus 70–75-vuotiailla oululaisilla liikuntaintervention ja sen jälkeisen seurannan aikana]. *Liikunta & Tiede* 2000;**6**:41–6.

Lord (in press) {unpublished data only}

Lord SR, Castell S, Corcoran J, Dayhew J, Shan A, Matters B, Williams P. The effect of group exercise on physical functioning and falls in frail older people living in retirement villages: a randomized controlled trial. *Journal of the American Geriatrics Society* in press.

Schoenfelder 2000 {published data only}

Schoenfelder DP. A fall prevention programme for elderly individuals. Exercise in long-term care settings. *Journal of Gerontological Nursing* 2000;**26**(3):43–51.

Schwab 1999 {published data only}

Schwab M, Roder F, Morike K, Thon K, Klotz U. Prevention of falls in elderly people [letter]. *Lancet* 1999;**353**(9156):928.

Steadman 2003 {published data only}

Kalra L. Can an enhanced balance training programme improve mobility & reduce falls in elderly patients presenting to Health Services. In: National Research Register, Oxford: Update Software; 2003, issue 2.
* Steadman J, Donaldson N, Kalra L. A randomized controlled trial of an enhanced balance training program to improve mobility and reduce falls in elderly patients. *Journal of the American Geriatrics Society* 2003;**51**(6):847–52.

Toulotte 2003 {published data only}

Toulotte C, Fabre C, Dangremont B, Lensele G, Thevenon A. Effects of physical training on the physical capacity of frail, demented patients with a history of falling: a randomised controlled trial. *Age & Ageing* 2003;**32**:67–73.

Wolf (in press) {unpublished data only}

* Wolf SL, Sattin RW, Kutner M, O'Grady M, Greenspan AI, Gregor RJ. Intense Tai Chi exercise training and falls occurrences in older, transitionally frail adults: A randomized clinical trial. *Journal of the American Geriatrics Society* in press.
Wolf SL, Sattin RW, O'Grady M, Freret N, Ricci L, Greenspan AI, et al. A study design to investigate the effect of intense Tai Chi in reducing falls among older adults transitioning into frailty. *Controlled Clinical Trials* 2001;**22**: 689–704.

References to ongoing studies

Allegrante {published data only}

Allegrante JP. Improving functional recovery after hip fracture. *ClinicalTrials.gov* <http://clinicaltrials.gov> (accessed 11/07/03).
Ruchlin HS, Elkin EB, Allegrante JP. The economic impact of a multifactorial intervention to improve postoperative rehabilitation of hip fracture patients. *Arthritis & Rheumatism* 2001;**45**(5):446–52.

Allen {published data only}

Allen A, Simpson JM. A primary care based fall prevention programme. *Physiotherapy Theory and Practice* 1999;**15**: 121–133.

Behrman {unpublished data only}

Behrman R. A study into the prediction and prevention of disability and falls in the over 75 year population. In:

National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0105089406]
Behrman R. Prediction and prevention of falls in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID:N0105009461]

Brown {published data only}

* Brown A. Functional adaptation to exercise in elderly subjects. Thesis in preparation, Curtin University, Western Australia.

Piotrowski A, Cole J, Allison G. The influence of functional ability and physical and social intervention on falls in elderly subjects [Abstract]. World Congress of Gerontology. Adelaide, Australia, 1997:581.

Clemson {published data only}

Clemson L. The effectiveness of a community-based program for reducing the incidence of falls among the elderly: a randomized trial. personal communication July 31 2003.

Cumming {published data only}

Cumming RG. Randomised trial of vision improvement for prevention of falls. personal communication July 22 2003.

Dyer {published data only}

Dyer C. Preventing falls in residential homes: a multi-agency pilot study. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Edwards {published data only}

Edwards N, Cere M, Leblond D. A community-based intervention to prevent falls among seniors. *Family and Community Health* 1993;**15**(4):57–65.

Gordon {published data only}

Gordon C. The Winchester Falls Project: A randomised controlled trial of multidisciplinary assessment in the secondary prevention of falls. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Grove {published data only}

Grove M. Effects of T'ai Chi training on general wellbeing and motor performance in patients with Parkinson's Disease. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0202102542]

Haines {published data only}

Haines T. Effectiveness of a targeted falls prevention program in the sub-acute hospital setting. A randomised controlled trial. personal communication July 19 2003.

Harwood {unpublished data only}

Foss AJE. Randomised controlled trial of second eye cataract extraction to prevent falls in elderly women. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0192080923]

Foss AJE. Randomised trial to assess the efficacy of expedited cataract extraction in the prevention of falls in elderly people awaiting cataract surgery. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Harwood R. Does expedited cataract extraction reduce the risk of falls in elderly people? - a randomised controlled trial. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Healey *{published data only}*

Healey F. personal communication February 14 2003.

Lamb *{published data only}*

Lamb S. Prevention of fall injury trial: PRE-FIT. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Lesser *{published data only}*

Lesser THJ. Vestibular rehabilitation in prevention of falls due to vestibular disorders in adults. In: National Research Register, Oxford: Update Software; 2001, issue 1.

Lord *{published data only}*

Lord SL. The effect of tailored falls prevention program on fall risk and falls in older people: a randomized controlled trial. personal communication July 21 2003.

Michie *{published data only}*

Michie C. A randomised trial of vitamin D supplementation in preventing hip fracture. In: National Research Register, Oxford: Update Software; 2001, issue 1.

Moxon *{published data only}*

Moxon S. Promoting mental health in elderly care homes. In: National Research Register, Oxford: Update Software; 2003, issue 2.

RECORD *{published and unpublished data}*

Andrew JG. Randomised placebo-controlled trial of daily oral vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly (RECORD). In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0217084004]

Armstrong A. MREC 97/0/7 The MRC RECORD Study. Randomised placebo-controlled trial of daily oral vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Chikanza I. Vitamin D and Calcium for secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0147078505]

Chuck A. The MRC Record study - Randomised trial vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0521092364]

Francis RM. Randomised trial of Vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Gillespie WJ. Randomised trial of Vitamin D and Calcium for the secondary prevention of osteoporosis related fractures in the elderly. RECORD STUDY. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0519058601]

* Grant AM. Randomised trial of vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly (MRC RECORD study). In: National

Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0411050637]

Howell F. Randomised placebo-controlled trial of daily oral vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2.

Poulton S. MRC RECORD TRIAL: Randomised placebo controlled trial of daily oral vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0187062340]

Rowley DI. Multicentre randomised trial of vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0405042439]

Summers GD. A randomised trial of vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0077049118]

Wallace WA. Randomised trial of vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly (the RECORD study). ISRCTN 51647438. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0192080910]

SAFE PACE 2 *{unpublished data only}*

Brooksby W. SAFE PACE 2 trial. Syncope and falls in the elderly - pacing and carotid sinus evaluation randomized control trial of cardiac pacing in older patients with carotid sinus hypersensitivity. In: National Research Register, Oxford: Update Software; 2000, issue 1. [: Publication ID: N0183041329]

Gray R. SAFE PACE 2 - Syncope and falls in the elderly - pacing and carotid sinus evaluation: a randomised control trial of cardiac pacing in older patients with falls and carotid sinus hypersensitivity. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0277056223]

Holdright D. A randomised control trial of cardiac pacing in older patients with falls and carotid sinus hypersensitivity. In: National Research Register, Oxford: Update Software; 2000, issue 2.

Kenny RA. SAFE PACE 2: Syncope and falls in the elderly - Pacing and carotid sinus evaluation - A randomized controlled trial of cardiac pacing in older patients with falls and carotid sinus hypersensitivity. *Europace* 1999;1(1): 69-72.

* Kenny RA, Seifer C. SAFE PACE 2: Syncope and falls in the elderly pacing and carotid sinus evaluation: A randomized control trial of cardiac pacing in older patients with falls and carotid sinus hypersensitivity. *American Journal of Geriatric Cardiology* 1999;8(2):87.

Mitchell S. 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. In: National Research

- Register, Oxford: Update Software; 2000, issue 2. [: Publication ID: N0277050145]
- O'Brien A. 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 *Safe Pace 2*. In: National Research Register, Oxford: Update Software; 2001, issue 1. [: Publication ID: N0232077535]
- Pascaul J. Syncope and falls in the elderly - Pacing and carotid sinus evaluation: a randomised control trial of cardiac pacing in older patients with falls and carotid sinus hypersensitivity. In: National Research Register, Oxford: Update Software; 2000, issue 3. [: NRR Project: M0021042314]
- Safe-Grip {published data only}**
Safe-Grip fall/injuries intervention: a randomized controlled trial. In: ClinicalTrials.gov <http://clinicaltrials.gov> (accessed 11/07/2003).
- SAFER 2 {published data only}**
Aske J. Can the incidence of falls in the elderly be reduced by a secondary falls prevention protocol. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0116069489]
- Davis M. SAFER2 - Syncope and falls in the emergency room - an explanatory randomised controlled trial of a multidisciplinary post-fall assessment and intervention strategy in elderly recurrent fallers attending casualty. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0009027144]
- Kenny RA. A post-fall intervention strategy after presentation to casualty. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0145036249]
- Kenny RA. A post-fall intervention strategy after presentation to casualty - Safer 2. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0145049230]
- Kenny RA. SAFER 2 - Syncope and falls in the emergency room - The Tyneside casualty falls intervention project. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0503055776]
- * Kenny RA. Syncope and falls in the emergency room (Safer 2). In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0461044518]
- Smith {published data only}**
Smith H. Primary prevention of fractures in the elderly: RCT of an annual injection of vitamin D in the prevention of hip and other non-vertebral fractures. In: National Research Register, Oxford: Update Software; 2001, issue 1.
- Spice {published data only}**
Spice C. Secondary prevention of falls in community based elderly. personal communication June 23 2000.
- Swift {published data only}**
Swift C. A controlled intervention study of vitamin D supplementation on neuromuscular and psychomotor function in elderly people who fall. In: National Research Register, Oxford: Update Software; 2003, issue 2.
- Torgerson {published data only}**
Baverstock M. A randomised controlled trial of calcium and vitamin D supplementation for fracture and falls prevention. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0544116517]
- Baverstock M. A randomised-controlled trial of nurse led clinics for calcium and vitamin D supplementation to prevent fractures. In: National Research Register, Oxford: Update Software; 2003, issue 2. [: Publication ID: N0096112099]
- * Torgerson D. Randomised trial of fall and fracture prevention advice by practice nurses. personal communication 01 July 2003.
- VIP trial {published data only}**
Robertson MC. A randomised controlled trial of home based exercise in visually impaired elderly people. personal communication May 28 2003.
- Voukelatos {published data only}**
Voukelatos A. Central Sydney Tai Chi trial. personal communication July 25 2003.
- Wark {published data only}**
Flicker L, MacInnis R, Stein M, Scherer S, Mead K, Nowson C, et al. Should all older people in residential care be supplemented with vitamin D to prevent falls? Results of a randomised trial. 14th National conference on falls and postural instability; 2003 Sept 8; London. 2003.
- Wark J. personal communication August 14 2003.

Additional references

Berg 1997

Berg WP, Alessio HM, Mills EM, Tong C. Circumstances and consequences of falls in independent community-dwelling older adults. *Age and Ageing* 1997;**26**:261–8.

Blake 1988

Blake AJ, Morgan K, Bendall MJ, Dallosso H, Ebrahim SBJ, Arie THD, et al. Falls by elderly people at home: prevalence and associated factors. *Age and Ageing* 1988;**17**:365–72.

Buchner 1993

Buchner DM, Hornbrook MC, Kutner NG, Tinetti ME, Ory MG, Mulrow CD, et al. Development of the common data base for the FICSIT trials. *Journal of the American Geriatrics Society* 1993;**41**:297–308.

Campbell 1990

Campbell AJ, Borrie MJ, Spears GF, Jackson SL, Brown JS, Fitzgerald JL. Circumstances and consequences of falls experienced by a community population 70 years and over during a prospective study. *Age and Ageing* 1990;**19**:136–41.

Campbell 1999a

Campbell AJ, Robertson MC, Gardner MM, Norton RN, Buchner D. Falls prevention over 2 years: a randomized controlled trial in women 80 years and older. *Age and Ageing* 1999;**28**:513–18.

Clarke 2003a

Clarke M, Oxman AD, editors. Format for OVID. Cochrane Reviewers Handbook 4.2.0 [updated March

- 2003]; Appendix 5b1. In: The Cochrane Library [database on disk and CDROM]. The Cochrane Collaboration. Oxford: Update Software; 2003, issue 2.
- Clarke 2003b**
Clarke M, Oxman AD, editors. Selection bias. Cochrane Reviewers Handbook 4.2.0 [updated March 2003]; Section 6.3. In: The Cochrane Library [database on disk and CDROM]. The Cochrane Collaboration. Oxford: Update Software; 2003, issue 2. Oxford, England.
- Clemson 1996**
Clemson L, Cumming RG, Roland M. Case-control study of hazards in the home and risk of falls and hip fractures. *Age and Ageing* 1996;**25**:97–101.
- Connell 1997**
Connell BR, Wolf SL. Environmental and behavioral circumstances associated with falls at home among healthy elderly individuals. *Archives of Physical Medicine and Rehabilitation* 1997;**78**:179–86.
- Cummings 1988**
Cummings SR, Nevitt MC, Kidd S. Forgetting falls. The limited accuracy of recall of falls in the elderly. *Journal of the American Geriatrics Society* 1988;**36**(7):613–6.
- Cummings 1995**
Cummings SR, Nevitt MC, Browner WS, Stone K, Fox KM, Ensrud KE, et al. Risk factors for hip fracture in white women. Study of Osteoporotic Fractures Research Group [see comments]. *New England Journal of Medicine* 1995; **332**(12):767–73.
- Downton 1991**
Downton JH, Andrews K. Prevalence, characteristics and factors associated with falls among the elderly living at home. *Aging Milano* 1991;**3**:219–28.
- Gill 2000**
Gill TM, Williams CS, Tinetti ME. Environmental hazards and the risk of nonsyncopal falls in the homes of community-living older persons. *Medical Care* 2000;**38**(12):1174–83.
- Gotzsche 1996**
Gotzsche PC, Liberati A, Torri V, Rossetti L. Beware of surrogate outcome measures. *International Journal of Technology Assessment in Health Care* 1996;**12**(2):238–46.
- Gryfe 1977**
Gryfe CI, Amie A, Ashley MJ. A longitudinal study of falls in an elderly population: I. Incidence and morbidity. *Age and Ageing* 1977;**6**:201–10.
- Hale 1993**
Hale WA, Delaney MJ, Cable T. Accuracy of patient recall and chart documentation of falls. *Journal of the American Board of Family Practice* 1993;**6**(3):239–42.
- McLean 1996**
McLean D, Lord S. Falling in older people at home: transfer limitations and environmental risk factors. *Australian Occupational Therapy Journal* 1996;**43**(1):13–8.
- Northridge 1995**
Northridge ME, Nevitt MC, Kelsey JL, Link B. Home hazards and falls in the elderly: the role of health and functional status. *American Journal of Public Health* 1995; **85**(4):509–15. [MEDLINE: 95216678]
- Parker 1996**
Parker MJ, Twemlow TR, Pryor GA. Environmental hazards and hip fractures. *Age and Ageing* 1996;**25**(4): 322–5. [MEDLINE: 96428778 96428778]
- PROFANE**
PROFANE (Prevention of falls network europe). <http://www.profane.eu.org> (accessed 15/07/03).
- Prudham 1981**
Prudham D, Evans JG. Factors associated with falls in the elderly: a community study. *Age and Ageing* 1981;**10**:141–6. [MEDLINE: 81278872]
- Reinsch 1992a**
Reinsch S, MacRae P, Lachenbruch PA, Tobis JS. Attempts to prevent falls and injury: a prospective community study. *Gerontologist* 1992;**32**:450–6. [MEDLINE: 93051520]
- RevMan 2003**
The Cochrane Collaboration. Review Manager (RevMan). 4.2 for Windows. Oxford, England: The Cochrane Collaboration, 2003.
- Rizzo 1996**
Rizzo JA, Baker DI, McAvay G, Tinetti ME. The cost-effectiveness of a multifactorial targeted prevention program for falls among community elderly persons. *Medical Care* 1996;**34**:954–69. [MEDLINE: 96384923]
- Robertson 2001b**
Robertson MC. *Development of a falls prevention programme for elderly people: evaluation of efficacy, effectiveness, and efficiency [PhD thesis]*. Dunedin, New Zealand: University of Otago, 2001.
- Salkeld 2000**
Salkeld G, Cumming RG, O'Neill E, Thomas M, Szonyi G, Westbury C. The cost effectiveness of a home hazard reduction program to reduce falls among older persons. *Australian & New Zealand Journal of Public Health* 2000;**24**(3):265–71. [MEDLINE: 20393108]
- Sattin 1992**
Sattin RW. Falls among older persons: a public health perspective. *Annual Review of Public Health* 1992;**13**: 489–508. [MEDLINE: 92287237 92287237 92287237]
- Sattin 1998**
Sattin RW, Rodriguez JG, DeVito CA, Wingo PA. Home environmental hazards and the risk of fall injury events among community-dwelling older persons. Study to Assess Falls Among the Elderly (SAFE) Group. *Journal of the American Geriatrics Society* 1998;**46**(6):669–76. [MEDLINE: 98286844]
- Stevens 1991**
Stevens VJ, Hornbrook MC, Wingfield DJ, Hollis JF, Greenlick MR. Design and implementation of a falls

prevention intervention for community-dwelling older persons. *Behavior, Health, and Aging* 1991/1992;**2**:57–73.

Tinetti 1988

Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine* 1988;**319**:1701–7. [MEDLINE: 89082567 89082567]

Tinetti 1994a

Tinetti ME, Baker DI, McAvay G, Claus EB, Garrett P, Gottschalk M, et al. A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *New England Journal of Medicine* 1994;**331**: 821–7. [MEDLINE: 94359542]

Ytterstad 1996a

Ytterstad B. The Harstad injury prevention study: community based prevention of fall-fractures in the elderly

evaluated by means of a hospital based injury recording system in Norway. *Journal of Epidemiology and Community Health* 1996;**50**:551–8. [MEDLINE: 97100303]

References to other published versions of this review

Gillespie 1997

Gillespie LD, Gillespie WJ, Cumming R, Lamb S, Rowe BH. Interventions for preventing falls in the elderly (Cochrane Review). *The Cochrane Library* 1997, Issue 4.

Gillespie 2001

Gillespie LD, Gillespie WJ, Robertson MC, Lamb SE, Cumming RG, Rowe BH. Interventions for preventing falls in elderly people (Cochrane Review). *The Cochrane Library* 2001, Issue 3. [Art. No.: CD000340. DOI: 10.1002/14651858.CD000340]

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Armstrong 1996

Methods	Randomised controlled trial. Randomised by phone using 'computer generated pseudo-random numbers'. Blocked, stratified randomisation. Partial blinding. Losses: 8 of 116 (7%). Analysis by intention to treat	
Participants	Setting: community, United Kingdom. N=116. Sample: post menopausal women recruited following a distal forearm fracture treated at hospital. Age: mean (SD) 60.9 (5.8) years. Inclusion criteria: white (North European) ethnic origin. Exclusion criteria: history of breast or endometrial cancer, otosclerosis, known liver disease, uncontrolled cardiac failure of hypertension, Rotor or Dubin-Johnson syndrome; inability to collaborate with handgrip strength and balance assessments; history of balance disorders; severe anaemia, angina, or chronic obstructive airways disease; current or recent therapy with HRT, corticosteroids anti-epileptic drugs; chronic alcoholism; hyperparathyroidism	
Interventions	a. HRT (Prempak C 0.625 mg or Premarin 0.625 mg) and calcium (Sandocal 1000 mg). b. Control: Calcium (Sandocal 1000 mg). For part of the study, an HRT placebo was also given to this group	
Outcomes	Length of follow up 48 weeks. Falls data collected at 12 weekly intervals. 1. Number of participants falling during the study.	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Becker 2003

Methods	Randomised controlled trial. Cluster randomised by city government official using sealed envelopes. Losses: none reported. Intention to treat analysis.	
Participants	Setting: nursing homes, Germany. N=981 Sample: men and women requiring long term care in 6 nursing homes. Age: mean (SD) intervention group 83.5 (7.5), control group 84.3 (6.9) years. Inclusion criteria: all levels of mobility and cognitive status included. Exclusion criteria: if admitted for post hospital care, geriatric rehabilitation or palliative care	

Becker 2003 (Continued)

Interventions	<p>a. Staff training (60 minute course and written information on falls and fall prevention) and monthly feedback (fallers, fall rates, severe injuries). Could discuss problems with study nurse in person or by telephone; environmental adaptations (76 items e.g. lighting, chair and bed heights, floor surfaces, clutter, grab bars for toilets and bathrooms, proper use of walking aids).</p> <p>Hip protectors (Safety Pants or Safehip, patients' choice) offered to residents who could stand with or without assistance or who occasionally tried to rise from a chair unattended (5 protectors per subject, to be worn from arising until going to bed).</p> <p>In addition residents could choose any combination of the following, for any length of time: written information on fall prevention; personal fall consultation if not bed or chair-bound introducing idea of 2 months exercise and use of hip protectors; group exercise programme (balance and progressive resistance exercises using ankle weights and dumbbells, 75 minutes 2 x per week)</p>	
Outcomes	<p>Length of follow up 365 days from a specified date.</p> <p>Falls and fall sheets completed daily by nursing staff and supervised regularly by study nurse.</p> <ol style="list-style-type: none"> 1. Number of participants falling 2. Number with 2 or more falls 3. Fall rate per 1000 person years 4. Time to first fall 5. Number of hip fractures 6. Number of non hip fractures 	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Bischoff 2003

Methods	<p>Randomised controlled trial. Double blind. Randomised by an independent statistician in groups of four.</p> <p>Losses: 33 of 122 (27%)</p> <p>Intention to treat analysis.</p>	
Participants	<p>Setting: long stay geriatric care units in two acute hospitals, Switzerland.</p> <p>N=122</p> <p>Sample: elderly institutionalised women waiting placement in nursing homes.</p> <p>Age: mean 85 years.</p> <p>Inclusion criteria: aged 60 and over, able to walk 3 m with or without a walking aid.</p> <p>Exclusion criteria: primary hyperparathyroidism, hypocalcaemia, hypercalciuria, renal insufficiency, previous treatment with HRT, calcitonin, fluoride or bisphosphonates in previous 24 months, or fracture or stroke in the previous 3 months</p>	
Interventions	<p>a. Vitamin D plus calcium carbonate (400 IU cholecalciferol per tablet), for 12 weeks.</p> <p>b. Control: two tablets of 600 mg calcium carbonate per tablet.</p> <p>Tablets looked identical in both groups. Administered twice a day with breakfast and dinner</p>	

Bischoff 2003 (Continued)

Outcomes	<p>Length of follow up 12 weeks (duration of intervention) or until discharged to nursing home. Falls recorded by staff using a falls protocol (date, time, circumstances, injuries).</p> <p>1. Number of participants falling 2. Number of falls</p> <p>Also measured but not considered in this review were multiple serum biochemical values, overall musculo-skeletal function using a summed score on various measures e.g. strength, timed up & go test</p>
----------	---

Notes	
-------	--

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Buchner 1997a

Methods	<p>Randomised controlled trial.</p> <p>Randomised by 'variation of randomly permuted blocks'.</p> <p>Randomised to 7 groups: 6 intervention groups (3 FICSIT, 3 MoveIT), and 1 control group</p> <p>Only FICSIT and control groups reported in this paper.</p> <p>Losses: 15 of 105 (14%) (14 from intervention groups).</p> <p>Intention to treat analysis.</p>
---------	--

Participants	<p>Setting: community, Seattle, USA.</p> <p>N=105</p> <p>Sample: HMO members (FICSIT intervention groups only).</p> <p>Age: mean 75 years.</p> <p>Inclusion criteria: aged between 68 and 85 years; unable to do 8 step tandem gait test without errors; below 50 th percentile in knee extensor strength for height and weight.</p> <p>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</p>
--------------	--

Interventions	<p>Supervised exercise classes 1 hour x 3 per week for 24-26 weeks followed by unsupervised exercise.</p> <p>a. Six months endurance training (ET) (stationary cycles) with arms and legs propelling wheel</p> <p>b. Six months strength training (ST) classes (using weight machines for resistance exercises for upper and lower body)</p> <p>c. Six months ST plus ET</p> <p>d. Control: usual activity levels but 'allowed to exercise after 6 months'</p> <p>Exercise sessions started with a 10 to 15 minute warm-up and ended with a 5 to 10 minute cool down</p>
---------------	--

Outcomes	<p>Length of follow up: variable, from randomisation to the end of study funding (0-25 months, median 18 months). Fall outcomes reported for any exercise (all 3 groups combined) compared with control group (states 'a priori decision').</p> <p>Falls reported immediately by mail, also monthly postcard return; telephone follow up if no postcard</p>
----------	---

Buchner 1997a (Continued)

	<p>received.</p> <ol style="list-style-type: none"> 1. Number of fallers at 1 year 2. Time to first fall 3. Number of falls per person
Notes	<p>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 of 30 subjects did</p>

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Campbell 1997

Methods	<p>Randomised controlled trial. Allocation schedule developed using computer generated numbers. Assignment by independent person off site. Losses: 20 of 233 (9%). Intention to treat analysis.</p>
Participants	<p>Setting: community, Dunedin, New Zealand. N=233 Sample: women identified from general practice registers. Age: mean (SD) 84.1 (3.1) years Inclusion criteria: at least 80 years old; community living. Exclusion criteria: cognitive impairment; not ambulatory in own residence; already receiving physiotherapy</p>
Interventions	<p>Baseline health and physical assessment for both groups.</p> <ol style="list-style-type: none"> 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 Control: social visit by research nurse x 4 in first two months. Regular phone contact
Outcomes	<p>Length of follow up: 12 months and 24 months. Falls recorded daily on postcard calendars, mail registration monthly by postcard, telephone follow up.</p> <ol style="list-style-type: none"> 1. Number of participants falling at 1 year and 2 years 2. Number with injury fall at 1 and 2 years 3. Number with 2 or more falls 4. Mean rate of falls (falls/per year) 5. Fall rate per 100 person years 6. Number complying with intervention

Campbell 1997 (Continued)

	7. Deaths	
Notes	Otago Exercise Programme manual can be ordered from http:// www.acc.co.nz/injury-prevention	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Campbell 1999

Methods	Randomised controlled trial, 2 by 2 factorial design. Allocation schedule developed using computer generated numbers. Assignment by independent person off site. Losses: 21 of 93 (23%). Intention to treat analysis.
Participants	Setting: community. Dunedin, New Zealand. N=93 Sample: men (N=22) and women (N=77) identified from general practice registers. Age: mean (SD) 74.7 (7.2) years 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. a. Gradual withdrawal of psychotropic medication over 14 week period plus home based exercise programme. b. Psychotropic medication withdrawal with no exercise programme c. No change in psychotropic medication plus exercise programme d. 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	Length of follow up: 44 weeks. Falls recorded daily on postcard calendars, mail registration monthly by postcard, telephone follow up. 1. Number of participants falling 2. Number sustaining medical care fall 3. Number sustaining fracture fall 4. Number sustaining injury fall 5. Number sustaining 2 or more falls 6. Number sustaining 1 or more falls indoors 7. Fall rate per 100 person years

Campbell 1999 (Continued)

	8. Number sustaining an adverse effect 9. Number who complied with intervention	
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/injury-prevention	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Carpenter 1990

Methods	Prospective randomised controlled trial. Women randomised by random number tables and husbands allocated to same group. Losses: 172 of 539 (32%). Analysis by intention to treat.	
Participants	Setting: community, Andover, United Kingdom. N=539 Sample: women (N=351) and men (N=188) recruited from patient lists of two general medical practices. The sample represents 89.5% of those in the age group in the participating practices. Age: 75 years or over. 23 men and 49 women were over 85 years. Inclusion criteria: aged 75 years and over; living in Andover area. Exclusion criteria: living in residential care.	
Interventions	a. 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. b. Control: no disability surveillance between initial and final evaluation	
Outcomes	Measured at 3 years 1. Total number of falls in each group in the month before the final interview Also measured but not considered in this review: number of participants admitted to institutions during the study period; mean (SD) length of stay in institutions; number of participants admitted to institution for more than 6 months; death during the study period	
Notes		
Risk of bias		
Item	Authors' judgement	Description

Carpenter 1990 (Continued)

Allocation concealment?	Unclear	B - Unclear
-------------------------	---------	-------------

Carter 1997

Methods	Randomised controlled trial. Losses: 200 of 658 (30%). Analysis by intention to treat not possible.
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 years or older; 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	a. Brief feedback on home safety plus pamphlets on home safety and medication use (low intensity intervention). b. Action plan for home safety plus medication review (high intensity intervention). c. Control: no intervention during study period but intervention after the end of the study period
Outcomes	Length of follow up 1 year. 1. Number sustaining a fall with or without injury. 2. Number sustaining a fall resulting in injury. 3. Number sustaining a fall resulting in medical treatment. 4. Number sustaining another event resulting in injury or medical treatment
Notes	Unpublished study.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Carter 2002

Methods	Randomised controlled trial. Randomised by computer generated programme. Losses: 13 of 93 (14%) Intention to treat not possible.
Participants	Setting: community, Vancouver, Canada. N=93 Subjects: community dwelling osteoporotic women. 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

Carter 2002 (Continued)

	during 20 week programme	
Interventions	a. 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. Control: usual routine activities and bimonthly social seminar separate from intervention group	
Outcomes	Length of follow up 20 weeks (duration of intervention). Falls recorded in falls calendars returned monthly. 1. Number of falls. Also measured but not included in this review: static and dynamic balance and quadriceps strength	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Cerny 1998

Methods	Randomised controlled trial. Randomised by coin toss but some clusters e.g. couples or two ladies dependent on another for transport. Losses: none described Intention to treat analysis not possible.	
Participants	Setting: community, California, USA. N=28 Sample: community dwelling well-elderly. Age: mean (SD) 71 (4) years. Inclusion criteria: none described. Exclusion criteria: none described.	
Interventions	a. 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. b. Control: no intervention.	
Outcomes	Follow up at 3 months and 6 months 1. Number of participants falling.	
Notes	Other outcomes analysed as pre-post intervention: strength, range of motion, balance and gait	
Risk of bias		
Item	Authors' judgement	Description

Cerny 1998 (Continued)

Allocation concealment?	Unclear	B - Unclear
-------------------------	---------	-------------

Close 1999

Methods	Randomised controlled trial. Randomised by random numbers table and list held independently of the investigators. Losses: 93 of 397 (23%) Intention to treat analysis not possible
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 (SD) 78.2 (7.5) years Inclusion criteria: aged at least 65 years; 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	a. 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. b. Control: usual care only
Outcomes	Follow up every 4 months for 1 year. Falls diary 1. Number of participants falling 2. Number with injury fall 3. Number sustaining 3 or more falls 4. Number of falls Also measured but not considered in this review: doctor and hospital visits, and admissions; function
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Coleman 1999

Methods	Randomised controlled trial. Cluster randomisation by physician practice. Losses: 56 of 169 (33%) Intention to treat analysis.
---------	--

Coleman 1999 (Continued)

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 years. Inclusion criteria: at least 65 years old; 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	a. 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. b. Control: usual care (4 practices)	
Outcomes	Follow up 24 months. Falls recorded retrospectively by questionnaire at 12 and 24 months. 1. Percentage of participants falling	
Notes		
Risk of bias		
Item	Authors’ judgement	Description
Allocation concealment?	No	C - Inadequate

Cornillon 2002

Methods	Randomised controlled trial. Randomised by random number tables. Losses: 5 of 303 (1.7%) Intention to treat analysis possible.	
Participants	Setting: community, St Étienne, France. N=303 Subjects: community dwelling and independent in ADL (83% female). Age: mean 71 years. Inclusion criteria: >65 years old; living at home; ADL independent; consented. Exclusion criteria: cognitively impaired (MMSE <20); obvious disorder of walking or balance	
Interventions	a. 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. b. Control	
Outcomes	Follow up 12 months. Falls and fall related injuries recorded on 6 monthly falls calenders. 1. Number of participants falling 2. Mean number of falls (no standard deviation)	

Cornillon 2002 (Continued)

	3. Mean number of medical care falls (no standard deviation)	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Cumming 1999

Methods	Randomised controlled trial Stratified block randomisation. Losses: 142 of 530 (27%) Intention to treat analysis.	
Participants	Setting: community, Sydney, Australia. N=530 Sample: community dwelling subjects recruited in hospital wards, clinics, and day care centres. Age: mean (SD) 77 (7.2) years. Inclusion criteria: aged at least 65 years; 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	a. One home visit by experienced occupational therapist assessing environmental hazards (standardised form) and supervision of home modifications. Telephone follow up after 2 weeks. b. Control: usual care	
Outcomes	12 month follow up with monthly falls calendar. 1. Number of fallers (by location of fall, home or away) 2. Compliance with recommendations	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Dawson-Hughes 1997

Methods	Randomised controlled trial. Stratified block randomisation using random numbers tables. Losses: 56 of 445 (13%). Intention to treat analysis.	
Participants	Setting: community, Boston, MA, USA. N=445 Sample: men (N=199) and women (N=246) recruited by direct mailings and presentations (sample frame not given). Age: mean age 71 years Inclusion criteria: aged 65 years 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	a. Calcium citrate malate (500 mg elemental calcium) and cholecalciferol (700 IU vitamin D) orally, daily at bedtime for 3 years b. Control: double placebo tablets	
Outcomes	Length of follow up 3 years. Postcard sent in 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 Xray reports or hospital records. 1. Number of participants falling during study 2. Number of falls per subject 3. Fall related non-vertebral fractures Also measured at 6 month intervals, but not considered in this review, were bone mineral density, biochemical assays, and other measures	
Notes		
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Day 2002

Methods	Randomised controlled trial. Factorial design. Randomised by "adaptive biased coin" technique, to ensure balanced group numbers (computer generated by an independent third party by telephone). Losses: 17 of 1107 (1.5%). Intention to treat analysis.	
Participants	Setting: community, Melbourne, Australia. N=1107	

Day 2002 (Continued)

	<p>Sample: community dwelling men and women identified from electoral roll (59.8% female). Age: mean (SD) 76.1 (5.0) Inclusion criteria: living in own home or apartment or leasing similar accommodation and able to make modifications; aged 70 and over. 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</p>	
Interventions	<p>a. 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)</p> <p>b. 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.</p> <p>c. 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.</p> <p>d. a+b e. a+c f. c+b g. a+b+c h. No intervention. Received brochure on eye care for over 40 year olds</p>	
Outcomes	<p>Length of follow up 18 months. 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.</p> <ol style="list-style-type: none"> 1. Time to first fall 2. Number of fallers 	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Donald 2000

Methods	<p>Randomised controlled trial, 2 by 2 factorial design. Stratified by fall risk and randomised by "randomized envelopes". Losses: 9 of 54 (17%) Intention to treat analysis.</p>	
---------	---	--

Donald 2000 (Continued)

Participants	Setting: hospital, Gloucester, UK. N=54 Sample: individuals admitted to one elderly care rehabilitation ward over an 8 month period, 81% female. Age: mean 82.9 years. Inclusion criteria: elderly patients referred for rehabilitation. Exclusion criteria: none.
Interventions	a. Assigned to ward area with vinyl floor covering and conventional physiotherapy (functional based physiotherapy, once or twice daily). b. As above (a) plus seated leg strengthening exercises (hip flexors and ankle dorsiflexors). c. Assigned to ward area with carpet and conventional physiotherapy. d. As above (c) plus seated leg strengthening exercises (hip flexors and ankle dorsiflexors)
Outcomes	Length of follow up: variable depending on length of hospital admission. 1. Number of participants falling during admission 2. Number of fracture falls. Also measured at admission and discharge, but not considered for this review: Barthel scores, hip and ankle strength, timed walk and functional reach test
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Ebrahim 1997

Methods	Randomised controlled trial. Randomly assigned using prepared envelopes containing computer generated allocation. Losses: 68 of 165 (41%). Intention to treat analysis not possible.
Participants	Setting: UK N=165 Sample: post menopausal women identified from A&E and orthopaedic fracture clinic records. Inclusion criteria: fractured upper limb in last 2 years Exclusion criteria: on bisphosphonates for osteoporosis; life expectancy <1 year; cognitive impairment; too frail for brisk walking or to travel for measurements
Interventions	a. Initial advice on general health/diet. Encouraged to build up to brisk walking 40 minutes x 3 per week. b. Control: initial advice on general health/diet. Upper limb exercises to improve post-fracture function
Outcomes	Length of follow up 2 years. Results reported for 1 and 2 year follow up. Falls monitored by monthly telephone calls. 1. Number of participants falling 2. Total number of falls

Ebrahim 1997 (Continued)

	3. Number sustaining fracture fall Also measured, but not considered in this review were bone mineral density, vertebral fractures, physical capacity	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Fabacher 1994

Methods	Randomised controlled trial. Randomised with randomly generated assignment cards in sealed envelopes. Losses: 59 of 254 (23%). Intention to treat analysis not possible.	
Participants	Setting: community, California, USA. N=254 Sample: men (N=248) and women (N=6) aged over 70 years and eligible for veterans medical care. Identified from voter registration lists and membership lists of service organisations. Age: mean 73 years Inclusion criteria: aged 70 years and over; not receiving health care at Veterans Administration Medical Centre. Exclusion criteria: known terminal disease, dementia.	
Interventions	a. 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. b. Control: follow-up telephone calls for outcome data only.	
Outcomes	Measured at 4 monthly intervals for one year, by structured interview for active arm and by telephone for controls. 1. Number of individuals falling.	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Fiatarone 1997

Methods	Randomised controlled trial. Method of randomisation not described. Losses: 4 of 34 (11%) No intention to treat analysis.
Participants	Setting: community, USA N=34 Sample: frail older people (94% female). Age: mean 82 Inclusion criteria: community dwelling older people; moderate to severe functional impairment Exclusion criteria: none given.
Interventions	a 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. b. Control: wait list control. Weekly phone calls.
Outcomes	Length of follow up 16 weeks (duration of intervention). Falls identified weekly by phone (assumed). 1. Falls Also measured, but not considered in this review: strength, gait velocity, self-reported activity level, Attitude towards Ageing on the PGC Morale Scale, bed days, health care visits
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Gallagher 1996

Methods	Randomised controlled trial. Method of randomisation not described. Observers unblinded at 6 months. Losses: none described. Intention to treat analysis not possible
Participants	Setting: community, Victoria, British Columbia, Canada. N=100 Sample: men (N=20) and women (N=80) community dwelling volunteers Age: mean 73.8 years (control group); 75.4 years (intervention group). Inclusion criteria: aged 60 years or over; sustained a fall in previous 3 months. Exclusion criteria: none described.
Interventions	a. Two risk assessment interviews of 45 minutes each. One counseling interview of 60 minutes showing video and booklet and results of risk assessment. b. Control: baseline interview and follow up only. No intervention

Gallagher 1996 (Continued)

Outcomes	Length of follow up 6 months. Calendar postcards completed and returned every two weeks for six months. Telephone follow up of reported falls. 1. Mean number of falls per group Also measured, but not considered in this review were fear of falling, self-efficacy, social function, health services use, and quality of life	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Gray-Donald 1995

Methods	Randomised controlled trial. Method of randomisation not described. Stratified by gender and nutritional risk criteria. Losses: 4 of 50 (8%) Intention to treat analysis.	
Participants	Setting: community, Quebec, Canada. N=50 Subjects: men and women recruited from those receiving long term home help services. Age: mean (SD) 77.5 (8) years. Inclusion criteria: aged over 60 years; requiring community services; elevated risk of undernutrition (excessive weight loss or BMI <24 kg/m ²). Exclusion criteria: alcoholic; terminal illness.	
Interventions	a. 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. b. Control: visits only (encouragement and suggestions about improving diets)	
Outcomes	Retrospectively monitored at 6 and 12 weeks. 1. Number of participants falling	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Hogan 2001

Methods	Randomised controlled trial. Computer generated sequence concealed in locked cabinet prior to randomisation. Stratified by number of falls in previous year: 1 or >1. Losses: 24 of 163 (15%) Intention to treat analysis.	
Participants	Setting: community, Calgary, Canada. N=163 Sample: high risk community dwelling men and women (71% women) Age: mean (SD) 77.6 (6.8) Inclusion criteria: fall in previous 3 months; living in the community; age 65 years and over; 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	a. 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 minute). 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. b. Control: One home visit by recreational therapist.	
Outcomes	Length of follow up: 12 months. Falls recorded on monthly calendars (47.8% returned). Also retrospective recall at 3, 6 months (at visit) and 12 months (by phone). 1. Number of participants falling 2. Number sustaining medical care fall 3. Number sustaining injury fall 4. Number sustaining 3 or more falls 5. Time to first fall 6. Mean number of falls per participant (SD) 7. Mean number of injurious falls 8. Number who complied with treatment 9. Death	
Notes		
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Hornbrook 1994

Methods	Cluster randomised controlled trial. Losses: 156 of 3182 (5%) in the intervention group. Intention to treat analysis not possible.	
---------	--	--

Hornbrook 1994 (Continued)

Participants	<p>Setting: community, USA. N=3182 Sample: independently living members of HMO, men (N=1971) and women (N=1211), recruited by mail. Age: mean (SD) 73 (6) years. Inclusion criteria: over 65 years; 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</p>	
Interventions	<p>a. Home visit, safety inspection (prior to randomisation), hazards booklet, repair advice, fall prevention classes (environmental, behavioural, and physical risk factors), financial and technical assistance. b. Control: home visit, safety inspection (prior to randomisation), hazards booklet</p>	
Outcomes	<p>Measured over 24 months, using monthly diaries, and quarterly mail/telephone contacts. Length of follow up was not uniform. Data available for proportion with or without falls over time, and rate of falls per 1000 person years.</p> <ol style="list-style-type: none"> 1. Number of participants falling. 2. Number sustaining medical care fall. 3. Number sustaining fracture fall. 4. Number sustaining injury fall. 5. Number sustaining 2 or more falls. 6. Number sustaining near fall. 7. Fall rate per 1000 person years. 8. Number complying with treatment programme. <ol style="list-style-type: none"> 4. Fracture falls. 5. Hospitalised falls. 	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Jensen 2002

Methods	<p>Cluster randomised controlled trial. Nine residential care facilities divided into group A and group B based on age, number of residents, type of setting, and record of previous falls. Random allocation conducted by person with no knowledge of the study, using two sealed envelopes containing letter A or B. Before draw the first to be drawn was designated to be the intervention group. Losses: 78 of 402 (19%) Intention to treat analysis not possible.</p>	
Participants	<p>Setting: institutions, Umeå, Sweden. N=9 residential care facilities, total N=402 residents at randomisation. Age: median 83 years, range 65-100. Subjects: Nine elderly care facilities; frail elderly people with physical or cognitive impairment, 72%</p>	

Jensen 2002 (Continued)

	female, Inclusion criteria: Institution: more than 25 residents Residents: age 65 and over. Exclusion criteria: none listed.	
Interventions	Multifactorial, multidisciplinary baseline assessment in all facilities: prescribed drugs, delirium, MMSE, Barthel score, mobility, hearing, vision, depression, miscellaneous diseases. Residents classed as high or low risk of falling. Environmental hazards screened using checklist. a. Intervention for 11 weeks targeting staff and residents at high risk of falling and those at lower risk who fell during intervention period: 4 hour staff educational session, environmental hazard modification, exercises for strength, balance and to promote safe movement, provision and repair of aids, medication modification, provision of hip protectors, post fall problem solving conferences, staff guidance. b. Control: usual care.	
Outcomes	Follow up 34 weeks. Falls registered by nurses and aides, if witnessed or reported, using structured report designed for study. 1. Number of people falling 2. Number of falls 3. Time to first fall 4. Number sustaining injury fall.	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Jitapunkul 1998

Methods	Randomised controlled trial. Method of randomisation not described. 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. Age: mean (SD) years 76.1 (5.9) intervention; 75.1 (5.7) control. Inclusion criteria: at least 70 years old; living at home. Exclusion criteria: none stated.
Interventions	a. 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. b. Control: no intervention. Visit at the end of 3 years

Jitapunkul 1998 (Continued)

Outcomes	Measured at the end of 3 years. Falls during last 3 months only. 1. Number of participants falling	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kenny 2001

Methods	Randomised controlled trial. Randomised in blocks of eight, method of randomisation not described. Losses: 16 of 175 (9%) Intention to treat analysis not possible	
Participants	Setting: Cardiovascular Investigation Unit, UK. N=175 Subjects: individuals presenting at A&E with non-accidental fall (60% female). Age: mean (SD) 73 (10) Inclusion criteria: aged 50 years and over, history of a 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	a. Pacemaker (rate drop response physiologic dual-chamber pacemaker: Thera RDR, Medtronic, Minneapolis, Minnesota). b. Control: no pacemaker	
Outcomes	Follow up 1 year after randomisation. 1. Number of falls 2. Number of injurious falls Also measured but not considered in this review were number of episodes of syncope	
Notes	Out of 71,299 A&E attendees screened, 1624 received carotid sinus massage and 175 agreed to be randomised	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kingston 2001

Methods	Randomised controlled trial. Method of randomisation not described. Losses: 17 of 109 (16%) Intention to treat analysis not possible
Participants	Setting: A&E, Staffordshire, UK. N=109 Age: mean 71.9 years Subjects: community dwelling women attending A&E with a fall. Inclusion criteria: female, aged 65-79, history of a fall, discharged directly to own home. Exclusion criteria: male, admitted from A&E to hospital or any form of institutional care
Interventions	a. 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. b. 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	Follow up 12 weeks. No description of how falls monitored, presumably retrospective at day 4 and week 12. 1. Number of participants falling Also measured but not considered for this review, SF36 assessment at day 4 and 12 weeks
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Latham 2003

Methods	Randomised controlled trial. Factorial design. Stratified block randomisation; six per block. Randomised to one of four treatment arms in block using a computerised central randomisation scheme. Biostatistician generated the randomisation sequence. Losses: 43 of 243 (17%) Intention to treat analysis.
Participants	Setting: Five hospitals in Auckland, New Zealand and Sydney, Australia. N=243 Subjects: frail older people recently discharged from hospital. Age: mean 79 years. Inclusion criteria: 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

Latham 2003 (Continued)

	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	<p>a. 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.</p> <p>b. Exercise control: frequency matched telephone calls and home visits from research physical therapist including general enquiry about recovery, general advice on problems, support.</p> <p>c. Vitamin D: single oral dose of six 1.25 mg calciferol (300,000 IU).</p> <p>d. Vitamin D control: placebo tablets.</p>	
Outcomes	<p>Follow up follow up 6 months.</p> <p>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.</p> <ol style="list-style-type: none"> 1. Number of participants falling 2. Number of falls 3. Fall rate in person years 4. Time to first fall 5. Adverse events <p>Also measured but not considered for this review, self assessed health (physical component score of SF36), Barthel index, Falls self efficacy scale, Adelaide activities profile, quadriceps strength, timed walking test, timed up&go test, Berg balance test</p>	
Notes	Detailed description of exercise regimen given in paper.	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Lightbody 2002

Methods	<p>Randomised controlled trial.</p> <p>Method of randomisation not described. "block-randomised consecutively into groups".</p> <p>Losses: 34 of 348 (10%).</p> <p>Intention to treat analysis not possible.</p>	
Participants	<p>Setting: hospital, Liverpool, UK.</p> <p>N=348</p> <p>Subjects: consecutive patients attending A&E with a fall (74.4% women).</p> <p>Age: median (IQR) 75 (70-81).</p> <p>Inclusion criteria: age > 65 years,</p> <p>Exclusion criteria: admitted to hospital as result of index fall, living in institutional care, refused or unable to consent, lived out of the area</p>	

Lightbody 2002 (Continued)

Interventions	a. 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. Control: usual care.	
Outcomes	Length of follow up 6 months. Falls, injury and treatment recorded in diary. Postal questionnaire at 6 months to collect data. GP records and hospital databases searched. 1. Number of people falling 2. Number of falls 3. Number sustaining injury fall.	
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
Allocation concealment?	Unclear	B - Unclear

Lord 1995

Methods	Randomised controlled trial. Pre-randomisation prior to consent, from a schedule of participants in a previous study. Losses: 19 of 194 (10%), all from intervention group. Inadequate data for intention to treat analysis.	
Participants	Setting: community, Australia. N=194 Sample: women, recruited from a schedule from a previous epidemiologic study. Fitness level not defined. Age: range 60-85 years (mean (SD) 71.6 (5.4) years. Inclusion criteria: living independently in the community Exclusion criteria: unable to use English.	
Interventions	a. Twice weekly exercise programme (warm-up, conditioning, stretching, relaxation) lasting 1 hour, over a 12 month period. b. Control: no intervention.	
Outcomes	Measured over 12 months. Fall ascertainment questionnaires sent out every 2 months. Telephone call if questionnaire not returned. 1. Number of participants falling. 2. Number of participants sustaining 2 or more falls. 3. Number of participants sustaining 1 or more falls indoors. 4. Number sustaining non-accidental falls.	

Lord 1995 (Continued)

	5. Number sustaining "balance falls".	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Mayo 1994

Methods	Randomised controlled trial. Method of randomisation not described. Losses: none Analysis by intention to treat.	
Participants	Setting: rehabilitation hospital inpatients, Canada. N=134 Sample: men and women; falling status - high risk. Age: mean (SD) years 70.9 (12.6) intervention, 72.9 (11.8) control. Inclusion criteria: one or more perceived risk factors for falls or fractures. Primary: stroke, ataxia, history of multiple falls, incontinence. Secondary: aged over 80, use of topical eye preparations, anticonvulsants, vitamin supplements, anti-ulcer medications. Exclusion criteria: none described.	
Interventions	a. During hospital stay, identification bracelets worn to identify "high risk faller". b. Control: no identification bracelet.	
Outcomes	Length of follow up variable - duration of hospital admission. Falls recorded by incident reports. 1. Number of participants falling. 2. Number of participants sustaining injury fall. 3. Time to first fall.	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

McMurdo 1997

Methods	Randomised controlled trial. States 'randomly allocated'. Losses: 26 of 118 (22%) over 2 years. Intention to treat analysis not possible.
Participants	Setting: community, Dundee, United Kingdom. N=118 Sample: community dwelling post menopausal women recruited by advertisement. Age: mean 64.5 years (range 60-73 years). Exclusion criteria: conditions or drug treatment likely to affect bone
Interventions	45 minute exercise programme of weight bearing exercise to music, 3 x weekly, 30 weeks per year, over 2 years, with 1000 mg calcium carbonate daily. b. Control: 1000 mg calcium carbonate daily.
Outcomes	Length of follow up 2 years 1. Number of women falling Also measured, but not considered in this review: bone mineral density
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

McMurdo 2000

Methods	Randomised controlled trial. Cluster randomisation of nine residential homes. Losses: 49 of 133 (37%). Intention to treat analysis not possible.
Participants	Setting: institutional care, Dundee, United Kingdom. N=133 Sample: men and women in 9 residential homes for elderly people. Age: mean (SD) 84.9 (6.9) years in intervention group; 83.7 (6.7) years in control group. Inclusion criteria: aged 70 years and over; resident in participant nursing home. Exclusion criteria: MMSE score <12
Interventions	a. Falls risk factor assessment and modification x 2 (at start and 6 months) blood pressure, medication review, visual acuity, ambient lighting levels; seated exercise sessions for balance, strength and flexibility 30 minutes x 2 weekly for 6 months. b. Control: reminiscence sessions 30 minutes x 2 per week for 6 months
Outcomes	Length of follow up 1 year. Staff recorded falls daily on a calendar from 7-12 months. 1. Number of participants falling 2. Mean number of falls (no SD) 3. Number complying with treatment

McMurdo 2000 (Continued)

	4. Falls per person week	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Means 1996

Methods	Randomised trial nested within a pre-test post-test experimental design. Losses: 34 of 99 (33%). Inadequate data for intention to treat analysis.	
Participants	Setting: community, Arkanas, USA. N=99 Sample: volunteers recruited from Veterans Administration medical centre outpatient clinics. Age: mean (SD) 75 (5) years. Inclusion criteria: age 65 years or over; ambulatory for at least 30 feet; community dwelling; able to comprehend instructions and give informed consent; history of 1 or more falls in previous year	
Interventions	a. Exercise programme including obstacle course training. b. Control: exercise programme without obstacle course training	
Outcomes	Length of follow up 6 months 1. Mean number of falls per participant in each group, with standard deviation	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	No	C - Inadequate

Mulrow 1994

Methods	Randomised controlled trial. Randomisation blocked and stratified by nursing home. Losses: 14 of 194 (7%). Inadequate data for intention to treat analysis.	
Participants	Setting: one academic nursing home and 8 community nursing homes, USA. N=194 Sample: elderly residents dependent in at least 2 activities of daily living. Falling status on entry not defined.	

Mulrow 1994 (Continued)

	Age: mean (SD) 79 (8) years. Inclusion criteria: age over 60 years; resident in a nursing home for at least 3 months; dependent in at least 2 activities of daily living. Exclusion criteria: Terminal illness; severe dementia; known assaultive behaviour pattern; currently or recently having physiotherapy	
Interventions	a. 30-45 minute one on one physiotherapy session x 3 weekly for 4 months. b. Control: 30-45 minute one on one friendly visit x 3 weekly for 4 months	
Outcomes	Length of follow up 1 year but only results at 4 months reported. Falls identified from patient charts and/or incident reports. 1. Number of participants falling. 2. Number sustaining medical care fall. 3. Number sustaining injury fall. 4. Total number of falls in each group. 5. Number sustaining adverse effect. 6. Number who complied with treatment programme. 7. Death during study.	
Notes	San Antonio FICSIT trial [Province 1995]	
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Newbury 2001

Methods	Randomised controlled trial. Randomisation by random numbers in sequentially numbered sealed envelopes. Losses: 11 of 100 (11%) Intention to treat analysis.
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% female). Age: range 75 - 91 years; median age in intervention group 78.5, control group 80 years. Inclusion criteria: aged 75 years and over; living independently in the community. Exclusion criteria: none.
Interventions	a. 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. b. No 75+HA until 12 months

Newbury 2001 (Continued)

Outcomes	Falls identified retrospectively when 75+HA repeated at 12 months. 1. Number of participants falling. Numerous other outcome measures recorded 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

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Nikolaus 2003

Methods	Randomised controlled trial. Randomised by "sealed envelopes containing group assignments using a random number sequence". Losses: 81 of 360 (23%) Intention to treat analysis.
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 (SD) 81.5 (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; 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	a. 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. b. Control: comprehensive geriatric assessment alone. No home visit until final assessment at one year. Usual postdischarge management by GPs
Outcomes	Length of follow up 1 year. Falls recorded in falls diary and by monthly telephone calls. 1. Number of participants falling 2. Number sustaining injury fall 3. Number sustaining 2 or more falls 4. Fall rate per 100 person years 5. Injury fall rate per 100 person years 6. Compliance with recommendations.
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)

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Nowalk 2001

Methods	Randomised controlled trial, stratified by age and gender. Randomised by permuted blocks (block size = 9). Performed separately for each site. Losses: 32 of 112 (29%) Intention to treat analysis not possible.
Participants	Setting: senior housing facilities (independent living to skilled nursing care), USA. N=112 Sample: residents of 2 long term care facilities (87% female). Age: mean 84 years. Inclusion criteria: resident of facility; age 65 years or over; cognitively able to be tested; ambulatory with or without assistive device; able to follow simple directions; co-operative; capable of participating in group exercises. Exclusion criteria: unable or unwilling to complete the baseline assessments
Interventions	a. "Fit NB Free" individualised progressive strength training and conditioning (treadmill, walking, bi-cycling, weight lifting) 3 x weekly for 13 to 28 months depending on date of enrolment. Could also participate in control activities. b. "Living and Learning/Tai Chi": behavioural and psychotherapeutic methods to modulate fear of falling (nurse and social worker 1 x per month) and Tai Chi 3 x per week throughout programme. Could also participate in control activities. c. Control: basic enhanced programme: "Walk-Along" programme to encourage interaction between staff and residents while walking (1 x per month), "Pill Talk" to discuss medications commonly used by seniors (frequency not described), "Music and Memories" using music of their past to stimulate pleasant memories (frequency not described)
Outcomes	Length of follow up variable depending on time of enrolment (mean (SD) 21.9 (4.6) months), range 13 -28 months. Falls identified from incident reports. 1. Number of participants falling 2. Time to first fall 3. Number who complied with programme 4. Death during study.
Notes	

Risk of bias

Item	Authors' judgement	Description
------	--------------------	-------------

Nowalk 2001 (Continued)

Allocation concealment?	Unclear	B - Unclear
-------------------------	---------	-------------

Pardessus 2002

Methods	Randomised controlled trial. Randomised using random numbers table. Losses: 9 of 60 (15%) Intention to treat analysis.
Participants	Setting: recruited in hospital, community dwelling, France. N=60 Sample: individuals hospitalised for a fall. Age: mean (SD) 83.2 (7.7) Inclusion criteria: hospitalised for a “mechanical” fall; living at home. Exclusion criteria: cognitive impairment (MMSE <24); falls due to cardiac, neurologic, vascular or therapeutic problems; without a phone; lived > 30 km from hospital
Interventions	a. Comprehensive 2 hour home visit with physical medicine doctor, rehabilitation doctor and OT prior to discharge. 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. b. Control: usual care.
Outcomes	Length of follow up 1 year. Falls identified by monthly telephone calls. 1. Number of participants falling 2. Mean number of falls per participant.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Pereira 1998

Methods	Randomised controlled trial 1982-85. Reporting 10 year follow up. Losses: 31 of 229 (14%). Intention to treat analysis not possible.
Participants	Setting: community, Pittsburgh, USA N=229 randomised - 198 available for 10 year follow up. Sample: healthy volunteers Age: mean 57 years at randomisation. Mean (SD) at follow up 70 (4) years. Inclusion criteria: 1 year post menopause; aged between 50 and 65 years. Exclusion criteria: on HRT; unable to walk.

Pereira 1998 (Continued)

Interventions	a. 8 week training period with organised group walking scheme x 2 weekly. Also encouraged to walk x 1 weekly on their own. Building up to 7 miles per week total. b. Control: no intervention
Outcomes	Reporting 10 year follow-up. Falls in the previous 12 months ascertained by telephone interview. 1. Number of participants falling 2. Number sustaining 2 or more falls Also measured, but not considered in this review were self reported walking; functional status; sport and exercise index; chronic diseases and conditions
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Pfeifer 2000

Methods	Double blind randomised controlled trial. Method of randomisation not described. Losses: 11 of 148 (7%) Intention to treat analysis not possible.
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 a. 600 mg elemental calcium (calcium carbonate) plus 400 IU vitamin D b. Control: 600 mg calcium carbonate
Outcomes	Length of follow up 1 year. Falls and fractures monitored retrospectively by questionnaire at 1 year. 1. Number of participants falling 2. Number of sustaining fracture fall Also measured, but not considered in this review were body sway parameters, and biochemical measures
Notes	

Risk of bias

Pfeifer 2000 (Continued)

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Ray 1997

Methods	Randomised controlled trial of 7 pairs of nursing homes matched by number of beds and randomised within pairs. Statistician generated sealed envelope, random assignments for each pair. Losses: 25 of 499 (5%) Intention to treat analysis.
Participants	Setting: nursing homes, Tennessee, USA N=499 Sample: residents at high risk of falling Age: mean 82 years First level inclusion criteria (for nursing homes): 80 - 250 beds; not specialising in psychiatric or short stay skilled nursing care; not in the lowest tercile of psychotropic drug use (Medicaid data); no more than one violation on the most recent Health Care Financing Administration survey. Second level inclusion criteria (for nursing homes): administrative stability; agreement to participate from medical director and other physicians whose patients made up 25% or more of residents; agreement to appoint a falls co-coordinator for 2-4 hours per week; able to provide study data Inclusion criteria (for subjects): at least 65 years of age; fallen in past year; expected to stay in home for 6 months; with possible safety domain problem Exclusion criteria: bed bound
Interventions	a. Multidisciplinary patient safety assessment by nurse, psychiatrist, OT (environmental and personal safety, wheelchairs, psychotropic drugs, transferring and ambulation) and individualised treatment planning Interventions at nursing home level to encourage implementation: team physicians meeting with patient's physicians; inservice education for nurses b. Control: usual care. Offered inservices on fall prevention after follow-up period
Outcomes	Follow up 365 days in home from time of assessment. Falls recorded from incident reports and medical records. 1. Number of recurrent fallers (2 or more falls during follow up) 2. Number of injurious falls (serious injuries e.g. fractures, head injuries with altered consciousness, joint dislocations, sprains, sutured lacerations) 3. Change in function 4. Mortality
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Reinsch 1992

Methods	Randomised controlled trial. Randomisation by senior centre rather than by individual participant. Losses: 46 of 230 (20%). Intention to treat analysis not possible.	
Participants	Setting: community, California, USA. N=230 men and women Sample: recruited from senior centres Age: mean (SD) 74 (6.0) years. Inclusion criteria: over 60 years of age No exclusion criteria listed.	
Interventions	a. "Stand up/step up" exercise programme, with preliminary stretching exercise. 1 hour, x 3 days per week, for 1 year. b. 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. c. Exercise (2 meetings per week) and cognitive intervention (x 1 meeting per week) for 1 year. d. Discussion control group. 1 hour, x 1 day per week, for 1 year	
Outcomes	Length of follow up 1 year. Falling ascertained by recall, at weekly intervals. 1. Number of participants falling. 2. Number sustaining injury fall. 3. Number sustaining medical care fall. 4. Number sustaining fracture fall. 5. Number sustaining 2 or more falls.	
Notes		
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Robertson 2001a

Methods	Randomised controlled trial. Allocation schedule developed using computer generated numbers. Assignment by independent person off site. Losses: 29 of 240 (12%) Intention to treat analysis.	
Participants	Setting: community, West Auckland, New Zealand N= 240 Sample: men and women living at home, identified from computerised registers at 17 general practices (30 doctors) Age: mean (SD) 80.9 (4.2), range 75 - 95 years Inclusion criteria: aged 75 years and older Exclusion criteria: inability to walk around own residence; receiving physiotherapy at the time of recruitment; not able to understand trial requirements	

Robertson 2001a (Continued)

Interventions	<p>a. 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</p> <p>b. Control: usual care</p>	
Outcomes	<p>Length of follow up 1 year. Active fall registration with daily calendars returned monthly + telephone calls.</p> <ol style="list-style-type: none"> 1. Number of participants falling. 2. Number sustaining 2 or more falls. 3. Number sustaining fracture fall. 4. Number sustaining injury fall. 5. Time to first fall. 6. Mean number of falls per participant. 7. Fall rate per 100 person years. 8. Death during study. 9. Mean number of falls per year (SD) 10. Number sustaining an adverse effect 11. Number who complied with programme 	
Notes	<p>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/injury-prevention</p>	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Rubenstein 1990

Methods	<p>Randomised controlled trial. Randomised with computer generated, randomly sequenced cards in sealed envelopes. Losses: none described. Analysis appears to be by intention to treat.</p>	
Participants	<p>Setting: institution, California, USA. Sample: men and women in long term residential care N=160 Age: mean (SD) 87 (8) years Inclusion criteria: sustained a fall within previous seven days. Exclusion criteria: inability to walk, severe dementia, poor understanding of English</p>	

Rubenstein 1990 (Continued)

Interventions	a. Nurse practitioner assessment within 7 days of a fall, followed by physician recommendations for action, and referral for intervention if appropriate. b. Control group: usual care	
Outcomes	Falls recorded in daily log. Length of follow up 2 years. 1. Number of participants falling. 2. Number sustaining fracture fall. 3. Number sustaining injury fall. 4. Mean number of falls per participant. 5. Death during study.	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Rubenstein 2000

Methods	Randomised controlled trial. Randomised in blocks of 16-20 at 3-6 month intervals, using randomly generated sequence cards in sealed envelopes. Losses: 4 of 59 (7%). Intention to treat analysis.	
Participants	Setting: community, California, USA N=59 Sample: men recruited from Veterans Administration ambulatory care centre (volunteers). Age: mean 74 years Inclusion criteria: aged 70 years and older; 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	a. Exercise sessions (strength, endurance and balance training) in groups of 16-20, 3 x 90 minute sessions per week for 12 weeks b. Control: usual activities	
Outcomes	Follow up for 3 months from randomisation. No active fall registration. Fall ascertainment for intervention group at weekly classes. Controls phoned every 2 weeks. 1. Number of fallers 2. Number of falls 3. Number sustaining injury falls 4. Fall rate per 1000 person years	

Rubenstein 2000 (Continued)

Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Ryan 1996

Methods	Randomised controlled trial. Method of randomisation not described. Losses: none described. Assume intention to treat analysis.	
Participants	Setting: community, USA N=45 Sample: rural and urban dwelling women. Volunteers from senior meal sites. Inclusion criteria: at least 65 years of age; 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 a. 1 hour fall prevention education programme discussing personal (intrinsic) and environmental (extrinsic) risk modification in small groups of 7-8 women (nurse led). b. Same educational programme but individual sessions with nurse. c. Controls received health promotion presentation (no fall prevention component) in small groups of 7-8	
Outcomes	Follow up follow up monthly for 3 months. 1. Number of fallers 2. Number of falls 3. Number of fall related injuries 4. Number of fall prevention changes made	
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
Allocation concealment?	Unclear	B - Unclear

Sato 1999

Methods	Double-blind randomised study. Randomisation by computer generated random numbers. Losses: none described Intention to treat not possible.	
Participants	Setting: community dwelling, Japan N=86 (35 men, 51 women) Sample: elderly people with Parkinson's disease (mean Hoehn and Yahr Stage 3) Age: mean 70.6 years, 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	a. 1 alpha (OH) Vitamin D3 1.0 mcg daily for 18 months b. Control: identical placebo.	
Outcomes	Length of follow up 18 months. Number of falls per subject 'recorded' during 18 months. 1. Mean number of falls (SD) 2. Number of participants sustaining a fracture fall 3. Number sustaining a fall related hip fracture Also measured, but not considered in this review were bone mineral density, and biochemical measures	
Notes		
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Schnelle 2003

Methods	Randomised controlled trial. Randomised within nursing homes by "computerized programs". Losses: 18 of 190 (9%) Intention to treat not possible.	
Participants	Setting: nursing homes, California, USA. N=190 (85% female) Sample: residents of four nursing homes. Age: mean (SD) intervention group 87.3 (8.0) years, controls 88.6 (6.7) years. Inclusion criteria: incontinence of urine, able to follow a simple one-step instruction. Exclusion criteria: catheterised, on Medicare Part A reimbursement for postacute skilled care or terminal illness	
Interventions	a. FIT intervention (low intensity, functionally oriented exercise and incontinence care) provided every 2 hours from 8.00 am and 4.00 pm for 5 days a week, for 8 months (see notes for further details). Controls: usual care.	

Schnelle 2003 (Continued)

Outcomes	<p>Length of follow up 8 months. Falls identified from patient records weekly.</p> <ol style="list-style-type: none"> 1. Number of participants falling 2. Number of falls 3. Number of participants sustaining falls with skin injury 4. Number of participants sustaining a fracture 5. Number of participants sustaining other fall related injuries 6. Number of fall related skin injuries 7. Number of fall related fractures 8. Number of fall related other injuries 9. Number of falls per 1000 resident weeks 10. Number of fall related skin injuries per 1000 resident weeks 11. Number of fall related fractures per 1000 resident weeks 12. Number of other fall related injuries per 1000 resident weeks <p>Also measured, but not considered in this review: several other selected acute conditions associated with physical inactivity, incontinence, and immobility e.g. dermatological, genitourinary, gastrointestinal, respiratory, endocrine, neurological, cardiovascular, pain, psychiatric and nutritional disturbances</p>
Notes	<p>During each episode of care subjects were prompted to toilet, and were changed if wet. Before or after incontinence care they were encouraged to walk or, if not ambulatory, to wheel their chairs and to repeat sit to stands up to 8 times using minimal level of human assistance necessary. During one trial per day, subject did upper body resistance training (arm curls or arm raises), usually in bed. Subjects offered fluids to drink before and after each trial to increase intake. Individual target goals for exercise adjusted weekly</p>

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Shaw 2003

Methods	<p>Randomised controlled trial. Block randomisation by computer generated random numbers by researcher independent of recruitment process and blind to baseline interview data. Stratified by MMSE score at study entry: 20-23 (mild impairment), 12-19 (moderate impairment), 4-11 (severe impairment).</p> <p>Losses: 92 of 308 (30%)</p> <p>Intention to treat analysis.</p>
Participants	<p>Setting: two inner city A&E departments, Newcastle upon Tyne, UK.</p> <p>N=274</p> <p>Sample: older people with cognitive impairment or dementia attending A&E after a fall (community dwelling or in institutions).</p> <p>Age: mean 84, range 71-97 years.</p> <p>Inclusion criteria: age 65 years or over; cognitive impairment and dementia (MMSE <24; consent from three people (patient, immediate carer, and next of kin).</p> <p>Exclusion criteria: if MMSE no longer <24 two weeks after presentation at A&E; unable to walk; medical diagnosis likely to have caused index fall e.g. stroke; unfit for investigation within 4 months; unable to communicate for reasons other than dementia; living > 15 miles from site of recruitment; had no major informant i.e. someone in contact with patient at least 2 x per week</p>

Shaw 2003 (Continued)

Interventions	<p>a. Multifactorial, multidisciplinary clinical assessment (medical, physiotherapy, occupational therapy, cardiovascular) and intervention for all identified risk factors for falls.</p> <p>b. Control: clinical assessment but no intervention.</p>	
Outcomes	<p>Length of follow up 1 year. Falls identified by weekly diary mailed as a postcard, and telephone contact if no card for 2 weeks.</p> <ol style="list-style-type: none"> 1. Number of participants falling 2. Number of falls 3. Time to first fall 4. Number sustaining major injury 5. Number sustaining a fractured neck of femur 6. Number of fall related A&E attendances 7. Number of fall related hospital admissions 	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Steinberg 2000

Methods	<p>Randomised controlled trial. Cluster randomisation. 4 groups with approximately equal numbers formed from 2 or 3 National Seniors Branches. Groups randomly allocated to 1 of 4 interventions. Method of randomisation not described.</p> <p>Losses: 9 of 252 (4%)</p> <p>Intention to treat analysis.</p>	
Participants	<p>Setting: community, Australia</p> <p>N=252</p> <p>Sample: volunteers from branches of National Seniors Association clubs.</p> <p>Age: mean age 69 years (range 51 - 87)</p> <p>Inclusion criteria: National Seniors Club member; aged 50 years or over, with capacity to understand and comply with the project.</p> <p>Exclusion criteria: none stated.</p>	
Interventions	<p>Cumulative intervention</p> <ol style="list-style-type: none"> a. Intervention d. 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. b. Intervention d. plus a. plus home safety assessment and financial and practical assistance to make modifications. c. Intervention d. plus a. plus b. plus clinical assessment and advice on medical risk factors for falls. d. Control: oral presentation; video on home safety; pamphlet on fall risk factors and prevention 	

Steinberg 2000 (Continued)

Outcomes	Follow up up to 17 months but varied between groups. Follow up commenced after start of all components for each intervention. Fall calendar, marked daily, returned monthly. Telephone follow up of reported falls and no monthly returns 1. Time to first fall 2. Fallers per 100 person months 3. Falls per 100 person months.	
Notes	Younger, healthier and more active sample than elderly population as a whole	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	No	C - Inadequate

Stevens 2001

Methods	Cluster randomised controlled trial. Unit of randomisation individual household. 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%) Intention to treat analysis.	
Participants	Setting: community, Perth, Australia. N=1737 (53% female) 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. Age: mean 76 years. Inclusion criteria: aged 70 years 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	a. 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). b. Control: One home visit by nurse to confirm consent, educate about how to recognise a fall, and complete the daily calendar	
Outcomes	Follow up follow up 1 year. Falls recorded on daily calendar. No raw data. Results presented as adjusted and unadjusted odds ratios and incident rate ratios 1. Rate of falls (all falls) 2. Rate of falls on environmental hazard inside home 3. Rate of falls inside the home 4. Proportion of fallers (all falls)	

Stevens 2001 (Continued)

	<p>5. Proportion of fallers (falls on environmental hazards)</p> <p>6. Proportion of fallers (falls inside home)</p> <p>7. Fall related injuries</p> <p>8. Fall related injuries requiring medical care (rate ratios)</p>
Notes	<p>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</p>

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Tideiksaar 1993

Methods	<p>Randomised controlled trial.</p> <p>Losses: none described.</p> <p>Analysis by intention to treat.</p>
Participants	<p>Setting: hospital, New York, USA.</p> <p>N=70</p> <p>Sample: men and women admitted to an acute care facility for older patients during a 9 month period.</p> <p>Age: mean 84 years (range 67-97).</p> <p>Inclusion criteria: patients with poor bed mobility (difficulty with transfers)</p>
Interventions	<p>a. Bed alarm system during hospital stay.</p> <p>b. No bed alarm.</p>
Outcomes	<p>Measured over 9 months. Followed-up for duration of hospital stay.</p> <p>Hours of exposure to system available for experimental group.</p> <p>1. Number of participants sustaining fall from bed.</p> <p>2. Number sustaining other falls.</p>
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Tinetti 1994

Methods	Randomised controlled trial. 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%). Analysis by intention to treat not possible due to missing data. Outcome assessors blinded to assignment.
Participants	Setting: community, Southern Connecticut, USA N=301 Sample: independently ambulant community dwelling individuals (208 women, 93 men) Age: mean (SD) 78.3 (5.3) years (intervention group) mean (SD) 77.5 (5.3) years (control group) Inclusion criteria: Aged > 70 years; 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	a. Interventions targeted to individual risk factors, according to decision rules and priority lists. 3 month programme duration. b. Control visits by social work students over same period.
Outcomes	Measured at 1 year. Falls ascertained by monthly postal survey, followed by personal or telephone contact. 1. Number falling. 2. Number sustaining medical care fall. 3. Number sustaining serious injury fall. 4. Death during study.
Notes	Yale (New Haven) FICSIT trial [Province 1995] 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
Allocation concealment?	Unclear	B - Unclear

van Haastregt 2000

Methods	Randomised controlled trial. Randomisation by computer generated random numbers. Losses 81 of 316 (26%). Inadequate data for intention to treat analysis.
---------	---

van Haastregt 2000 (Continued)

Participants	Setting: community, Hoensbroek, Netherlands. N=316 Sample: community dwelling men and women registered with 6 general medical practices Age: mean (SD) 77.2 (5.1) years Inclusion criteria: aged 70 years 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	a. 5 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”. b. Control: usual care	
Outcomes	Follow up follow up 12 months and 18 months. Falls recorded in weekly diary. 1. Number falling 2. Number sustaining medical care fall. 3. Number sustaining injury fall 4. Number sustaining 2 or more falls 5. Number complying with recommendations 6. Death during study	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

van Rossum 1993

Methods	Randomised controlled trial. Stratified on sex, self rated health, composition of household and social class prior to randomisation. People living together allocated to same group. Intervention group randomised to nurses. Losses 102 of 580 (18%). Intention to treat analysis.	
Participants	Setting: community, Netherlands N=580 Sample: general population sampled, not volunteers Inclusion criteria: aged 75 to 84 living at home. Exclusion criteria: subject or partner already receiving regular home nursing care	
Interventions	a. 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. Gave advice and referrals to other services. b. Control received no home visits	

van Rossum 1993 (Continued)

Outcomes	Follow up follow up at 1½ years and 3 years by postal survey and interview. Falls in previous 6 months recorded. 1. Number of falls. Also measured, but not considered in this review were self rated health; functional state; wellbeing and mental state; use of services	
Notes		
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Vassallo 2001

Methods	Cluster randomised controlled trial. Method of randomisation not described. Losses: none described. Inadequate data for intention to treat analysis.	
Participants	Setting: geriatric rehabilitation wards, UK. N=825 Sample: consecutive admissions to three geriatric rehabilitation wards. Age: not stated Inclusion criteria: not described. Exclusion criteria: not described.	
Interventions	a. One ward. Multifactorial, multidisciplinary assessment and intervention. Assessed by consultant, nurse, OT, social worker, physiotherapist who met weekly to discuss patients' fall risk and formulate targeted plan. Patients at risk identified with wrist bands, risk factors corrected or environmental changes instituted (observation beds, alarms, toilet facilities etc) to enhance safety. b. Control: 2 wards, usual care.	
Outcomes	Length of follow up not stated. 1. Number of fallers 2. Number sustaining injury 3. Number of recurrent fallers 4. Number of falls 5. Number of falls per 100 patient days	
Notes	Abstract only	
Risk of bias		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Vellas 1991

Methods	Randomised controlled trial. Randomised 7 days after a fall. Losses: 6 out of 95 (6%). Inadequate data for intention to treat analysis.
Participants	Setting: community, France N=95 Sample: community dwelling men and women presenting to their general medical practitioner with a history of a fall. 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	a. Iskédy® (combination of raubasine and dihydroergocristine) 2 droppers morning and evening for 180 days b. Placebo for 180 days
Outcomes	Follow up follow up 180 days. 1. Number of fallers
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Vetter 1992

Methods	Randomised controlled trial. Randomisation by household. Losses: 224 of 674 (33%). Inadequate data for intention to treat analysis.
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. No exclusion criteria listed.
Interventions	a. Health visitor visits, minimum yearly, for 4 years, with advice on nutrition, environmental modification, concomitant medical conditions, and availability of physiotherapy classes if desired. b. Control: usual care
Outcomes	Length of follow up 4 years. Falling status ascertained by interview at end of study period. 1. Number of participants sustaining a fall. 2. Number of participants sustaining fracture fall. 3. Deaths during study.
Notes	

Vetter 1992 (Continued)

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Wagner 1994

Methods	Randomised controlled but method of randomisation not described. Losses: 89 of 1559 (6%). Inadequate data for intention to treat analysis.
Participants	Setting: community, Seattle, USA N=1559 Sample: 'healthy elderly' men and women, HMO enrollees. Age: mean 72 years Inclusion criteria: aged 65 years or over; HMO members; ambulatory and independent. Exclusion criteria: Too ill to participate as defined by primary care physician
Interventions	a. 60-90 minute interview with nurse, including review of risk factors, audiometry and blood pressure measurement, development of tailored intervention plan, motivation to increase physical and social activity. b. Chronic disease prevention nurse visit. c. Control: usual care
Outcomes	Measured at 1 and 2 years. 1. Number of participants falling. 2. Number sustaining medical care fall. 3. Number sustaining injury fall. 4. Death during the study.
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

<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Wolf 1996

Methods	Randomised controlled trial. Randomised using computer generated procedure. Losses: 40 of 200 (20%). Inadequate data for intention to treat analysis.	
Participants	Setting: community, Atlanta, USA. N=200 Sample: men (N=38) and women (N=162) residing in an independent living facility, recruited by local advertisements and direct contact. Age: mean (SD) 76.9 (4.8) years for intervention a, 76.3 (5.1) for intervention b, and 75.4 (4.1) for controls. Inclusion criteria: over 70 years old; 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	a. Tai Chi Quan (balance enhancing exercise). Group sessions twice weekly, for 15 weeks. (Individual contact with instructor approximately 45 minutes per week.) b. Computerised balance training. Individual sessions once weekly, for 15 weeks. (Individual contact with instructor approximately 45 minutes per week.) c. Control: group discussions of topics of interest to older people with gerontological nurse, 1 hour once weekly for 15 weeks	
Outcomes	Length of follow up 7-20 months. Falls ascertained by monthly calendar or by monthly phone call from project staff. Used modified definition of a fall rather than agreed definition for FICSIT trials described in Buchner 1993. 1. Number of falls. 2. Time to 1 or more falls. 3. Time to 1 or more injurious falls.	
Notes	Atlanta FICSIT trial [Province 1995]. Published data is not in a useable form. 1997 paper included under this study id reports on a sub-group of the trial, reporting on outcomes other than falls	
<i>Risk of bias</i>		
Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

ABBREVIATIONS AND ACRONYMS:

A&E: accident and emergency department

ADL: activities of daily living

AMT: abbreviated mental test

BMD: bone mineral density

BMI: body mass index

CHF: congestive heart failure

CSH: carotid sinus hypersensitivity

CSM: carotid sinus massage

FICSIT: frailty and injuries: cooperative studies of intervention techniques

GP: general practitioner

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, traveling, using the telephone

IQR: Interquartile range

m: meters

MMSE: mini mental state examination

OT: occupational therapist

SD: standard deviation

SF36: medical outcomes study 36-item short form questionnaire, a standard measure of health related quality of life

x: times

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

Study	Reason for exclusion
Abreu 1998	Not RCT. Divided into groups by convenience sampling. Intervention: group versus home fall prevention education. Falls outcomes
Ades 1996	RCT. Intervention: weight training exercise. No falls outcome. Outcome gait velocity and strength
Allen 1986	RCT. Intervention: geriatric consultation team. No falls outcome. Outcome compliance of hospital doctors
Bean 2002	RCT. Intervention: 12 week exercise programme of stair climbing using weighted vests versus walking. Outcomes: strength, power and physical performance in mobility-limited older people. No falls outcome
Binder 1995	RCT. Intervention: exercise programme, randomised to vitamin D or not. Outcome balance. All participants demented. No falls outcome
Bowling 1992	RCT. Intervention: randomised to nursing home or long stay hospital ward. No falls outcome. Outcomes accidents, quality of life
Buchner 1997b	RCT. Intervention: endurance training. MoveIT study. Same control group as included FICSIT study. No falls outcome
Caplan 1999	RCT. Intervention: Hospital in the Home instead of acute admission. Not just elderly (age range 17-111 years). Not fall prevention trial; falls monitored as possible complications
Charette 1991	RCT. Intervention: resistance exercise. No falls outcome. Outcome - cross section of muscle fibre
Cheng 2001	RCT. Intervention: symmetrical standing training and repetitive sit-to-stand training using a standing biofeedback trainer. Falls outcome but all subjects had hemiplegic stroke and not just elderly
Chin A Paw 2001	RCT. Intervention: exercise and enriched food regimen. Outcome: functional performance. No falls outcome
Clark 1975	RCT. Exercise intervention. No falls outcome.

(Continued)

Crilly 1989	RCT. Intervention: exercise programme. Outcome postural sway. No falls outcome
Crotty 2002	RCT. Intervention: accelerated discharge and home based rehabilitation after hip fracture. Not intervention to prevent falls; falls recorded but as adverse events
Deery 2000	Not RCT. Controlled trial. Pre-post intervention analysis. Intervention: fall prevention programme consisting of peer presented education sessions. Falls outcomes
Earles 2001	RCT. High-velocity resistance training versus self-paced walking program in high functioning older adults. No falls outcomes
Fiatarone 1994	RCT. Exercise/nutritional intervention. No falls outcome. Outcomes muscle strength and mobility, gait, stair climbing and others. FICSIT trial
Galindo-Ciocon 1995	Not RCT. Pre-post intervention design. Intervention: fall prevention counseling and gait and balance training. Falls outcomes
Geiger 2001	RCT. Stroke patients with hemiplegia. Physical therapy alone vs physical therapy plus visual biofeedback/forceplate training. Outcome: balance and Get up & Go
Gerson 2001	RCT. Intervention in Emergency Department: giving fallers fall prevention brochures vs home hazard checklist vs home hazard checklist plus counseling on making home safety changes. No falls outcome. Outcome: reduction in hazards
Graafmans 1996	Sub-group of RCT testing daily Vitamin D versus placebo. 2578 persons randomised. This paper reports an epidemiological study of risk factors for falls in a sub-group of 368 subjects. The source population for this paper were subjects from 13 homes or apartment houses and randomisation had taken place within these units in blocks of 10, however of 458 eligible subjects only 368 agreed to enrol in this study (80.1%). Although the percentage who fell in intervention and control groups are reported, 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)
Green 2002	RCT. Intervention: physiotherapy for patients with mobility problems more than 1 year after a stroke. Falls outcomes but all stroke patients aged 50 years and over. 95% had left or right hemiparesis
Greendale 2000	RCT. Intervention: use of a weighted vest (no vest, 3% of body weight or 5% of body weight) to be worn 2 hours per day, 4 days per week, for 27 weeks. No falls outcome. Outcome knee extensor and flexor strength, selected measures of physical performance, serum and urine markers of bone turnover, and quality of life indices
Hagberg 1989	RCT. Intervention: exercise. No falls outcome. Outcome new cardiovascular event
Hall 1992	RCT. Intervention nurse visit, individualised interventions. No falls outcome. Outcomes psychological tests, care status
Hansen 1992	RCT. Intervention: geriatric follow up after hospital discharge. Outcome admission to nursing homes. No falls outcome

(Continued)

Hebert 2001	RCT. Intervention: multifactorial assessment of community dwelling people aged 75 and over. Primary outcome: functional decline (defined as death, admission to an institution or increase of > or = 5 points on the Functional Autonomy Measurement System (SMAF) scale disability score during one year follow-up) . Secondary outcomes: functional autonomy, well-being, perceived social support , and use of health care services. No falls outcome
Hendrich 1988	Not RCT. Hospital prevention plan. Falls outcomes.
Hendriksen 1984	RCT. Intervention: home visits and provision of aids. Outcome GP visits, hospitalisation. No falls outcome.
Hendriksen 1989	RCT. Intervention: preventive home visits. Outcome: hospitalisation. No falls outcome.
Hofmeyer 2002	RCT. Intervention: training to improve the ability of disabled older adults to rise from the floor. Not fall prevention. No falls outcome
Holmqvist 1998	RCT. Intervention: early supported discharge after stroke. Not fall prevention. Falls reported as a possible adverse effect
Hopman-Rock 1999	RCT. Intervention: psychomotor activation programme for cognitively impaired elderly in institutional care. Not fall prevention. Falls monitored as a possible adverse effect
Hu 1994	RCT. Not fall prevention. Falls artificially induced. Balance parameters measured
Judge 1993	RCT. Outcome static balance, muscle strength. No falls outcome
Kelly 2002	Not RCT. Pre-post test design in skilled nursing care facility (USA) of adhesive credit card sized alarm activated by weight bearing
Kempton 2000	Not RCT. Evaluation of non randomised community fall prevention programme targeting eight risk factors. Geographical control
Kerschan-Schindl2000	Not RCT. Sample selected from controlled trial of home exercise programme. Falls outcomes
Kilpack 1991	Not RCT. Pre-post intervention design. Nursing intervention. Outcome falling
Krishna 1983	Not RCT. Pre-post intervention design. Hospital based, staff education programme. Outcome falling
Kuipers 1993	Controlled study. Pre-post intervention. Hospital based risk assessment and intervention. Falls outcome
Kustaborder 1983	Not RCT. Pre-post intervention design. Hospital based. Outcome accidents (not just falls)
Lamoureux 2003	RCT. Intervention: progressive resistance. Outcome: strength assessed using an obstacle course. No falls outcome

(Continued)

Latham 2001	RCT. Hospital based. Intervention: progressive resistance strength training. No falls outcome. Outcome: strength, gait speed, timed "up-and-go", balance (Berg)
Lauritzen 1993	RCT. Intervention hip protectors. Hip fracture outcome.
Lawrence 1992	Not RCT. Case series. Nursing intervention. Outcome falling.
Li 2001	RCT. Exercise intervention (Tai Chi). No falls outcome. Outcome self-efficacy and self-reported physical functioning
Lichtenstein 1989	RCT. Exercise intervention. No falls outcome. Outcome balance and sway
Lord 1996a	RCT. Exercise intervention. No falls outcome. Outcome gait related
Lord 1996b	RCT. Exercise intervention. No falls outcome. Outcome balance related
MacRae 1996	Not RCT. Pre-post intervention. Walking programme for nursing home residents. Falls monitored as possible adverse events
McCabe 1985	Not RCT. Nursing intervention. Falls outcomes.
McEwan 1990	RCT. Intervention: screening programme by nurses with general assessment. Outcome - health indices, ADL, morale. No falls outcome
McMurdo 1993	RCT. Intervention: exercise. Outcome sway, depression, ADLs, chair to stand time. No falls outcome
Mills 1994	RCT. Low intensity aerobic exercise. No falls outcome.
Mohide 1988	RCT. Intervention: quality assurance programme in nursing homes. No falls outcome. Outcome: hazardous mobility and constipation
Morganti 1995	RCT. Intervention; resistance training. Outcome not falling. Outcome strength
Morton 1989	Not RCT. Falls prevention programme. Hospital.
Naso 1990	RCT. Exercise intervention. No falls outcome. Outcome 'training effect'
Nichols 1993	RCT. Intervention: resistance training. No falls outcome. Outcome: strength
Obonyo 1983	Not RCT. No untreated group. Falls outcomes.
Pathy 1992	RCT. Intervention: postal health screening by questionnaire. Outcome: mortality, quality of life, health service use. No falls outcome
Plautz 1996	Not RCT. Pre-post intervention design. Falling outcome.
Ploeg 1994	RCT. Intervention: safety assessment. No falls outcome. Outcome: safety behaviour changes

(Continued)

Pomeroy 1999	RCT. Intervention: physiotherapy to improve mobility in demented elderly people. No falls outcome
Posner 1990	RCT. Intervention: aerobic exercise intervention. No falls outcome. Outcome new cardiovascular diagnoses
Poulstrup 2000	Not RCT. Community based intervention programme. Quasi experimental, with non-randomised control communities. Intervention: information and home visits with follow-up, removing physical hazards, treating somatic and psychiatric illnesses and dealing with improper drug consumption, diet insufficiencies and physical and mental inactivity. Outcome: fall related fractures
Pujiula 2001	Not RCT. Community-based intervention programme (methods). Quasi experimental, with non-randomised control communities. Intervention: multifactorial community intervention
Rainville 1984	Not RCT. Pre-post intervention. Hospital fall prevention programme
Rantz 2001	RCT (cluster randomised nursing homes). Intervention: staff workshops and feedback about 23 quality indicators versus workshops and feedback and clinical consultation versus control. Outcomes: reporting of 23 quality indicators. Subgroup analysis of nursing homes that made use of clinical consultation v those that did not. Falls one of 23 quality indicators but no useable data
Reuben 1995	RCT. Intervention: geriatric assessment of hospital patients. No falls outcome. Outcome functional and health status, mortality
Robbins 1992	RCT. Balance outcomes. No falls outcome.
Robertson 2001c	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 2001. Outcome: falls, injuries resulting from falls, and cost effectiveness
Robinson 2002	Not RCT. Controlled study of physiotherapy in community dwelling elderly people, but subjects self selected to participate in intervention
Sauvage 1992	RCT. Intervention: aerobic exercise programme. No falls outcome. Outcome: strength, gait, balance
Schlicht 2001	RCT. Intervention: intense strength training to improve functional ability related to the risk of falling. No falls outcomes. Outcome strength, walking speed, balance, sit-to-stand performance
Schmid 1990	Not RCT (pre-post intervention design). Development of injury risk assessment tool in nursing home patients. Outcome falling
Schnelle 1996	RCT. Intervention: exercise to improve mobility in physically restrained nursing home residents. No falls outcomes
Sherrington 1997	RCT. Intervention: home exercise programme. No falls outcome. Outcome: improved mobility and strength, post hip fracture
Shigematsu 2002	RCT (cluster). Intervention: dance based aerobic exercise. No falls outcome. Outcome: balance, strength and locomotion/agility

(Continued)

Shumway-Cook 1997	Not RCT. Quasi-experimental design. Exercise intervention. Non-equivalent control group. Logistic regression model of fall risk was an outcome, but not actual falls
Simmons 1996	RCT. Intervention: exercise in water. No falls outcome. Outcome: functional reach as a measure of fall risk
Sinaki 2002	RCT. Intervention: proprioceptive dynamic posture training in osteoporotic women with kyphotic posture. Outcome: spinal X-rays, back extensor, hip extensor, knee extensor and grip strength, balance tested by computerised dynamic posturography. No falls outcomes
Skelton 1999	Not RCT. Pre-post test design. Describes Falls Management Exercise (FaME) Programme and ongoing evaluation study which is not randomised
Speltz 1987	Not RCT. Pre-post intervention. Hospital. Falls outcomes.
Svanstrom 1996	Not RCT. Quasi experimental, with non-randomised controls. Intervention - environmental risk control. Pre-post intervention design. Outcomes hip fracture (discharge data)
Sweeting 1994	Not RCT. Pre-post intervention. Hospital. Falls outcomes.
Tennstedt 1998	RCT. Intervention: to reduce fear of falling and increase activity levels. Not fall prevention. Falls reported as possible adverse effect
Thompson 1988	RCT. Exercise intervention. No falls outcome.
Thompson 1996	Not RCT. Pre-post intervention. Environmental risk factor modification. Falls outcomes
Tideiksaar 1990	Not RCT. Pre-post intervention. Falls outcomes.
Tideiksaar 1992	Not RCT. Community based survey and falls prevention programme. Qualitative evaluation only. Falls outcomes
Tinetti 1992	Not RCT. Prospective cohort study. Outcome injurious falls.
Tinetti 1999	RCT. Intervention: home based multicomponent rehabilitation after hip fracture. Not intervention to prevent falls; falls recorded but as adverse events
Topp 1993	RCT. Intervention: resistance training classes. Outcome: change in gait and balance. No falls outcome
Topp 1996	RCT. Intervention: home based resistance training. Outcome: change in ankle strength, training intensity, postural control, and gait. No falls outcome
Tynan 1987	Not RCT. Description of fall and fracture prevention programme
Urton 1991	Not RCT. Description of falls prevention programme
von Koch 2000	RCT. Intervention: early supported discharge and rehabilitation at home after a stroke. Falls outcome but stroke patients and not a fall prevention strategy; falls monitored as adverse event

(Continued)

White 1991	Not RCT. Description of intervention in rehabilitation unit
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
Yates 2001	RCT. Intervention: multifactorial intervention to reduce fall risk (fall risk education, 10 week exercise programme, nutritional counseling and/or referral, environmental hazard education). Outcome: decrease in selected fall risk factors (physiological outcome measures, locus of control for nutrition, nutritious food behaviour, falls efficacy score, depression, environmental hazards). No falls outcomes
Ytterstad 1996	Not RCT. Quasi experimental, with non-randomised controls. Pre-post intervention design. Outcomes include falling

RCT: randomised controlled trial

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

Allegrante

Trial name or title	Self efficacy and strength training to improve postoperative rehabilitation of hip fracture patients
Methods	
Participants	200 patients with a hip fracture
Interventions	In hospital instruction of patient and care giver post operatively, 8 weeks high intensity strength training, home based walking programme, supportive phone calls vs standard care
Outcomes	Follow up follow up 1 year. Primary: within patient change in physical, social, and role function subscales of SF-36. Secondary: recurrent falls, ADL, muscle strength, balance, institutionalisation
Starting date	July 1993 Completed June 2000
Contact information	Dr JP Allegrante, Hospital for Special Surgery, 535 East 70 th St, New York, NY, 10021, USA.
Notes	Includes economic analysis

Allen

Trial name or title	A primary care based fall prevention programme: evaluation of the Canterbury fall prevention programme
Methods	
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	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 versus usual care. Intervention carried out by East Kent Health Promotion Service and nurses employed by the general practice
Outcomes	Follow up follow up at 6, 12 and 18 months. Falls
Starting date	Enrolling from August 1996 to Sept 1998
Contact information	Alison Allen, East Kent Health Promotion Service, East Kent Community NHS Trust, 43 Old Dover Road, Canterbury, Kent, CT1 3HR UK.
Notes	Completion date March 2000? Methods reported in Allen A, Simpson JM, Physiotherapy Theory and Practice (1999);15:121-133

Behrman

Trial name or title	Prediction and prevention of falls in the elderly
Methods	
Participants	500 individuals aged over 75 years at high risk of developing disabilities, from each general practice in Maidenhead
Interventions	Full geriatric assessment at day hospital and course of group exercises vs 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

Behrman (Continued)

Contact information	Dr R Behrman, Geriatric Dept, St Mark's Hospital, Maidenhead, SL6 6DU Berks, UK.
Notes	? falls outcomes

Brown

Trial name or title	Functional adaptation to exercise in elderly subjects
Methods	
Participants	108 community dwelling people
Interventions	16 week exercise and functional retraining programme including balance, strength, gait components
Outcomes	Falls, and balance and functional abilities
Starting date	Completed. Data analysis in progress
Contact information	A Piotrowski Brown, School of Physiotherapy, Curtin University, Selby Street, Shenton Park 6008, Western Australia. Tel +61 8 9266 3650, Fax +62 8 9266 3636 email a.brown@info.curtin.edu.au
Notes	

Clemson

Trial name or title	The effectiveness of a community-based program for reducing the incidence of falls among the elderly: a randomised trial
Methods	
Participants	310 community residing people aged 70 years or over
Interventions	Falls prevention and confidence building program (Stepping Out) employing a multi-faceted small group approach. It combines a range of strategies: balance and strength exercises, environmental adaptation (home and community), managing medications, coping with low vision, behavioural change, education, and risk management skills

Clemson (Continued)

Outcomes	Falls (daily calendar, posted monthly for up to 14 months). Secondary measures: SF-36; Modified Falls-Efficacy Scale (MFES); Mobility Efficacy Scale (MES); Physical Activity Scale for the Elderly (PASE); Worry Scale; Falls Behavioural Scale for older people (FaB)
Starting date	August 1999 Complete Paper submitted for publication
Contact information	Dr L. Clemson School of Occupation & Leisure Sciences The University of Sydney PO Box 170 Lidcombe NSW 1825 Australia Email: l.clemson@fhs.usyd.edu.au
Notes	

Cumming

Trial name or title	Randomised trial of vision improvement for prevention of falls
Methods	
Participants	800 males and females aged 70 years and over, mainly recruited from aged care service clients
Interventions	Vision testing, with appropriate interventions if required (mainly new glasses or cataract surgery)
Outcomes	Falls Vision-related quality of life
Starting date	August 2002
Contact information	R.G Cumming Centre for Education and Research on Ageing, University of Sydney Email: bobc@health.usyd.edu.au
Notes	

Dyer

Trial name or title	Preventing falls in residential homes: a multi-agency pilot study
Methods	
Participants	300 residents of residential homes
Interventions	Not described
Outcomes	Number of falls per resident, number of sedative medications, Tinetti gait assessment
Starting date	01/09/2000
Contact information	Dr Chris Dyer, St Martin's Hospital, Midford Road, Bath BA2 5RP Tel: 01225 831749
Notes	

Edwards

Trial name or title	Randomised controlled trial of falls clinic and follow up home intervention
Methods	
Participants	Volunteer community living seniors residing in apartments
Interventions	On site "falls clinic" assessment to identify those at high risk of falls, followed by intensive in-home comprehensive assessment and tailored intervention programme vs low intensity educational session
Outcomes	Incidence and risk of falls
Starting date	? completed
Contact information	N. Edwards, Career Scientist, School of Nursing, University of Ottawa, Canada.
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

Gordon

Trial name or title	The Winchester Falls Project: a randomised controlled trial of multidisciplinary assessment in the secondary prevention of falls
Methods	
Participants	People aged over 65 living in the community who have had a least 1 previous fall in the preceding month
Interventions	Multidisciplinary assessment. The study also aims to determine whether such an intervention, if effective, is best carried out in a primary or secondary care setting
Outcomes	Mean rate of falls per subject per year
Starting date	01/02/2000
Contact information	Dr Chris Gordon, Consultant Physician, Winchester and Eastleigh Health Care NHS Trust, Royal Hampshire County Hospital, Romsey Road, Winchester, SO22 5DG UK. Telephone: 01962 825572
Notes	

Grove

Trial name or title	Effects of T'ai Chi training on general wellbeing and motor performance in patients with Parkinson's disease
Methods	
Participants	20 patients with Parkinson's disease recruited from the Parkinson's disease clinic
Interventions	T'ai Chi training
Outcomes	Get up and go test, log book of falls
Starting date	31/03/2000
Contact information	Dr M. Grove Royal Cornwall Hospitals NHS Trust Treliske Truro TR1 3LJ UK

Grove (Continued)

Notes	
-------	--

Haines

Trial name or title	Effectiveness of a targeted falls prevention program in the sub-acute hospital setting. A randomised controlled trial
Methods	
Participants	626 sub-acute inpatients
Interventions	Targeted multiple intervention program. Includes falls risk alert cards, exercise program, education program and hip protectors delivered on top of "regular care". Control group received "regular care" alone
Outcomes	Falls (primary), fallers, falls with injuries Intervention sub-group analyses
Starting date	March 2002 Completed April 2003 Now in data analysis phase and preparation for publication
Contact information	T Haines B.Physio.Hons (PhD student at the University of Melbourne and National Ageing Research Institute) Telephone: +61398812431 Email: terrence.haines@peterjames.org.au
Notes	

Harwood

Trial name or title	Does expedited cataract extraction reduce the risk of falls in elderly people? - a randomised controlled trial
Methods	
Participants	400 women aged 75 -85 years with bilateral cataract suitable for surgery, who have not had previous ocular surgery
Interventions	Two trials. 1. Expedited vs routine surgery for first eye 2. Expedited surgery vs routine surgery for second eye
Outcomes	Time to first fall, mean fall frequency over 12 months, visual acuity, visual disability (VF-14), Barthel Index, London Handicap Scale, Euroqol, formal and informal care costs

Harwood (Continued)

Starting date	01/09/98 Completed
Contact information	Dr R. Harwood or Mr AJE Foss, Health Care of the Elderly, A Floor, East Block, University Hospital, Nottingham, NG7 2UH UK. Telephone: 0115 924 9924 ext 42809
Notes	Collecting data for cost-effectiveness analysis

Healey

Trial name or title	Using targeted risk factor reduction to prevent falls in older in-patients
Methods	
Participants	Eight Care of the Elderly wards or units of a district general hospital cluster randomised in matched pairs
Interventions	Use of pre-printed care plan for patients identified as at risk of falling, plus appropriate remedial measures versus usual care
Outcomes	Number of falls.
Starting date	12 month duration Complete
Contact information	F. Healey, Dept of Elderly Medicine, York District Hospital, Wigginton Road, York YO31 8HE United Kingdom email: Frances.Healey@york.nhs.uk
Notes	

Lamb

Trial name or title	Prevention of fall injury trial: PRE-FIT
Methods	
Participants	Setting: Primary care
Interventions	Targeted multi-factorial fall prevention versus usual care
Outcomes	Injurious falls, quality of life, costs
Starting date	01/06/2002
Contact information	Prof S Lamb, Inter-disciplinary Research Centre in Health (HSS), Coventry University, Priory Street, Coventry, CV1 5FB United Kingdom Telephone: 024 76887451 Fax: 024 76888020 email: s.lamb@coventry.ac.uk
Notes	

Lesser

Trial name or title	Vestibular rehabilitation in prevention of falls due to vestibular disorders in adults
Methods	
Participants	Adults with vestibular disorders
Interventions	Vestibular rehabilitation
Outcomes	Falls and quality of life
Starting date	01/08/2000
Contact information	Mr THJ Lesser, Otolaryngology, University Hospital Aintree, Longmoor Lane, Liverpool, L9 7AL United Kingdom Telephone: 0151 529 4035 Fax: 0151 529 5263

Lesser (Continued)

Notes	
-------	--

Lord

Trial name or title	The effect of tailored falls prevention program on fall risk and falls in older people: a randomized controlled trial
Methods	
Participants	Six hundred and twenty people aged 75 years and older (mean age 80.4, SD = 4.5) who were randomly recruited from a membership database of a private health insurance company
Interventions	A tailored falls prevention program that targets deficits identified from a physiological profile assessment (PPA). The interventions comprised tailored exercise, visual and counseling interventions based on the PPA results
Outcomes	Falls, injurious falls, postural sway, coordinated stability, reaction time, lower limb muscle strength and health status
Starting date	June 1999
Contact information	Assoc. Prof. Stephen Lord, Prince of Wales Medical Research Institute, Barker Street, Randwick, Sydney, NSW, 2031 Australia Telephone: +61-2-9382-2721 Fax: +61-2-9382-2722 Email: s.lord@unsw.edu.au
Notes	The PPA uses a web-based computer software program to assess an individual's performance in relation to a normative database compiled from large population studies. A falls risk assessment report is produced for each individual that includes a graph indicating an individual's overall falls risk score, and a profile of the individual's test performances in tests of vision, sensation, strength, reaction time and balance

Michie

Trial name or title	A randomised trial of vitamin D supplementation in preventing hip fracture
Methods	
Participants	Elderly residents of nursing and residential homes
Interventions	Vitamin D supplements for 2 years using a dose 20 times lower than the minimum toxic dose
Outcomes	Research question is to determine whether vitamin D supplementation reduces the high incidences of falls and hip fractures in elderly people living in nursing and residential care homes but no mention of falls outcomes. Outcome number of hip fractures.

Michie (Continued)

Starting date	01/03/2001
Contact information	Dr C Michie, Ealing Hospital NHS Trust, Uxbridge Road, Southall, Middlesex, UB1 3HW England. Telephone: 0181 967 5569 Fax: 0181 967 5339 E-mail: colinm@easynet.co.uk
Notes	Cluster randomisation by care home

Moxon

Trial name or title	Promoting mental health in elderly care homes
Methods	
Participants	Cluster randomised trial. 24 elderly care homes (12 matched pairs). Each home with average of 35 residents, and 11 care staff. Exclusion criteria for residents: too confused (MMSE assessment)
Interventions	1. York Programme for reducing prevalence and incidence of depression in elderly care homes: training course for staff; mentoring and reinforcing training; managing depression using psychosocial and medical insights. 2. Control: York Programme not introduced
Outcomes	Depression Falls
Starting date	01/11/1998 to 31/10/2002
Contact information	Mrs Sallie Moxon Senior Researcher c/o Dept of Mental Health for the Elderly Bootham Park York YO30 7BY United Kingdom Telephone: 01904 454839 Fax: 01904 454810 email: YHSRU@yorkhealth.demon.co.uk
Notes	

RECORD

Trial name or title	Randomised placebo-controlled trial of daily oral vitamin D and calcium for the secondary prevention of osteoporosis related fractures in the elderly (MRC RECORD study)
Methods	
Participants	6500 people aged at least 70 years with a recent proximal femur or other appendicular fracture or clinical vertebral fracture, and able to comply with protocol e.g. MMSE >7. Those with multiple or high transfer injury; inability to walk prior to presenting fracture without support, suffering from malignant disease, contraindication to calcium or vitamin D, current or recent (<1 year) treatment with >200 IU daily of vitamin D, any vitamin D metabolite, vitamin D by injection, calcium, fluoride, diphosphonates or calcitonin will be excluded
Interventions	Vitamin D3 800 IU plus calcium 1 g vs vitamin D3 alone vs calcium alone vs placebo
Outcomes	4 monthly postal questionnaire (plus notification by participant, contact person or GP) about: new fractures, death, hospital admission, change of residence type, falls, EuroQol and SF12
Starting date	01/11/98
Contact information	Prof Adrian Maxwell Grant, MRC/RECORD Study Office, Health Services Research Unit, Drew Kay Wing, Polwarth Building, Foresterhill, Aberdeen, AB25 2ZD Scotland, UK. Telephone: 01224 553908 Fax: 01224 663087 E-mail: a.grant@abdn.ac.uk
Notes	

SAFE PACE 2

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	
Participants	Patients with carotid sinus hypersensitivity. 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

SAFE PACE 2 (Continued)

Interventions	1. Medtronic Kappa 700 (Europe) or Kappa 400 (North America) pacemaker 2. Control group: implantable loop recorder (Medtronic Reveal)
Outcomes	Weekly fall diaries. Number of fallers in 24 months after intervention. Secondary outcome: 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
Contact information	Dr RA Kenny Cardiovascular Investigation Unit Victoria Wing Royal Victoria Infirmary Newcastle upon Tyne NE1 4LP United Kingdom
Notes	International multicentre trial

Safe-Grip

Trial name or title	Safe-Grip fall injuries intervention: a randomised trial
Methods	
Participants	210 men and women aged 60 and over, recently released from an inpatient visit or already inactive at home
Interventions	Physical restoration programme (SAFE-GRIP)
Outcomes	Falls, physical functional capacity (ADL/IADL, health related quality of life), fall related injuries
Starting date	October 1995 Complete
Contact information	Dr C.A. DeVito VA Medical Centre Miami Florida 33125 USA Tel: 305-324-3179 or Dr R.O. Morgan Houston VA Medical Centre

Safe-Grip (Continued)

	Houston Texas 77030 USA
Notes	

SAFER 2

Trial name or title	SAFER 2 - Syncope and falls in the emergency room - an explanatory randomised controlled trial of a multidisciplinary post-fall assessment and intervention strategy in elderly recurrent fallers attending casualty
Methods	
Participants	625 patients from 2 centres. Inclusion criteria: over 65 years old with recurrent falls (2 or more falls in preceding 12 months) presenting to the casualty department. Exclusion criteria: MMSE score <23
Interventions	Global specialised post fall multi-disciplinary assessment and individualised intervention strategy. Duration tailored to each individual patient. Controls receive usual care
Outcomes	Follow up follow up for 12 months. Interviewed at home at 3, 6 and 12 months Primary outcome: number of patients who fall within 1 year of assessment. Number of falls recorded by fall diary. Secondary outcome: mortality, injury rates and hospitalisation, assessment of mental health, SF-36, EuroQol, and use of health services
Starting date	01/12/98 Complete
Contact information	Dr M Davis, Gateshead Health NHS Trust, Queen Elizabeth Hospital, Sheriff Hill, Gateshead, NE9 6SX UK. Telephone: 0191 482 0000 Fax: 0191 4824711
Notes	Assessment includes patient history (including medication), full physical examination including visual acuity, laboratory blood tests, 12 lead ECG and a cardiovascular assessment. Physiotherapy assessment of gait, balance, muscle strength and footwear. Occupational therapy home hazard assessment.

Smith

Trial name or title	Primary prevention of fractures in the elderly: RCT of an annual injection of vitamin D in the prevention of hip and other non-vertebral fractures
Methods	
Participants	10,000 men and women aged 75 years and over from a general practice population (96 practices)
Interventions	300,000 IU (1 ml) vitamin D (ergocalciferol) intra-muscularly given annually in the autumn over 3 years vs placebo
Outcomes	Hip fractures, non vertebral fractures and falls. Outcome data collected at 6 months intervals from the trial participants in a short self-administered questionnaire
Starting date	01/09/2000 Complete Undertaking data analysis
Contact information	Dr Helen Smith, Aldermoor Health Centre, Aldermoor Close, Southampton, SO16 5ST UK. Telephone: 023 8024 1055 Fax: 023 8070 1125 E-mail: h.e.smith@bsms.ac.uk
Notes	

Spice

Trial name or title	Secondary prevention of falls
Methods	
Participants	450 community dwelling elderly aged over 64 years who have fallen at least twice
Interventions	3 arms: 1. Health visitor/practice nurse falls risk assessment/referral 2. Multidisciplinary day hospital assessment by physician, OT and physiotherapist 3. Usual care
Outcomes	Falls. Follow up follow up monthly using postcards +/- phone call for 1 year
Starting date	Sept 2000
Contact information	Dr C Spice, Registrar in Elderly Medicine, Dept of Elderly Medicine,

Spice (Continued)

	Royal Hampshire County Hospital, Romsey Road, Winchester, Hants, SO22 5DG UK.
Notes	Cluster randomisation

Swift

Trial name or title	A controlled intervention study of Vitamin D supplementation on neuromuscular and psychomotor function in elderly people who fall
Methods	
Participants	160 patients over 65 years who have had a fall (identified through A&E records) and are Vitamin D deficient
Interventions	1. Vitamin D supplementation with IM ergocalciferol 2. Matched placebo
Outcomes	Fall rates (secondary outcome). Primary outcome: choice reaction time and aggregate functional performance
Starting date	01/04/1999 Complete
Contact information	Prof C . Swift Division of Health of the Elderly King's College Hospital (Dulwich) East Dulwich Grove London SE22 8PT
Notes	

Torgerson

Trial name or title	Randomised trial of fall and fracture prevention advice by practice nurses
Methods	
Participants	6200 women aged 70 and over, recruited from GP patient lists, or hospital fracture clinics, UK. Inclusion criteria: body weight <58 kg; history of fracture; current smoker; mother or sibling who has had a hip fracture; poor/fair health; needs to use arms to get up from a chair. Exclusion criteria: bed or chair bound patients; unable to give informed consent

Torgerson (Continued)

Interventions	1. Invitation to attend for assessment by practice nurse or osteoporosis nurse specialist depending on where recruited: fracture risk, medication, vision and foot assessment. Individualised advice and referrals depending on age and risk factors identified. Patients with history of vertebral fracture or height loss will be advised to consider using calcium and vitamin D supplements and to see GP for referral for bone mass measurement. GPs of patients who are frequent fallers will be asked to consider referral to specialist falls clinic and/or medication review. Eyesight and feet will be checked and recommendations to attend optician and podiatrist. Summary of assessment and recommendations sent to subject's GP, copied to subject with lay summary. Subjects considered high fracture risk recalled after 3 months to discuss action taken by GP, interventions adopted and alternative treatment options if none adopted. Further written contact with GP if communication problem. Control: usual care
Outcomes	Follow up at 6, 12, 18 and 24 months by postal questionnaire. Primary outcome: fracture reduction. Secondary outcomes: falls, use of medications and hip protectors, number of referrals to specialists for BMD assessment, dietary and life-style changes, quality of life (SF12, EuroQol, fear of falling scale), costs, satisfaction with treatment
Starting date	01/10/2001
Contact information	Dr David Torgerson Reader Director of York Trials Unit Area 4 Seebohm Rowntree Building Dept of Health Sciences University of York York YO10 5DD Phone 01904 321340 Fax 01904 321383 (email: djt6@york.ac.uk)
Notes	

VIP trial

Trial name or title	VIP falls prevention trial
Methods	
Participants	400 men and women aged 75 years and over with impaired vision (visual acuity 6/24 or less) living in the community, recruited through NZ Foundation for the Blind, hospital and university low vision clinics
Interventions	1. Otago Exercise Programme (home based balance and strength retraining programme, previously tested in 4 controlled trials in normally sighted older people) delivered by physiotherapists. 2. Home safety programme
Outcomes	All falls and injuries resulting from falls during one year of follow up
Starting date	October 2002

VIP trial (Continued)

Contact information	Dr MC Robertson Senior Research Fellow Dept of Medical and Surgical Sciences University of Otago Medical School PO Box 913 Dunedin New Zealand Tel: +64 3 474 7007 ext 8508 Fax: +64 3 474 7641 email: clare.robertson@stonebow.otago.ac.nz
Notes	

Voukelatos

Trial name or title	Central Sydney Tai Chi trial - A randomised control trial investigating the effectiveness of Tai Chi to reduce the risk of falling
Methods	
Participants	700 community dwelling elderly people recruited through community newspapers. Inclusion criteria: community dwelling; aged 60 and over. Exclusion criteria: dementia, Parkinson's, Alzheimer's, or other cognitively degenerative disease; blind; crippling arthritis or are unable to walk across a room unaided or with, at most, a walking stick; participated in Tai Chi within the last 12 months
Interventions	Intervention: 16 week modified beginners Tai Chi programme; one class of 1 hour per week. Controls: waiting list controls received Tai Chi after 6 months
Outcomes	Number of falls in the study period of 6 months (intervention 4 months plus 2 months follow-up). Secondary outcome measures: balance, leg strength, ankle flexibility, fear of falling (using the falls efficacy scale), and functionality (using the IADL questionnaire)
Starting date	May 2000
Contact information	Alexander Voukelatos, Health Promotion Unit, Level 4, Queen Mary Building, Grose Street, Camperdown, NSW 2050 Australia Telephone: +61 2 9515 3358 or +61 2 9515 3350 Fax: +61 2 9515 3351 Email: avouk@email.cs.nsw.gov.au
Notes	Trial funded through the NSW Health, Health Promotion Research Demonstration Grants scheme

Wark

Trial name or title	A vitamin D study in older women in residential care
Methods	
Participants	601 residents of nursing homes and assisted living facilities. Exclusion criteria: 25-hydroxyvitamin D levels less than 25 nmol/l or greater than 90 nmol/l
Interventions	Intervention: ergocalciferol (initially 10,000 IU per week, then 1000 IU per day) plus 600 mg of calcium carbonate Control: matching placebo plus 600 mg of calcium carbonate
Outcomes	Falls and fractures recorded in diaries for duration of intervention (2 years). Compliance monitored by pill counts.
Starting date	January 1996 (complete)
Contact information	Prof John D Wark, Dept of Medicine, The University of Melbourne, C/- The Royal Melbourne Hospital Victoria, 3050 Australia. Telephone: +61 3 9342 7109 Fax: +61 3 9348 2254 Email: jdward@unimelb.edu.au
Notes	

ABBREVIATIONS AND ACRONYMS:

A&E: accident and emergency department

ADL: activities of daily living

IADL: instrumental activities of daily living - e.g. use of telephone, shopping, housework, managing finances

MMSE: mini-mental state examination (cognitive assessment)

wk: week

DATA AND ANALYSES

Comparison 1. Exercise/physical therapy alone vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	15		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Community dwelling - untargeted	9	1387	Risk Ratio (M-H, Fixed, 95% CI)	0.89 [0.79, 1.01]
1.2 Community dwelling (strength, balance, walking) - individually targeted	3	566	Risk Ratio (M-H, Fixed, 95% CI)	0.80 [0.66, 0.98]
1.3 Community dwelling (strength training) - individually targeted	1	222	Risk Ratio (M-H, Fixed, 95% CI)	0.92 [0.73, 1.16]
1.4 Institutional care - individually targeted	2	248	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.74, 1.41]
2 Number sustaining medical care fall	2		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.2 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
2.3 Institutional care - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
3 Number sustaining fracture fall	3		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Community dwelling - untargeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
3.2 Community dwelling - individually targeted	2		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
4 Number sustaining injury fall	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Community dwelling - untargeted	1	59	Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
4.2 Community dwelling - individually targeted	3	546	Risk Ratio (M-H, Fixed, 95% CI)	0.67 [0.51, 0.89]
4.3 Institutional care - individually targeted	1	194	Risk Ratio (M-H, Fixed, 95% CI)	3.06 [0.75, 16.43]
5 Number sustaining two or more falls	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
5.1 Community dwelling - untargeted	2	365	Risk Ratio (M-H, Fixed, 95% CI)	0.78 [0.52, 1.18]
5.2 Community dwelling - individually targeted	3	566	Risk Ratio (M-H, Fixed, 95% CI)	0.76 [0.54, 1.05]
6 Mean number of falls	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6.1 Community dwelling - untargeted	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
6.2 Community dwelling - individually targeted	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable

7 Number sustaining musculoskeletal injury during study	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
---	---	--	---------------------------------	---------------------

Comparison 2. Exercise plus medication withdrawal vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
2 Number sustaining medical care fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
3 Number sustaining fracture fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
4 Number sustaining injury fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
4.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
5 Number sustaining two or more falls	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
5.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 3. Exercise plus incontinence management vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Number sustaining fracture fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Number sustaining injury fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 4. Home safety intervention alone vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	4		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Community dwelling - no falls in year prior to randomisation	1	324	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.75, 1.41]
1.2 Community dwelling - falling history in year prior to randomisation	3	374	Risk Ratio (M-H, Fixed, 95% CI)	0.66 [0.54, 0.81]
1.3 Community dwelling - fallers and non-fallers in year prior to randomisation	3	1163	Risk Ratio (M-H, Fixed, 95% CI)	0.85 [0.74, 0.96]

Comparison 5. Home safety intervention plus medication withdrawal vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 High intensity intervention	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
1.2 Low intensity intervention	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
2 Number sustaining two or more falls	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 High intensity intervention	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
2.2 Low intensity intervention	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 6. Home safety intervention plus fall prevention classes vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Group instruction vs control	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
1.2 One on one instruction session	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 7. Medication withdrawal vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Random, 95% CI)	Totals not selected
1.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Random, 95% CI)	Not estimable
2 Number sustaining medical care fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
3 Number sustaining a fracture fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
4 Number sustaining injury fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
4.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
5 Number sustaining two or more falls	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
5.1 Community dwelling - individually targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 8. Nutritional supplementation vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Community dwelling - targeted	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 9. Vitamin D vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	3	461	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.70, 1.08]
1.1 Community dwelling - targeted	2	372	Risk Ratio (M-H, Fixed, 95% CI)	0.90 [0.71, 1.13]
1.2 Long stay geriatric care	1	89	Risk Ratio (M-H, Fixed, 95% CI)	0.76 [0.43, 1.33]
2 Mean number of falls	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Community dwelling - targeted	1		Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 Number sustaining fracture fall	2		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

3.1 Community dwelling -
targeted

2

Risk Ratio (M-H, Fixed, 95% CI)

Not estimable

Comparison 10. HRT plus calcium vs calcium alone

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Community dwelling - post fracture	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 11. Pharmacological therapies vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 12. Vision assessment and referral vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 13. Cardiac pacing vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants with syncope	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Number sustaining fracture fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Mean number of falls	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 14. Exercise, visual correction, and home safety intervention (community dwelling)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Exercise, visual correction and home safety vs control	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
1.2 Exercise and visual correction vs control	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
1.3 Exercise and home safety intervention vs control	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 15. Assessment followed by multifactorial intervention vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	11		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Community dwelling - geriatric screening (fallers and non fallers)	4	1651	Risk Ratio (M-H, Fixed, 95% CI)	0.73 [0.63, 0.85]
1.2 Community dwelling - targeting known fallers or fall risk factors only	5	1176	Risk Ratio (M-H, Fixed, 95% CI)	0.86 [0.76, 0.98]
1.3 Institutional care - targeting known fallers or fall risk factors only	1	160	Risk Ratio (M-H, Fixed, 95% CI)	0.97 [0.84, 1.11]
1.4 Cognitively impaired - any residence	1	274	Risk Ratio (M-H, Fixed, 95% CI)	0.92 [0.81, 1.05]
2 Number sustaining medical care fall	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Community dwelling - geriatric screening (fallers and non fallers)	1	1242	Risk Ratio (M-H, Fixed, 95% CI)	0.70 [0.48, 1.03]
2.2 Community dwelling - targeting known fallers or fall risk factors only	2	415	Risk Ratio (M-H, Fixed, 95% CI)	1.26 [0.71, 2.23]
3 Number sustaining fracture fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Institutional care - targeting known fallers	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
4 Number sustaining injury fall	4		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 Community dwelling - geriatric screening (fallers and non fallers)	1	1242	Risk Ratio (M-H, Fixed, 95% CI)	0.68 [0.51, 0.93]
4.2 Community dwelling - targeting known fallers or fall risk factors only	2	556	Risk Ratio (M-H, Fixed, 95% CI)	0.93 [0.61, 1.44]

4.3 Institutional care - targeting known fallers or fall risk factors	1	160	Risk Ratio (M-H, Fixed, 95% CI)	1.32 [0.52, 3.37]
5 Number sustaining two or more falls	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
5.1 Community dwelling - targeting known fallers or fall risk factors only	1		Risk Ratio (M-H, Fixed, 95% CI)	Not estimable

Comparison 16. Identification bracelets for high risk hospital patients vs no bracelet

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2 Number sustaining injury fall	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3 Time to first fall	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only

Comparison 17. Vinyl vs carpet flooring in rehabilitation wards

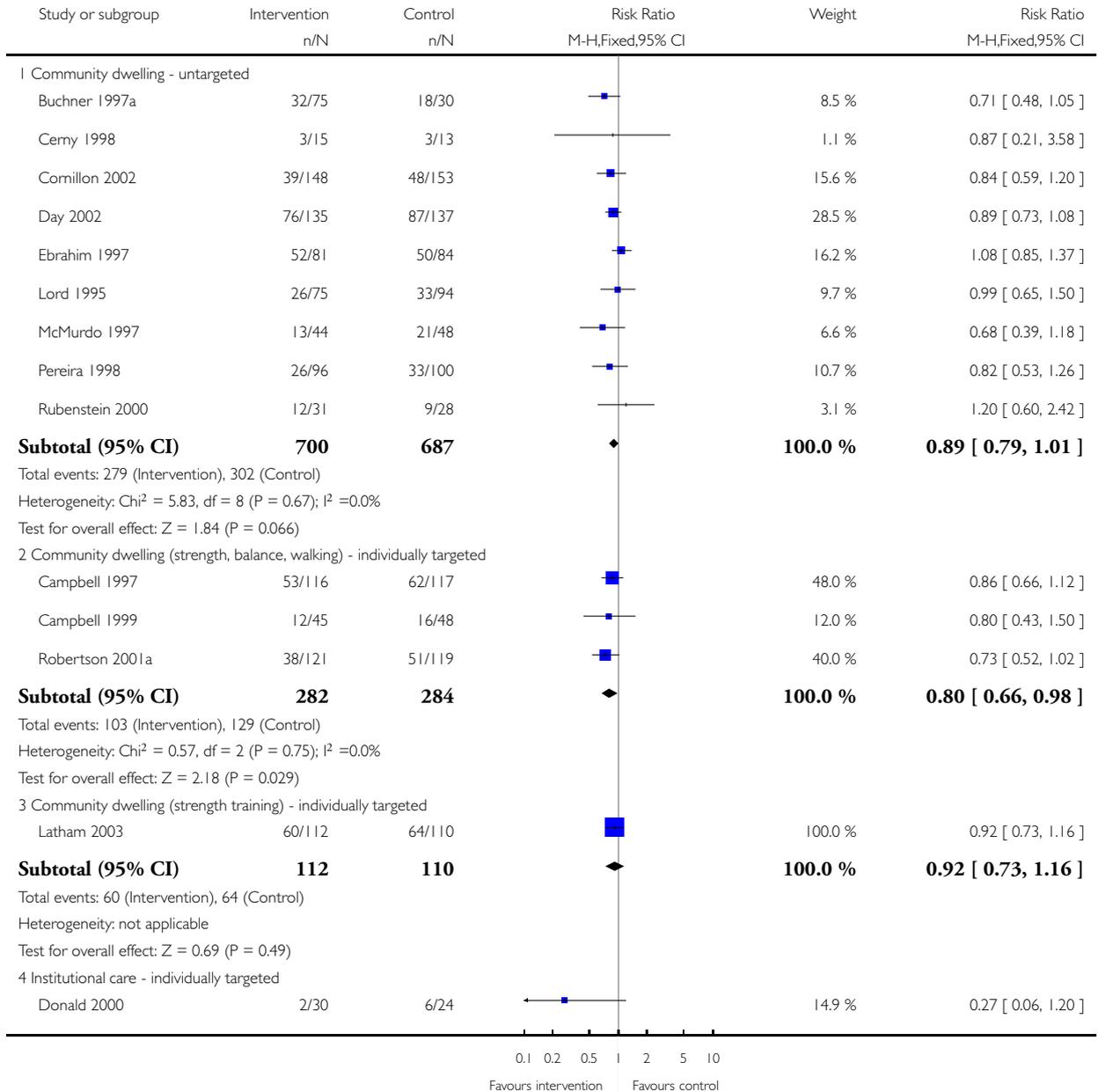
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of participants falling	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

Analysis 1.1. Comparison 1 Exercise/physical therapy alone vs control, Outcome 1 Number of participants falling.

Review: Interventions for preventing falls in elderly people

Comparison: 1 Exercise/physical therapy alone vs control

Outcome: 1 Number of participants falling



(Continued ...)