Appendix E: Evidence table 9 rehabilitation: other key documents

1. Cameron et al (2000) Geriatric rehabilitation following fractures in older people: a systematic review, *Health Technology Assessment,* 2000; 4 (2).

Summary of methods

Aim of the review

To assess the clinical and cost effectiveness of programmes of care following the acute management of fractures in older people. The principle focus was on rehabilitative care after proximal femoral fracture.

Selection criteria:

Study design

- Systematic reviews
- RCTs, quasi-randomised
- Controlled cohort
- Published UK audit data in the last five years.

Participants

Patients aged 65 years and above with any fracture of the lower limbs, pelvis, upper limbs or spine that required hospital care either as an inpatient or in ambulatory care.

Interventions

Interventions included were those designed to improve function (mobility and self-care) and/or reduced hospital care. Primary outcome of reducing the incidence of further falls was not considered.

The interventions fell into three broad categories:

1. Packages of care: geriatric orthopaedic rehabilitation unit (GORU), geriatric hip fracture programme (GHFP), early supported discharge (ESD), application of a clinical pathway.
2. The consequences of the introduction of prospective payment systems (PPS).
3. Specific multidisciplinary intervention designed to improve particular aspects of mobility or self care.

Outcomes

- Length of hospital stay
- Readmission to hospital
- Residence following discharge
- All cause mortality
- Morbidity
- Mobility
- Activities of daily living

- Health related quality of life.

Primary outcome of reducing the incidence of further falls was not considered.

Main results

Forty-one comparative studies (of which 14 were RCTs) and seven audit studies were included. The studies were heterogeneous. The very limited data that were available suggest that:

- GHFP, ESD and clinical pathways reduce total length of stay in hospital
- There is no evidence that length of stay in a GORU is less than in a conventional orthopaedic unit
- Length of stay may be reduced by the introduction of a PPS
- Readmission rate after ESD shows a statistically non-significant increase
- Significantly higher rates of return to previous residential status are achieved by GHFP and by ESD
- PPSs have led to increased use of nursing homes in the USA
- There is no evidence that any of the programmes evaluated, nor the introduction of PPSs, are associated with changes in mortality
- There are insufficient data to assess the impact of any programme on level function, morbidity, quality of life or impact on carers.
- From a health and social services perspective, GHFP and ESD are likely to be cost saving. The economic implications of GORU are less clear.

Quality

The quality criteria met by this systematic review (NHMRC 2001) was high.

2. Scottish Intercollegiate Guidelines Network (2002) *Prevention and management of hip fracture on older people*,

The evidence base for this guideline was synthesised in accordance with SIGN methodology.

The guideline refers to recommendations for the following:

- Prevention of hip fracture
- Pre-hospital management
- Management in A&E
- Preoperative care
- Anaesthetic management
- Surgical management
- Early postoperative management
- Rehabilitation and discharge.

The following is a summary of the recommendations relating to rehabilitation following a fracture.

Rehabilitation and discharge

- **Early assessment: [B]**

Within 48 hours of admission, a corroborated history should be obtained, which should include:

- premorbid function and mobility
- available social support
- current relevant clinical conditions mental state.

Patients with co-morbidity, poor functional ability and low mental test scores prior to admission should undergo rehabilitation in a geriatric orthopaedic rehabilitation unit (GORU). [B]

- **Rehabilitation:**

NUTRITION AND REHABILITATION

Supplementing the diet of hip fracture patients in rehabilitation with high-energy protein preparations containing minerals and vitamins should be considered. [A]

MEDICAL MANAGEMENT AND REHABILITATION

Multidisciplinary team working facilitates the rehabilitation process. [B]

- **Discharge**

SUPPORTED DISCHARGE

Supported discharge schemes should be used to facilitate the safe discharge of elderly hip fracture patients and reduce acute hospital stay. [B]

Discharge management

- The patient should be central to discharge planning and, where realistic, their needs and wishes taken into consideration. The views of a carer are also important.
- Liaison between hospital and community - including social work department - facilitates the discharge process.
- Occupational therapy home assessments assist in preparing patients for discharge.
- Patient, carer, GP, and other community services should be given as much notice as possible of the date of discharge.
- Discharge should not take place until arrangements for post-discharge support are in place and the patient is fit for discharge.
- Written information on medication, mobility, expected progress, pain control and sources of help and advice should be available to patient and carer.
- General practitioners have an important role to play in post discharge rehabilitation and should receive early and comprehensive information on hospital stay, services arranged

and future follow-up arrangements. Complicated discharges that may have considerable impact on the primary care team should be discussed in advance with the GP.

- Consideration should be given to the prevention of falls with particular attention being paid to potential household hazards, footwear, and provision of adaptive equipment/walking aids and alarm systems.

Quality

The quality of this guideline was evaluated with the AGREE (Appraisal of guidelines for research and evaluation) instrument. The following scores for the specified six domains are given below. The quality of the result is represented by a higher percentage.

1. Scope and purpose 66%
2. Stakeholder involvement 75%
3. Rigour of development 100%
4. Clarity of expression 92%
5. Applicability 55%
6. Editorial independence 100%

3. The Chartered Society of Physiotherapy and the College of Occupational Therapists (June 2000) *Guidelines for the collaborative rehabilitative management of elderly people who have fallen.*

There were no clear methods described in this document and results with recommendations are summarised here. The guideline is intended to assist physiotherapists, occupational therapists and nurses working in the community, acute care or long-term care in making decisions about appropriate treatment for elderly people who have fallen.

To improve elderly people's ability to withstand threats to their balance

- **Assess** to identify the impairments, likely to respond to rehabilitative intervention, which probably contributed to the person's previous falls or might lead to further falls.
- **Intervene** to increase the elderly person's stability, transferring, walking and other functional movement by:
  -balance training
  -strengthening the muscles around the knee, hip and ankle
  -increasing the flexibility of the trunk and lower limbs
  -providing mobility aids and appliances if really necessary.

To improve the safety of the elderly person's surroundings

- **Assess** to identify any environmental hazards that contributed to previous falls and that might lead to further falls.
- **Intervene** by:

-removing, replacing or modifying any hazards with the person's consent
-teaching the person to be aware of hazards and how to avoid them.

To prevent elderly people suffering from the consequences of a long lie

- **Assess** to establish how the elderly person (and their carer) coped following previous fall and if they have any strategies for coping following a fall in the future.
- **Intervene** by teaching the person how to:
  -get up from the floor
  -summon help
  -move about, keep warm etc while on the floor.

To optimise elderly people's confidence and, whenever relevant, their carer's confidence, in their ability to move about as safely and as independently as possible

- **Assess** to identify any psychological consequences of the fall that might lead to self-imposed restrictions of activity.
- **Intervene** to help the elderly person regain confidence in their balance ability and functional competence, by encouraging the person to cope successfully with increasingly severe threats to their balance and increasingly demanding functional tasks.

Good practice points

- A physician should examine a faller to identify any underlying medical reasons.
- A plan of intervention is agreed with the elderly person and, where relevant, their carer.
- Establish baselines of appropriate measurements about the elderly person's pre intervention state against which their post-intervention state can be compared.
- Establish the extent to which the elderly people (and their carer) are likely to be able to co-operate with an intervention programme in terms of memory ability and willingness to participate.
- Note any relevant signs or symptoms of contributory factors that may have led to the fall, that need to be brought to the attention of the elderly person's doctor.

Quality

The quality of this guideline was evaluated with the AGREE (Appraisal of guidelines for research and evaluation) instrument. The following scores for the specified six domains are given below. The quality of the result is represented by a higher percentage.

1. Scope and purpose 66%
2. Stakeholder involvement 33%
3. Rigour of development 33%
4. Clarity of expression 83%
5. Applicability 33%
6. Editorial independence 50%

Systematic reviews identified were:

Parker et al (2002) Mobilisation strategies after hip fracture surgery in adults (Cochrane Review), in *The Cochrane Library,* issue 4, 2002, Oxford.

Summary of methods

Aim of the review

To evaluate the effects of different mobilisation strategies and programmes after hip fracture surgery.

Study design

RCTs, quasi-randomised.

Participants

Skeletally mature patients with a hip fracture.

Interventions

Post-operative care programmes such as immediate or delayed weight bearing after surgery.

Outcomes

These are described within the following broad categories:

- Fracture healing complications
- Post-operative course and complications
- Anatomical restoration
- Other: mortality, pain, return to living at home, return of mobility, functional outcomes, health related quality of life.

Primary outcome of reducing the incidence of further falls was not considered.

Main results

There is insufficient evidence from RCTs to determine the effects of more frequent physiotherapy, quadriceps strengthening exercises, treadmill gait training, or neuromuscular stimulation after hip fracture surgery. There is also insufficient evidence to determine the effects of early weight bearing after the internal fixation of an intracapsular proximal femoral fracture.

Quality

The quality criteria met by this systematic review (NHMRC 2001) was high.

Cameron et al (2002) Co-ordinated multidisciplinary approaches for in patient rehabilitation of older patients with proximal femoral fractures (Cochrane Review), in *The Cochrane Library,* issue 3, 2002, Oxford.

Aim of the review

To examine the effects of co-ordinated multidisciplinary inpatient rehabilitation, compared with usual (orthopaedic) care for older patients with hip fracture.

Study design

RCTs, quasi-randomised.

Participants

Older patients with any type of fracture of the proximal femur, which had been surgically fixed prior to entry on the care programme.

Interventions

Treatment in a geriatric orthopaedic rehabilitation unit (GORH) or other types of specialised multidisciplinary inpatient rehabilitation.

Outcomes

- Mortality
- Morbidity
- Post-operative functional status
- Length of hospital stay
- Level of care and extent of support required on discharge
- Patient's perceived quality of life on discharge
- Carer burden and stress
- Direct, indirect and hidden costs.

Primary outcome of reducing the incidence of further falls was not considered.

Main results

There is no conclusive evidence of the effectiveness of co-ordinated post-surgical care typified by the GORU model following proximal femoral fracture. However there is a trend towards effectiveness in all main outcome measures.

Quality

The quality criteria met by this systematic review (NHMRC 2001) was high.

Ward et al (2003) Care home versus hospital and own home environments for rehabilitation of older people (Cochrane Review), in *The Cochrane Library,* issue 3.

Aim of the review

To compare the effects of home care environments versus hospital environments in the rehabilitation of older people.

Study design

- RCTs, quasi-randomised
- CCTs
- CBAs
- ITS.

Participants

Persons aged 60 years or older who are in receipt of rehabilitation. The following population subgroups were included:

-Persons aged 60 or above with stroke

-Persons aged 60 or above with fracture of neck of femur.

Interventions

Home care environments.

Outcomes

- ADL
- Health status, quality of life
- Mortality
- Adverse effects
- Readmission to an acute facility
- Patient and carer satisfaction
- Number of days receiving rehabilitation.

Primary outcome of reducing the incidence of further falls was not considered.

Main results

There is insufficient evidence to compare the effects of home care environments, hospital environments and own home environments on an older person's rehabilitation outcomes.

Quality

The quality criteria met by this systematic review (NHMRC 2001) was high.

National service framework for older people (2001): standard six: falls

Improving care and treatment following a fall: key messages/ principles of care

Primary care

Minor falls or injuries, and the subsequent loss of confidence, may seriously restrict an older person's ability to carry out their normal activities at home. Some older people will seek treatment from, or be referred to their GP.

Older people who fall should, with their consent, be referred to a specialist falls service particularly those who:

- have had previous fragility fractures
- attend A&E having fallen
- called an emergency ambulance having fallen
- have two or more intrinsic risk factors in the context of any fall
- have frequent unexplained falls
- fall in hospital or in a nursing or residential care home
- live in unsafe housing conditions
- are very afraid of falling.

In hospital

- Older people who are taken to hospital following a fall should have their needs assessed as soon as possible after arrival in A&E to determine whether they are safe to return home, or should be admitted to intermediate care or to hospital for further assessment and management.

- All older people taken to hospital with a fall should be reviewed by a member of the specialist falls service and the need (or otherwise) for a fuller assessment determined. For older people returning home from A&E, this initial review can be undertaken either on-site or subsequently on an outpatient, day patient or domicilliary basis. Comprehensive specialist assessment, if indicated, will need to take place in outpatient or day hospital settings, with access to full diagnostic and multidisciplinary facilities.

- Older people exhibiting high risk for osteoporotic fracture but without any injury to their bones should be referred for assessment of bone mineral density (BMD). Those with results consistent with osteoporosis should be offered appropriate therapeutic interventions. This is currently being addressed by the NICE in *The assessment of fracture risk and prevention of osteoporotic fractures in individuals at high risk.*

- If the older person does not need admission to hospital, or referral to intermediate care services, other options are available that offer more than discharge, while awaiting review at home by a member of the specialist falls service. These include:
    - discharge home accompanied by occupational therapist to assess risks in the home and provide immediate advice or plan equipment provision or home repair services
    - discharge home accompanied by, and with low key support from, a voluntary agency or good neighbour scheme
    - discharge home with care from statutory agencies
    - discharge home with safety or mobility equipment.

- Older people with suspected hip fracture or other serious injury should be admitted to hospital as soon as possible after arrival in A&E. Potentially serious injuries may present in a complex fashion. For example, an older person may complain of a pain in the knee, which is in fact due to a hip fracture (referred pain). Examinations and investigations of apparently minor injuries should also determine whether a more serious injury has occurred.

- Discharge from hospital needs careful and early planning by a multidisciplinary team fully involving older people and their carers. The specialist falls service will be responsible for co-ordinating the assessment and individual care plan for discharge and for ensuring that arrangements for support are in place prior to discharge. This assessment should build on any assessment information already held on the older person.

Rehabilitation

Many older people will need rehabilitation after a fall whether they have been treated in hospital or remain at home. The aim is to maximise an older person's independence and enable them to carry out their normal activities of daily living and social participation. Effective rehabilitation will be responsive to the wishes of older people, involve a number of agencies and disciplines, and be available when required and work towards identified outcomes. A combination of clinical, therapeutic and social interventions may be needed to address an older person's health and social care needs and to reduce the risk of further falls.

Rehabilitation strategies should aim to:

- increase the older person's stability during standing, transferring, walking and other functional movement by:
    - balance training
    - strengthening the muscles around the hip, knee and ankle
    - increasing the flexibility of the trunk and lower limbs
    - providing appropriate mobility and safety equipment

- help older people regain their independence and confidence to relearn and practise their previous skills in every day living, and to cope successfully with increasing threats to their balance and increasingly demanding functional tasks
- improve the safety of the older person's environment by, with their consent, removing, replacing or modifying any hazards
- teach awareness of hazards and how to avoid them
- teach the older person strategies to cope with any further fall and prevent a long lie. If possible the person should be trained how to get up from the floor. Otherwise methods for summoning help, including use of community alarms, should be rehearsed. Strategies for preventing hypothermia and pressure sores should also be discussed
- establish a network of community support and supervision if this is needed, including the voluntary sector and organisations such as the National Osteoporosis Society, many of whom have befriending services to relieve isolation and support rehabilitation of older people.

Long-term support

Longer-term support may be required. Care practices should not aim to restrict mobility, but explore how older people can manage safely in their own home, or in a residential or nursing home. The least invasive methods of intervention and management of care should be used. The use of community alarm systems - including pendants and phone-based systems - for people who have fallen to summon help can increase the security and confidence of an older person. But they are only valuable if the person is conscious or within reach of a pull cord. The community equipment services initiative (standard 2) includes proposals to extend the use of 'tele-care' or environmental control technologies - including passive alarms - capable of providing added safety for those who are particularly vulnerable.

- Older people who have fallen should be assessed and reviewed regularly to monitor their needs. Longer-term social and emotional support may be required to minimise any loss of independence caused by the effects of the fall. This may include provision of personal or domestic care services or introduction to social activities to prevent social isolation and depression.

Falls clinics and assessment

Specialist assessment should be carried out by the falls service in collaboration with primary and social care professionals. This should build on the single assessment process. It should identify risk factors associated with an older person's health and their environment and should:

- identify and diagnose any risk factors for falls associated with an older person's health (including any physical impairment) and environment, particularly those likely to respond to intervention
- establish how the older person (and their carer) coped following any previous fall and if they have any strategies for coping with a fall in the future
- identify any psychological consequences of the fall that might lead to self-imposed restriction of activity
- lead to an investigation and treatment for osteoporotic risk.

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Close 1999 UK	Randomised by random numbers table and list held independently of the investigators. Intention to treat analysis not possible.	Community dwelling individuals presenting at A/E after a fall, recruited on discharge. Mean age: 78.2 (>65). History of falling.	Medical and occupational therapy assessments and interventions. Medical assessments to identify primary cause of fall and other risk factors present (general examination and visual acuity, balance, cognition, affect, medications). Interventions and referral as required. Home visit by occupational therapist (functional assessment and environmental hazards). Advice, equipment and referrals as required. N=141. Comparison: usual care. N=163.	Follow-up every four months for one year. Falls diary. Losses: 93/397=(23%). <u>Outcomes</u> 1. Number of participants falling. 2. Number with injury fall. 3. Number sustaining three or more falls. 4. Number of falls. Also measured but not considered in this review were doctor and hospital visits, admissions, function. <u>Results</u> Multi-factorial intervention n=59 vs. control n=111, number of participants falling-targeting known fallers or fall risk factors RR 0.61 [0.49, 0.77]. Multi-factorial intervention n=8 vs. control n=16, number sustaining injury fall-RR 0.58 [0.26, 1.31].	B*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Crotty 2002 Australia (excluded in Cochrane)	Randomisation computer generated and performed by hospital pharmacist blinded to study and medical status of patient. Intention to treat.	Admission for fall related to hip fracture for surgical treatment >65 expected to return to suitable home environment.	Accelerated discharge and home based rehabilitation. Home modifications. N=34. Comparison: conventional treatment. N=32.	Follow up four months. Losses to follow-up none stated. Adverse events. <u>Outcome</u> 1. Number of falls. 2. Falls requiring hospital treatment. Also measured but not considered in this review were physical and social independence, balance confidence, quality of life, carer strain, patient and carer satisfaction, use of community service. <u>Results</u> Home care intervention n=6 vs. control n=4 Number participants falling untargeted RR 0.71 [0.60, 0.82]. Home care intervention n=1 vs. control n=1 number of participants with falls requiring hospitalisation untargeted RR 0.94 [0.88, 1.0].	A*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Ebrahim 1997 UK	Randomly assigned using prepared envelopes containing computer generated allocation. Intention to treat analysis not possible.	Post-menopausal women identified from A&E and orthopaedic fracture clinic records. With a fractured upper limb in last two years.	Initial advice on general health/diet. Encouraged to build up to brisk walking 40 minutes x three per week. N= 81. Comparison: initial advice on general health/diet. Upper limb exercises to improve post-fracture function. N=84.	Follow-up two years. Losses: 68 of 165 (41%). <u>Outcomes</u> Falls monitored by monthly telephone calls. 1. Number of participants falling. 2. Total number of falls. 3. Number sustaining fracture fall. Also measured, but not considered in this review were bone mineral density, vertebral fractures, physical capacity. <u>Results</u> Exercise/physical therapy alone n=52 vs control n=50 Number of participants falling, community dwelling untargeted. RR 1.08 [0.85, 1.37]. Exercise/physical therapy alone n=2 vs control n=3 Number of participants sustaining fracture fall, community dwelling untargeted. RR 0.69 [0.12, 4.03].	A*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Kingston 2001 UK	Method of randomisation not described. Intention to treat analysis not possible.	Community dwelling women attending A&E with a fall. Mean Age 71.9 years, history of a fall, discharged directly to own home.	Rapid health visitor intervention within five 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. N=60. Comparison: 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. N=49.	Follow-up 12 weeks. Losses: 17 of 109 (16%). Outcomes No description of how falls monitored, presumably retrospective at day four and week 12. 1. Number of participants falling. Also measured but not considered for this review were SF36 assessment at day four and 12 weeks. Results Multi-factorial intervention n=4 vs. control n=5, number of participants falling-targeting known fallers or fall risk factors RR 0.65 [0.19, 2.30].	B*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Lightbody 2002 UK	Method of randomisation not described. 'Block-randomised consecutively into groups'. Intention to treat analysis not possible.	Consecutive patients attending A&E with a fall (74.4% women). Age: median (IQR) 75 (70-81). > 65 years.	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. N=171. Comparison: usual care .N=177.	Follow-up six months. Losses: 34/348 (10%). Outcomes Falls, injury and treatment recorded in diary. Postal questionnaire at six months to collect data. GP records and hospital databases searched. 1. Number of people falling. 2. Number of falls. 3. Number sustaining injury fall. Results Multi-factorial intervention n=43 vs. control n=44, number of participants falling-targeting known fallers or fall risk factors RR 1.01 [0.07, 1.46].	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. B*
Pardessus 2002 France	Randomised using random numbers table. Intention to treat analysis.	Individuals hospitalised for a 'mechanical' fall and recruited in hospital, but community dwelling, Age: mean 83.2.	Comprehensive two 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. N=30. Comparison: usual care. N=15.	Follow-up one year. Losses: 9 of 60 (15%). Outcomes Falls identified by monthly telephone calls. 1. Number of participants falling. 2. Mean number of falls per participant. Results Home safety intervention n=13 vs control n=15 Falling history in year prior to randomisation RR 0.87 [0.50, 1.49].	B*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Rubinstein 1990 USA	Randomised with computer generated, randomly sequenced cards in sealed envelopes. Analysis appears to be by intention to treat.	Men and women in long-term residential care who have sustained a fall within previous seven days. Age: mean 87years.	Nurse practitioner assessment within seven days of a fall, followed by physician recommendations for action, and referral for intervention if appropriate. N=79. Comparison: usual care. N=81.	Follow up two years. Losses: none described. Outcomes Falls recorded in daily log. 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. Results Multi-factorial intervention n=64 vs. control n=68, number of participants falling Institutional care-targeting known fallers or fall risk factors RR 0.97 [0.84, 1.11]. Assessment followed by multi-factorial intervention n=7 vs control n=5, institutional care-targeting known fallers RR 1.44 [0.48, 4.33]. Assessment followed by multi-factorial intervention n=9 vs control n=7 institutional care-targeting known fallers or fall risk factors RR 1.32 [0.52, 3.37].	A*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

Study	Methods	Participants and setting	Intervention	Results	Quality (allocation concealment) & comments
Shaw 2003 UK	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). Intention to treat analysis.	Older people with cognitive impairment or dementia attending A&E after a fall. Community dwelling or in institutions). Age 65 years or over; cognitive impairment and dementia (MMSE <24; consent from three people (patient, immediate carer, and next of kin). Age: mean 84, range 71-97 years.	Multifactorial, multidisciplinary clinical assessment (medical, physiotherapy, occupational therapy, cardiovascular) and intervention for all identified risk factors for falls. N=130. Comparison: clinical assessment but no intervention. N=115.	Follow-up one year. Losses: 92 of 308 (30%). <u>Outcomes</u> Length of falls identified by weekly diary mailed as a postcard, and telephone contact if no card for two weeks. 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 attendance. 7. Number of fall related hospital admissions. <u>Results</u> Assessment followed by multi-factorial intervention n=96 vs control n=115 - cognitively impaired any residence RR 0.92 [0.81, 1.05].	A*
Tinnetti 1999 US (Excluded in Cochrane)	Randomised at hospital discharge, stratified by pre-fracture functional level and by initial discharge location. Appears to be intention to treat analysis.	Non-demented persons > 65 years who underwent surgical repair of a hip fracture and return home within 100 days.	Systematic multi-component rehabilitation strategy-includes ADL strategy. N=148. Comparison: usual care (rehabilitation care with limited ADL activities). N=156.	Follow up six months and one year. Losses to follow up 31/304 (10%). <u>Outcomes</u> Adverse events: 1. falls or injuries 2. hospitalisation. Also measured but not relevant for this review were a battery of self-report and performance based measures of physical and social function. <u>Results</u> Multifactorial intervention n=28 vs. control n=27 number of participants falling untargeted RR 1.1 [1.06, 1.14]. Multifactorial intervention n=16 vs. control n=20 number of participants hospitalised untargeted RR 0.84 [0.8, 0.88].	B*

Appendix E: Evidence table 8: Interventions of rehabilitation programmes (Reproduced from Gillespie et al, 2003)

*Quality gradings for concealment of allocation from Cochrane review for interventions for preventing falls in elderly people (Gillespie, et al 2003)
A= Assigned treatment adequately concealed prior to allocation.
B= Information inadequate to judge concealment.
C= Assigned treatment clearly not concealed prior to treatment.

Appendix E: Evidence table 7b Patients' views and experiences of falls prevention strategies: Quantitative studies

Author	Study design Objective	Setting	Population Characteristics	Methods Interventions Outcomes measured	Results	Comments Quality issues
Specific falls prevention programs or general behaviour change interventions						
Culos-Reed 2000	Narrative review of predictors of adherence to behaviour change interventions.	All settings.	"Elderly" - no ages specified.	Physical activity, pharmacological and dietary interventions. Outcomes measured listed in Results column.	No quantitative data presented. Predictors of increased exercise compliance include past exercise history, home-based program location. Dietary compliance may be adversely effected by lack of nutritional knowledge, changed living situations.	Non-systematic literature review.
Lambert 2001	Before/after study designed to determine if participants in falls prevention programs make the required changes, and to identify factors affecting compliance with the program.	5 USA seniors centres. USA	84 health, community-dwelling adults, aged 65-97 years.	2 session falls prevention education program including risk modification advice, risk screening and balance confidence assessment. Outcomes: changes in health habits 1-2 weeks after program, anecdotal statements regarding perceived barriers and cost implications.	Positive stage change for doing regular exercise and some home modifications. Statement that program involved minimal cost but no data given.	Only descriptive statistics given for outcome measures, no statistical differences assessed. Author recommendations were reasonable based on literature review provided, but not on data provided by the study.
Yardley 2002	Before/after study of random sub-sample of larger randomised trial. This study aimed to identify commonly feared consequences of falling and how these affect activity avoidance.	Community living adults in UK.	224 healthy, community-dwelling adults, mean age 81 years.	Measured falls history and fear of falling at baseline. Measured these outcomes again 6 months later plus consequences of fear of falling and activity avoidance. Mostly used validated scales to assess outcomes.	No relationship found over time. Cross sectional analysis showed that previous fall, increasing age, being female, and increased anticipation of loss of function and identity were all independently associated with activity avoidance.	No data tables provided for the cross-sectional analyses, results reported narratively in text only. Decreased activity due to fear of falling presumed to decrease participation in falls prevention programs, although actual participation was not measured directly.

Appendix E: Evidence table 7b Patients' views and experiences of falls prevention strategies: Quantitative studies

Author	Study design Objective	Setting	Population Characteristics	Methods Interventions Outcomes measured	Results	Comments Quality issues
Specific falls prevention programs or general behaviour change interventions						
Simpson 1995	Cross sectional observational study examining the reactions of elderly people at risk of falling to being taught how to get up from the floor.	Rehabilitation wards in London hospitals. Subjects could be inpatients or day unit patients. UK	105 rehab patients at risk of falling but capable of getting up off the floor and expected to return to own home after discharge. Mean age 83.5 years.	Assessed ability and confidence in getting up alone after a fall, before a teaching session was given. Some qualitative assessment of reasons for refusal to be taught.	87% agreed to be taught how to get up after a fall. 51% quite or very confident of being able to get up again after a fall before the teaching session. No significant relationship between practical session performance and before session confidence measures. Reasons given for refusal to be taught were that most people were not facing up to their risk of falling (no data provided).	No results given regarding any change in ability to get up off the floor after the teaching session compared with pre-session ability. Conclusions drawn difficult to substantiate with evidence provided from the study.
Cheal 2001	Before/after study design using qualitative methods to explore the perception of activity change and to evaluate efficacy of a falls prevention program to enhance self-efficacy.	Community setting Australia.	8 community dwelling adults identified by health workers as at risk of falling.	Self-efficacy assessed 2 weeks before and 4 weeks after participation in 'Steady As You Go' falls prevention program. Qualitative in-depth interviews and Modified Falls Efficacy Scales (MRES) were conducted / administered.	MFES scores increased by an average of 15 points after the program. Main theme the authors concluded from the qualitative results was that activity participation and mastery experiences should be included in falls prevention programs.	Qualitative findings may be useful to supplement other quantitative data.

Appendix E: Evidence table 7b Patients' views and experiences of falls prevention strategies: Quantitative studies

Author	Study design Objective	Setting	Population Characteristics	Methods Interventions Outcomes measured	Results	Comments Quality issues
Exercise behaviour programs						
King 1998	Narrative review of 'recent' (years not specified) randomised or quasi-randomised trials to assess interventions designed to promote physical activity in older adults.	Community based settings.	Searched for trials which assessed general exercise promotion activities in adults over 50 years. Studies including people with coronary heart disease were excluded.	Trials assessing participation rates and activity level outcomes were included in the review selection criteria.	29 studies were included in the review, 13 of which contained results relevant to this review. Suggested home based, telephone supervised, low intensity programs had the greatest compliance. Potential barriers to participation included: transportation problems, fear of injury, lack of perceived ability, and illness.	Did not specify years when trials were selected, no assessment of data quality. Appropriately, did not pool results as main outcomes were measured very differently.
Hillsdon 1995	Systematic review of 10 randomised trials assessing effective promotion of physical activity.	Community settings.	Adults (no age limits), but included older adults in 3 of the 10 trials.	Included randomised trials assessing single factors interventions to increase exercise activity and where exercise behaviour outcomes were measured.	Common features in the trials involving older adults which showed high exercise participation rates: home-based; informal, unsupervised exercise; frequent professional contact, moderate intensity exercise (e.g. walking); moderate frequency of sessions (2-3/week).	High quality: specific search strategy and inclusion criteria; quality assessment undertaken. Appropriately, did not pool results as outcomes measured very differently between studies.
Rejeski 1997	3 arm randomised trials designed to assess the effect of 2 types of exercise programs on self reported disability.	Sedentary volunteers. Method of recruitment not stated. All study arms had a 3 month clinic-based phase followed by 15 months home-based training, telephone support and follow-up.	439 ambulant subjects (mean age 67 years) who had radiographic evidence of knee osteoarthritis and self reported difficulty with activities of daily living due to knee pain.	Control group: education sessions for 3 months, then phone follow-up for 15 months. Intervention 1: aerobic exercise program (walking), 1 hr sessions, 3 times / week. Intervention 2: resistance exercise	Only consistent predictor of compliance across time was prior exercise behaviour ($p<0.01$). Demographic, psychosocial, fitness and disability-related measures did not predict compliance.	Approx half of the subjects in both treatment arms had 'dropped out' by 16 months follow-up point. Results presented as changes in R^2 values over time: difficult to interpret these in real terms e.g. the reduction in time

Appendix E: Evidence table 7b Patients' views and experiences of falls prevention strategies: Quantitative studies

		Canada		program (exercises with weights), 1 hr sessions, 3 times / week. Multiple regression used to	Frequent exercise (3 times / week) for moderate duration (35 mins) produced the greatest	spent exercising or the decrease in attendance.
Author	**Study design Objective**	**Setting**	**Population Characteristics**	**Methods Interventions Outcomes measured**	**Results**	**Comments Quality issues**
Exercise behaviour programs						
Rejeski 1997 cont.				examine factors predictive of level of attendance and time spent exercising (compliance measures) at 3 follow-up time points (3, 9, 16 months). Also examined dose-response effects of compliance.	reduction in disability.	
King 1995 (main trial) Oman 1998 (subset of main trial)	4 arm randomised trial comparing different exercise program formats and intensities.	Community setting in California USA.	269 healthy 50-65 years olds, mostly white and well-educated. Recruited by random digit dialling and community media campaign.	Gp1: high intensity home based program (60min session x3/wk); Gp2: high intensity group based program (60 min class session x3/wk); Gp3: lower intensity home based program: (30min walk x5/wk); control gp: choice of above programs after one year waitlist. Outcomes relevant to this review: exercise adherence and self-efficacy measures with logs, treadmill data, self reported exertion perception, validated self-efficacy scale (in a subset of 63).	At 1 year: group based program had significantly lower participation rates compared with home based programs ($p<0.0005$). By 2 years there was a drop in the participation rates for the moderate intensity group (authors speculate difficulty in maintaining frequency of 5 times/wk for long periods). Past exercise history was the best predictor of current exercise adherence.	Almost 90% follow-up rate at 2 years strengthens results. No sample size calculations.

Appendix E: Evidence table 7b Patients' views and experiences of falls prevention strategies: Quantitative studies

Author	Study design Objective	Setting	Population Characteristics	Methods Interventions Outcomes measured	Results	Comments Quality issues
Exercise behaviour programs						
Resnick 2002	Randomised trial designed to assess the effect of the WALC intervention on self-efficacy, exercise activity, falls and fall-related injuries.	USA community care retirement community.	20 randomly selected individuals from a list of 120 eligible people. Participants were sedentary, older women (mean age 88 years). Prognostic baseline characteristics well balanced between groups.	WALC intervention (W=walk, A=address pain, fear, fatigue; L=learn about exercise and overcoming barriers; C=visual cues e.g. reminder calendars. Control group: routine care, assessment and treatment when necessary. Outcomes: exercise self-efficacy, health status, exercise behaviour and activity.	Treatment group had higher exercise self-efficacy and activity at 6 months follow-up. Authors concluded that WALC intervention is effective in initiating exercise in sedentary older adults and increasing adherence to the program.	No sample size calculations, but did post hoc power calculations. Excluded 15% patients after randomisation and only had relatively short follow-up time (6 months). Unclear whether these results can be maintained in the long-term.
Resnick 2000 Resnick 2001	Qualitative and quantitative (cross sectional observational study) to explore factors influencing adherence to an exercise program in older adults. Descriptive cross-sectional survey to assess the same factors.	USA continuing care retirement village.	23 of original 24 volunteer members of a walking group. Mean age 81 years. Mostly white, well-educated women. 201 adults from the same setting, mean age 85 years.	Qualitative component: open-ended interviews, audio-taped and transcribed; coded and categorised into main themes. Quantitative component: assessed self-efficacy, motivation, fear of falling and health status using validated scores then assessed association between these factors and exercise adherence (measured by session attendance).	Participants who exercised more regularly (i.e. had greater program adherence) had higher self-efficacy expectations related to exercise, better functional performance and fewer functional limitations attributable to health. Adherence to the program was influenced positively by beliefs in exercise benefits, goal identification, positive peer role models and past exercise experience.	Direction of effect unclear. Not a randomised trial thus causal association cannot be determined.

Appendix E: Evidence table 7b Patients' views and experiences of falls prevention strategies: Quantitative studies

Author	Study design Objective	Setting	Population Characteristics	Methods Interventions Outcomes measured	Results	Comments Quality issues
Exercise behaviour programs						
Bruce 2003	Cross sectional analysis of baseline data from longitudinal study to determine whether fear of falling was associated with the level of recreational activity in independently functioning women.	West Australian community setting.	Random selection of 1,500 women, 70 years and older from the electoral role. Primary aim was to enrol them in a randomised trial of oral calcium supplements to prevent osteoporitic fractures. Mean age 75.2 years, 24% were obese (BMI >30m^2/kg).	Measured fear of falling using simple questions (said to correlate well with other validated scores) and physical activity (also via questioning). Performed multiple regression and linear modelling to assess associations between these factors.	Fear of falling was independently associated with lower physical activity (p=0.003) and obesity (p=0.001). Conclusion that the common fear of falling even in healthy, high-functioning adults is an important psychological barrier that may need to be overcome in programs attempting to improve activity levels in older women.	Only associations can be drawn from this cross sectional data. No cause and effect link can be demonstrated using this study design.
Wielandt 2000	Narrative literature review to assess compliance with prescribed adaptive equipment.	No specific settings stated, but the review covered a wide range practice settings.	The age of the participants in the included studies ranged from 2.5-93 years. There were 31 included studies.	Medline and Cinahl database were searched for the years 1963-1996. The types of studies or interventions included in the review were not specifically stated. There was a wide variety of adaptive equipment reviewed, although no studies specifically included hip protectors.	Factors which generally increased compliance with the use of adaptive equipment included: living alone; made-to-measure devices; perceived benefit of the equipment; home visits to fit, provide training in the device's use and assess ongoing use. Factors which decreased compliance with use of adaptive equipment included: physical deterioration; loss of self confidence; lack of aesthetic appeal; embarrassment regarding needing to use the device.	Although many of the studies included in the review did not pertain to the age group under consideration, the results seemed generalisable to the guideline population.

Appendix E: Evidence table 7a: Patient views and experiences of falls prevention strategies: Qualitative studies

Study	Aim	Method	Sample characteristics	Setting	Results	Conclusions
Aminzedah & Edwards 1998 Canada	To ascertain views on use of assistive devices to prevent falling.	Four focus group interviews (tape-recorded) with each subject participating in one.	n=30 from Italian and British Canadian backgrounds; n=21 female; mean age 72.2 (61-86); n=16 lived alone; n=18 primary school education. No information on fall status.	Community	Falls associated with injury, psychological trauma, loss of independent and death. Consensus on advantages of mobility aids but majority believed they did not require them, even among those who reported fear of falling and a history of falls.	Social stigmas attached to ageing, disability and device use may influence older people's decisions to accept or reject mobility aids. However, participants had favourably evaluated bathroom aids. Those from non-English speaking background (NESB) have greater need for targeted health promotion education.
Ballinger & Payne 2000 UK	To explore perspectives on falls/falling among older people with hip fracture.	Semi-structured interviews (analysis involved discourse analysis).	n=8 Consecutive patients (>65 years) admitted to an orthopaedic trauma elderly care ward with hip #; n=7 females; mean age 81.	Orthopaedic trauma elderly care ward	Patients attributed falls to bad luck or incompetence of others. Therapists and patients do not share the same agendas and perspectives about falls.	Older people distance themselves from the possibility of a fall and involvement in prevention initiatives, through fear of stigma and stereotyping.
C'wealth Australia 2000	To investigate fall prevention strategies most likely to be accepted. To examine information needs and perceptions of older people concerning falls and their prevention.	Seven group discussions and 10 individual in-depth interviews (taped and transcribed for content and thematic analysis).	n=59 (included those who had and hadn't experienced a fall; carers). 'Culturally and linguistically diverse' - no details given; age=65 and over; females dominated.	Rural and metropolitan community dwellers	*Most readily accepted strategies:* • Walking aids • Home modification. *Strategies accepted with some reservations* • Speaking with GP about preventing falls • Participation in a falls prevention program - concept unfamiliar and some consider themselves past the stage of learning. *Strategies less readily accepted* • Eyesight checks • Feet check and footwear • Medication review • Home help • Improving balance and exercise levels.	The term 'fall prevention' is unfamiliar and the concept difficult to grasp. Perceived relevance of falls prevention strategies is low until a fall has been experienced. Falls interventions need to be communicated as a life-style enhancing measure and as a means to staying independent for longer in order to gain the full support of older people.

Appendix E: Evidence table 7a: Patient views and experiences of falls prevention strategies: Qualitative studies

					Barriers to adopting fall prevention strategies • Disbelief that the risk of falling can be reduced • If a person has not had any falls or near misses or already has a walking aid because of a pre-existing health condition • Signifies admission of being 'old, old' • Inaccessible and unappealing information.	
Study	**Aim**	**Method**	**Sample characteristics**	**Setting**	**Results**	**Conclusions**
Kong 2002 Hong Kong	To explore the psychosocial consequences of falling.	Explorative approach with semi-structured interviews.	n=20 Chinese; aged 65 and above; recent fall either in community or hospital setting (within 48 hours of interview); n=15 females; degree of injury ranged from no injury to fractured ribs.	Elder care wards	Informants perceived falls as unpredictable and not preventable. Older Chinese people take a passive role in seeking help and information.	Falls interventions should promote a sense of mastery and facilitate supportive social interactions with others.
Health Education Board 1999 Scotland	To examine how elderly people perceive and constructs risks of falling.	Five group and nine in-depth individual interviews.	n= 50 (fallers and non-fallers) recruited via established group and organisations working with older people. Included Asians but proportion not given. n=58 aged less than 75; n=40 female.	Community (rural and urban)	Respondents distinguished between trips (experienced by self) and falls (experienced by others). Those who had experienced falls that they regarded as condition-linked could see no scope for falls prevention. Non-fallers felt there were environmental and personal changes that might prevent or minimise falling, but advocated change for others rather than self.	The word 'falls' is contentious - its use is likely to inhibit engagement with any preventive programme. Targeting 'older people' is also likely to provide a negative or non-response among people who do not relate to portrayals with which they do not identify. People may be more receptive to messages around prevention when they have actually had a fall or near fall.

Appendix E: Evidence table 7a: Patient views and experiences of falls prevention strategies: Qualitative studies

					Formal exercise seen as something only 'exceptional' people do. Participants in exercise classes found the value in social rather than physical benefits.	
Porter 1999 USA	To explore the experience of falling and trying to get up while at home alone.	Descriptive (Husserlian) phenomenological study.	n=25 women aged 80 or more who had reported at least one fall, lived alone.	Community	Older women who have fallen assess their abilities and opportunities to control their environments to prevent further falls.	There is a need to build relationships with key health professionals before problem-solving and offering falls prevention strategies with an emphasis on finding out what characteristics the person is willing to modify and what changes they are prepared to make.

Study	Aim	Method	Sample characteristics	Setting	Results	Conclusions
Resnick 1999 USA	To explore what motivates older people in nursing homes to perform functional activities (with reference to falls).	Semi-structured interviews using naturalistic/ constructivist inquiry.	n=44 (n=37 females); average age: 88 yrs; length of stay in nursing home: 2.8 yrs.	Nursing home	Fear of falling had a major impact on function. Many participants had been admitted to the nursing home following a fall. There was a reluctance to walk and inappropriate use of wheelchairs to avoid walking.	Beliefs held by the participants influenced motivation to participate in falls prevention strategies. Reminders by nursing home staff that they were able to perform an activity, rather than warning them to avoid performing an activity that put them at risk of falling, helped increase motivation and strengthen willingness to be more active, thus preventing further falls
Simpson 2003 UK	To examine the precautions older people are prepared to take to prevent falls (with an emphasis on exercise).	'Qualitative'. Semi-structured interview.	n=32 inpatients (reasons for admission not reported) n=26 women; mean age 83 (sd 5.3).	Acute elderly care medical wards	Most respondents were unaware of the benefits of exercise in general or the positive effect of specific exercises on balance and muscle strength. Neither hospital doctors nor GPs were mentioned as a source of encouragement to exercise. Clients reported concern about health professional's personal manner of assessing and intervening and this affected	Professionals should be alert to and counter the belief among some older people that nothing can be done for falls attributed to chance. The strategy with the strongest evidence (balance and strengthening) is much less likely to be adopted. The benefits of strategies such as exercise and home modification should be promoted and clients should be reassured that pain and fatigue are not inevitable when exercising. Professionals who advise on hazard reduction strategies

Appendix E: Evidence table 7a: Patient views and experiences of falls prevention strategies: Qualitative studies

					their response to safety recommendations. Perceived barriers to exercises were pain, effort and age.	in older people's homes should take account of client's views.
Stead 1997 Scotland	To investigate the factors which influence participation in physical activity.	Focus group discussions.	Aged 55-75+ (n=not reported). Nine focus groups. No further information.	Community dwelling	There are two distinct groups: those who already incorporate exercise into their lifestyle and those who do not. The non-active group are more likely to regard exercise as potentially harmful and as using up finite energy resources. There is a discrepancy between the benefits that health professionals and older people attach to exercise, with the former highlighting the physiological and health benefits and the latter the social and psychological rewards.	Confirms findings that older people prefer exercise of a moderate intensity that includes a strong social and recreational component. For the non-active group there is a low health expectation and low confidence in their physical abilities. Again, the social benefits needs to be emphasised and incorporation of physical activity in everyday routines should be encouraged. Failure to take proper account of the relevance of exercise to lifestyle and the meanings that people attach to it, can result in the provision of services that do not adequately reflect need and may alienate their intended audience.
Study	**Aim**	**Method**	**Sample characteristics**	**Setting**	**Results**	**Conclusions**
Grossman 2003	To investigate physical activity perceptions, motivations and barriers.	In-depth qualitative interviews using open-ended questions.	Aged 75 years and above. n=33 under-active adults (defined as participating in < 20 minutes of endurance-type physical activity of moderate intensity, three times/wk for minimum three months).	Community dwelling	Misperception that physical activity levels relatively high. Knowledge of physical activity benefits expressed in terms of dangers of a sedentary lifestyle. Encouragement from family/friends important. Quality of life and independence more important than longevity. Lack of time, ageing process, adverse environment were all cited as barriers.	Misconceptions and gaps in knowledge exist. However, under-active people continue to be interested in learning about physical activity despite cited barriers. Recommendations for practice include giving specific advice to older patients, engaging family in the motivation process, addressing unique incentives for this age group and improving self-efficacy in patients who face multiple barriers. The presence of multiple barriers suggests that physical activity prescription and counselling should be ongoing and included in every visit.

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Armstrong 1996	Randomised controlled trial. Randomised by phone using 'computer generated pseudo-random numbers'. Blocked, stratified randomisation. Partial blinding. Analysis by intention to treat.	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 or 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.	a. HRT (Prempak C 0.625 mg or Premarin 0.625 mg) and calcium (Sandocal 1,000 mg). b. Control: calcium (Sandocal 1,000 mg). For part of the study, an HRT placebo was also given to this group.	Length of follow-up 48 weeks. Losses: eight of 116 (7%). <u>Outcome</u> Falls data collected at 12 weekly intervals. 1. Number of participants falling during the study. <u>Results:</u> HRT plus calcium n=24/53 vs calcium alone n=16/55, number of participants falling, community dwelling post fracture RR 1.56 [0.94, 2.59].		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Becker 2003	Randomised controlled trial. Cluster randomised by city government official using sealed envelopes. Intention to treat analysis.	Setting: nursing homes, Germany. N=981. Sample: men and women requiring long-term care in six 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.	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). 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, five protectors per subject, to be worn from arising until going to bed. 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 two months exercise and use of hip protectors; group exercise programme (balance and progressive resistance exercises	Length of follow-up 365 days from a specified date. Losses: none reported. <u>Outcomes</u> Falls and fall sheets completed daily by nursing staff and supervised regularly by study nurse. 1. Number of participants falling. 2. Number with two or more falls. 3. Fall rate per 1,000 person years. 4. Time to first fall. 5. Number of hip fractures. 6. Number of non-hip fractures. <u>Results:</u> Cluster N=6 =981 participants. Multifaceted intervention vs control. Number of fallers RR 0.75 [0.57, 0.98]. Incidence density rate of falls per 1,000 resident years RR 0.55 [0.41, 0.73] (trialists' analysis).		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

			using ankle weights and dumbbells, 75 minutes two x per week).			

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Bischoff 2003	Randomised controlled trial. Double blind. Randomised by an independent statistician in groups of four. Analysis by intention to treat.	Setting: long stay geriatric care units in two acute hospitals, Switzerland. N=122. Sample: elderly institutionalised women waiting placement in nursing homes. Age: mean 85 years. Inclusion criteria: aged 60 and over, able to walk three m with or without a walking aid. 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 three months.	a. Vitamin D plus calcium carbonate (4000IU cholecalciferol per tablet), for 12 weeks. b. Control: two tablets of 600mg calcium carbonate per tablet. Tablets looked identical in both groups. Administered twice a day with breakfast and dinner.	Length of follow-up 12 weeks (duration of intervention) or until discharge to nursing home. Losses: 33 of 122 (27%). <u>Outcome</u> Falls recorded by staff using a falls protocol (date, time, circumstances, injuries). 1. Number of participants falling. 2. Number of falls. <u>Results:</u> Vitamin D n=14/45 vs control n=18/44, number of participants falling, long stay geriatric care RR 0.76 [0.43, 1.33].	Also measured but not considered in the review were multiple serum biochemical values, overall musculoskeletal function using a summed score on various measures – for example, strength, timed up and go test.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Buchner 1997a	Randomised controlled trial. Randomised by 'variation of randomly permuted blocks'. Randomised to seven groups: six intervention groups (three FICSIT, three MoveIT), and one control group. Only FICSIT and control groups reported in this paper. Intention to treat analysis.	Setting: community, Seattle, USA. N=105. Sample: HMO members (FICSIT intervention groups only). Age: mean 75 years. Inclusion criteria: aged between 68 and 85 years; unable to do eight step tandem gait test without errors; below 50th percentile in knee extensor strength for height and weight. Exclusion criteria: active cardiovascular, pulmonary, vestibular, and bone disease; positive cardiac stress test; body weight >180% ideal; major psychiatric illness; active metabolic disease; chronic anaemia; amputation; chronic neurological or muscle disease; inability to walk; dependency in eating, dressing, transfer or bathing; terminal illness; inability to speak English or complete written forms.	Supervised exercise classes one hour x three per week for 24-26 weeks, followed by unsupervised exercise. a. Six months endurance training (ET) (stationary cycles) with arms and legs propelling wheel. b. Six months strength training (ST) classes (using weight machines for resistance exercises for upper and lower body). c. Six months ST plus ET. d. Control: usual activity levels but 'allowed to exercise after six months'. Exercise sessions started with a 10 to 15 minute warm up and ended with a five to 10 minute cool down.	Length of follow-up: variable, from randomisation to the end of study funding (0-25 months, median 18 months). Losses: 15 of 105 (14%) (14 from intervention groups). <u>Outcomes</u> Fall outcomes reported for any exercise (all three groups combined) compared with control group (states 'a priori decision'). Falls reported immediately by mail, also monthly postcard return; telephone follow-up if no postcard received. 1. Number of fallers at 1 year. 2. Time to first fall. 3. Number of falls per person. <u>Results</u> Exercise/physical therapy alone n=32/75 vs control n=18/30, number of participants falling community dwelling untargeted RR 0.71 [0.48, 1.05].	Seattle FICSIT trial [Province 1995] Only 1.3% of original sample randomised. Falls not primary outcome. Other outcomes assessed at end of intervention (six months) then 'control group allowed to exercise after 6 months'. Seven of 30 subjects did.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Campbell 1997	Randomised controlled trial. Allocation schedule developed using computer generated numbers. Assignment by independent person off site. Intention to treat analysis.	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.	Baseline health and physical assessment for both groups. a. One hour visits by physiotherapist x four in first two months to prescribe home-based individualised exercise and walking programme. Exercise 30 minutes x three per week plus walk outside home x three per week. Encouraged to continue for one year. Regular phone contact to maintain motivation after first two months. b. Control: social visit by research nurse x four in first two months. Regular phone contact.	Length of follow-up: 12 months and 24 months. Losses: 20 of 233 (9%). <u>Outcomes</u> Falls recorded daily on postcard calendars, mail registration monthly by postcard, telephone follow-up. 1. Number of participants falling at one year and two years. 2. Number with injury fall at one and two years. 3. Number with two or more falls. 4. Mean rate of falls (falls/per year). 5. Fall rate per 100 person years. 6. Number complying with intervention. <u>Results</u> Exercise/physical therapy alone n=53/116 vs control 62/117 number of participants falling, community dwelling (strength, balance, walking)-individually targeted RR 0.86 [0.66, 1.12]. Exercise/physical therapy alone n=27/103 vs control n=43/110 1.Number of participants sustaining injury fall, community dwelling – individually targeted RR 0.67 [0.45, 1.00].		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				2.Number sustaining two or more falls n=22/116 vs 34/117 RR 0.65 [0.41, 1.05].		
Study	**Methods**	**Population/setting**	**Interventions**	**Results**	**Comments**	**Quality (allocation concealment)**
Campbell 1999	Randomised controlled trial, two by two factorial design. Allocation schedule developed using computer generated numbers. Assignment by independent person off site. Intention to treat analysis.	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.	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 and no exercise programme. Exercise programme: one hour physiotherapist visits x four in first two months to prescribe home-based individualised exercises (muscle strengthening and balance retraining exercises 30 min x three per week) and walking x two 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.	Length of follow-up: 44 weeks. Losses: 21 of 93 (23%). <u>Outcomes</u> 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 two or more falls. 6. Number sustaining one or more falls indoors. 7. Fall rate per 100 person years. 8. Number sustaining an adverse effect. 9. Number who complied with intervention. <u>Results</u> Exercise/physical therapy alone vs control. Community dwelling-individually targeted 1.Number of participants falling community dwelling (strength, balance,	Only 19% randomised. Psychotropic medications recorded one month after completion of study. Eight of the 17 who taken placebo only for 30 weeks had restarted one month after end of study.	A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Campbell 1999 cont.				walking)-individually targeted: N=12/45 vs n=16/48 RR 0.80 [0.43, 1.50]. 2.Number sustaining medical fall: N=3/45 vs 4/48 RR 0.80 [0.19, 3.38]. 3.Number. sustaining fracture fall: N=1/45 vs n=0/48 RR 3.20 [0.13, 76.48]. 4.Number sustaining injury fall, n=5/45 vs 8/48 RR 0.67 [0.24, 1.89]. 5.Number sustaining two or more falls: n=5/45 vs 7/48 RR 0.76 [0.26, 2.23]. Exercise plus medication withdrawal vs control community dwelling individually targeted 1.Number of participants falling: n=6/24 vs 11/24 RR 0.55 [0.24, 1.24]. 2.Number sustaining medical care fall: n=2/24 vs 3/24 RR 0.67 [0.12, 3.64]. 3.Number sustaining fracture fall: n=1/24 vs 0/24 RR 3.00 [0.13, 70.16]. 4.Number sustaining injury fall: n=2/24 vs 3/24 RR 0.67 [0.12, 3.64]. 5.Number sustaining two or more falls: n=3/24 vs 6/24 RR 0.50 [0.14, 1.77]. Medication withdrawal vs control community dwelling individually targeted 1.Number of participants falling: n=11/48 vs 17/45		

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				RR 0.61 [0.32, 1.15]. 2.Numbersustaining medical care fall: n=3/48 vs 4/45 RR 0.70 [0.17, 2.97]. 3.Number sustaining a fracture fall: n=1/48 vs 0/45 RR 2.82 [0.12, 67.40] 4.Number sustaining injury fall: n=7/48 vs 6/45 RR 1.09 [0.40, 3.01]. 5.Number sustaining two or more falls: n=4/48 vs 8/45 RR 0.47 [0.15, 1.45].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Carpenter 1990	Prospective randomised controlled trial. Women randomised by random number tables and husbands allocated to same group. Analysis by intention to treat.	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 above. 23 men and 49 women were over 85 years. Inclusion criteria: aged 75 years and above; living in Andover area. Exclusion criteria: living in residential care.	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 five or more. B. Control: no disability surveillance between initial and final evaluation.	Measured at three years Losses: 172 of 539 (32%). <u>Outcomes</u> 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 six months; death during the study period. <u>Results</u> The trailists reported significantly fewer falls in the experimental group during the month before the final interview, but insufficient data were		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				available to calculate an effect size		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (Allocation concealment)
Carter 1997	Randomised controlled trial. Analysis by intention to treat not possible.	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.	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.	Length of follow-up 1 year. Losses: 200 of 658 (30%). <u>Outcomes</u> 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. <u>Results</u> Home safety intervention. High density and low density intervention plus medication withdrawal vs control. 1.No of participants falling: High density n=19/133 vs 29/161 RR 0.79 [0.47, 1.35] Low density N=19/163 vs 29/161 RR 0.65 [0.38, 1.11]	Unpublished study.	A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				2.Number sustaining two or more falls: High density N=2/133 vs n=11/161 RR 0.22 [0.05, 0.98] Low density N=3/163 vs n=11/161 RR 0.27 [0.08, 0.95]		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Carter 2002	Randomised controlled trial. Randomised by computer generated programme. Intention to treat not possible.	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 > eight hours / week moderate to hard exercise; planning to be out of city > four weeks during 20 week programme.	a. Exercise class (Osteofit) for 40 minutes, two x per week, for 20 weeks in community centres. Classes of 12 per instructor. Eight 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.	Length of follow-up 20 weeks (duration of intervention). Losses: 13 of 93 (14%). <u>Outcomes</u> 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. <u>Results</u> Report no difference between groups in the number of people falling. No summary statistic for falls reported and insufficient data presented to calculate one.		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Cerny 1998	Randomised controlled trial. Randomised by coin toss but some clusters, for example couples or two ladies dependent on another for transport. Intention to treat analysis not possible.	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.	a. Exercise programme of progressive resistance, stretching, aerobic and balance exercises and brisk walking over various terrains for 1½ hours, x weekly, for six months. b. Control: no intervention.	Follow-up at three and six months Losses: none described. <u>Outcome</u> 1. Number of participants falling. <u>Results</u> Exercise/physical therapy alone vs control community dwelling untargeted. Number of participants falling n=3/15 vs n=3/13 RR 0.87 [0.21, 3.58].	Other outcomes analysed as pre-post intervention: strength, range of motion, balance and gait.	B*

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Close 1999	Randomised controlled trial. Randomised by random numbers table and list held independently of the investigators. Intention to treat analysis not possible	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.	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.	Follow-up every four months for one year. Losses: 93 of 397 (23%). <u>Outcomes</u> Falls diary 1. Number of participants falling. 2. Number with injury fall. 3. Number sustaining three or more falls. 4. Number of falls. Also measured but not considered in this review: doctor and hospital visits, and admissions; function. <u>Results</u> Assessment followed by multifactorial intervention vs control community dwelling		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				targeting known fallers or fall risk factors only. 1.Number participants falling n=59/141 vs 111/163 RR 0.61 [0.49, 0.77]. 2.Number sustaining injury fall n=8/141 vs 16/163 RR 0.58 [0.26, 1.31].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Coleman 1999	Randomised controlled trial. Cluster randomisation by physician practice. Intention to treat analysis.	Setting: HMO members, Washington, USA. N=169. Sample: community dwelling men and women in nine 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).	a. Half-day chronic care clinics every three-four months in five 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 (four practices).	Follow-up 24 months. Losses: 56 of 169 (33%). <u>Outcomes</u> Falls recorded retrospectively by questionnaire at 12 and 24 months. 1. Percentage of participants falling. <u>Results</u> Reported that screening and intervention in a chronic care clinic provided no improvement in the incidence of falls at 12 or 24 months. No summary statistic provided.		C*
Cornillon 2002	Randomised controlled trial. Randomised by random number tables. Intention to treat analysis possible.	Setting: community, St Étienne, France. N=303. Subjects: community dwelling and independent in ADL (83% female).	a. Information on fall risk, and balance and sensory training in groups of 10-16. One session per week for eight weeks. Session started with foot and ankle warm-up (walking on tip	Follow-up 12 months. Falls and fall related injuries recorded on six monthly falls calendars. Losses: five of 303 (1.7%). <u>Outcomes</u>		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		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.	toe and on heals 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.	1. Number of participants falling. 2. Mean number of falls (no standard deviation). 3. Mean number of medical care falls (no standard deviation). Results Exercise/physical therapy alone vs control community dwelling untargeted, number of participants falling N=39/148 vs 48/153 RR 0.84 [0.59, 1.20].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Cumming 1999	Randomised controlled trial. Stratified block randomisation. Intention to treat analysis.	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.	a. One home visit by experienced occupational therapist assessing environmental hazards (standardised form) and supervision of home modifications. Telephone follow-up after two weeks. b. Control: usual care.	12-month follow-up with monthly falls calendar. Losses: 142 of 530 (27%). Outcomes 1. Number of fallers (by location of fall, home or away). 2. Compliance with recommendations. Results Home safety intervention alone vs control, community dwelling, number of participants falling: 1.Number of falls in year prior to randomisation, n=53/161 vs 52/163 RR 1.03 [0.75, 1.41].		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				2.Falling history in year prior to randomisation, n=43/103 vs 67/103 RR 0.64 [0.49, 0.84]. 3.Fallers and non fallers in year prior to randomisation, n=96/264 vs n=119/266 RR 0.81 [0.66, 1.00].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Dawson-Hughes 1997	Randomised controlled trial. Stratified block randomisation using random numbers tables. Intention to treat analysis.	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 five years; renal disease; bilateral hip surgery; therapy with a bisphosphonate, calcitonin, oestrogen, tamoxifen, or testosterone in past six months, or fluoride in past two years; femoral neck bone	a. Calcium citrate malate (500 mg elemental calcium) and cholecalciferol (700 IU vitamin D) orally, daily at bedtime for three years. b. Control: double placebo tablets.	Length of follow-up three years. Postcard sent in after any fall. Telephone call to verify circumstances. Subjects reported any additional falls at six monthly follow-up visit. Non-vertebral fractures reported at six monthly follow-up visit and verified by review of x-ray reports or hospital records. Losses: 56 of 445 (13%). Outcomes 1. Number of participants falling during study. 2. Number of falls per subject. 3. Fall related non-vertebral fractures.		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		mineral density more than 2 SD below the mean for subjects of the same age and sex; dietary calcium intake exceeding 1,500 mg per day; laboratory evidence of kidney disease.		Also measured at six-month intervals, but not considered in this review, were bone mineral density, biochemical assays, and other measures. Results The number of participants falling did not differ significantly between intervention and control groups. Data were not presented.		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Day 2002	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). Intention to treat analysis.	Setting: community, Melbourne, Australia. N=1,107. 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 two years (except for short absences); had participated in regular to moderate physical activity with a balance component in previous two	a. Exercise: weekly class of one 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. 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. c. Vision improvement: assessed at baseline using dual visual acuity chart. Referred to	Length of follow-up 18 months. Falls reported using monthly postcard to record daily falls. Telephone follow-up if calendar not returned within five working days of the end of each month, or reporting a fall. Losses: 17 of 1,107 (1.5%). Outcomes 1. Time to first fall. 2. Number of fallers. Results Exercise/physical therapy alone vs control community dwelling untargeted, number of participants		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Day 2002 cont.		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.	usual eye care provider, general practitioner or local optometrist if not already receiving treatment for identified impairment. 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.	falling n=76/135 vs n=87/137 RR 0.89 [0.73, 1.08]. Home safety intervention alone vs control, fallers and non-fallers prior to year of randomisation number of participants falling, n=78/136 vs 87/137 RR 0.90 [0.74, 1.10]. Vision assessment and referral vs control, number of participants falling, n=84/139 vs 87/137 RR 0.95 [0.79, 1.14]. Exercise visual correction and home safety intervention (community dwelling). Number of participants falling 1.Exercise, visual correction and home safety n= 65/135 vs control n=87/137 RR 0.76 [0.61, 0.94]. 2.Exercise and visual correction n=66/136 vs control n=87/137 RR 0.76 [0.62, 0.95]. 3.Exercise and home safety intervention n=72/135 vs control n=87/137 RR 0.84 [0.69, 1.03].		

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Donald 2000	Randomised controlled trial, two by two factorial design. Stratified by fall risk and randomised by 'randomised envelopes'. Analysis by intention to treat.	Setting: hospital, Gloucester, United Kingdom. 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.	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 dorsiflexors). c. Assigned to ward area with carpet and conventional physiotherapy. d. As above © plus seated leg strengthening exercises (hip flexors ankle dorsiflexors).	Length of follow-up variable depending on length of hospital admission. Losses: 9 of 54 (17%). <u>Outcome</u> 1. Number of participants falling during admission. 2. Number of fracture falls. <u>Results:</u> 1.Exercise/physical therapy alone n=2/30 vs control n=6/24, number of participants falling, institutional care-individually targeted RR 0.27 [0.06, 1.20]. 2. Vinyl n=1/26 vs carpet flooring n=7/28 in rehabilitation ward, number of participants falling RR 0.15 [0.02, 1.17].	Also measured at admission and discharge, but not considered in the review: Barthel scores, hip and ankle strength, timed walk and functional reach test.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Ebrahim 1997	Randomised controlled trial. Randomly assigned using prepared envelopes containing computer generated allocation. Intention to treat analysis not possible.	Setting: UK. N=165. Sample: post-menopausal women identified from A&E and orthopaedic fracture clinic records. Inclusion criteria: fractured upper limb in last two years. Exclusion criteria: on bisphosphonates for osteoporosis; life expectancy <1 year; cognitive impairment; too frail for brisk walking or to travel for measurements.	a. Initial advice on general health/diet. Encouraged to build up to brisk walking 40 minutes x three per week. B. Control: initial advice on general health/diet. Upper limb exercises to improve post-fracture function.	Length of follow-up two years. Results reported for one and two year follow-up. Falls monitored by monthly telephone calls. Losses: 68 of 165 (41%). Outcomes 1. Number of participants falling. 2. Total number of falls. 3. Number sustaining fracture fall. Also measured, but not considered in this review were bone mineral density, vertebral fractures, physical capacity. Results Exercise/physical therapy alone vs control community dwelling untargeted. 1.Number of participants falling, n=52/81 vs n=50/84 RR 1.08 [0.85, 1.37]. 2.Number sustaining fracture fall, n=2/81 vs 3/84 RR 0.69 [0.12, 4.03].		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Fabacher 1994	Randomised controlled trial. Randomised with randomly generated assignment cards in sealed envelopes. Intention to treat analysis not possible.	Setting: community, California, USA. N=254. Sample: men (N=248) and women (N=6) aged above 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.	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.	Measured at four monthly intervals for one year, by structured interview for active arm and by telephone for controls. Losses: 59 of 254 (23%). <u>Outcome</u> 1. Number of individuals falling. <u>Results</u> Assessment followed by multifactorial intervention vs control community dwelling-geriatric screening (fallers and non fallers), number of participants falling n=14/100 vs 22/95 RR 0.60 [0.33, 1.11].		A*

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Fiatarone 1997	Randomised controlled trial. Method of randomisation not described. No intention to treat analysis.	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.	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, three days per week for 16 weeks. b. Control: wait list control. Weekly phone calls.	Length of follow-up 16 weeks (duration of intervention). Falls identified weekly by phone (assumed). Losses: four of 34 (11%). <u>Outcomes</u> 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		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				care visits. Results No difference between groups was observed in the frequency of falls in this study. No summary statistic and no data provided.		
Study	**Methods**	**Population/setting**	**Interventions**	**Results**	**Comments**	**Quality (allocation concealment)**
Gallagher 1996	Randomised controlled trial. Method of randomisation not described. Observers unblinded at six months. Intention to treat analysis not possible	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 more; sustained a fall in previous three months. Exclusion criteria: none described.	a. Two risk assessment interviews of 45 minutes each. One counselling interview of 60 minutes showing video and booklet and results of risk assessment. b. Control: baseline interview and follow-up only. No intervention.	Length of follow-up six 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. Results The intervention had no statistically significant impact on the main outcome measures. Comparisons between intervention and control groups controlling for pre-programme differences.		B*
Gray-Donald 1995	Randomised controlled trial. Method of randomisation not described. Stratified by gender and nutritional risk criteria. Intention to treat analysis.	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 above 60 years; requiring community	a. 12 week intervention of high-energy nutrient dense supplements provided by dietician. Two 235 ml cans per day (1045-1480 kj per can) for 12 weeks. b. Control: visits only (encouragement and suggestions about improving	Retrospectively monitored at six and 12 weeks. Losses: four of 50 (8%). Outcomes 1. Number of participants falling. Results Nutritional supplementation		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		services; elevated risk of under-nutrition (excessive weight loss or BMI <24 kg/m2). Exclusion criteria: alcoholic; terminal illness.	diets).	vs control, community dwelling targeted, number of participants, n=0/22 vs 5/24 RR 0.10 [0.01, 1.69].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Hogan 2001	Randomised controlled trial. Computer generated sequence concealed in locked cabinet prior to randomisation. Stratified by number of falls in previous year: 1 or >1. Intention to treat analysis.	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 three months; living in the community; age 65 years and above; 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.	a. One in-home assessment by a geriatric specialist (doctor, nurse, physiotherapist or OT) lasting one-two hours. Intrinsic and environmental risk factors assessed. Multidisciplinary case conference (20 minutes). Recommendations sent to patients and patients' doctor for implementation. Subjects referred to exercise class if problems with balance or gait and not already attending an exercise programme. Given instructed about exercises to do at home. b. Control: one home visit by recreational therapist.	Length of follow-up: 12 months. Falls recorded on monthly calendars (47.8% returned). Also retrospective recall at three, six months (at visit) and 12 months (by phone). Losses: 24 of 163 (15%). <u>Outcomes</u> 1. Number of participants falling. 2. Number sustaining medical care fall. 3. Number sustaining injury fall. 4. Number sustaining three 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. <u>Results</u> Assessment followed by multifactorial intervention vs control, community dwelling targeting known fallers or fall risk factors only:		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				1.Number of participants falling, n=54/79 vs 61/84 RR 0.94 [0.77, 1.15]. 2.Number sustaining medical care fall, n=9/79 vs 8/84 RR 1.20 [0.49, 2.95].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Hornbrook 1994	Cluster randomised controlled trial. Intention to treat analysis not possible.	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: above 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.	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.	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 1,000 person years. Losses: 156 of 3,182 (5%) in the intervention group. Outcomes 1. Number of participants falling. 2. Number sustaining medical care fall. 3. Number sustaining fracture fall. 4. Number sustaining injury fall. 5. Number sustaining two or more falls. 6. Number sustaining near fall. 7. Fall rate per 1,000 person years. 8. Number complying with treatment programme. 4. Fracture falls.		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				5. Hospitalised falls. Results Unadjusted rates for all falls were significantly lower among intervention participants; for other categories of fall (injury falls, medical care falls). There were no statistically significant differences between groups OR 0.85 p<.05, no confidence intervals.		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Jensen 2002	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. Intention to treat analysis not possible.	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% female, Inclusion criteria: institution: more than 25 residents. Residents: age 65 and above. Exclusion criteria: none listed.	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: four 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,	Follow-up 34 weeks. Falls registered by nurses and aides, if witnessed or reported, using structured report designed for study. Losses: 78 of 402 (19%). Outcomes 1. Number of people falling. 2. Number of falls. 3. Time to first fall. 4. Number sustaining injury fall. Results Incidence of falls in the intervention group. Adjusted Incidence rate ratio 0.60 [0.50, 0.73.		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

			staff guidance. b. Control: usual care.			

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Jitapunkul 1998	Randomised controlled trial. Method of randomisation not described.	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.	a. Home visit from non-health professional with structured questionnaire. Three monthly visits for three years. Referred to nurse/geriatrician (community based) if Barthel ADL index and/or Chula ADL index declined two or more points, or subject fell more than once during previous three 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 three years.	Measured at the end of three years. Falls during last three months only. Losses: 44 of 160 (28%). <u>Outcomes</u> 1. Number of participants falling. <u>Results</u> Assessment followed by multifactorial intervention vs control Community dwelling-geriatric screening (fallers and non-fallers), number of participants falling, n=3/57 vs n=6/59 RR 0.52 [0.14, 1.97].		B*
Kenny 2001	Randomised controlled trial. Randomised in blocks of eight, method of randomisation not described. Intention to treat analysis not possible	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 more, history of a fall, diagnosed as having cardioinhibitory CSH by carotid	a. Pacemaker (rate drop response physiologic dual-chamber pacemaker: Thera RDR, Medtronic, Minneapolis, Minnesota). b. Control: no pacemaker.	Follow-up one year after randomisation. Losses: 16 of 175 (9%). <u>Outcomes</u> 1. Number of falls. 2. Number of injurious falls. Also measured but not considered in this review were number of episodes of syncope.	Out of 71,299 A&E attendees screened, 1,624 received carotid sinus massage and 175 agreed to be randomised.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		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.		Results Cardiac pacing vs control 1.Number of participants with syncope, n=22/84 vs n=47/87. RR 0.48 [0.32, 0.73] 2.Number sustaining fracture fall, n=3/84 vs n=4/87 RR 0.78 [0.18, 3.37] 3.Mean number of falls 4.10 vs 9.3 WMD –5.20 [-9.40, -1.00].		

Study	Methods	Population/setting	Interventions	Results	Comments	Allocation concealment
Kingston 2001	Randomised controlled trial. Method of randomisation not described. Intention to treat analysis not possible	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.	a. Rapid health visitor intervention within five 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.	Follow-up 12 weeks. No description of how falls monitored, presumably retrospective at day four and week 12. Losses: 17 of 109 (16%). Outcomes 1. Number of participants falling. Also measured but not considered for this review, SF36 assessment at day four and 12 weeks. Results Assessment followed by multifactorial intervention vs control, community dwelling-targeting known fallers or fall risk factors only, number of participants falling, n=4/60 vs n=5/49 RR 0.065 [0.19, 2.30].		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Latham 2003	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. Intention to treat analysis.	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 six months; severe cognitive impairment; physical limitations that would limit adherence to exercise programme; unstable cardiac status; large ulcers around ankles that would preclude use of ankle weights; living outside hospitals' geographical zone; not fluent in English.	a. Exercise: quadriceps exercises using adjustable ankle cuff weights three x per week for 10 weeks. First two sessions in hospital, remainder at home. Monitored weekly by physiotherapist: alternating home visit with telephone calls. b. Exercise control: frequency matched telephone calls and home visits from research physical therapist including general enquiry about recovery, general advice on problems, support. c. Vitamin D: single oral dose of six 1.25 mg calciferol (300,000 IU). d. Vitamin D control: placebo tablets.	Follow-up six months. Falls recorded in fall diary with weekly reminders for first 10 weeks. Nurses examined fall diaries and sought further details about each fall at three and six month visits. Reminder phone call between visits. Losses: 43 of 243 (17%). <u>Outcomes</u> 1. Number of participants falling. 2. Number of falls. 3. Fall rate in person years. 4. Time to first fall. 5. Adverse events. 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. <u>Results</u> Exercise/physical therapy alone vs control, community dwelling (strength training)-individually targeted, 1.Number of participants falling, n=60/112 vs n=64/110 RR 0.92 [0.73, 1.16]. 2.Number sustaining muscoskeletal injury during study, n=18/112 vs n=5/110	Detailed description of exercise regimen given in paper.	A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				RR 3.54 [1.36, 9.19]. Vitamin vs control, community dwelling targeted, number of participants falling, n=64/121 vs n=60/114 RR 1.00 [0.79, 1.28].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Lightbody 2002	Randomised controlled trial. Method of randomisation not described. 'Block-randomised consecutively into groups'. Intention to treat analysis not possible.	Setting: hospital, Liverpool, UK. N=348. Subjects: consecutive patients attending A&E with a fall (74.4% women). Age: median (IQR) 75 (70-81). Inclusion criteria: age > 65 years. Exclusion criteria: admitted to hospital as result of index fall, living in institutional care, refused or unable to consent, lived out of the area.	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.	Length of follow-up six months. Falls, injury and treatment recorded in diary. Postal questionnaire at six months to collect data. GP records and hospital databases searched. Losses: 34 of 348 (10%). <u>Outcomes</u> 1. Number of people falling. 2. Number of falls. 3. Number sustaining injury fall. <u>Results</u> Assessment followed by multifactorial intervention vs control, community dwelling targeting known fallers or fall risk factors, number of participants falling, n=43/171 vs n=44/177 RR 1.01 [0.70, 1.46].	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.	B*

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Lord 1995	Randomised controlled trial. Pre-randomisation prior to consent, from a schedule of participants	Setting: community, Australia. N=194. Sample: women, recruited from	a. Twice weekly exercise programme (warm up, conditioning, stretching,	Measured over 12 months. Fall ascertainment questionnaires sent out		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Lord continued	in a previous study. All from intervention group. Inadequate data for intention to treat analysis.	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.	relaxation) lasting one hour, over a 12-month period. b. Control: no intervention.	every two months. Telephone call if questionnaire not returned. Losses: 19 of 194 (10%). <u>Outcomes</u> 1. Number of participants falling. 2. Number of participants sustaining two or more falls. 3. Number of participants sustaining one or more falls indoors. 4. Number sustaining non-accidental falls. 5. Number sustaining 'balance falls'. <u>Results</u> Exercise/physical therapy alone vs control, community dwelling untargeted, 1.Number of participants falling, n=26/75 vs 33/94 RR 0.99 [0.65, 1.50]. 2.Numbersustaining two or more falls, n=8/75 vs n=12/94 RR 0.84 [0.36, 1.94].		

McMurdo 1997	Randomised controlled trial. States 'randomly allocated'. Intention to treat analysis not possible.	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.	45 minute exercise programme of weight bearing exercise to music, three x weekly, 30 weeks per year, over two years, with 1,000 mg calcium carbonate daily. b. Control: 1,000 mg calcium carbonate daily.	Length of follow-up two years. Losses: 26 of 118 (22%) over two years. <u>Outcomes</u> 1. Number of women falling. Also measured, but not considered in this review: bone mineral density. <u>Results</u>		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				Exercise/physical therapy, community dwelling untargeted, number of participants falling, n-13/44 vs n=21/48 RR 0.68 [0.39, 1.18].		
Study	**Methods**	**Population/setting**	**Interventions**	**Results**	**Comments**	**Quality (allocation concealment)**
McMurdo 2000	Randomised controlled trial. Cluster randomisation of nine residential homes. Intention to treat analysis not possible.	Setting: institutional care, Dundee, United Kingdom. N=133. Sample: men and women in nine 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 more; resident in participant nursing home. Exclusion criteria: MMSE score <12.	a. Falls risk factor assessment and modification x two (at start and six months) blood pressure, medication review, visual acuity, ambient lighting levels; seated exercise sessions for balance, strength and flexibility 30 minutes x two weekly for six months. b. Control: reminiscence sessions 30 minutes x two per week for six months.	Length of follow-up one year. Staff recorded falls daily on a calendar from seven-12 months. Losses: 49 of 133 (37%). <u>Outcomes</u> 1. Number of participants falling. 2. Mean number of falls (no SD). 3. Number complying with treatment. 4. Falls per person week. <u>Results</u> Reported no difference between intervention and control groups in the percentage of participants falling in the six-month period after completion of the intervention. There was no difference between the groups in the number of falls sustained, the risk of falling: OR 0.45 [0.19, 1.14].		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				The risk of recurrent falling: OR 1.07 [0.40, 2.97].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Means 1996	Randomised trial nested within a pre-test post-test experimental design. Inadequate data for intention to treat analysis.	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 above; ambulatory for at least 30 feet; community dwelling; able to comprehend instructions and give informed consent; history of one or more falls in previous year.	a. Exercise programme including obstacle course training. b. Control: exercise programme without obstacle course training.	Length of follow-up six months. Losses: 34 of 99 (33%). Outcomes 1. Mean number of falls per participant in each group, with standard deviation. Results Exercise/physical therapy alone vs control, community dwelling, untargeted, mean number of falls, n=31 mean 1.50 vs n=34 mean 1.90, WMD –0.40 [-1.61, 0.81].		C*

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Mulrow 1994	Randomised controlled trial. Randomisation blocked and stratified by nursing home. Inadequate data for intention to treat analysis.	Setting: one academic nursing home and eight community nursing homes, USA. N=194. Sample: elderly residents dependent in at least two	a. 30-45 minute one on one physiotherapy session x three weekly for four months. b. Control: 30-45 minute one on one friendly visit x three weekly for four months.	Length of follow-up one year but only results at four months reported. Falls identified from patient charts and/or incident reports. Losses: 14 of 194	San Antonio FICSIT trial [Province 1995]	A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		activities of daily living. Falling status on entry not defined. Age: mean (SD) 79 (8) years. Inclusion criteria: age above 60 years; resident in a nursing home for at least three months; dependent in at least two activities of daily living. Exclusion criteria: terminal illness; severe dementia; known assaultive behaviour pattern; currently or recently having physiotherapy.		(7%). Outcomes 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. Results Exercise/physical therapy, institutional, care, individually targeted. 1.Number of participants falling, n=44/97 vs n=38/97 RR 1.16 [0.83, 1.61]. 2.Number sustaining medical fall, n=13/97 vs n=7/97 RR 1.86 [0.77, 4.45]. 3.Number sustaining injury fall, n=7/97 vs n=2/97 RR 3.50 [0.75, 16.43].		
Study	**Methods**	**Population/setting**	**Interventions**	**Results**	**Comments**	**Quality (allocation concealment)**
Newbury 2001	Randomised controlled trial. Randomisation by random numbers in sequentially numbered sealed envelopes. Intention to treat analysis.	Setting: community, Adelaide, Australia. N=100. Sample: every 20th name in an age-sex register of community dwelling patients registered with six general practices (63% female). Age: range 75 - 91 years;	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	Falls identified retrospectively when 75+HA repeated at 12 months. Losses: 11 of 100 (11%). Outcomes 1. Number of participants falling. Numerous other outcome	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	A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		median age in intervention group 78.5, control group 80 years. Inclusion criteria: aged 75 years and above; living independently in the community. Exclusion criteria: none.		measures recorded but not included in this review. Results Assessment followed by multifactorial intervention, community dwelling, geriatric screening (fallers and non fallers), number of participants falling, n=12/48 vs n=17/50 RR 0.74 [0.39, 1.37]	Kingdom.	

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Nikolaus 2003	Randomised controlled trial. Randomised by 'sealed envelopes containing group assignments using a random number sequence'. Intention to treat analysis.	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 (SR) 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;	a. Comprehensive geriatric assessment + at least two 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 post discharge management by GPs.	Length of follow-up one year. Falls recorded in falls diary and by monthly telephone calls. Losses: 81 of 360 (23%). Outcomes 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. Results Home safety intervention alone vs control, community dwelling,	Home intervention team consisted of three 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.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		living >15 km from clinic.		number of participants falling. 1.Falling history in year prior to randomisation, n=21/53 vs n=36/55 RR 0.61 [0.41, 0.89]. 2.Fallers and non-fallers in year prior to randomisation, n=51/181 vs n= 61/179 RR 0.83 [0.61, 1.31].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Nowalk 2001	Randomised controlled trial, stratified by age gender. Randomised by permuted blocks (block size = nine). Performed separately for each site. Intention to treat analysis not possible.	Setting: senior housing facilities (independent living to skilled nursing care), USA. N=112. Sample: residents of two long-term care facilities (87% female). Age: mean 84 years. Inclusion criteria: resident of facility; age 65 years or more; 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 willing to complete the baseline assessments.	a. 'Fit NB free' individualised progressive strength training and conditioning (treadmill, walking, bicycling, weight lifting) three 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 one x per month) and Tai Chi three 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	Length of follow-up variable depending on time of enrolment (mean (SD) 21.9 (4.6) months, range 13 -28 months. Losses: 32 of 112 (29%). Falls identified from incident reports. <u>Outcomes</u> 1. Number of participants falling. 2. Time to first fall. 3. Number who complied with programme. 4. Death during study. <u>Results</u> Reported no significant difference in number of falls between a control group and two exercise groups.		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

			residents while walking (one 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).	No summary statistic and insufficient data to calculate one.		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Pardessus 2002	Randomised controlled trial. Randomised using random numbers table. Intention to treat analysis.	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.	a. Comprehensive two-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.	Length of follow-up one year. Falls identified by monthly telephone calls. Losses: 9 of 60 (15%). <u>Outcomes</u> 1. Number of participants falling. 2. Mean number of falls per participant. <u>Results</u> Home safety intervention alone vs control, community dwelling, falling history in year prior to randomisation, number of participants falling n=13/30 vs n=15/30 RR 0.87 [0.50, 1.49].		B*
Pereira 1998	Randomised controlled trial 1982-85. Reporting 10-year follow-up. Intention to treat analysis not	Setting: community, Pittsburgh, USA N=229 randomised – 198 available for 10-year follow-up.	a. Eight week training period with organised group walking scheme x two weekly. Also encouraged to walk x once	Reporting 10-year follow-up. Falls in the previous 12 months ascertained by telephone interview. Losses:		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

	possible.	Sample: healthy volunteers. Age: mean 57 years at randomisation. Mean (SD) at follow-up 70 (4) years. Inclusion criteria: one year post-menopause; aged between 50 and 65 years. Exclusion criteria: on HRT; unable to walk.	weekly on their own. Building up to seven miles per week total. B. Control: no intervention.	31 of 229 (14%). Outcomes 1. Number of participants falling. 2. Number sustaining two 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. Results Exercise/physical therapy alone vs control, community dwelling untargeted, 1.Number of participants falling, n=26/96 vs n=33/100 RR 0.82 [0.53, 1.26]. 2.Number sustaining two or more falls, n=22/96 vs n=30/100 RR 0.76 [0.48, 1.23].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Pfeifer 2000	Double blind randomised controlled trial. Method of randomisation not described. Intention to treat analysis not possible.	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,	An eight 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.	Length of follow-up one year. Falls and fractures monitored retrospectively by questionnaire at one year. Losses: 11 of 148 (7%). Outcomes 1. Number of participants falling. 2. Number of sustaining fracture fall. Also measured, but not considered in this review were body sway		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		calcitonin, vitamin D or metabolites, oestrogen, tamoxifen in past six months; fluoride in last two 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.		parameters, and biochemical measures. Results Vitamin D vs control, community dwelling, targeted. 1.Number of participants falling, n=11/70 vs n=19/67 RR 0.55 [0.29, 1.08]. 2.Number sustaining fracture fall, n=3/70 vs n=6/67 RR 0.48 [0.12, 1.84].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Ray 1997	Randomised controlled trial of seven pairs of nursing homes matched by number of beds and randomised within pairs. Statistician generated sealed envelope, random assignments for each pair. Intention to treat analysis.	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):	a. Multidisciplinary patient safety assessment (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; in-service education for nurses. b. Control: usual care. Offered in-services on fall prevention after follow-up period.	Follow-up 365 days in home from time of assessment. Falls recorded from incident reports and medical records. Losses: 25 of 499 (5%). Outcomes 1. Number of recurrent fallers (two 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.		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		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-co-ordinator for two-four 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 six months; with possible safety domain problem. Exclusion criteria: bed bound.		Results The mean recurrent faller proportion in intervention facilities: 43.8% [2%, 36%] vs control 54% p=.03. The mean rate of injurious falls in intervention facilities (13.7 falls per 100 person years): 31.2% [24.6%, 86.4%] vs control facilities (19.9 per 100 person years) p=.22.		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Reinsch 1992	Randomised controlled trial. Randomisation by senior centre rather than by individual participant. Intention to treat analysis not possible.	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.	a. 'Stand up/ step up' exercise programme, with preliminary stretching exercise. One hour, x three days per week, for one year. b. Cognitive-behavioural intervention, consisting of relaxation training, reaction time training and health and safety curriculum. One hour, x one day per week, for one year. c. Exercise (two meetings per week) and cognitive intervention (x one meeting per week) for one year. d. Discussion control group. One hour, x one day per week, for one year.	Length of follow-up one year. Falling ascertained by recall, at weekly intervals. Losses: 46 of 230 (20%). Outcomes 1. Number of participants falling. 2. Number sustaining injury fall. 3. Number sustaining medical care fall. 4. Number sustaining fracture fall. 5. Number sustaining two or more falls. Results		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				Survival analysis used. The number of fallers during the first year of the intervention did not differ significantly among groups. Log rank $\chi 2$ (3, n=229) =2.21, p=.53].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Robertson 2001a	Randomised controlled trial. Allocation schedule developed using computer generated numbers. Assignment by independent person off site. Intention to treat analysis.	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	3. Home exercise programme, individually prescribed by district nurse in conjunction with her district nursing duties (see notes). Visit from nurse at one week (one hour) and at two, four and eight weeks and six months (half hour) plus monthly telephone call to maintain motivation. Progressively difficult strength and balance retraining exercises plus walking plan. Participants expected to exercise three x	Length of follow-up one year. Active fall registration with daily calendars returned monthly + telephone calls. Losses: 29 of 240 (12%). <u>Outcomes</u> 1. Number of participants falling. 2. Number sustaining two or more falls. 3. Number sustaining fracture fall. 4. Number sustaining	District nurse had no previous experience in exercise prescription. Received one week's training from research group's physiotherapist, who also made site visits and phone calls to monitor quality.	A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Robertson 2001a cont.		time of recruitment; not able to understand trial requirements.	weekly and walk two x weekly for one year. b. Control: usual care.	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. <u>Results</u> Exercise/physical therapy alone vs control, community dwelling (strength, balance, walking)-individually targeted. 1.Number of participants falling, n=38/121 vs n=51/119 RR 0.73 [0.52, 1.02]. 2.Number sustaining fracture fall, n=2/121 vs 7/119 RR 028 [0.06, 1.33]. 3.Number sustaining injury fall, 27/121 vs n=39/119 RR 0.68 [0.45, 1.04]. 4.Number sustaining two or more falls, n=22/121 vs n=24/119 RR 0.90 [0.54, 1.52]. 5. Mean number of falls n= 121 mean (SD) 0.67(1.29) vs n=119 Mean (SD) 0.92 (1.80) WMD –0.25 [-0.65, 0.15].		
Study	**Methods**	**Population/setting**	**Interventions**	**Results**	**Comments**	**Quality (allocation**

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

						concealment)
Rubenstein 1990	Randomised controlled trial. Randomised with computer generated, randomly sequenced cards in sealed envelopes. Analysis appears to be by intention to treat.	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.	a. Nurse practitioner assessment within seven days of a fall, followed by physician recommendations for action, and referral for intervention if appropriate. B. Control group: usual care.	Falls recorded in daily log. Length of follow-up two years. Losses: none described. <u>Outcomes</u> 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. <u>Results</u> Assessment followed by multifactorial intervention vs control, institutional care, targeting known fallers or fall risk factors only. 1.Number. of participants falling, n=64/79 vs n=68/81 RR 0.97 [0.84, 1.11]. 2.Number sustaining fracture fall, n=7/79 vs 5/81 RR 1.44 [0.48, 4.33]. 3.Number sustaining injury fall, n=9/79 vs n=7/81 RR 1.32 [0.52, 3.37].		A*

Study	**Methods**	**Population/setting**	**Interventions**	**Results**	**Comments**	**Quality (allocation concealment)**
Rubenstein 2000	Randomised controlled trial Randomised in blocks of 16-20 at three-six month intervals, using randomly generated sequence cards in sealed envelopes. Intention to treat analysis.	Setting: community, California, USA. N=59. Sample: men recruited from veterans administration ambulatory care centre (volunteers). Age: mean 74 years.	a. Exercise sessions (strength, endurance and balance training) in groups of 16-20, three x 90 minute sessions per week for 12 weeks. b. Control: usual activities.	Follow-up for three months from randomisation. No active fall registration. Fall ascertainment for intervention group at weekly classes. Controls phoned every two weeks. Losses: 4 of 59 (7%).		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

		Inclusion criteria: aged 70 years and older; ambulatory; with at least one fall risk factor: lower limb weakness, impaired gait, impaired balance, more than one fall in previous six months. Exclusion criteria: exercised regularly; severe cardiac or pulmonary disease; terminal illness; severe joint pain; dementia; medically unresponsive depression; progressive neurological disease.		Outcomes 1. Number of fallers. 2. Number of falls. 3. Number sustaining injury falls. 4. Fall rate per 1,000 person years. Results Exercise/physical therapy, community dwelling, untargeted, 1.Number of participants falling, n=12/31 vs 9/28 RR 1.20 [0.60, 2.42]. 2.Number sustaining injury fall, n=0/31 vs 0.28 RR not estimable.		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Ryan 1996	Randomised controlled trial. Method of randomisation not described. Assume intention to treat analysis.	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.	Interview and physical assessment by nurse prior to randomisation. a. One hour fall prevention education programme discussing personal (intrinsic) and environmental (extrinsic) risk modification in small groups of seven-eight women (nurse-led).	Follow-up monthly for three months Losses: none described. Outcomes 1. Number of fallers. 2. Number of falls. 3. Number of fall related injuries. 4. Number of fall prevention changes made.	Pilot research. Primarily to test methodology of a fall prevention education programme and resulting changes in fall prevention behaviour.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

			b. Same educational programme but individual sessions with nurse c. Controls received health promotion presentation (no fall prevention component) in small groups of seven-eight.	<u>Results</u> Home safety intervention plus fall prevention classes vs control, number of participants falling. 1.Group instruction vs control, n=1/16 vs n=3/15 RR 0.31 [0.04, 2.68]. 2. One on one instruction vs control, n=2/14 vs 3/15 RR 0.71 [0.14, 3.66].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Sato 1999	Double-blind randomised study. Randomisation by computer generated random numbers. Intention to treat not possible.	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 three months or longer during the previous 18 months, or at any time in the previous two months.	a. One alpha (OH) Vitamin D3 1.0 mcg daily for 18 months. b. Control: identical placebo.	Length of follow-up 18 months. Number of falls per subject 'recorded' during 18 months. Losses: none described. <u>Outcomes</u> 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. <u>Results</u> Vitamin D vs control Community dwelling targeted. 1.Mean number of falls, n=40, mean (SD), 1.40 (1.80) vs n=40 mean (SD) 1.30 (1.90)		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				WMD 0.10 [-0.71, 0.91]. 2.Number sustaining a fracture fall, n=1/40 vs n=8/40, RR 0.13 [0.02, 0.95].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Schnelle 2003	Randomised controlled trial. Randomised within nursing homes by 'computerized programs'. Intention to treat not possible.	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 post-acute skilled care or terminal illness.	a. FIT intervention (low intensity, functionally oriented exercise and incontinence care) provided every two hours from 8.00 am and 4.00 pm for five days a week, for eight months (see notes for further details). Controls: usual care.	Length of follow-up eight months. Falls identified from patient records weekly. Losses: 18 of 190 (9%). <u>Outcomes</u> 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 1,000 resident weeks. 10. Number of fall related skin injuries per 1,000 resident weeks. 11. Number of fall related fractures per 1,000 resident	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 eight 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	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Schnelle 2003 cont.				weeks. 12. Number of other fall related injuries per 1,000 resident weeks. 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. <u>Results</u> Exercise plus incontinence management vs control. 1.Number of participants falling, n=17/92 vs n=29/98 RR 0.62 [0.37, 1.06]. 2.Number sustaining fracture fall, n=4/92 vs 1/98 RR 4.26 [0.49, 37.42] 3.Number sustaining injury fall, n=8/92 vs n=11/98 RR 0.77 [0.33, 1.84].	goals for exercise adjusted weekly.	

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Shaw 2003	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). Intention to treat analysis.	Setting: two inner city A&E departments, Newcastle upon Tyne, UK. N=274. Sample: older people with cognitive impairment or dementia attending A&E after a fall (community dwelling or in institutions). Age: mean 84, range 71-97 years. Inclusion criteria: age 65 years or above; cognitive impairment and dementia (MMSE <24; consent from three people (patient, immediate carer, and next of kin). 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 four 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 two x per week.	a. Multifactorial, multidisciplinary clinical assessment (medical, physiotherapy, occupational therapy, cardiovascular) and intervention for all identified risk factors for falls. b. Control: clinical assessment but no intervention.	Length of follow-up one year. Falls identified by weekly diary mailed as a postcard, and telephone contact if no card for two weeks. Losses: 92 of 308 (30%). <u>Outcomes</u> 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. <u>Results</u> Assessment followed by multifactorial intervention vs control, cognitively impaired, any residence, number of participants falling, n=96/130 vs n=115/144 RR 0.92 [0.81, 1.05].		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Steinberg 2000	Randomised controlled trial. Cluster randomisation. Four groups with approximately equal numbers formed from two or three national seniors branches. Groups randomly allocated to one of four interventions. Method of randomisation not described. Intention to treat analysis.	Setting: community, Australia. N=252. Sample: volunteers from branches of National Seniors Association clubs. Age: mean age 69 years (range 51 - 87). Inclusion criteria: National Seniors Club member; aged 50 years or over, with capacity to understand and comply with the project. Exclusion criteria: none stated.	Cumulative intervention a. Intervention d. plus exercise classes designed to improve strength and balance, one 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.	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. Losses: 9 of 252 (4%). <u>Outcomes</u> 1.Time to first fall. 2. Fallers per 100 person months. 3. Falls per 100 person months. <u>Results</u> Cox's proportional hazards regression model used, adjusted hazard ratios comparing intervention with control ranged: For slips HR 0.35 [0.17, 0.73] to 0.48 [0.25, 0.91] For trips HR 0.29 [0.16, 0.51] to o.45 [0.27, 0.74] For falls 0.60 [0.36, 1.01] to 0.82 [0.51, 1.31.]	Younger, healthier and more active sample than elderly population as a whole.	C*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Stevens 2001	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. Co-inhabitants assigned to same group as index recruit. Intention to treat analysis.	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 above; 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 two other older people.	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.	Follow-up one year. Falls recorded on daily calendar. No raw data. Results presented as adjusted and unadjusted odds ratios and incident rate ratios. Losses: 264 of 1879 (14%). <u>Outcomes</u> 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). 5. Proportion of fallers (falls on environmental hazards). 6. Proportion of fallers (falls inside home). 7. Fall related injuries. 8. Fall related injuries. requiring medical care (rate ratios). <u>Results</u> Participants falling: 1.Involving environmental hazards in the home Adjusted rate ratio 1.11 [0.82, 1.50]. 2. Fell because of hazards in the home Adjusted OR 0.97 [0.74, 1.28]. 3. Rate of all falls Adjusted rate ratio 1.02 [0.83, 1.27].	Hazard list designed with OT input to include factors identified from literature and existing checklists. 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 two weeks of visit.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

				4. Rate of falls inside the home Adjusted rate ratio 1.17 [0.85, 1.60]. 5. Rate of injurious falls Adjusted rate ratio 0.92 [0.73, 1.14].		

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Tinetti 1994	Randomised controlled trial. Randomisation of 16 treating physicians, matched in four groups of four, into two control and two intervention in each group; enrolled subjects assigned to same group as their physician. Analysis by intention to treat not possible due to missing data. Outcome assessors blinded to assignment.	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 >four 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.	a. Interventions targeted to individual risk factors, according to decision rules and priority lists. Three month programme duration. b. Control visits by social work students over same period.	Measured at one year. Falls ascertained by monthly postal survey, followed by personal or telephone contact. Losses: 10 of 301 (3%). <u>Outcomes</u> 1. Number falling. 2. Number sustaining medical care fall. 3. Number sustaining serious injury fall. 4. Death during study. <u>Results</u> Participants falling n=304 in the intervention group Adjusted Incidence ratio 0.69 [0.52, 0.90]. Units of randomisation and analysis appear to be different, this may have resulted in a narrower confidence.	Yale (New Haven) FICSIT trial [Province 1995] Risk factors screened for included: postural hypotension; sedative/hypnotic drugs e.g. benzodiazepine; four or more medications; impaired transfer skills; environmental hazards for falls; impaired gait; leg/arm muscle strength; range of movement.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
van Haastregt 2000	Randomised controlled trial. Randomisation by computer generated random numbers. Inadequate data for intention to treat analysis.	Setting: community, Hoensbroek, Netherlands. N=316. Sample: community dwelling men and women registered with six general medical practices. Age: mean (SD) 77.2 (5.1) years. Inclusion criteria: aged 70 years and above; living in the community; two or more falls in previous six months or score three 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.	a. Five home visits from community nurse over one year. Screened for medical, environmental and behavioural risk factors for falls and mobility impairment; advice, referrals and 'other actions'. b. Control: usual care.	Follow-up 12 months and 18 months. Falls recorded in weekly diary. Losses 81 of 316 (26%). <u>Outcomes</u> 1. Number falling. 2. Number sustaining medical care fall. 3. Number sustaining injury fall. 4. Number sustaining two or more falls. 5. Number complying with recommendations. 6. Death during study. <u>Results</u> Assessment followed by multifactorial intervention vs control, community dwelling, targeting known fallers or fall risk factors only. 1.Number of participants falling, n=63/129 vs 53/123 RR 1.13 [0.87, 1.48]. 2.Numbersustaining medical care fall, n=15/129 vs 11/123 RR 1.30 [0.62, 2.72]. 3.Number sustaining injury fall,n=26/129 vs 21/123 RR 1.18 [0.70, 1.98]. 4.Number sustaining two or more falls, n=34/129 vs 29/123 RR 1.12 [0.73, 1.72].		B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
van Rossum 1993	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. Intention to treat analysis.	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.	a. Preventive home visits by public health nurse x four per year for three years. Extra visits/ telephone contact as required. Checklist of health topics to discuss. Gave advice and referrals to other services. b. Control: received no home visits.	Follow-up at 1½ years and three years by postal survey and interview. Falls in previous six months recorded. Losses 102 of 580 (18%). <u>Outcomes</u> 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. <u>Results</u> Found no difference in the incidence of falls between the control and intervention groups. No data provided.		A*
Vassallo 2001	Cluster randomised controlled trial. Method of randomisation not described. Inadequate data for intention to treat analysis.	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.	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: two wards, usual care.	Length of follow-up not stated. Losses: none described. <u>Outcomes</u> 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.	Abstract only	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Vellas 1991	Randomised controlled trial. Randomised seven days after a fall. Inadequate data for intention to treat analysis.	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 seven days previously. Exclusion criteria: hospitalised for more than seven days after the fall; demented; sustaining major trauma e.g. hip fracture or other fracture; unable to mobilise or be evaluated within seven days of the fall.	a. Iskédyl® (combination of raubasine and dihydroergocristine) two droppers morning and evening for 180 days. b. Placebo for 180 days	Follow-up 180 days. Losses 6 out of 95 (6%). <u>Outcome</u> 1. Number of fallers. <u>Results</u> Pharmacological therapies vs control, number of participants falling, n=14/45 vs n=28/43 RR 0.48 [0.29, 0.78].		B*
Vetter 1992	Randomised controlled trial. Randomisation by household. Inadequate data for intention to treat analysis.	Setting: community, Wales, UK. N=674. Sample: men and women aged abouve 70 years on the list of a general practice in a market town. No exclusion criteria listed.	a. Health visitor visits, minimum yearly, for four years, with advice on nutrition, environmental modification, concomitant medical conditions, and availability of physiotherapy classes if desired. b. Control: usual care.	Length of follow-up four years. Falling status ascertained by interview at end of study period. Losses: 224 of 674 (33%). <u>Outcomes</u> 1. Number of participants sustaining a fall. 2. Number of participants sustaining fracture fall. 3. Deaths during study. <u>Results</u> Participants falling, intervention vs control 95/240 (40%) vs 65/210 (31%) 9% difference; -5% to 21%. Incidence of fractures was 5% (16/350 vs 4% (14/324)- difference not significant.		A*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Wagner 1994	Randomised controlled but method of randomisation not described. Inadequate data for intention to treat analysis.	Setting: community, Seattle, USA. N=1,559. Sample: 'healthy elderly' men and women, HMO enrollees. Age: mean 72 years. Inclusion criteria: aged 65 years or more; HMO members; ambulatory and independent. Exclusion criteria: too ill to participate as defined by primary care physician.	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.	Measured at one and two years. Losses: 89 of 1559 (6%). <u>Outcomes</u> 1. Number of participants falling. 2. Number sustaining medical care fall. 3. Number sustaining injury fall. 4. Death during the study. <u>Results</u> Assessment followed by multifactorial intervention vs control, community dwelling, geriatric screening (fallers and non fallers). 1.Number of participants falling, n=175/635 vs n=223/607 RR 0.75 [0.64, 0.88]. 2.Number sustaining medical care fall, n=42/635 vs n=57/607 RR 0.70 [0.48, 1.03]. 3.Number sustaining injury fall, n=63/635 vs n=88/607 RR 0.68 [0.51, 0.93].	Risk factors identified: inadequate exercise, high risk alcohol use, environmental hazards if increased fall risk, high risk prescription drug use, impaired vision, impaired hearing.	B*

Appendix E: Evidence table 6: Interventions for the prevention of falls (reproduced from Gillespie et al, 2003)

Study	Methods	Population/setting	Interventions	Results	Comments	Quality (allocation concealment)
Wolf 1996	Randomised controlled trial. Randomised using computer generated procedure. Inadequate data for intention to treat analysis.	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: above 70 years old; ambulatory; living in unsupervised environment; agreeing to participate on a weekly basis for 15 weeks with four month follow-up. Exclusion criteria: debilitating conditions e.g. cognitive impairment, metastatic cancer, crippling arthritis, Parkinson's disease, major stroke, profound visual defects.	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, one hour once weekly for 15 weeks.	Length of follow-up seven - 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. Losses: 40 of 200 (20%). <u>Outcomes</u> 1. Number of falls. 2. Time to one or more falls. 3. Time to one or more injurious falls. <u>Results</u> 15 week Tai Chi intervention vs control, participants falling RR 0.51 [0.36, 0.73]. When using a narrower definition of falling excluding stumbling RR 0.67 [0.41, 1.09].	Atlanta FICSIT trial [Province 1995]. Published data is not in a useable form. 1997 paper included under this study reports on a sub-group of the trial, reporting on outcomes other than falls.	B*

*Quality gradings for concealment of allocation from Cochrane review for interventions for preventing falls in elderly people (Gillespe, et al 2003)
A= Assigned treatment adequately concealed prior to allocation
B= Information inadequate to judge concealment
C= Assigned treatment clearly not concealed prior to treatment

Appendix E: Evidence table 5: fear as a risk factor

Study	Population/setting	Method	Results	Quality & comments
Cumming 2000 Australia	Community dwelling aged 65 and over.N=418 (79%) able to participate for falls efficacy scale. Other data excluded (see excluded studies). N=169 fell during follow-up.	Risk factors – socio-demographic, falls efficacy scale (o=low 100=high), falls history ADL from self-report during interview-administered questionnaire. Outcome measurement - daily falls calendar posted monthly to researchers for a period of one year.	*Adjusted hazard ratio (95%CI)* Falls efficacy scale ≤ 75 (n= 88) =2.09 (1.31-3.33).	Medium Statistical methods - subjects divided into sub categories based on scores and previous reported categorisation.
Tromp 2001 Netherlands	Community dwelling aged 65 and over. N=1374 (94% agreed to participate) N=1285 (93%) completed all four data points. Single falls n= 281 (22%) Recurrent fallers n=146 (11%).	Risk factors - baseline interview with questionnaire component including socio-demographic, physical function, ADL, functional performance, falls history and fear of falling. Outcome measurement - participants completed a falls diary weekly that was posted to researchers every three months for a period of one year.	*Odds ratio (95%CI)* Fear of falling/fall at follow up= Single fall=2.6(2.0-3.3) Recurrent falls=3.1(2.2-4.4)	High Statistical methods - bivariate analysis Fear ns in multivariate analysis.
Friedman 2002 USA	Community dwelling aged 65 to 86 years. N=2520 at baseline, 88.9% at follow-up with n=2212 that had completed follow-up information. Follow-up period 20 months. N=615 with a history of falling at baseline. N=459 expressed fear of falling at baseline, n=212 had reduced activities because of fear. No details of number of falls at follow-up.	Risk factors - baseline data measurement by a home administered questionnaire and clinical examination, including demographic, vision assessment, comorbidities, neuropsychiatric status, medications, physical performance based testing and fear of falling. Fear of falling included falls history. Fear was assessed asking if participants are afraid of falling and if they limit their activities because of the fear of falling. Outcome measurement - fear of falling status and falls incidence.	Results *OR (95%CI)* Shared risk factors between fall predictors and fear of falling predictors: Female/ falls=1.53(1.24-1.89) Female/fear= 2.0 (1.56-2.57) Stroke/falls=1.61-1.15-2.25) Stroke/ fear= 1.54(1.06-2.24). Fear of falling at baseline/ fall at follow-up: 1.78(1.41-2.24) Fear at baseline/ fear at follow-up: 5.40(4.23-6.91) Falls at baseline/ fear at follow-up: 1.58(1.24-2.01).	High Statistical methods: stepwise logistical regression. Outcomes of falls and fear of falls modelled separately. Adjusted for other variables in the model. Further analysis of those expressing fear at baseline and had reduced their activities OR=2.10(p=<0.0001).

Appendix E: Evidence table 5: fear as a risk factor

Study	Population/setting	Method	Results	Quality & comments
Arfken 1994 USA	N=890 community dwelling participants stratified in age groups ranging from 66 to 81+years. <u>Falls</u> At least one fall No fear n=26 Moderately fearful n=36 Very fearful n=48 p=<0.0001. Recurrent falls No fear n=8 Moderately fearful n=13 Very fearful n=22 p=<0.0001.	Falls surveillance following recruitment with participants reporting falls to a hotline, plus monthly postcards reporting the incidence of falls. At one year follow-up the participants received a structured in-home assessment including demographics, health status, activity level, satisfaction with life, depressed mood and a brief physical assessment. Fear was determined with a 3-point verbal rating scale and dichotomised to summarise outcome as odds ratios. A=moderately fearful and not fearful; B= very fearful.	*OR (95%CI)* One fall: A= 1.52 (1.06-2.17) B= 2.49(1.48-4.20) Recurrent falls: A=1.71(1.01-2.89) B=3.12(1.61-6.06).	High Statistical methods - logistic regression adjusted for age, gender.

Appendix E: Evidence table 4 minimum data set - home care, minimum data set - residential assessment instrument

Study	Aim/objective of study	Population/ setting	Methods	Results	Quality & comments
Fries 1997 US	To evaluate the effect of the implementation of the National RAI System on selected conditions representing outcomes for nursing home residents.	Before: Implementation N=2188 from 268 homes. After: Implementation 2088 from 254 of the same nursing homes. Mean age=79.6.	Simple pre & post at six month interval. Measures at baseline: dehydration, falls, decubitus, vision, stasis ulcer, pain, dental status, malnutrition at baseline then again at follow-up. Outcomes: decline or improvement. Prevalence falls, observation and recording on records.	Decline Improvement OR (adj.) Falls 0.79 NS 1.20NS (N=3005) (N=382) N=no. of falls Prevalence falls 30 days prior to admission. Falls before N=6,597 and after N=6,178 non-significant P.0.97. Though the prevalence in falls suggests a decrease post RAI, the adjusted OR for pre vs post is not statistically significant. OR was adjusted for additional variables – age, gender, length of stay or facility characteristics and did not demonstrate any consistent effect.	Medium The sample pre and post were different individuals.

Appendix E: Evidence table 4 minimum data set - home care, minimum data set - residential assessment instrument

Study	Aim/objective of study	Population/ setting	Methods	Results	Quality & comments
Morris 1997 Australia, Canada, the Czech Republic, Japan, US	To describe the results of an international trial of the home care version of the MDS instrument.	A sample of N=781 randomly selected volunteered clients of home care agencies in five countries. (But does not constitute a random sample of all older people served in those countries). Mean age=79.6 Female=59.5% Married=37.9% Did not go out of house one week prior to assessment =26% Live alone=32.1%.	Cross national field trial (A multi-centre study, centres volunteered). To examine the frequency with which CAPs were triggered in the 780 sample in the presence or absence of cognitive impairment, which is measured by the cognitive performance scale(CPS) identifying those that are cognitively intact, have mild to moderate impairment or are severely impaired. CPS measured on the Folstein mini mental examination. CAP triggers-from MDS items.	N=780. Total potential CAPS=30 Mean caps triggered for 780 participants = 11.8 (5.5% triggered <5 or 2.1% triggered>20) Most prevalent triggered: Preventative health measures 87% IADL rehabilitation 83% Falls 79% Social function 77% Health promotion 74% % triggered on CAPs within categories of CPS (falls reported only) CPS Scale Total Intact Mild Severe Sig N=780 N=451 N=190 N=117 Across CAPS 78.8 % 82.5% 78.4% 65 % .001 The prevalence of the falls CAP being triggered is 78.8% for all subjects and is higher for those cognitively intact (82.5%) than those with severe cognitive impairment (65%).	Medium These results are descriptive and the sample is not internationally representative. The suggestion is made that the results indicate a consistency across countries. CAP areas where the cognitively intact clients are more likely to trigger include IADL rehabilitation, social function, cardio-respiratory, falls and pain.

Appendix E: Evidence table 4 minimum data set - home care, minimum data set - residential assessment instrument

Study	Aim/objective of study	Population/ setting	Methods	Results	Quality & comments
Ritchie 2002 US	To institute a co-ordinated care approach to address needs in a systematic fashion for at risk rural elders to receive assessments that leads to effective treatment/referral/care plans.	Pop: screening of 2600 rural elder (>75) community dwelling residents to locate at risk group Setting: 2 southern counties N=238 (84.3% participant rate) (ave. over both counties) Mean age=78.75 Male=99.6% African Am.=21.8% Education ≤ 8th grade=41.7% Income <$900/month =20.8% Married=83.65%.	Longitudinal study with Intervention of a co-ordinated advocacy for rural elders program utilising MDS-HC (10a) for initial and subsequent assessments. Baseline measurements - multiple instruments used to obtain demographic, ADL, cognitive etc. measurements. Falls was not specifically measured. Outcomes - first assessment: prevalence of triggered CAPS-MDS-HC measure. Subsequent assessments: typical initial CARE activities in response to triggers. Measured on visits and interviews on telephone and reassessment.	First assessment Prevalence of initial triggered CAPS Falls reported only County 1 County 2 Georgia S. Carolina N=108* N=118* 63%(68) 76.3 (90) Subsequent assessment Typical Initial CARE activities in response to triggers Falls reported only Initial visit No. with prob. N=159** Selected care Pts, receiving Activity Service Fall prevention ed. 38.4% Prosthetics 5.0% Exercise/rehab referral 3.8% Adult protective serv. 1.3% Although the CAP for falls had been triggered in well over half the original sample, the response of initiating services was given to approximately 50% of those identified as at risk of falling.	Medium *Discrepancy in numbers not explained. **Does not match expected of 158. The sample was community dwelling elders who were mainly white married males, which are not typical of this review's target population and therefore extrapolation is difficult.

Appendix E: Evidence table 3 Profile of Tools

Turn 180
Developers: Simpson et al 2002.
Setting: For use in hospitals and the community.
Populations: Older people, particularly those around 75 years with complex problems.
Objective: To assess dynamic postural stability.
Procedure: Older people are prepared with comfortable and suitable clothing and footwear. Stable handholds are made available. A suitable chair that requires minimal effort to stand up by the older person is provided. For comparability, all future tests need to be conducted in similar conditions – for example, time of day, same observer and setting. Instructions for the older person may need to be repeated to ensure they have understood. Instructions could be written on a card so that they may be read. The older person needs to stand up and, on request, turn to face the opposite direction, without holding onto chairs, if possible. They must try not to use objects to support their body weight, as this would invalidate the test. They can choose the direction in which they turn. An observer behind the older person counts the steps taken.
Length of time to carry out test: The test is not timed and the subject may take as long as they require.
Special equipment needed: None.
Training required: Not specified, however the practice of standardising this test is attempting to eliminate errors of judgement on the part of the assessors.
Burden/acceptability to patients: Devised for the frail older person, the development of the standardised procedure evaluated fear where the majority (87.3%) did not experience fear of falling during the test.
Measure type. Describe: Observation and counting of steps taken to turn 180°.
Cut off points for level of risk. How were these derived? More than fours steps are associated with an increased fall risk (Nevitt *et al*, 1989).
Further testing of tool: Nevitt et al (1989) – the aim of this study was to ascertain risk factors for recurrent falls. This study included a test for the number of steps taken to turn 180°. No procedure is given for the test. This was a single sample prospective cohort of N=325 community dwelling older people above 60 years, with a history of one previous fall in the last 12 months. Syncopal falls were excluded. Outcome measurement was taken of the number of steps to complete a 180° turn. The mean number of steps taken was 4±2. The unadjusted RR 1.9 (1.2-3.2) for greater than five steps to make the turn was associated with an increased risk of multiple falls - two or more. Simpson et al (2002) – the aim of this study was to describe the development of a standardised procedure for the 180° turn. Patients admitted to acute geriatric wards were screened for eligibility as soon as their discharge date was set. N=142 patients with a mean age of 81years completed the tests (two tests turning clockwise or anti-clockwise). Turn 180 step counts correlated positively with number of falls recalled in the last 6 months. (rho = 0.35, P=0.001).
Conclusions: Retest reliability and between operator reliability of the turn 180 version are being examined. No other evaluations of the 180° have been identified.

Berg balance scale
Developers: Berg Katherine O et al 1989.
Setting: All settings. Previous testing includes elderly care home, acute care settings and laboratory.
Populations: Ambulatory elderly.
Objective: To identify those at risk □ To identify those at highest risk □ Both.

Appendix E: Evidence table 3 Profile of Tools

To rate the ability of an individual to maintain balance while performing ADL related tasks. Components include balance, lower and upper extremity strength.

Procedure:
Assessment by professional and (0-4) grading ability to perform 14 common everyday movements:

- Ability to maintain positions of decreasing stability
- To change positions
- Perform tasks in unstable positions
- Perform movements with increasing speed.

Components include balance, lower and upper extremity strength.
Aspects of balance measured:
Sit to stand
Stand to sit
Stand and sit unsupported
Transfer bed to chair
Stand eyes closed
Stand feet together
Standing one foot in front of other
Reach forward
Pick up object from floor
Single leg stance
Look over shoulders
Turn 360º
Alternate foot on stool.

Length of time to carry out test: 15 minutes.

Special equipment needed:
Stopwatch
Chair
Bed
Ruler
Stool.

Training required: Yes

Burden/acceptability to patients: Not reported.

Measurement type. Describe:
Scale 0- 56 points, divided into sub-scales. Ordinal level of measurement.

Cut off points for level of risk. How were these derived?
Clinical experience and judgement. 45 is stated as a cut off point.

Further testing of tool:
1. Berg (1992) Extended setting n=113 participants
Inter rater reliability
Caregiver and participants gave a global rating scale score of their balance ability (good, fair, poor). Four data points: initial assessment, 3, 6 and 9 months.
Results (Pearson product moment correlation coefficient)
Caregiver ratings and BBS: r= 0.47 to 0.61
Self-rating and BBS: r=0.39 to 0.41
Concurrent validity
Researchers assessed participants with Berg balance scale (BBS) and functional independence with the Barthel index (Mahoney et al 1965).
BBS cut-off point of 45 or greater determined those who are safe in independent ambulation based on clinical experience.
Results (Pearson product moment correlation coefficient)
BBS and Barthel index: r=0.87 to 0.93
Predictive validity
At one year follow-up participants were classified according to fall status.
Results (Relative risk 95%CI)
Score of less than 45: RR 2.7 (1.5-4.9)

Reviews (narrative):

Appendix E: Evidence table 3 Profile of Tools

1. Whitney SL et al (1998) A review of balance instruments for older adults, *American Journal of Occupational Therapy,* 52;8:666-671.

Reliability
Interrater ICC= 0.98
Interrater rs= 0.88
Internal consistency/ Cronbach's alpha= 0.96
Validity
Concurrent
Barthel Index: r=0.67
Timed up and Go: r=0.76
Tinetti: r=0.91
Predictive
<45 predicted falls
All settings
Quality of review
Specific questions guided the review:

- Aspects of balance
- Administration time
- Tools needed
- Reliability
- Validity
- Population.

2. Thorbahn LD (1998) Value and limitations of the Berg balance test to predict risk of falls in nursing home residents, *Annals of Long Term Care,* 6;2:49-53.

As above
Predictive validity: Cut off point of 45 described for one study, other not stated. Both studies participants were community dwelling and sample size less than 70.
Sensitivity: range= 53% to 91%
Specificity: range= 82% to 96%
Suggests that further research is needed on individuals who score between 31 and 45.
Quality of review
Mainly descriptive and discussion.

3. Zwick D et al (2000) Evaluation and treatment of balance in the elderly: A review of the efficacy of the Berg balance test and Tai Chi Quan, *Neuro Rehabilitation,*15: 49-56.

Refers to the following study not included in the above:

- Harada et al (1995)

N= 53 extended care participants.
Cut off point of 48
Sensitivity=84%
Specificity=78%

4. Perell KL (2001) Fall risk assessment measures: an analytic review, *Journal of Gerontology,* 56A;12:M761-M766.

Refers to Berg (1989)
Outpatient and CVA patients.
Cut off point of 49
Sensitivity = 77%
Specificity = 86%

Appendix E: Evidence table 3 Profile of Tools

Comments on reviews: Generally these were narrative reviews with a clear emphasis on specific tests and scales. Limited information is given regarding the quality of studies, demographic information, which provided the data source for the review.
Other comments: Other studies exist that have tested this scale with inpatients and stroke patients, assessing general aspects of balance not related to falls, but perhaps stroke disability severity. Most of the reliability and validity studies are with small sampled populations and have therefore been excluded.
Conclusions: Detailed assessment of balance. Has been extensively tested with different populations but does take 15 minutes to administer.

Dynamic gait index
Developers: Shumway-Cook(1997).
Setting: All settings.
Populations: Ambulatory elderly.
Objective: To identify those at risk. To rate the ability of an individual to modify gait in response to changing task demands.
Procedure: Assessment by professional on a 4 point scale (0-3) grading ability to perform the following: • Walk on level surface • Change gait speed • Perform head turns while walking • Stepping over and around objects • Pivoting during walking • Stair climbing.
Length of time to carry out test: 15 minutes.
Special equipment needed: Stairs.
Training required: Yes.
Burden/acceptability to patients: Not reported.
Measurement type: Ordinal. 0-3 point rating scale of observers judgement (0= severe impairment, 3=normal) Total score 24.
Cut off points for level of risk: Initial development by the authors using a small sample (n=44) of community dwelling participants. Using a cut off value of <19 the DGI identified 64% of the non fallers from previous history of falls. No further data extracted due to sample size.
Further testing of tool: 1. Whitney et al (2000) USA N= 247 outpatients referred for treatment of vestibular dysfunction. Falls history obtained from participants. DGI scores of 19 or lower/ falls =OR 2.58 (1.47-4.53).
Reviews (narrative): 1. Perell KL (2001) Fall risk assessment measures: an analytic review, *Journal of Gerontology,* 56A;12:M761-M766. Refers to Whitney et al (2000) as above.
Other comments: Other studies were referred to but have been excluded based on either not enough information or small sample size.
Conclusions: Assesses all aspects of gait but longer to administer.

Appendix E: Evidence table 3 Profile of Tools

Functional reach test
Developers: Duncan P et al (1990).
Setting: All settings.
Populations: Ambulatory elderly.
Objective: To assess balance that may contribute to risk of falling.
Procedure: • Measurement in inches/cm of the distance between arm's length and maximal forward reach using a fixed base of support.
Length of time to carry out test: One to two minutes.
Special equipment needed: Force platform/ electronic system for measuring functional reach or 'yardstick'.
Training required: Yes.
Burden/acceptability to patients: Not reported.
Measurement type: Inches/cm.
Cut off points for level of risk: Developmental study by the authors indicate that a reach of less than or equal to six inches (15cms) predicted a fall. Inter rater reliability on reach measurement reported as 0.98.
Further testing of tool 1. Eagle et al (1999) Inpatients therefore excluded. 2. Dite et al (2002) Australia N=81 community dwelling participants Concurrent validity FR/TUGT: rs = -0.47 FR/Step test: rs=0.50 FR/FSST: rs = -0.47 3. Behrman et al (2002) USA Case control study, in patients therefore excluded.
Conclusions: Only assesses ability to reach forward and no other balance or performance.

Performance-oriented assessment of mobility problems
Developers: Tinetti ME et al 1986.
Setting: Aimed at all settings.
Populations: Ambulatory elderly.
**Objective: To identify those at risk To identify those at highest risk ** Both. To rate the ability of an individual to maintain balance while performing ADL related tasks. Components include balance, lower and upper extremity strength.
Procedure: Assessment by professional. Short form = (0-2) grading ability to perform nine common everyday movements: 0 = most impairment, 2 =independence. Long form as above. **Aspects of balance measured** 13 balance items, nine gait items including: Standing and sitting balance Stand to sit, sit to stand Turn 360º Nudge on sternum Turn head

Appendix E: Evidence table 3 Profile of Tools

Lean back Unilateral stance Reach object from high shelf Pick up object from the floor.
Length of time to carry out test: 10 minutes.
Special equipment needed: Stopwatch Chair 5lb object 15ft walkway.
Training required: Yes.
Burden/acceptability to patients: Not reported.
Measurement type: Short form scale 0 - 28. Long form scale 0 - 40 Ordinal level of measurement.
Cut off points for level of risk. How were these derived? Clinical experience and judgement. >18 (short form) is stated as a cut off point that predicts falls (Tinetti 1986).
Further testing of tool: 1. Raiche et al (2000) N=225 community dwelling participants (Canada) Cut off score = 36 or less: Sensitivity = 70% Specificity = 52%.
Reviews (narrative): 1. Whitney SL et al (1998) A review of balance instruments for older adults, *American Journal of Occupational Therapy,* 52;8:666-671. **Reliability** Interrater 85% ±10% **Validity** Concurrent Berg balance scale: r=0.91 Predictive (short form) >18 predicted falls All settings. 2. Perell KL (2001) Fall risk assessment measures: an analytic review, *Journal of Gerontology,* 56A;12:M761-M766. Refers to Tinetti (1986) In and out patients. Cut off point of 10 (short form) Sensitivity = 80% Specificity = 74%.
Comments on reviews: Generally these were narrative reviews with a clear emphasis on specific tests and scales. Limited information is given regarding the quality of studies, demographic information, which provided the data source for the review.
Conclusions: Most aspects of balance and performance assessed. Longer to administer and burden to patients.

Appendix E: Evidence table 3 Profile of Tools

Timed 'up and go' test
Developers:
Setting: All settings.
Populations: Ambulatory elderly.
Objective: To identify those with balance deficits.
Procedure: Client stands from a chair with an armrest, walks 3m and turns around, returns to chair and sits down.
Length of time to carry out test: One to three minutes reported.
Special equipment needed: Stop watch Chair 3m walkway.
Training required: Yes.
Burden/acceptability to patients: Not reported.
Measurement type: • Measurement of time to complete the test. • Ordinal. 5 point rating scale of observer's perception of patient's risk of falling (1 = normal, not at risk of falling; 5= severely abnormal).
Cut off points for level of risk: 10-14 seconds.
Further testing of tool: 1. Podsiadlo & Richardson (1991) N=60 Community dwelling participants attending day hospital (Canada) Interrater/ intrarater reliability = ICC 0.99 Concurrent validity TUGT/ Berg balance test: r= -0.81 TUGT/ Gait speed: r= -0.61 TUGT/ Barthel: r= -0.78. 2. Dite eta al (2002) N=81 community dwelling participants Concurrent validity TUGT/ FSST: rs= 0.88 TUGT/ Step test: rs = -0.79 TUGT/ FR: rs = -0.47. 3. Rose et al (2002) N= 134 community dwelling participants (USA) Cut off time =10 seconds: Sensitivity = 71% Specificity = 89%.
Reviews (narrative): 1. Whitney SL et al (1998) A review of balance Instruments for older adults, *American Journal of Occupational Therapy,* 52;8:666-671. Refers to: • Podsiadlo & Richardson 1991 as above. • Okumiya et al (1998) Japan Community dwelling Cut off time = 16 seconds: Sensitivity = 54% Specificity = 74% PPV 44%.

Appendix E: Evidence table 3 Profile of Tools

2. Perell KL (2001) Fall risk assessment measures: an analytic review, *Journal of Gerontology,* 56A;12:M761-M766. Refers to Shumway-Cook (2000). Outpatient setting N=30 Inter-rater reliability 0.98 Cut off time = 14 seconds Sensitivity and specificity 87%.
Comments on reviews: Generally these were narrative reviews with a clear emphasis on specific tests and scales. Limited information is given regarding the quality of studies, and demographic information, which provided the data source for the review.
Conclusions: This assessment appears to have clinical utility demonstrated by time to administer and little burden to patients. Specified cut-off points vary between studies.

Multi factorial assessment instruments for community dwelling settings
1. Caledonia home health care fall risk assessment tool, Laferriere RH (1998) USA
Nine itemed tool with intrinsic and extrinsic factors. Assessment and intervention strategy.
Laferriere RH (1998) Rural research: piloting a tool to identify home care clients risk of falling, *Home Care Provider, 3 (3), 162-169.*

2. Elderly fall screening test (EFST), Cwikel JG et al (1998)
Five item test including: fall in last year, injurious fall in last year, frequent falls, slow walking speed, unsteady gait. 17 minutes to administer, sensitivity 93%, specificity 78%.
Cwikel J, Fried AV, Galinsky D, Ring H Gait and activity in the elderly: implications for community falls-prevention and treatment programmes, *Disability Rehabilitation*,1995;17:277-80.

3. Home assessment profile, Chandler JM, Prescott B, Duncan PW (1991) USA
Identifies frequency of hazards present and scores patient difficulty. Total score with cut off for risk.
Chandler JM, Prescott B, Duncan PW (2001) Special feature: the home assessment profile - a reliable and valid assessment tool, *Top Geriatric Rehabilitation* 16(3) 77-88.

4. HOME FAST: home falls and accidents screening tool, Mackenzie L, Byles J, Higginbotham N (2000) Australia
Contains information to identify hazards associated with the physical environment, assessment of functioning and personal behaviour factors. Identification prompts further assessment and prevention/modification strategy. Total items =25.
Mackenzie L, Byles J, Higginbotham N (2000) Designing the home falls and accidents screening tool (HOME FAST): selecting the items, *British Journal of Occupational Therapy,* 63(6), 260-269.

5. Objective safe at home, Anemaet WK, Motta-Trotter E (1997) USA
Ordinal scale tool that evaluates major areas of the home environment and rates both the assistance required and difficulty demonstrated by patients.
Anemaet WK, Motta-Trotter E (1997) *The user-friendly home care handbook*, USA: Learn Publications.

6. WeHSA: Westmead home safety assessment, Clemson L (1997) Australia
Four-page list of potential hazards in 72 categories. Uses a summed score of nominal data.

Appendix E: Evidence table 3 Profile of Tools

Clemson L (1997) *Home fall hazards and the Westmead home safety assessment,* West Brunswick: Coordinates publications.

7. Elderly fall screening test (EFST), Cwikel JG et al (1998) Israel
Five item test including: fall in last year, injurious fall in last year, frequent falls, slow walking speed, unsteady gait. 17 minutes to administer, sensitivity 93%, specificity 78%.
Cwikel J, Fried AV, Galinsky D, Ring H Gait and activity in the elderly: implications for community falls prevention and treatment programmes, *Disability Rehabilitation, 1995;17:277-80.*

Appendix E: Evidence table 2 risk factors: multivariate analysis (please refer to Evidence table 1 for further details)

Falls history

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Northridge 1996	Baseline status for all analysis included one fall prior to baseline. *OR (95%CI)* One non-environmental fall at follow-up 1.15 (1.01-1.31) One environmental fall at follow-up 1.20 (1.05-1.36) Two non-environmental falls 1.19 (1.05-1.36) Two environmental falls 1.15 (1.00-1.32).	Medium	Only previous fallers were recruited. Subjective baseline measurement of risk factors Analysis of two falls at follow-up n= less than 50. OR are adjusted for all other variables.
Covinsky 2001	*OR (95% CI)* 2.42 (1.49-3.93).	Medium	Retrospective falls history at follow-up. Subjective baseline measurement of risk factors. Three models were computed and each adjusted for falls history. All risk factors significant at p<0.05 were retained in multivariate analysis.
Tromp 2001	*OR (95%CI)* Single fallers 2.6 (2.0-3.3) Recurrent fallers 3.1 (2.2-4.4).	High	All risk factors were adjusted for the others and all were adjusted for age, gender. Recurrent falls and fractures.
Friedman 2002	*OR (95% CI)* 2.51(2.04-3.09)	High	Logistical regression. Adjusted for other variables in the model. (Please refer to Evidence table 5 for further details).
Stalenhoef 2002	*OR (95%CI)* 3.1 (1.5-6.7).	High	Variables meeting an OR of two or more in bivariate analysis were entered into multivariate analysis. Stratification included age and sex were also entered. Adjustment reported but unclear.
Stenbacka 2002	*RR(95%CI)* Earlier injuries: men >60years 2.48(1.19-5.13).	Medium	
Wood 2002	*OR (95%CI)* 4.0 (1.3-12.1.	Low	Variables significant at p<0.1 were entered in logistic regression analysis. No adjustment for covariates reported. Small sample n=74 fallers. Parkinson's disease only.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Extended care: statistically significant results

Study	Results	Quality	Comments
Thapa 1996	*IDR (95%CI)* Non-ambulatory 2.23 (1.14-4.37).	High	Multivariate model included factors with a significance of p=≤0.10. Separate analysis was conducted for the non-ambulatory and ambulatory participants. Each variable was adjusted for other variables with exception of falls history. Falls history was assessed in a separate model.
Bueno-Cavanillas 2000	*DR (95%CI)* Intrinsic falls 1.9 (1.3-2.9).	Low	Adjusted density ratios referred to but no details. Small sample n=106 falls.
Kallin 2002	*OR (95%CI* 4.65 (1.48-14.60).	Low	Small sample multivariate analysis. No adjustment for confounding.

Extended care: statistically non-significant results

Study	Comments
O Loughlin 1993	Falls history not included in pooled logistical regression for other factors. Secondary analysis including falls history in the model (IRR= 2.1 (1.4-3.3). Poor methods of reporting.
Tinetti 1995	*Adjusted RR (95%CI)* 1.2 (0.9-1.5)
Thapa 1996	*Adjusted IDR (95%CI)* *Ambulatory* 1.22(0.73-2.04)
Koski 1998	Measured but not reported.
Tromp 1998	Previous falls established by history of fracture.
Cesari 2002	Unsure if measured at baseline. MDS at baseline. Not reported as significant in results.
Stenbacka 2002	Adjusted for age *RR(95%CI)* Earlier injuries: Women>60 years 1.21(0.76-1.92)

Appendix E: Evidence table 2 risk factors: multivariate analysis

Muscle weakness

Statistically non-significant results (ns)

Study	Comments
Bueno-Cavanillas 2000	*DR (95%CI) Adjusted but unclear reporting* Intrinsic fall Poor muscle tone in hand: 1.4 (0.9-2.4) Extrinsic fall Poor muscle tone in hand: 1.3 (0.7-2.3).
Koski 1998	Ns in multivariate analysis.

Gait deficit

Gait, mobility and balance described separately but some overlap may be present due to some tests examining both aspects

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Koski 1998	*OR (95%CI)* Incomplete step continuity 2.2 (1.11-4.17).	High	Logistic regression with adjustment for age and gender.
Cesari 2002	*OR (95%CI)* Gait problems 2.13 (1.81-2.51).	Medium	Logistic regression with adjustment for age and gender.
Northridge 1996	*OR (95%CI)* Tandem walk performance: non-environmental single fall 1.96(1.44-2.68).	Medium	Only previous fallers were recruited. Analysis of two falls at follow-up n= less than 50. OR are adjusted for all other variables.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Extended care: statistically non-significant results

Study	Comments
Bueno-Cavanillas 2000	Gait disorders were examined in this study but categorised into twelve domains. Adjusted density ratios referred to but no details Small sample n=106 falls: Multivariate analysis: sitting down incorrectly: (? Not specific enough) DR=3.4 (1.5-7.6)
Kallin 2002	Ns in logistic regression.

Community dwelling: non-significant results

Northridge 1996	Adjusted for all variables. Tandem walk performance: environmental single fall 1.24 (0.91-1.69) Non-environmental and environmental second fall both ns in multivariate analysis (no data).
Stalenhoef 2002	TUGT: Ns in logistical regression.
Wood 2002	Parkinson's disease only. Gait measured at baseline, ns in multivariate analysis (no data).
Tinetti 1995	Gait speed: Ns Multivariate analysis.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Balance (including dizziness)

Community dwelling: statistically significant results

Study	Results	Quality	Comments
O Loughlin 1993	*IRR(95%CI) (Adjusted)* *Dizziness*= 2.0(1.3-2.8).	Medium	Pooled logistical regression, with all ns risk factors that were not retained in the model were entered one by one to identify potential confounders.
Stalenhoef 2002	*OR(95%CI)* *Abnormal postural sway* 3.9 (1.3-12.1).	HIgh	Variables meeting an OR of two or more in bivariate analysis were entered into multivariate analysis. Stratification included age and sex were also entered. Adjustment reported but unclear.
Covinsky 2001	*OR(95%CI)* *Unbalanced or dizzy:* Model 2 adjusted for falls history= 1.96(1.25-3.07) Model 3 included falls history= 1.83(1.16-2.89).	Medium	Multivariate logistic regression.

Extended care: statistically significant results

Bueno-Cavanillas 2000	Eight aspects of balance examined and analysis according to intrinsic or extrinsic fall. All ns in multivariate analyses with exception of Romberg incorrect: DR=4.0 (1.2-13.3)	Low small sample	Cox regression analysis no adjustment variables reported.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Extended care: statistically non-significant results (ns)

Study	Comments
O Loughlin 1993	NS in pooled logistical regression, with all ns risk factors that were not retained in the model were entered one by one to identify potential confounders.
Tinetti 1995	Balance and Gait score= ns in multivariate analysis.
Northridge 1996	*Balance on one leg* Multivariate analysis with adjustment for all other variables First fall Environmental= ns Non-environmental = ns. Second fall Environmental= OR 1.12(0.94-1.32) Non-environmental = OR 0.71(0.55-0.93).
Koski 1998	*Unsteady standing* NS in multivariate analysis.
Wood 2001	Balance score ns in multivariate analysis. Small sample n= 69 fallers/ 32 non fallers.
Stalenhoef 2002	Trendelenburg test (abnormal), bending down test, functional reach test. All ns in logistic regression.
Bueno-Cavanillas 2000	Eight aspects of balance examined and analysis according to intrinsic or extrinsic fall. All ns in multivariate analyses with exception of Romberg incorrect test as above.
Kallin 2002	Functional reach: ns in multivariate analysis.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Mobility impairment

Community dwelling: statistically significant results

Study	Results	Quality	Comments
O Loughlin 1993	*IRR(95%CI) (adjusted)* *Trouble walking 400m=* 1.6(1.2-2.4) *Trouble bending down=* 1.4(1.0-2.0).	Medium	Pooled logistical regression, with all ns risk factors that were not retained in the model were entered one by one to identify potential confounders.
Covinsky 2001	*OR(95%CI)* *Impaired mobility:* Model 2 adjusted for falls history= 3.06(1.93-4.86) Model 3 included falls history= 2.64(1.64-4.26).	Medium	Multivariate logistic regression.

Community dwelling: statistically non-significant results

Study	Comments
Bueno-Cavanillas et al (2000)	See gait and balance.
Kallin et al (2002)	*User of walking aid* ns in logistic regression.
Cesari et al (2002)	Unsure if measured at baseline. MDS at baseline. Not reported as significant in results.
Stalenhoef et al (2002)	Mobility was assessed with balance and gait tests. SIP68 MC also utilised within the mobility domain= ns in multivariate analysis. Bivariate= 2.6(1.3-5.3).

Appendix E: Evidence table 2 risk factors: multivariate analysis

Fear of falling

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Arfken 1994 USA	*OR (95%CI)* 1 fall A= 1.52 (1.06-2.17) B= 2.49(1.48-4.20) Recurrent falls A=1.71(1.01-2.89) B=3.12(1.61-6.06).	High	Statistical methods: Logistic regression adjusted for age, gender. (Please refer to Evidence table 5 for further details).
Cumming 2000	*Adjusted hazard ratio (95%CI)* Falls efficacy scale ≤ 75 (n= 88) =2.09 (1.31-3.33).	High	Linear regression with adjustment for other related variables.
Friedman 2002	*OR(95%CI)* Fear of falling at baseline/ falls at follow-up= 1.78(1.41-2.24) Fear of falling at baseline and follow-up= 5.40(4.23-6.91) Fear of falling at baseline with no history of falling= 1.79(1.33-2.42).	Medium	This study explored the temporal relationship between falls and the fear of falling. Logistic regression analysis with all other factors entered into the model.

Community dwelling: statistically non-significant results

Study	Comments
Tromp 2001	Ns in multivariate analysis.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Visual deficit

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Northridge 1996	*OR(95%CI) adjusted* *Second fall: non-environmental* *Corrected visual acuity (5 units worse)* 1.18(1.00-1.39) *Environmental* 1.22(1.02-1.46).	Low	Multivariate logistic regression. Each variable adjusted for others.
Koski 1998	*OR (95%CI)* *Poor distant visual acuity* 2.3(1.18-4.63).	High	Logistic regression with adjustment for age and gender.

Extended care: statistically significant results

Kallin 2002	*OR (95%CI)* *Impaired vision* 5.85(1.14-30.08).	Low - small sample	Logistic regression. No adjustment for confounding reported.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Extended care: statistically non-significant results (ns)

Study	Comments
Tinetti 1995	*Visual impairment* Ns in multivariate analysis.
Northridge 1996	*OR(95%CI)* *Depth perception score* Multivariate analysis with adjustment for all other variables First fall Environmental= 0.81(0.70-0.94) Non-environmental = 1.04(0.92-1.18).
Tromp 1998	Multivariate analysis adjusted for age and gender, and recurrent falls: *Vision problems:* OR 1.7(0.9-3.0).
Cesari 2002	*Visual impairment* Ns in multivariate analysis.
Stalenhoef 2002	*Distant vision* Ns in multivariate analysis.
Wood 2002	*Visual acuity* Ns in multivariate analysis.
Thapa 1996	Visual impairment measured but ns in multivariate analysis. No data reported.
Bueno-Cavanillas 2000	Many aspects of vision were measured. Ns in multivariate analysis.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Cognitive impairment

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Tinetti 1995	*Adjusted OR (95%CI)* Serious injurious fall (entire cohort) MMSE<26 = 2.2(1.5-3.2) Serious injurious fall (those who fell at least once MMSE<26 =2.4(1.6-3.4).	High	Pooled logistic regression adjusted for housing stratum, moth of follow-up, history of fall, at least two chronic conditions, Balance and gait scores female gender, body mass index.
van Schoor 2002	*Adjusted OR (95%CI)* *RCPM and adjusted variable Age and education=1.03(1.00-1.07) **CT Age and education=1.02(1.00-1.04).	Medium	Logistic regression with adjustment for age, sex, depression, education level and stroke.

Extended care: statistically significant results

Bueno-Cavanillas 2000	*DR (95%CI)* Intrinsic fall / dementia 6.2(1.7-23.3).	Low - small sample	Cox regression analysis no adjustment variables reported.

***** RCPM = non-verbal, visual test to measure a persons ability of nonverbal and abstract reasoning.
** CT= coding task

Appendix E: Evidence table 2 risk factors: multivariate analysis

Community dwelling and extended care: statistically non-significant results (ns)

Study	Comments
Tinetti 1995	MMSE <20 ns in multivariate analysis.
Northridge 1996	Mental status test ns in multivariate analysis.
Tromp 1998	Cognitive impairment ns in multivariate analysis.
Cesari 2002	Cognitive performance scale ns in multivariate analysis.
Stalenhoef 2002	MMSE<24 ns in multivariate analysis.
van Schoor 2002	RCPM and adjusted variable Age= 1.02(0.98-1.05) Age and depression and education= 1.03(0.99-1.07) MMSE and adjusted variable Age= 1.03(0.99-1.07) Age and depression= 1.02(0.97-1.06) Age and depression and education= 1.03(0.99-1.08) CT and adjusted variable Age= 1.00(0.99-1.02) Age and depression and education= 1.02(0.99-1.04).
Thapa 1996	*Adjusted IDR(95%CI)* Cognitive impairment / moderate 1.49(0.89-2.50) Cognitive impairment / severe 1.59(0.78-3.26) Adjusted for all other variables.
Kallin 2002	MMSE ns in multivariate analysis.
Wood 2002	MMSE ns in multivariate analysis.

MMSE= mini mental state examination

Appendix E: Evidence table 2 risk factors: multivariate analysis

Urinary incontinence

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Tromp 1998	*Adjusted OR(95%CI)* 1.8(1.2-2.7).	High	Logistic regression adjusted for age, gender recurrent falls
Brown 2000	*Adjusted OR(95%CI)* Urge incontinence 1.26(1.14-1.40).	High	Multivariate model with adjustment for all factors.

Statistically non-significant results

Study	Comments
Tinetti 1995	Ns in multivariate analysis.
Koski 1998	Urinary incontinence ns in multivariate analysis.
Brown 2000	*Adjusted OR(95%CI)* Stress incontinence 1.06(0.95-1.19).
Cesari 2002	*Adjusted OR(95%CI)* 1.06(0.93-1.20) Adjusted for age and gender.
Thapa 1996	Ns in multivariate analysis.

Appendix E: Evidence table 2 risk factors: multivariate analysis

Home hazards

Community dwelling: statistically significant results

Study	Results	Quality	Comments
Cesari 2002	*Adjusted OR(95%CI)* 1.51(1.43-1.69).	Medium	Logistic regression with adjustment for age and gender.
Gill 2000	*Proportional Hazards ratio (95%CI)* Loose rugs, mats etc= 5.87(1.42-24.2) Carpet fold or tripping hazard= 3.45(1.29-9.27).	High	Adjusted for age, gender and housing type. Many potential hazards were assessed in this study. Only significant in adjusted results reported here.

Appendix E: Evidence table 11: Hip protectors for the prevention of hip fracture (Reproduced from Parker et al, 2003). Other outcomes were reported in this systematic review and details are given as follows:

1. Incidence of falls
It is unclear whether the use of hip protectors has any impact on the frequency of falls amongst those randomised to their use. Eight studies reported a similar proportion of falls in the protector and control group.
• Cameron (2001) reported 365 falls for 80 individuals in the protector group versus 384 for 80 individuals in the control group. • Cameron (2003) reported 365 falls for 80 individuals in the protector group versus 384 for 80 individuals in the control group. • Ekman (1997) reported 294 for 302 individuals in the protector group versus 531 for 442 individuals in the control group. • Jantti (1996) noted 197 falls for 36 individuals in the intervention group versus 158 for 36 individuals in the control group. • Lauritzen (1993) reported on a subgroup of 116 residents with 45 falls for 45 individuals in the intervention group versus 90 for 71 individuals in the control group. • Harada (2001) reported 131 falls (or 1.37) falls per person for those allocated to protectors against 90 falls (1.09 per person) in the control group. • Chan (2000) reported 191 falls in the 40 allocated to protectors against 101 falls in the 31 controls. • Hubacher (2001) reported a fall rate of 1.16 per person per year in the protector group and 1.21 in the control group. • Meyer (2003) reported no significant difference in the proportion of fallers (mean difference between groups -0.06, 95% CI -0.16 to 0.05) or in the number of falls per resident in each group (mean difference -0.80, 95% CI -1.85 to 0.24). • van Schoor (2003) reported 727 falls in 276 participants in the protector group against 1,075 in the control group. One hundred participants in the protector group had recurrent falls against 114 in the control group.

- Villar (1998) reported a greater but not statistically significant number of individuals suffering falls on the hip in those allocated to hip protectors (8/101 versus 1/40; RR 3.17, 95% CI 0.41 to 24.52).
- Kannus (2000) only reported on falls in the protector group with 1,404 falls occurring in the 653 individuals

2. Mortality

There was no evidence that the use of hip protectors had any effect on mortality.

- Jantti (1996) reported on mortality and morbidity expressed in terms of permanent hospitalisation for both groups. By one-year follow-up, the mortality (6/36 versus 8/36) and incidence of permanent hospitalisation (10/36 versus 9/36) were similar in the two groups.
- Cameron (2001) reported on mortality at 18 months.
- Meyer (2003) reported 157/459 deaths during the study in the protector group against 183/483 in the control group.
- van Schoor (2003) gave the number of deaths during the study period (mean of 69.6 weeks).
- Results for the four individual randomised studies are 150/700 (21.4%) versus 161/707 (22.8%) (RR 0.95, 95% CI 0.78 to 1.15).

3. Compliance

Amongst those who were assigned to their use, compliance with wearing of hip protectors was limited. It is not clear in some trials how compliance was measured but for those that stated the method of measurement, the length of time wearing them was calculated.

- Chan (2000) reported a compliance of 50.3 per cent with dementia given as a reason for non-compliance.
- Ekman (1997) reported an average compliance of 44 per cent, although it is not clear how this was calculated.
- Harada (2001) reported that 17/88 (19%) of those allocated to the protectors refused to wear them. Complete compliance estimated by hours worn was 70 per cent and partial compliance 17 per cent.
- Jantti (1996) stated that, of the 19 participants available at one year, 13 (68%) were still using hip protectors.
- Of the subgroup of 45 individuals allocated to hip pads monitored in Lauritzen (1993), only 11 (24%) wore the protectors regularly.
- In Kannus (2000), 31 per cent of those eligible declined to participate in the study, and a further 71 out of 446 patients discontinued use during the study. Compliance in those who agreed to participate in the study (assessed as the number of days the protector was worn as a percentage of all available follow-up days) was 48 per cent (±29%, range <1 to 100%).
- van Schoor (2003) used random visits to assess compliance. At one month 39 per cent were not compliant with wearing the protectors. This figure had risen to 55 per cent at six months and 63 per cent at one year.
- Hubacher (2001) reported that for 384 allocated to the protector group, 138 were regular wearers, 124 discontinued wearing them and 122 refused to wear them. Even the 138 'regular wearers' only wore the pads 49.1 per cent of the time.
- Birks (2003) gave an overall compliance figure of 34 per cent.
- Cameron (2001) stated total compliance was 57 per cent. At the end of the study only 37 per cent were still regular wearers of the protectors.

- Meyer (2003) reported that the hip protectors were worn by 34 per cent of the intervention group participants.
- Cameron (2003) approached 1,807 potential subjects living in their own homes and 34 per cent of these agreed to participate. By two years, the end of this study, only 33-38 per cent of participants were wearing the protectors all the time.
- In Villar (1998), of the 288 individuals approached only 141 consented to participate. Of the 101 who received the protectors only 27 (27%) wore them throughout the 12 week study period. In a breakdown of the reasons for non-compliance presented by Villar (1998), discomfort and poor fit were the most common reasons for discontinued use.

4. Complications (including skin damage/breakdown)

- Ekman (1997) mentioned that the occurrence of skin irritation was used as a reason for non-compliance.
- Villar (1998) reported three individuals who were unable to tolerate the special undergarments during a heat wave and also mentioned discomfort as the prime reason for non-compliance.
- Kannus (2000) reported skin irritation or abrasion in 15 cases. In addition one person reported the protector caused swelling of the legs and another that it caused bowel irritation.
- Hubacher (2001) reported that aches and pains and an uncomfortable feeling with wearing the protectors was given as a reason for non-compliance.
- Minor skin irritation was reported in Cameron (2001), and Cameron (2003) reported minor skin irritation or infection caused by hip protectors in 16 users (5%).
- Meyer (2003) reported five cases of skin irritation. In addition some of the care homes reported increased dependency of some of the residents at toileting, more difficulty in dressing and discomfort from wearing the protectors.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Birks 2003	Randomisation of individual participants by a telephone randomisation service.	366 community residents recruited as patients recovering from a hip fracture on orthopaedic wards of York District Hospital, England, or from the general population who had sustained a hip fracture in the past. Mean age: 80.0/80.2 years[1] Proportion male: 12.6%. Inclusion criteria: aged over 70 years; have sustained one hip fracture; had to have one hip intact; able to give informed consent. Exclusion criteria: bed or chair-bound; had bilateral hip replacement; a clothing size of 18 or above.	Allocation to wear hip protectors or not (control group). Hip protectors from Robinson Healthcare Ltd that are equivalent to those of Safehip, Denmark.	Length of follow-up: mean of 14 months (range 6-41 months). <u>Outcomes</u> Number of hip fractures. Number of other fractures. Compliance of wearing the protectors. Adverse effects of the protectors. <u>Results</u> 1.Incidence of hip fractures, randomised by individual patient, hip pads n=6/182 vs n=2/184 control. RR 3.03 [0.62, 14,83]. 2.Incidence of pelvic fractures Hip pads n= 3/182 vs n=0/184 control. RR 7.08 [0.37, 136.04]. 3.Incidence of other fractures, hip pads n=15/182 vs 17/184 control. RR 0.89 [0.46, 1.73].	A* Unpublished information made available from authors.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Cameron 2001	Method of randomisation by numbered sealed opaque envelopes.	174 living in residential care facilities in Sydney, Australia. Mean age: 85.6/84.0 years. All female. Inclusion criteria: aged 75 years and older; have had two or more falls in the last three months or one fall requiring hospital admission; at least one hip without prior surgery; able to understand English; have sufficient cognitive function to give informed consent; likely to continue to live at home for three months and to survive for at least one year; confirmation that the facility staff would assist with encouraging the participant to wear the protector.	Allocation to wear hip protectors or not (control). Hip protectors equivalent to those of Safehip, Denmark.	Length of follow-up: two years. <u>Outcomes</u> Number of hip fractures. Number of pelvic fractures. Number of other fractures. Compliance of wearing the protectors. Adverse effects of the protectors. Mortality. Falls. <u>Results</u> 1.Incidence of hip fractures, randomised by individual patient, hip pads n=8/86 vs n=7/88 control. RR 1.17 [0.44, 3.08]. 2.Incidence of pelvic fractures Hip pads n= 2/86 vs n=2/88 control. RR 1.02 [0.15, 7.10]. 3.Incidence of other fractures, hip pads n=4/86 vs 4/88 control. RR 1.02 [0.26, 3.96]. 4. Mortality, hip pads n=28/86 vs n=28/88 control. RR 1.02 [0.66, 1.58].	A*

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Cameron 2003	Method of randomisation by numbered sealed opaque envelopes.	600 living in their own homes in Sydney, Australia. Mean age: 83.2/83.0 years. All female. Inclusion criteria: aged 74 years and over; in contact with aged care health services; at least two falls in the last three months or one fall requiring hospital admission; at least one hip without prior surgery; sufficient cognitive function to give informed consent; likely to continue to live at home for three months; likely to survive for at least one year; able to understand English.	Allocation to wear hip protectors or not (control). Two adherence nurses fitted protectors and encouraged adherence with three visits, followed by two telephone contacts. Further visits or telephone contact if not adhering. Hip protectors equivalent to those of Safehip, Denmark.	Length of follow-up: two years. Outcomes Number of hip fractures. Number of pelvic fractures. Number of other fractures. Compliance of wearing the protectors. Adverse effects of the protectors. Mortality. Number of falls. Results 1.Incidence of hip fractures, randomised by individual patient, hip pads n=21/302 vs n=22/298 control. RR 0.94 [0.53, 1.68]. 2.Incidence of pelvic fractures Hip pads n= 8/302 vs n=6/298 control. RR 1.32 [0.46, 3.75]. 3.Incidence of other fractures, hip pads n=23/302 vs n=21/298 control. RR 1.08 [0.61, 1.91]. 4. Mortality, hip pads 33/302 vs n=46/298 control. RR 0.17 [0.47, 1.07].	A*

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Chan 2000	The method or randomisation was stated as 'taking draws literally'	71 residents of nine nursing homes in Randwick, New South Wales, Australia. Mean age: not stated. Proportion male: not stated.	Allocation to wear hip protectors or not (control group). Type of protector was locally made pads and pants.	Length of follow-up: nine months. Outcomes Number of hip fractures. Falls. Compliance of wearing the protectors. Results 1.Incidence of hip fractures, randomised by individual patient, hip pads n=3/40 vs n=6/31 control. RR 0.39 [0.11, 1.43].	B* Additional information supplied by authors via email.
Ekman 1997	The selection of one nursing home for study was stated as being 'randomised'. This home's residents were offered external hip protectors and the incidence of hip fracture compared with three 'control' homes.	744 residents of four nursing homes in Uppsala, Sweden. Mean age: 84 years. Proportion male: not stated.	Allocation to wear hip protectors or not (control group). Type of protector was JOFA AB, Malung, Sweden. No special fixation method was used.	Length of follow-up: 11 months. Outcomes Number of hip fractures. Mortality. Falls. Compliance of wearing the protectors. Results 1.Incidence of hip fractures, randomised by unit or nursing home, hip pads n=4/302 vs n=17/442 control. RR 0.34 [0.12, 1.01].	C*

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Harada 2001	Randomised by the room or ward number.	164 residents of a nursing home in Japan. Mean age: 83.2 years. All female.	Allocation to wear hip protectors or not (control). Hip protectors - Safehip, Denmark.	Length of follow-up: 19 months. Outcomes Number of hip fractures. Number of other fractures. Number of falls. Compliance with wearing the protectors. Results 1.Incidence of hip fractures, randomised by unit or nursing home, hip pads n=1/88 vs n=8/76 control. RR 0.11 [0.01, 0.84]. 2.Incidence of pelvic fractures Hip pads n= 0/88 vs n=0/76 control. 3.Incidence of other fractures, hip pads n=2/88 vs n=0/79 control. RR 4.33 [0.21, 88.74].	C* Bone density was measured in all patients by ultrasonic evaluation of the calcaneal bone. Additional information supplied by the authors on method of randomisation and that no patients were excluded after allocation.
Hubacher 2001	Randomised trial of 20 nursing homes. For half of these homes randomisation of each participant was by 'computer'; for the other half the head of the nursing home randomised fall prone residents in 'random order'. New patients to the home were assigned in order of their entry	548 residents of 20 nursing homes in Zurich, Switzerland. Mean age: 85.5 years. Proportion male: 22%.	Allocation to wear hip protectors or not (control group). Type of protector was Safehip, Denmark.	Length of follow-up: 10 months. Outcomes Number of hip fractures Number of pelvic fractures. Number of other fractures. Falls. Compliance of wearing the protectors. Adverse effects of the protectors. Results 1.Incidence of hip fractures, randomised by individual	Additional information supplied by trialists.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

	(even to the hip protector group, odd to the control group).			patient, hip pads n=7/384 vs n=2/164 control. RR 1.49 [0.31, 7.12]. 2.Incidence of pelvic fractures Hip pads n= 1/384 vs n=0/164.	
Study	**Methods**	**Participants**	**Interventions**	**Results**	**Quality (allocation concealment) & Comments**
Hubacher 2001 cont.				control. RR 1.29 [0.05, 31.40] 3.Incidence of other fractures, hip pads n=7/384 vs n=3/164 control. RR 1.00 [0.26, 3.81]	C*
Jantti 1996	Randomised trial by the opening of sealed envelopes for each patient in the study.	72 residents of a municipal old people's home in Tampere, Finland. Mean age: groups 85.5/84 years (range 71-96). Proportion male: 11%.	Allocation to wear hip protectors or not (control group) Hip protectors used were designed by first named author of study. Consisted of pants with pockets which contain a 2 cm thick pad of closed-cell polyethylene foam measuring 20 cm by 15 cm.	Length of follow-up: 12 months. <u>Outcomes</u> Number of hip fractures. Compliance of wearing the protectors <u>Results</u> 1.Incidence of hip fractures, randomised by individual patient, hip pads n=1/36 vs n=5/36 control. RR 0.20 [0.02, 1.63]. 2.Incidence of pelvic fractures Hip pads n= 0/36 vs n=2/36 control. RR 0.20 [0.01, 4.03]. 3.Incidence of other fractures, hip pads n=0/36 vs n=0/36 control. 4. Mortality, hip pads n=6/36 vs n=8/36 control. RR 0.75 [0.29, 1.94].	B* By the end of the one-year observation period, 33 participants had been lost through death or permanent hospitalisation.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Kannus 2000	Treatment units (number not reported) within 22 community based health care centres were randomised by an independent physician using sealed envelopes to either receive the protectors or to act as a control group. Ratio of protector to control group 1:2.	1,801 users of 22 community based health care centres in southern and central Finland. Each centre had treatment units consisting of long-stay facilities or outpatient care units for supporting living at home. Mean age: 81/82 years. Proportion male: 23/21%. Inclusion criteria: ambulatory; aged 70 years or above; at least one identifiable risk factor for hip fracture (previous fall or fracture, impaired balance or mobility, use of walking aids; cognitive impairment; impaired vision; poor nutrition; or a disease or medication known to predispose people to falls and hip fractures). The patients in the protector group were, on average, one year younger (81 versus 82 years, p=0.006), of lower weight (63.1kg versus 65.5 kg, p<001), lower body mass index (24.3 versus 25.1, p<0.001), more likely to have dementia (33% versus 26%, p=0.001), more likely to have a previous stroke, bleeding, or related central nervous system condition (21% versus 15%, p=0.002), more likely to have impaired mental status (p<0.001) and were more likely to have a history of previous falls (p<0.001).	Allocation to wear hip protectors or not (control group) Type of protector was KPH hip protector, Respecta, Helsinki. Hip protectors were fixed in pockets in special underwear.	Length of follow-up: 611 person-years (mean 0.94 years per individual) in the protector group and 1,458 person-years (mean 1.27 years per individual) in the control group. <u>Outcomes</u> Number of hip fractures. Number of pelvic fractures. Number of other leg fractures. Number of other fractures. Falls. Compliance of wearing the protectors. Adverse effects of the protectors. <u>Results</u> 1.Incidence of hip fractures, randomised by unit or nursing home, hip pads n=13/653 vs n=67/1148 control. RR 0.34 [0.19, 0.61]. 2.Incidence of pelvic fractures Hip pads n=2/653 vs n=12/1148 control. RR 0.29 [0.07, 1.31]. 3.Incidence of other fractures, hip pads n=23/653 vs n=59/1148 control. RR 0.69 [0.43, 1.10].	C* 1,725 elderly adults were eligible for the trial. 204 out of the 650 randomised to the protector group and 94 out of 1,075 randomised to the control refused to participate. Further dropouts in the protector group were deaths (51 cases), became unable to walk (58), had a hip fracture (13), refused to continue (71) or other reasons (26). In the control group drop outs were deaths (137 cases), became unable to walk (108), had a hip fracture (67), refused to continue (90) or other reason (36). To replace the dropouts, eligible adults were recruited from the waiting list over the study period (207 in the protector group and 167 in the control group). Additional information supplied by trialists.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

Study	Methods	Participants	Interventions	Results	Quality (allocation concealment) & Comments
Lauritzen 1993	Randomised trial by drawing a number to allocate 10 out of 28 wards of a nursing home to receive protectors.	665 residents of a nursing home in Copenhagen, Denmark. All aged above 69 years. Proportion male: 30%.	Allocation to wear hip protectors or not (control group). Hip protectors used consisted of a outer shield of polypropylene and an inner part of Plastazote. Hip protectors were fixed in special underwear (Safehip, Denmark).	Length of follow-up: 11 months. <u>Outcomes</u> Number of hip fractures. Number of other fractures. Falls (subgroup). Compliance of wearing the protectors (subgroup). <u>Results</u> 1.Incidence of hip fractures, randomised by unit or nursing home, hip pads n=8/247 vs n=31/418 control. RR 0.44 [0.20, 0.93]. 2.Incidence of pelvic fractures Hip pads n=0/247 vs n=2/418 control. RR 0.34 [0.02, 7.01]. 3.Incidence of other fractures, hip pads n=15/247 vs n=25/418 control. RR 1.02 [0.55, 1.89].	B* Additional information supplied by trialists.
Meyer 2003 Meyer 2003	Randomised 49 clusters, each with more than 70 residents. Nursing homes, or "independently working" wards of a large nursing home randomised using computer generated lists using random permuted blocks of four, six and 10 using external, central telephone.	942 residents of 42 nursing homes with 49 clusters in Hamburg, Germany. Age: 70 or more. Proportion male: 14%. Inclusion criteria: aged 70 or more; not bedridden; living in the nursing home for more than three months.	Allocation of 25 clusters to receive structured education of staff based on social learning theory, 60-90 minute session in small groups, (covered effectiveness of hip protectors, factors known to reduce use, strategies for successful implementation); educational material for residents, relatives and physicians; one nurse from each intervention cluster delivered same education programme to residents individually or in small groups. Nursing staff encouraged to wear hip protectors for these sessions. Free hip protectors provided to intervention groups.	Length of follow-up: 18 months. <u>Outcomes</u> Number of hip fractures. Number of other fractures. Falls. Mortality. Compliance of wearing the hip protectors. <u>Reasons for non-compliance:</u> Hospital admissions. Fall related medical consultations. Quality of life. Costs.	A*

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

cont.			Control: nominated study co-ordinator for each control cluster (n=24) received 10 minute session with information and demonstration of hip protector and	Results 1.Incidence of hip fractures, randomised by unit or nursing home, hip pads n=21/459 vs	
			provided with two free hip protectors for demonstration purposes. Hip protectors (Safehip, Denmark).	n=42/483 control. RR 0.53 [0.32, 0.87]. 2.Incidence of pelvic fractures Hip pads n=1/459 vs n=3/483 control. RR 0.35 [0.04, 3.36]. 3.Incidence of other fractures, hip pads n=38/459 vs n=35/483 control. RR 1.14 [0.74, 1.78].	
van Schoor 2003	Randomised in blocks of four after stratification for sex and age using computer generated random lists.	561 residents of apartment homes, homes for the elderly and nursing homes in Amsterdam, Holland. Mean age: 84.8/85.7 years. Proportion male: 11%. Inclusion criteria: 70 years and over; low bone density and/or high risk for falling (BUA 40 dB/MHz or less; or BUA 40-60 dB/MHz and at least two risk factors for falling; or BUA 60-70 dB/MHz and at least three risk factors for falling). Risk factors for falling were one or more falls in the previous six months; dizziness on standing up from a chair in the last two weeks; sustained a stroke with neurological impairment; urinary incontinence; low physical activity; impaired mobility; cognitive impairment. Exclusion criteria: completely immobile; previous hip fracture; or with a hip prosthesis on both sides.	Allocation to wear hip protectors or not (control). Hip protectors were Safehip, Denmark.	Mean length of follow-up: 69.6 weeks. Outcomes Number of hip fractures. Number of pelvic fractures. Number of other fractures. Compliance of wearing the protectors. Adverse effects of the protectors. Mortality. Falls. Results 1.Incidence of hip fractures, randomised by individual patient, hip pads n=18/276 vs n=20/285 control. RR 0.93 [0.50, 1.72]. 2.Incidence of pelvic fractures Hip pads n=2/276 vs n=3/285 control. RR 0.69 [0.12, 4.09]. 3.Incidence of other fractures, hip pads n=14/276 vs n=11/285 control. RR 1.31 [0.61, 2.84] 4. Mortality, hip pads n=83/276	A* 6.8% of the participants lived in apartment houses for the elderly, often with access to facilities in a home for the elderly nearby.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

				vs n=79/285 control. RR 1.08 [0.84, 1.41].	
Study	**Methods**	**Participants**	**Interventions**	**Results**	**Quality (allocation concealment) & Comments**
Villar 1998	'Randomised' – no details of method given.	141 residents in 31 rest homes in Dorset, UK. Age: range 64 – 98 years. All female. Exclusion criteria: dementia; communication problems; previous pressure sores; general practitioner unwilling to involve participant; dress size 18 or above (no suitable undergarment available).	Allocation to wear hip protectors or not (control). Hip protectors (Safehip, Denmark) made of an outer layer of polypropylene with an inner Plastazote lining were sewn into special underwear.	Length of follow-up: 12 weeks. Outcomes Number of hip fractures. Number of falls on hip. Compliance of wearing the hip protectors. Results Incidence of hip fracture nil.	B* This was a feasibility study set up as a pilot for a randomised trial of hip protectors. The primary aim was to evaluate compliance and reasons for non-compliance.

Other additional studies on compliance with hip protectors

Study	**Methods**	**Settings**	**Participants**	**Intervention**	**Results**	**Quality (allocation concealment) & Comments**
Cameron 2000	Randomised controlled trial that assessed the effect of hip protectors on fear of falling.	Community-dwelling Australian setting.	131 women aged 75 years or more who had two or more falls or one fall requiring hospital admission in the previous year.	The intervention group were issued with hip protectors and were encouraged to use them for two years by a home visiting adherence nurse (approximately monthly visits). Outcomes: fear of falling and falls efficacy. Adherence with the use of the hip protectors was reported, but there was no description of how adherence was measured.	Adherence with the use of hip protectors was described as 'not complete' but only 8% of subjects were completely non-adherent. This adherence rate was reported as being 'higher than reported by others' but there was concern that assessing this outcome only four months into a wear period of two years might not reflect long-term maintenance rates.	The lack of description regarding how adherence was defined and measured is a weakness of the study with regard to the assessment of this outcome. Also, cost was not a consideration for these trial participants, as the hip protector equipment was provided free of charge. This may be a potential barrier to use in non-trial populations.
Pakkari 1998	Before and after study designed to assess the acceptability and	Finnish nursing homes.	19 ambulatory nursing home residents at high risk of fracture. All eligible residents were approached and	Participants were fitted with the hip protectors and staff were given instruction on their use. Caregivers recorded wearing	12/19 (63%) of the eligible residents agreed to use the protector for six months. There were worn on 93% of	No real data was provided to support the conclusions drawn as this observational study

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

	compliance with hip protectors in ambulatory, institutionalised elderly people.		invited to participate.	hours and waking time in research diaries. Attitudes of the study subjects and caregivers were noted.	the subjects' active days, and for 91% of the waking time on those active days (=11 hours/day ± 4). There were mostly positive comments regarding their use by both staff and subjects. The main concern was that the required tight fit reduced the ability for independent toileting. The authors concluded that attitude, education and staff motivation may be factors in achieving good compliance.	had no control group against which the effect of lack of staff motivation or support could be assessed. Hence these conclusions should be considered with caution.
van Schoor 2002	Systematic review of the published literature to assess the determinants of compliance with hip protectors.	No settings specifically stated, presumably all settings included.	Included all types of studies that assessed the use of hip protectors in adults aged 65 years and over. 14 studies were included in the review.	Searched three electronic databases: PubMed, Embase and the Cochrane Library for studies which measured compliance or primary acceptance of hip protectors.	Primary acceptance of hip protectors was low to moderate (37-72%) and compliance with their use ranged from 20-92% in the included studies. Measurement of compliance was often unclear and many difference definitions were used. Most of the included studies were in nursing home settings. Unclear if these compliance results would thus be generalisable to community dwelling populations.	No specific search of Medline. Also did not note which parts of the Cochrane Library were searched, but presumably both the CENTRAL trials register and the Cochrane database of systematic reviews. Two reviewers, but no description of quality assessment or data extraction methods.
Villar 1998	Prevalence study that aimed to assess compliance with the use of hip protectors. It was undertaken as a feasibility study for a planned randomised trial of the efficacy of hip protectors.	31 rest homes in the UK.	101 participants allocated to the intervention arm of the pilot randomised trial. The ages of the participants ranged from 64-98 years. All were women.	Each of the participants was fitted with three pairs of protector pads sewn into specially designed undergarments. Randomly timed fortnightly visits were made to assess compliance for 12 weeks.	27/101 (27%) wore the hip protectors for the full 12 week period. 54/101 women worn the device for less than a week. The reasons for non-compliance were usually poor fit or discomfort. The authors concluded that compliance could be increased with modification	No practical suggestions made to how the comfort and ease of use issues could be overcome whilst still ensuring the necessary firm fit.

Appendix E: Evidence table 10: Hip protectors for the prevention of fracture in older people (reproduced from Parker et al, 2003)

					of the pads and garment to enhance fit, comfort and ease of use.	

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
AGS/BGS 2001 Guidelines and Perell review	All settings including inpatient.	The Perell review was written following the AGS guidelines and refers to such guidelines. Risk factors are summarised. Perell refers to Rubenstein's review of risk factors and reports the mean RR (OR) for each factor. The AGS guideline refers to individual studies (16) and reports the same figures. No details on study design are given. Perell review illustrates other studies that have examined risk factors. Two are not referred to in the AGS guidelines: • Rawsky: review of 100 studies and reports the frequency of selected intrinsic risk factors but no RR reported. All settings were included. • Connell carried out a review of extrinsic risk factor studies but no summary statistics are reported.	*Mean RR/OR (range*) Muscle weakness= 4.4 (1.5-10.3) History of falls= 3.0 (1.7-7.0) Gait deficit= 2.9 (1.3-5.6) Balance deficit= 2.9 (1.6-5.4) Use of assist dev= 2.6 (1.2-4.6) Visual deficit= 2.5 (1.6-3.5) Arthritis= 2.4 (1.9-2.9) Impaired ADL= 2.3 (1.5-3.1) Depression= 2.2 (1.7-2.5) Cog impairment= 1.8 (1.0-2.3) Age>80= 1.7 (1.1-2.5)	AGS/BGS Guidelines All study designs used: cohort, case control and cross sectional Quality: this guideline was evaluated with the AGREE (appraisal of guidelines for research and evaluation) instrument. The following scores for the specified six domains are given below. The quality of the result is represented by a higher percentage. 1. Scope and purpose 77% 2. Stakeholder involvement 58% 3. Rigour of development 81% 4. Clarity of expression 66% 5. Applicability 55% 6. Editorial independence 50%

Appendix E: Evidence table 1 risk factors

Prospective cohort studies				
Study	**Population/setting**	**Methods**	**Results**	**Quality & comments**
Malmivaara 1993 Finland	Community dwelling sub sample of general population study. N=3909 aged 60 years and over (n=1769 men, n=2140 females) N= 244 injuries from falls (n=68 men, n=176 females)	Risk factors - postal questionnaire included socio-demographic, mental and physical health. Outcome measurement - follow-up period for eight-11 years. Data source for injurious falls obtained from National Hospital Discharge Register.	*Relative risk (95%CI)* Widows over 64 years: 2.7 (1.00-7.00) Anti-anxiety drugs: Men 2.9 (1.15-7.09) Women 1.7 (1.09-2.68) History of MI/cardiovascular disease: Men 2.7 (1.84-8.72) Women 3.3 (1.68-6.59) Male diabetics 3.5 (1.07-11.60	Quality: low No details of participation rates and percentage at follow-up. Response and recall bias for the identification of risk factors No details of (n) for each sub group.
O'Loughlin 1993 Canada	Community dwelling, aged 65 and over randomly selected from Quebec electoral list. N=417 (75%) agreed to participate N=409 (98%) included in final analysis N=119 fallers (197 falls)	Risk factors - at home interviewer administered questionnaire with telephone interview every four weeks for 48 weeks. Stable and time varying exposure variables related to demographic information, physical activity, mobility, ADL and others were measured by self-report. Previous 12 months falls history also obtained. Outcome measurement - a memory aid calendar was provided in which participants placed a label on the date of a sustained fall.	*Incidence rate ratios: IRR (95%CI)* Variables associated with increased rate of falls Dizziness 2.0 (1.3-2.8) ≥10 activities in past week 2.0 (1.3-3.0) Activity limited days 1.9 (1.3-2.6) Trouble walking 400m 1.6 (1.2-2.4) Trouble bending 1.4 (1.0-2.0) 2ndry analysis with history of fall = 2.0 (1.5-2.7) Independent predictors of injurious falls Stroke 2.4 (1.3-4.5) Activity limited days 2.2 (1.4-3.6) ≥10 activities in past week 2.1 (1.1-3.8) Respiratory disorder 1.7 (1.1-2.8)	Quality: medium Method of measurement of risk factors and falls relying on self-report and memory (recall bias).

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Tinetti 1995 USA	Community dwelling aged 72 and over. N=1103 (79% agreed to participate) N= 927 at follow-up N=96 (10%) reported 2 or more falls.	Risk factors - baseline data included socio-demographic, health status, Folstein mini-mental state (FMMS), physical performance, sensory impairment, medications, incontinence and functional dependence. Face-to-face interview method. Outcome measurement - falls were recorded by self-report using a falls calendar daily that was posted to researchers monthly for one year and follow-up face-to-face interview.	*Relative risks RR (95%CI)* FMMS <20 2.6 (1.7-4.0) Insulin 2.2 (1.2-4.1) Arm strength imp. 2.2 (1.5-3.2) Gait deficit Range 2.2- 3.0 Functional dependence 2.0 (1.3-3.1) >2 chronic conds. 1.9 (1.3-2.8) Impairment 1.8 (1.1-2.9) Self rated health 1.8 (1.2-2.6) Chronic dizziness 1.7 (1.1-2.5) Vision imp >50% 1.6 (1.1-2.4) Vision and Hearing Psychotropic 1.4 (1.1-1.8) >5 medications 1.3 (1.1-1.6)	Quality: high
Tinetti 1995 USA	Community dwelling aged 72 and over. N=1103 (79% agreed to participate) N= 927 at follow-up N=96 (10%) reported 2 or more falls. Same data set as above.	Risk factors - baseline data included socio-demographic, health status, Folstein mini-mental state (FMMS), physical performance, sensory impairment, medications, incontinence and functional dependence. Face-to-face interview method. Outcome measurement - falls were recorded by self-report using a falls calendar daily that was posted to researchers monthly for one year and follow-up face-to-face interview.	*Adjusted odds ratio (95%CI)* Serious injury resulting from a fall: entire cohort: FMMS <26 2.2 (1.5-3.2) > 2 chron. Cond. 2.0 (1.4-2.9) Balance/gait score <12/22 1.8 (1.3-2.7) Body mass index <22 1.8 (1.2-2.5) Serious injury resulting from a single fall FMMS <26 2.4 (1.6-3.5) Female 1.9 (1.1-3.1) Body mass index <22 1.8 (1.2-2.6) > 2 chron. Cond. 1.5 (1.1-2.1)	Quality: high

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Northridge 1996 USA	Community dwelling, aged 60-93 with a fall history in the previous year. N=325 participants at baseline n=315 at follow-up N= 109 at least one fall N= 56 experienced a second fall N=26 experienced three or more falls.	Risk factors - baseline data included socio-demographic, physical exam, neuromuscular performance, vision and mental status. Data were collected from interview questionnaire, physician examination, clinical tests. Outcome measurement - pre-paid postcards, weekly for one year with telephone prompting.	*Adjusted odds ratio (95%CI)* (One) non-environmental fall (n=58) Parkinson's 7.66 (1.15-51.1) Home alone >10 hours per day 2.36 (1.20-4.61) (One) environmental fall (n=51) Arthritis 2.60 (1.32-5.09) (Two) non-environmental falls (n=31) Arthritis 2.69 (1.12-6.50) (Two) environmental falls (n=25) Arthritis 2.87 (1.17-7.04)	Quality: medium Only previous fallers included. Subjective self-report assessment of functional status and ADL independence-response bias.
Koski 1998 Finland	Community dwelling aged 70 and over. N=942 (>85%) agreed to participate N=785 participated in final data collection Participants categorised as *disabled (n=222)* or *independent (n=151)* N=373 reported falls.	Risk factors - data collection included socio-demographic, functional ability, physical factors, health indicators, history of falls. Various methods of data collection including postal questionnaire, clinical measurements, medical records Outcome measurement - telephone contacts, falls diary and medical records over a two-year period.	*Disabled* *OR (95%CI)* Low body mass Index 4.1 (1.20-8.24) Benzodiazepines 2.4 (1.01-5.87) Acuity (<0.3) 2.3 (1.18-4.63) Impaired gait 2.2 (1.11-4.17) Divorced, widowed or unmarried 2.2 (1.09-4.40) Poor distant visual *Independent* Insomnia 4.1 (1.70-9.79) Peripheral neuropathy 2.5 (1.13-5.71)	Quality: high Data analysis only included fallers. Recall bias/ measurement bias.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Stalenhoef 1998 Netherlands	Community dwelling aged 70 and over. N=1238 (75% agreed to participate) N=311 selected due to intensive assessment required (one in four sample obtained). Final at baseline n= 311 N=287 at follow-up N=98 fallers N=198 falls.	Risk factors - home safety checklist. Same data set as Stalenhoef (2002). Outcome measurement - telephone follow-up every six weeks for a period of 36 weeks.	*Odds ratio (95%CI)* Hazards associated with falls occurring in the entrance hall of homes: 2.5 (1.4-4.6) ***Other environment hazards not significant***	
Cesari 2002 Italy	Community dwelling admitted to home care programme aged 65 and over. N=5570 (95% participated) N=1997 falls at follow-up.	Risk factors - MDS-HC assessment data set. Outcome measurement: fall events within 90 days.	*Odds ratio (95%CI)* Wandering 2.38 (1.81-3.12) Gait problems 2.13 (1.81-2.51) Depression 1.53 (1.36-1.73) Environmental hazards 1.51 (1.34-1.69)	No details of how outcome was measured.
Brown 2000 USA	Community dwelling aged 65 and over. Subjects were participants in the study of osteoporotic fractures (SOF) N=9704 at baseline N=7847 at follow-up for SOF study N=6049 (77.1%) at visit five follow-up for this study.	Risk factors - urge urinary and stress incontinence Outcome measurement - incident falls. Postcards sent out four-monthly with telephone follow-up. Data collected between 1994-1996.	*Odds ratio (95%CI)* Weekly or more frequent urge incontinence was associated independently with falls: 1.26 (1.14-1.40) Weekly or more frequent stress incontinence was not associated with falling: 1.06 (0.95-1.19)	Multivariate model with adjustment for all factors.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Tromp 1998 Netherlands	Community dwelling aged 65 and over. N=1508 (87% agreed to participate) N=1469 (97%) at follow-up Single falls n= 464 (32%) Recurrent fallers n=217 (15%).	Risk factors - baseline interview with questionnaire component including socio-demographic, physical function, ADL, functional performance, falls history. Outcome measurement – self-reported falls history at three-year follow-up interview. See Tromp 2001 for further study.	*Adjusted odds ratio (95%CI)* Risk profile for recurrent falls Incontinence 1.8 (1.2-2.7) Low physical performance 1.2 (1.1-7.4) Low physical activity 1.2 (1.0-3.4)	Quality: medium Follow-up for three years, outcome status identified by self-reported falls history therefore predictor status may have changed.
Cumming 2000 Australia	Community dwelling aged 65 and over.N=418 (79%) able to participate for Falls Efficacy Scale Other data excluded (see excluded studies) N=169 fell during follow-up.	Risk factors – socio-demographic, falls efficacy scale (o=low 100=high), falls history ADL from self-report during interview-administered questionnaire. Outcome measurement - daily falls calendar posted monthly to researchers for a period of one year.	*Adjusted hazard ratio (95%CI)* Falls Efficacy Scale ≤ 75 (n= 88) =2.09 (1.31-3.33)	Quality: high Subjects divided into sub categories based on scores and previous reported categorisation.
Gill 2000 USA	Community dwelling aged 72 and over. N=1103 (79% agreed to participate) N=822 at follow-up N=520 participants reported a fall N=1110 total falls *(same data set as Tinetti et al 1995).*	Risk factor - environmental hazards were assessed at baseline and one year later. Outcome measurement - falls were recorded by self-report using a falls calendar daily that was posted to researchers monthly for three years (99% completion rate).	*Proportional hazards ratio HR (95%CI)* Carpet folds or tripping hazard = 2.33 (1.15-4.72) All other = ns.	Quality: high At follow-up 188 had died, 93 had been admitted to nursing homes Follow-up period three years but environmental assessment at baseline and one year.
Covinsky 2001 USA	Retirement community dwelling 70 years and over. N=667/ N=557 at follow-up (84%) N=122 (22% reported a fall).	Risk factors - baseline interview data included falls history, socio-demographic, health status, ADL, and physical examination. Outcome measurement – follow-up one year and final interview conducted with previous years fall history reported.	*Univariate/ multivariate regression: odds ratio (95%CI)* Model one: History of falls 3.15 (2.00-4.95) Model two: Abnormal mobility 3.06 (1.93-4.86) Unbalanced /dizzy 1.96 (1.25-3.07) Model three: Abnormal mobility 2.64 (1.64-4.26) Fall history 2.42 (1.49-3.93) Unbalanced /dizzy 1.83 (1.16-2.89)	Quality: low Retrospective falls history at follow-up. Recall bias. Subjective self-rated risk factor identification.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Tromp 2001 Netherlands	Community dwelling aged 65 and over. N=1374 (94% agreed to participate) N=1285 (93%) completed all four data points. Single falls n= 281 (22%) Recurrent fallers n=146 (11%).	Risk factors - baseline interview with questionnaire component, including socio-demographic, physical function, ADL, functional performance, falls history and fear of falling. Outcome measurement - participants completed a falls diary weekly that was posted to researchers every three months for a period of one year.	*Odds ratio (95%CI) Risk profile model* Single fallers: Previous falls 2.6 (2.0-3.3) Incontinence 1.8 (1.4-2.4) Visual impairment 1.7 (1.3-2.3) Benzodiazepines 1.6 (1.2-2.3) Recurrent fallers: Previous falls 3.1 (2.2-4.4) Visual impairment 2.6 (1.8-3.8) Incontinence 2.3 (1.6-3.2) Functional limitation 1.7 (1.6-3.3)	Quality: high
Biderman 2002 Israel	Community dwelling aged 60 and over. N=361 (64% agreed to participate). N=283 at follow-up (78%) N=155 frequent fallers.	Risk factors - data collection included socio-demographic, functional ADL, self-rated health and physical activity, falls history, depressive symptoms (GDS) and elderly falls screening test (EFST) from interview questionnaire. Outcome measurement - retrospective falls history by self-report at one year follow-up.	*Relative risk RR (95%CI)* ADL limitations 6.23 (3.51-11.04) ADL 2 or more limitations 5.89(2.76-12.54) Poor health (self rated) 4.82 (1.19-19.6) Female 3.93 (1.57-9.87) Depression 2.83(1.50-5.34) >3 chronic diseases 2.27(1.02-5.05) Physical activity (self rated) 2.19(1.16-4.14)	Quality: medium Retrospective falls history at follow-up. Recall bias Subjective self-rated health and physical activity.
Ensrud 2002 USA	Community dwelling females aged 65 and over. N=8127 (93% participated) N= 6301 at follow-up (77%) N= 2241 (28%) reported falling once N=917 (11%) experienced frequent falls.	Risk factors - medication history from participant and drug categorisation by physicians. Socio-demographic, function including gait speed, ADL, mini mental state examination, and geriatric depression scale and BMD. Outcome measurement - participants were contacted every four months by postcard or telephone for frequency of falls for a period of one year.	*Multivariate analysis adjusted for confounders. Relative risk (95%CI)* One fall: Benzodiazepines 1.34 (1.09-1.63) Anticonvulsants 1.75 (1.13-2.71) Frequent falls: Benzodiazepines 1.51 (1.14-2.01) Antidepressants 1.54 (1.14-2.07) Anticonvulsants 2.56 (1.49-4.41)	Quality: medium Incompleteness of data, losses to follow-up. Self-reported falls history over four months.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Leveille 2002 USA	Community dwelling females aged 65 and over, living at home with disabilities. N=1002 (71% agreed to participate) N= 940 (93%) at one year follow-up. N=366 reported a fall at the end of year one N=2078 total falls for the three-year study period.	Risk factors - pain classification was described in terms of location and intensity measured with a 0-10 numerical rating scale (NRS). A cut off of four differentiated those with mild or no pain (0-3) and moderate/severe pain (4-10). Outcome measure - interviews at home every six months for three years, participants were asked about their falls history.	*Odds ratio (95%CI)* One or more falls: Moderate/severe pain 1.36 (1.02-1.82) Widespread pain 1.66 (1.25-2.21) Recurrent falls: Moderate/severe pain 1.54 (1.01-2.35_ Widespread pain 2.97 (1.45-6.08)	Quality: medium Retrospective falls history at follow-up.
Stenbacka 2002 Sweden	Community dwelling. Data from population study (N=4023) age range 20-89. Age range 60-89= N=1148 at baseline N=109 sustained one injurious fall N=107 >2 falls.	Risk factors - postal questionnaire including socio-demographic, alcohol consumption, use of hypnotics or sedatives. Outcome measure - one or more falls leading to hospitalisation or death from inpatient register records and death register records during a one-year follow-up.	*Relative risks RR(95%CI)* Age >80 Range 3.95- 5.85 Men (n=31) Earlier injuries 2.48 (1.19-5.13) Living alone 2.02 (1.09-3.73) Women (n=78) High alcohol consumption 2.13 (1.05-4.32) Sedatives/hypnotics 1.50 (1.03-2.19)	Quality: medium Response and recall bias (questionnaire). Confounding: outcome status of death.
van Schoor 2002 Netherlands	Community dwelling aged 55 and over. N=1437 (95% agreed to participate) N=1437 at follow-up. N=370 recurrent fallers.	Risk factors - cognitive tests were determined at baseline with: mini-mental state examination(MMSE), Raven's coloured progressive matrices (RCPM), coding task (CT) and 15-word test (15WT). Memory was tested with modified version of auditory verbal learning test. Outcome measure - falls were recorded by self-report or proxy, using a falls calendar weekly and mail to researchers every three months for three years, with telephone reminder.	*Odds ratio OR (95%CI)* Recurrent falls 15WT/Age >75 1.12 (1.05-1.19)	Quality: medium

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Wood 2002 UK	Community dwelling participants with a diagnosis of Parkinson's Disease. Age ranges 54-92 (mean 75) 77% agreed to participate resulting in n=109 N=74 fallers.	Risk factors - baseline assessment included: Falls history, demographic information, disease severity, gait and balance function, visual acuity, cardiovascular function, bone density. Outcome measurement - participants were given a set of weekly pre-paid postcards in which to record the number of falls sustained during that week. These were then returned weekly for the duration of one year. Fallers were followed up and circumstances of the fall were determined.	Independent predictors for falling *Logistic regression OR (95%CI)* Dementia 6.7 (1.1-42.5) Loss of arm swing 4.3 (1.3-13.7) Previous falls 4.0 (1.3-12.1) Each year of disease 1.3 (1.1-1.6)	Quality: medium Subjective rating scales used for health status and disease severity.
EXTENDED AND COMMUNITY DWELLING				
Leipzig 1999 USA reported	Systematic review and meta analysis (1975-1993). All settings although predominantly community dwelling and extended care N= 40 studies.	Risk factors – benzodiazepines, antidepressants, neuroleptics, hypnotics or sedatives, other psychotropic drugs. Outcome measurement - **f**allers and recurrent fallers.	Fixed effect model Comparison of pooled ORs and pooled RRs from cohort studies. Psychotropics n=11 studies OR RR 1.66)1.40-1.97) 1.35 (1.22-1.48) Antidepressants n=11 studies 1.62 (1.23-2.14) 1.27 (1.12-1.44) Neuroleptics n=10 studies 1.90 (1.35-2.67) 1.31 (1.15-1.49) Sedatives/hypnotics n=9 studies 1.25 ((0.98-1.60) 1.12 (0.99-1.26) Benzodiazepines n=8 studies 1.40 (1.11-1.76) 1.20 (1.07-1.36) Tricyclics n=8 studies 1.40 (0.96-2.02) 1.16 (0.99-1.35)	Quality: medium All settings. Limited database search. All study designs included although cohort design as sub group analysis. Minimal adjustment for confounders, dosage or duration of therapy.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Leipzig 1999 USA reported	Systematic review and meta analysis (1975-1993). All settings although predominantly community dwelling and extended care N= 29 studies.	Risk factors - cardiac drugs: Thiazides, loop diuretics, Digoxin, nitrates, beta blockers, calcium channel blockers, ACE inhibitors, centrally acting antihypertensiveces, type 1A antiarrythmics. Analgesics: narcotics, NSAIDs, Aspirin, unclassified. Outcome measurement - fallers and recurrent falls.	Cardiac drugs *Odds ratio (95%CI)* *All studies*: Type 1A antiarrythmics: n=10 studies 1.59 (1.02-2.48) Digoxin: n=17 studies 1.22 (1.05-1.42) Any diuretic: n=26 studies 1.08 (1.02-1.16) *Cohort studies* Digoxin: n=9 studies 1.29 (1.01-1.65) *Community* Any diuretic: n=13 studies 1.07 (1.00-1.15) Digoxin: n=9 studies 1.21 (1.01-1.44) *Extended care* Nil significant Analgesic: Nil significant Multiple medication use N= 14 studies Single fallers/ ≥3 drugs: 4/11 significant OR: range 1.57-3.16 Single fallers/ ≥4 drugs: 3/9 significant OR: range 2.07-2.9 Recurrent fallers ≥3 drugs: 3/4significant OR: range 2.02-3.16 Recurrent fallers ≥4 drugs: 4/5 significant OR: range 1.71-2.91	Quality: medium All settings. Limited database search. All study designs included although cohort design as sub group analysis. Minimal adjustment for confounders, dosage or duration of therapy.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Lowery 2000 UK	Community dwelling. (n=21)and extended care (n=41) N=65 dementia patients. Mean age 78.3 95% (n=62) at follow-up N=44 >1 fall N=12 > 5 falls.	Risk factors - MMS, psychiatric history, physical examination. Multidisciplinary assessment by an occupational therapist using the environmental hazards checklist blind to contents of diary. Outcome measurement - falls and circumstances were reported over a three-month period using a weekly diary completed by carers.	Differences between exposed and non-exposed and outcome status was explored using Mann-Whitney U test and association between number and individual environmental hazards tested with Spearman's rank correlation analysis. Results Significant difference between number of environmental hazards found in own home (mean 5.4) compared to extended care environment (mean 1.8) MWU Z=4.16, p=0.0001. Number of environmental hazards and individual hazards =ns	Quality: high Small sample size. Short length of follow-up.
EXTENDED CARE				
Thapa 1996 USA	Extended care settings. N=1228 residents of 12 nursing homes over 65 years of age, n=725 non-ambulatory and n=503 ambulatory. N=548 fallers (n=1585 falls).	Risk factors - baseline data included demographic, body mass index, cognitive impairment, psychotropic drugs, previous falls history obtained from staff and resident records (minimum data set MDS). Outcome measurement - nursing home incident reports, MDS, hospital records for a period of one year.	*Non-ambulatory* *IDR (95%CI)* Fewer mobility Limitations 2.92 (1.07-7.99) Male gender 2.62 (1.31-5.26) Lowest tertile BMI 2.47(1.28-4.78) Previous fall 2.23 (1.14-4.37) *Ambulatory* Psychotropic drugs 2.49(1.43-4.33)	Quality: high Follow-up ceased with occurrence of study event.

Appendix E: Evidence table 1 risk factors

Study	Population/setting	Methods	Results	Quality & comments
Ray 2000 USA	Extended care setting. N=2510 residents aged 65 and over N=853 (34%) had at least one day of benzodiazepine use during follow-up. N= 3706 falls.	Risk factors - benzodiazepine use from records was categorised as *current, recent, none* and users classified by dose, duration and elimination half-life. Other data from MDS. Outcome measurement - incident reports and medical records. Follow-up continued until participant exited the facility or there was a change in antidepressant use status. Mean follow-up = 225 days.	*Adjusted rate ratio (95%CI)* Recent user 1.23 (1.07-1.42) Current user 1.44 (1.33-1.56) Dose 2-8mg range 1.30-1.38 >8mg 2.21 (1.89-2.60) Days since start: <7 days 2.96 (2.33-2.75) 7-29 days 2.23 (1.64-3.03) >30 days 1.30 (1.17-1.44) Elimination half-life 12-23 hours 1.45 (1.33-1.59) >24 hours 1.73 (1.40-2.14)	Quality: high
Bueno-Cavanillas 2001 Spain	Extended care settings. N=190 residents of two nursing homes aged 65 and over. N=72 fallers / N=106 falls (n=63 extrinsic falls n=43 intrinsic falls).	Risk factors - baseline data included socio-demographic, dependence, psychological, physical, falls history, gait, balance and strength obtained from medical records, carers and self-report from participants, clinical examination. Outcome measurement - records with details of 'intrinsic' and 'extrinsic' causes for a period of one year.	*Density ratio: DR (95%CI)* *Independent risk factors* Intrinsic falls: Dementia 6.2 (1.7-23.3) Antidepressants 5.7 (1.5 –22.0) Neuroleptics 4.5 (1.6-12.6) Romberg incorrect 4.0 (1.2-13.3) Diabetes 3.8 (1.6-9.0) Sitting down incorr 3.4 (1.5-7.6) Cardiotonic glycoside 2.9 (1.2-6.9) Slow pace 2.6 (1.2-5.3) Previous falls 1.9 (1.3-2.9) Extrinsic: Oral bronchodilators 5.6 (1.6-19.7) Diabetes 4.1 (1.9-8.8) Neuroleptics 3.2 (1.6-6.6)	Quality: low 9% dropout rate.
Kallin 2002 Sweden	Extended care setting. N=83 (n=58 females, n=25 men) N= 52 fallers (at least once), Total falls n=163.	Risk factors - baseline data included functional clinical tests, medications, cognitive, depression and mini-mental state. A physician or a physiotherapist assessed all participants. Outcome measurement - falls were reported by staff to researcher, and standardised form completed for a follow-up period of one year.	*Odds ratio (95%CI)* One time fallers: Impaired vision 5.85 (1.14-30.08) Antidepressants 4.66 (1.23-17.59) Recurrent fallers: Antidepressants 6.31 (1.60-24.93) Previous fall 4.65 (1.48-14.60) Age 1.12 (1.02-1.23)	Quality: low Small sample.