National Institute for Health and Care Excellence

Final

Falls: assessment and prevention in older people and people 50 and over at higher risk

F2 Evidence review: Interventions for prevention of falls in community settings: education, medication provision, vitamin D, nutrition, psychological and surgical interventions

NICE guideline NG249

Evidence reviews underpinning recommendations 1.3.1 to 1.3.14 and recommendations for research in the NICE guideline

April 2025

Final

This evidence review was developed by NICE

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1. Interventions for prevention of falls in community care settings: education, medication provision, vitamin D, nutrition therapy, psychological interventions and surgical interventions.

1.1. What are the most clinically effective and cost-effective interventions for preventing falls in older people in community settings?

1.1.1. Introduction

In 2013 falls cost the NHS £2.3 billion and the human cost to individuals and their families/carers can be devastating and includes distress, pain, loss of confidence and increased mortality (taken from NICE falls guideline 2013). It is therefore important to determine the most clinically effective and also cost-effective methods to prevent falls from occurring.

Currently older people identified with a risk of falling are assessed using a multifactorial risk assessment, this provides individualised identification of components which can then be targeted for intervention. Current recommendations include strength and balance training, home hazard and safety intervention, psychotropic medication review, cardiac pacing (where clinically indicated), participation in falls prevention programmes and education and information giving from the clinician to the person at risk of falling and to their families and carers.

This review was undertaken to ensure that further research in this area was taken into consideration within the recommendations.

1.1.2. Summary of the protocol

For full details see the review protocol in Appendix A.

Table 1: PICO characteristics of review question

Population	People in the community who are: • aged 65 and over • aged 50 to 64 who have a condition or conditions that may put them at higher risk of falling.
Intervention(s)	Any intervention designed to reduce falls in older people in the community. Interventions grouped by combination (single, multiple or multifactorial); then by type of intervention (descriptors). Possible descriptors include: • Exercise: group and individual • Medication: vitamin D; calcium; HRT • Medication withdrawal • Surgery: cardiac pacemaker insertion; cataract surgery. • Fluid or nutrition therapy

	• Psychological interventions: CBT • Environment/assistive technology: home safety interventions; aids for personal mobility. • Environmental aids for communication, information and signalling e.g. vision improvement. • Body worn aids for personal care and protection: footwear modification. • Knowledge/education interventions Multiple component interventions: combination of single categories of intervention (receive a fixed combination of 2 or more fall prevention interventions from the different categories above) Multifactorial interventions: more than one main category of intervention (assessment of an individual to determine the presence of 2 or more modifiable risk factors for falling, followed by specific interventions targeting those risk factors).
Comparison(s)	Single interventions' comparators: • Usual care/placebo Multicomponent or multifactorial interventions' comparators: • Usual care/attention control • Exercise as a single intervention. Exercise • Usual care/control • Exercise
Outcomes	All outcomes are considered equally important for decision making and therefore have all been rated as critical: • Rate of falls • Number of people sustaining one or more falls • Number of participants sustaining fall-related fractures • Adverse effects of the interventions (composite of all) • Validated health-related quality of life scores e.g. EQ-5D or similar
Study design	Randomised controlled trials (RCTs). There are enough RCTs identified within the area so we will not be including non-randomised studies. For a systematic review (SR) to be included it must be conducted in line with the methodological processes described in the NICE manual. If sufficient details are provided, reviewers will either include the SR fully or use it as the basis for further analyses where possible. If sufficient details are not provided to include a relevant SR, the review will only be used for citation searching. Published NMAs and IPDs will be considered for inclusion.

1.1.3. Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document.

This evidence review includes a Cochrane review Gillespie, 2012, [21] which matched the protocol for our question. Gillespie 2012[21], focused on multiple interventions for preventing falls in older people living in the community, including exercise, multifactorial/multicomponent, medication provision and withdrawal, surgical interventions, psychological interventions, environmental or assistive technology, and knowledge or educational interventions. We have updated the Gillespie 2012[21], Cochrane review to include all recent papers, which were identified in the search, which match the protocol for interventions for prevention of falls focusing on medication provision (including vitamin D, calcium and HRT); medication review; surgical (including cardiac pacemaker insertion and cataract surgery); fluid or nutrition therapy; psychological interventions (including CBT); and knowledge and educational interventions. Extractions for studies included in the Cochrane can be found within the Cochrane review [21], and any studies updating it can be found in the study extractions in this review.

A new Cochrane (Drahota 2024) investigated psychological and educational falls interventions. This incorporated additional categorisation of the interventions compared to Gillespie 2012[21], but included Cognitive Behavioural Interventions, motivational interviewing, other psychological interventions (health coaching, guided imagery, mental practice) and single-topic, multifactorial and multicomponent education. Studies included in the Cochrane review that fulfilled our inclusion criteria can be found in the evidence reviews on psychological, educational, multifactorial and multicomponent, and environmental interventions.

Population

Gillespie 2012[21] included studies with participants with a minimum age of 60 years or older. Younger participants could be included if the mean age minus one standard deviation was more than 60 years. This differs to the protocol for this review as participants were included if they were aged 65 years or older. Similarly to Gillespie, 2012,[21] we would include studies with younger participants if the mean age minus one standard deviation was more than 65 years. Trials were included if the majority of participants were living in the community, either at home or in places of residence that do not provide health-related care or rehabilitation. Trials of interventions to prevent falls in older people post stroke or with Parkinson's disease were excluded.

When focusing on surgical interventions, Gillespie 2012[21] subdivided the findings by those who were selected to be at a high risk of falling at baseline compared to those at a lower risk at the time of enrolment. These were not subgroups within the present protocol.

Outcomes

The Gillespie 2012[21] review reported the treatment effect for rate of falls as rate ratio (RaR) and 95% confidence interval. For number of fallers and number of participants sustaining fall related fractures they reported a risk ratio (RR) and a 95% confidence interval (CI).

Rate of falls

Gillespie 2012[21] used a rate ratio (incidence rate ratio or hazard ratio), and 95% CI, if these were reported in the paper. In the event both adjusted and unadjusted rate ratios were reported, the unadjusted estimate was used unless the adjustment was for clustering. For the updated included studies adjusted estimates were included. If the rate ratio was not reported but appropriate raw data was available, Excel was used to calculate a rate ratio and 95% confidence interval. The authors reported the rate of falls (falls per person year) in each group and the total number of falls in participants contributing data, or the rate of falls in each group was calculated from the total number of falls and the actual total length of time falls were monitored (person years) for participants contributing data. For the updated included studies rate ratios and 95% confidence intervals reported. Where rate ratios and 95% confidence intervals were not reported these were calculated where possible if raw data was

available. Studies where rate ratios were calculated are marked with footnotes in the GRADE table in appendix F.

Risk of falling

For number of fallers, Gillespie 2012[21] states that a risk ratio was used to compare the number of people who fell once or more between groups. The authors used a reported estimate of risk (hazard ratio for first fall, risk ratio (relative risk), or odds ratio) and 95% confidence interval if available. If both adjusted and unadjusted estimates were reported, the unadjusted estimate was used, unless the adjustment was for clustering. For the updated included studies risk ratios were used to compare number of people who fell once or more between groups. Adjusted estimates were included.

Quality of life

Studies included from the Cochrane review (Gillespie 2012)[21] were checked for potential Quality of life outcomes. If studies reported Quality of life outcomes, data were extracted and added to the analysis. Where standard errors (SE) were reported, standard deviations (SD) were calculated in excel.

Missing data

Only trials with complete data were used in Gillespie 2012[21]. Available case analysis was used in the included updated studies.

Meta-analysis and GRADE

We added studies from the update searches to the Gillespie 2012[21] Cochrane review to their Revman meta-analyses. We completed GRADE ratings for all available evidence. We used the Cochrane review's risk of bias ratings and extractions within GRADE, but graded other components, such as, indirectness, inconsistency and imprecision according to NICE methodology. Furthermore, the Gillespie review did not present summary of findings tables, whereas we require all findings to be reported in the review.

The Gillespie 2012[21] Cochrane review used the generic inverse variance method in Revman. This enables pooling of the adjusted and unadjusted treatment effect estimates for rate ratios or risk ratios. For our results from the new studies to be integrated with the Cochrane review we followed the generic inverse variance method. However, this meant that absolute effects were not reported for some of the data and where we normally base decisions on clinical importance (benefit, harm or no difference) on the point estimate of the absolute values we instead used the relative risk/rate ratio point estimate. Where absolute values could be established these were used. Quality of life utility data was not reported in Gillespie 2012[21] so the included studies were checked for this data and added to the analysis.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Education interventions for falls prevention in community care settings

1.1.4. Effectiveness evidence

1.1.4.1. Included studies

One Cochrane review (Gillespie 2012)[21] was identified in the search, which included 4 randomised controlled studies. One study (Hill 2019)[28] was identified from our search of the evidence, which although initially in hospital the delivery of the intervention was continued in the community. These studies are summarised in Table 2 below.

See also the study selection flow chart in Appendix C, study evidence tables in 0, forest plots in Appendix E and GRADEpro tables in E.3.

1.1.4.2. Excluded studies

See the excluded studies list in Appendix H.

1.1.5. Summary of studies included in the effectiveness evidence

Table 2: Summary of studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Dapp, 2011[15] RCT (cluster randomised if same household) Multicentre	Health risk appraisal with GP feedback and reinforcement sessions (n=878) Usual care (n=1702) Duration of the study: one year	Community dwelling adults aged 60 years or over Mean age (SD): 71.8 (7.6) years Sex: 63% female Setting: 14 General Practices, Hamburg, Germany	Number of fallers	Study identified in Cochrane (Gillespie, 2012)
Hill 2019[28] Cluster RCT	Education intervention while in hospital, with monthly phone calls after discharge (n=194) Usual care (n=188) Duration of the study: follow-up 6 months.	Adults in hospital rehabilitation wards and when back in the community Mean age (SD): IG: 77.4 (8.8); CG: 78.1 (8.5) years Sex: 61% female Setting: 3 hospitals, Australia	Rate of falls; number of fallers; number of participants who sustained a falls-related fracture	This intervention was conducted in hospital but was focused on preventing falls post-discharge and monthly phone calls were given after discharge to reinforce the education and modify the plan as required.
Huang, 2010[31]	Group teaching sessions (5 group teaching sessions	Community dwelling adults, 65 years or over	Number of fallers	Study identified in Cochrane (Gillespie, 2012)

Study	Intervention and comparison	Population	Outcomes	Comments
Cluster RCT (by village)	over 5 months – on medications, nutrition, environment (inside and outside), footwear plus discussion) (n=62) Control (n=62) Duration of the study: 5 months and 18 months	Mean age (SD): 71.5 (0.64) years Sex: 59% female Setting: 4 villages, Taipei, Taiwan		
Robson, 2003[58] Parallel RCT	Group teaching sessions (2 x 90-minute group sessions one month apart; client handbook) (n=235) Control (n=236) Duration of the study: 4 months	Community dwelling adults Mean age (SD): 73 (6.7) years Sex: 81% female Setting: Alberta, Canada	Number of fallers	Study identified in Cochrane (Gillespie, 2012)
Ryan, 1996[60] Parallel RCT	Group fall prevention education programme (1 hour fall prevention education programme discussing risk modification in groups and nurse-led) (n=16) Fall prevention education programme as above individually with nurse (n=14) Control (presentation on health promotion) (n=15) Duration of study: 3 months	Community dwelling women, 65 years or over Mean age (range): 78 (67 to 90) Sex: 100% female Setting: Baltimore, Maryland, USA	Rate of falls; number of fallers	Study identified in Cochrane (Gillespie, 2012)

(a) GP: General Practitioner

See 0 for full evidence tables.

1.1.6. Summary of the effectiveness evidence

See E.3 for full GRADEpro tables

Table 3: Clinical evidence summary: Education interventions versus control

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Knowledge/education interventions	
Rate of falls	427 (2 RCTs)	⊕◯◯◯ Very low[a,b,c]	**Rate ratio 1.01** (0.73 to 1.40)	-	-	MID: 0.8 to 1.25 (precision: CI crosses both MIDs) No difference
Number of fallers	2937 (5 RCTs)	⊕◯◯◯ Low[a]	**RR 0.97** (0.85 to 1.11)	-	-	MID: 0.8 to 1.25 No difference
Number of fall related fractures	382 (1 RCT)	⊕◯◯◯ Very low[a,c]	**RR 0.72** (0.29 to 1.77)	-	-	MID: 0.8 to 1.25 (precision: CI crosses both MIDs) Benefit of education

a. Downgraded by 2 increments for risk of bias due to no details about the randomisation process, no details about the allocation concealment process, participants and personnel were not blinded, the outcome assessment process was not blinded, no available protocol, and potential for recall bias.

b. Downgraded by 1 or 2 increments due to heterogeneity, I^2=50%, unexplained by subgroup analysis

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes.

1.1.7. Economic evidence

1.1.7.1. Included studies

No health economic studies were included.

1.1.7.2. Excluded studies

One economic study relating to this review question was identified but was excluded due to a combination of limited applicability and methodological limitations.[25] This is listed in Appendix H, with reasons for exclusion given.

See also the health economic study selection flow chart in F.1.

1.1.8. Summary of included economic evidence

No health economic studies were included for this review question.

1.1.9. Economic model

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

1.1.10. Evidence statements

1.1.10.1. Economic

- No relevant economic evaluations were identified.

1.1.11. The committee's discussion and interpretation of the evidence

1.1.11.1. The outcomes that matter most

The committee discussed that all outcomes were considered equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on education interventions for falls prevention only found evidence for the outcomes rate of falls, number of fallers and number of fall related fractures. No evidence was found for the outcomes of number of people sustaining one or more falls, adverse events and for the outcome of health-related quality of life.

1.1.11.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as low or very low. Findings were downgraded due to risk of bias (for example, lack of blinding, risk of bias in recall of falls, and poor reporting of randomisation procedures). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. The evidence was not downgraded for inconsistency and indirectness. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.11.3. Benefits and harms

The education interventions included both group and individual sessions focusing on raising awareness of risk reduction strategies and preventive measures such as environmental hazards, medication, footwear, vision, and improving strength and balance. There was no difference in the rate of falls and number of fallers between the education and control group. One study showed a benefit for education versus control in reducing the number of fall related fractures after discharge from hospital, however this finding was only based on one small study with imprecision. Evidence from a recently published Cochrane review (Drahota 2024) was discussed by the committee but could not be included in this guideline as it was published after the cut-date for the literature search. This review examined educational interventions and concluded that personalised (multifactorial) education made little-to-no difference to the rate of falls, and the evidence for other types of education (multiple topics, or single topic) on rate of falls, number of fallers and fall-related fractures was very uncertain.

The committee agreed standalone education interventions would not generally be provided in current practice but would often be part of a multifactorial package individualised according to individual needs. The committee thought education on its own would not have any impact on risk factors to reduce falls.

1.1.11.4. Cost effectiveness and resource use

No health economic evidence was identified for education interventions in community dwelling older adults. The committee made no standalone recommendations for education interventions. They noted that this reflects current practice. In current practice, education forms part of comprehensive assessment and intervention.

1.1.12. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.14 in the NICE guideline.

Medication provision interventions for falls prevention in community care settings

1.1.13. Effectiveness evidence

1.1.13.1. Included studies

A total of 17 studies were included in the review (Barker, 2022[3]; Boye, 2017[11]; Blalock, 2010[9]; Campbell, 1999[12]; Gallagher, 2001[20]; Greenspan, 2005[24]; Jungo, 2023[34]; Juraschek, 2019[35]; Meredith, 2002[40]; Montero-Odasso, 2019[41]; Mott, 2016[42]; Pit, 2007[50]; Ralston, 2011[55]; Reid, 2006[56]; Swart, 2016[65]; Witham, 2019[71]; Zhou, 2020[72]) these are summarised in Table 2 below. One Cochrane review (Gillespie, 2012)[21] was identified in the search, which included 8 randomised controlled trials. Four studies compared hormone replacement therapy (HRT) to control or placebo (Gallagher, 2001[20]; Greenspan, 200[24]6; Ralston, 2011[55]; Reid, 2006[56]), 7 studies compared medication review or withdrawal to control or care as usual (Blalock, 2010[9]; Boye, 2017[11]; Campbell, 1999[12]; Jungo, 2023[34]; Meredith, 2002[40]; Mott, 2016[42, 50], 1 study compared amplodipine to chlorthalidone and lisinopril (Juraschek 2019)[35], 1 study compared donepezil to placebo (Montero-Odasso, 2019),[41] 1 study compared vitamin B to placebo (Swart, 2016),[65] 1 study compared vitamin K to placebo (Witham, 2019),[71] 1 study compared aspirin to placebo (Barker, 2022) and 1 study compared calcium plus alfacalcidol plus alendronate to control (Zhou, 2020).[72] Seven studies reported rate of falls (Blalock, 2010[9]; Campbell, 1999[12]; Gallagher, 2001[20]; Jungo, 2023[34]; Montero-Odasso, 2019,[41] Swart, 2016[65]; Zhou, 2020[72]), Thirteen studies reported number of fallers (Blalock, 2010[9]; Boye, 2017[11]; Campbell, 1999[12]; Gallagher, 2001[20]; Greenspan, 2005[24]; Jungo, 2023[34]; Juraschek, 2019[35]; Meredith, 2002[40]; Montero-Odasso, 2019[41]; Mott, 2016[42]; Pit, 2007[50], Ralston, 2011[55]; Swart, 2016[65]), Three studies reported the number of people sustaining a fracture (Barker, 2022[3]; Jungo, 2023[34]; Reid, 2006[56], and 1 study reported adverse outcomes (Witham 2019)[71]. Evidence from these studies is summarised in the clinical evidence summary below (Table 3).

See also the study selection flow chart in Appendix C, study evidence tables in 0, forest plots in Appendix E and GRADEpro tables in E.3.

1.1.13.2. Excluded studies

See the excluded studies list in Appendix H.

1.1.14. Summary of studies included in the effectiveness evidence

Table 4: Summary of studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Barker, 2022[3] (ASPREE-FRACTURE sub study) Parallel RCT	Aspirin (oral 100mg low-dose aspirin) (n=8322) Placebo (identical placebo tablet) (n=8381) Duration of study: median follow-up 4.6 years	Community dwelling adults, 70 years and over Median age (IQR): 74 (72-78 years) Sex: 55% female Setting: Australia	Rate of serious falls; Number of people with at least one serious fall; Number of people sustaining a fracture	

Study	Intervention and comparison	Population	Outcomes	Comments
Blalock, 2010[9] Parallel RCT	Medication review and withdrawal (Pharmacist intervention: face to face consultation about medications) (n=93) Usual care (fall prevention brochure and home safety checklist) (n=93) Duration of the study: 1 year	Community dwelling adults, aged 65 years and over Mean age (SD): 74.8 (6.9) years Sex: 70.9% female Setting: North Carolina, USA	Rate of falls; number of fallers	Study identified in Cochrane (Gillespie, 2012)
Boye, 2017[11] (IMPROveFALL trial) Parallel RCT Multicentre	Medication review and withdrawal of Fall-risk-increasing-drugs (FRIDS) (n=319) Usual care (n=293) Duration of the study: follow-up 1 year	Community dwelling adults who visited an ED due to a fall Mean age: 76 years Sex: 62% female Setting: Netherlands	Number of fallers	
Campbell, 1999[12] Parallel RCT	Psychotropic medication withdrawal (n=45) Control (original medication) (n= 48) Duration of the study: 44 weeks	Community dwelling adults, 65 years or over Mean age (SD): 74.7 (7.2) years Sex: 76% female Setting: Dunedin, New Zealand	Rate of falls; number of fallers	Study identified in Cochrane (Gillespie, 2012)
Gallagher, 2001[20] Parallel RCT	HRT/ERT 0.625mg daily + medroxyprogesterone 2.5mg daily (n-122) Placebo (n=123) Duration of the study: 3 years	Community dwelling adults, aged 65-77 years Mean age (SD): 71 (4) years Sex: 100% female Setting: Omaha, USA	Rate of falls, number of fallers; number sustaining a fracture; number of people with adverse events	Study identified in Cochrane (Gillespie, 2012) Other arms were Calcitriol 0.25ug twice daily for 3 years; Calcitriol plus HRT/ERT as above
Greenspan, 2005[24] 2x2 factorial design RCT	HRT (n=187) Control (n=186) Duration of study: 3-year trial	Community dwelling women, 65 years and over Mean age (SD): 71.3 (5.2) years Sex: 100% female	Number of fallers	Study identified in Cochrane (Gillespie, 2012)

Study	Intervention and comparison	Population	Outcomes	Comments
		Setting: Greater Boston, USA		
Jungo, 2023[34]; Cluster RCT	Medication review using electronic clinical decision support system (n= 160) Usual care (n= 163) Duration of the study: 1 year	Community dwelling adults aged ≥65 years, taking five+ long term medications and with at least three chronic conditions Median age (IQR): 77 (73-83) years Sex: 45% female Setting: Switzerland	Rate of falls Number of fallers Number of people with fractures Quality of life (VAS)	
Juraschek, 2019[35] (sub trial of the ALLHAT trial) Parallel RCFT	Amplodipine (n= 6,522) Chlorthalidone (n= 11,000) Lisinopril (n= 6,442) Duration of study: follow-up 1 year	Community dwelling adults with hypertension, aged 65 and over Mean age (SD): 69.8 (6.8) years Sex: 45% female Setting: USA	Number of fallers	
Meredith, 2002[40]	Medication review and withdrawal (n= 160) Usual care (n= 157)	Community dwelling adults enrolled with home health care agencies Mean age (SD): 80 (8.0) Sex: 75% female Setting: USA	Number of fallers	Study identified in Cochrane (Gillespie, 2012)
Montero-Odasso, 2019[41]	Donepezil (n= 31) Placebo (n= 29) Duration of the study: 6 months	Community dwelling adults with mild cognitive impairment Mean age (SD): 75.3 (7.2) Sex: 45% female Setting: Canada	Number of falls, number of fallers	
Mott, 2016[42]	Medication review (n= 39) Usual care (n= 41) Duration of the study: 1 year	Community dwelling adults with previous falls Mean age (SD): 75.6 (14.7) Sex: 79% female	Number of fallers	

Study	Intervention and comparison	Population	Outcomes	Comments
		Setting: USA		
Pit, 2007[50] Cluster RCT	GP educational programme plus medication review and modification (n = 350) Control (n = 309) Duration of the study: 12 months	Community dwelling adults attending general practices Mean age (SD): NR (participants aged ≥65 years included) Sex: NR Setting: Australia	Number of fallers; Quality of life	Study identified in Cochrane (Gillespie, 2012)
Ralston, 2011[55]	Alendronate plus Vit D (n = 257) Control (n= 258) Duration of the study: 1 year	Community dwelling postmenopausal women with osteoporosis Mean age (SD): 73 years Sex: 100% female Setting: multicentre 24 countries worldwide	Number of fallers	Study identified in Cochrane (Gillespie, 2012)
Reid, 2006[56]	Calcium (n=732) Placebo (n=739) Duration of the study: 5 years	Community dwelling women Mean age (SD): 74.3 (4.3) Sex: 100% female Setting: New Zealand	Number of people sustaining a fracture	Study identified in Cochrane (Gillespie, 2012)
Swart, 2016[65] (B-PROOF study) Parallel RCT	Vitamin B12 and folic acid supplementation (daily oral supplement of 500ug vitamin B12, 400ug folic acid and 600 IU vitamin D) (n=1461) Placebo (600IU vitamin D placebo tablet) (n=1458) Duration of the study: 2 years	Community dwelling adults, 65 years and over Mean age (SD): IG: 74.2 (6.4); CG: 74 (6.6) years Sex: IG: 49.7%; CG 50.4% female Setting: the Netherlands	Number of falls; number of fallers; number of people sustaining a fracture	The main outcome of the trial was incidence of osteoporotic fractures.
Witham, 2019[71]	Vitamin K (200µg) (n=32) Vitamin K (400µg) (n=31)	Community dwelling adults with previous falls	Rate of falls; Adverse outcomes	

Study	Intervention and comparison	Population	Outcomes	Comments
	Placebo (n=32) Duration of the study: 1 year	Mean age (SD): IG1: 74.7 (7.4); IG2: 75.1 (6.5); placebo: 75 (6.9) years Sex: 61% female Setting: UK		
Zhou, 2020[72] Parallel RCT	Calcium plus alfacalcidol plus alendronate (n=62) Control (calcium plus alfacalcidol) (n=61) Duration of the study: 18 months	Community dwelling adults living with Osteopenia, 80 year or over Mean age (SD): 83.54 (2.99) years Sex: 25.2% women Setting: outpatient department of geriatrics in hospital, Beijing, China	Number of falls; number of people sustaining a fracture	

HRT: Hormone replacement therapy

See 0 for full evidence tables.

1.1.15. Summary of the effectiveness evidence

Table 5: Clinical evidence summary: Medication provision – Other medication vs control

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication withdrawal	
Rate of falls - Hormone replacement therapy vs placebo	212 (1 RCT)	⨁⨁◯◯ Low[a,b]	**Rate ratio 0.88** (0.65 to 1.18)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Rate of falls - Hormone replacement therapy + calcitriol vs placebo	214 (1 RCT)	⨁⨁◯◯ Low[a,b]	**Rate ratio 0.75** (0.58 to 0.97)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of HRT+calcitriol**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication withdrawal	
Rate of falls - Donepezil vs placebo	45 (1 RCT)[c]	⊕◯◯◯ Very low[d,e]	**Rate ratio 0.77** (0.38 to 1.56)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of Donepezil**
Rate of falls - Vitamin B vs placebo	2919 (1 RCT)[c]	⊕⊕⊕⊕ High	**Rate ratio 1.04** (0.98 to 1.10)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Rate of falls - Calcium + alfacalcidol + alendronate vs control	123 (1 RCT)[c]	⊕◯◯◯ Very low[e,f]	**Rate ratio 0.93** (0.51 to 1.70)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers – Hormone replacement therapy vs control/placebo	585 (2 RCTs)	⊕⊕⊕◯ Moderate[a]	**RR 0.94** (0.81 to 1.08)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers – Hormone replacement therapy + calcitriol vs placebo	214 (1 RCT)	⊕⊕◯◯ Low[a,b]	**RR 0.90** (0.72 to 1.11)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers – Alendronate + vitamin D3 vs control	515 (1 RCT)	⊕◯◯◯ Very low[b,g]	**RR 0.82** (0.59 to 1.14)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication withdrawal	
Number of fallers – Donepezil vs placebo	45 (1 RCT)	⊕◯◯◯ Very low[d,e]	**RR 0.73** (0.35 to 1.50)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of Donepezial**
Number of fallers – Vitamin B vs placebo	2919 (1 RCT)	⊕⊕⊕⊕ High	**RR 1.00** (0.93 to 1.08)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of people with serious falls – Aspirin vs placebo	16703 (1 RCT)	⊕⊕⊕⊕ High	**RR 1.10** (1.00 to 1.21)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Rate of serious falls – Aspirin vs placebo	16703 (1 RCT)	⊕⊕⊕◯ Moderate[b,c]	**Rate ratio 1.17** (1.03 to 1.33)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of people sustaining a fracture – Calcium vs placebo	1255 (1 RCT)	⊕⊕⊕◯ Moderate[b]	**RR 0.90** (0.69 to 1.16)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of people sustaining a fracture – Aspirin vs placebo	16703 (1 RCT)	⊕⊕⊕⊕ High	**RR 0.97** (0.88 to 1.06)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication withdrawal	
Number of people sustaining a fracture – Alendronate vs placebo	122 1 (RCT)	⊕⊕◯◯ Low[b,i]	**RR 0.40** (0.15 to 1.08)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of Alendronate**
Rate of falls - Amplodipine vs Chlorthalidone	17522 (1 RCT)	⊕⊕◯◯ Low[b,f]	**Hazard Ratio 2.24** (1.06 to 4.73)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical harm for amplodipine**
Rate of falls - Lisinopril vs Chlorthalidone	17442 (1 RCT)	⊕◯◯◯ Very low[e,f]	**Hazard Ratio 0.85** (0.32 to 2.26)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Rate of falls – Amplodipine vs Lisinopril	12964 (1 RCT)	⊕⊕◯◯ Low[b,f]	**Hazard Ratio 2.63** (1.03 to 6.72)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical harm for amplodipine**
Adverse events – Vitamin K (200µg) vs Vitamin K (400µg)	63 (1 RCT)	⊕⊕◯◯ Low[b,h]	**Rate ratio 1.30** (0.90 to 1.88)	0 per 1,000	0 fewer per 1,000 (0 fewer to 0 fewer)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical harm for lower (200µg) vitamin K dosage**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication withdrawal	
Adverse events - Vitamin K (200µg) vs Control	64 (1 RCT)	⊕⊕◯◯ Low[b,h]	**Rate ratio 1.45** (0.99 to 2.12)	0 per 1,000	0 fewer per 1,000 (0 fewer to 0 fewer)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical harm for vitamin K**
Adverse events - Vitamin K (400µg) vs Control	63 (1 RCT)	⊕◯◯◯ Very low[e,h]	**Rate ratio 1.11** (0.74 to 1.67)	0 per 1,000	0 fewer per 1,000 (0 fewer to 0 fewer)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical harm for vitamin K**

a. Downgraded by 1 increment due to high risk of bias in recall of falls

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Rate ratio calculated from number of events

d. Downgraded by 2 increments due to high risk of bias in missing outcome data and judgement for selection of the reported result

e. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

f. Downgraded by 1 increment due to lack of information regarding randomisation process.

g. Downgraded by 2 increments due to lack of blinding

h. Downgraded by 1 increment due to missing outcome data

i. Downgraded by 2 increments due to lack of blinding

Table 6: Clinical evidence summary: Medication review, medication withdrawal vs control

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication review/ withdrawal	
Rate of falls - Psychotropic medication withdrawal vs control	93 (1 RCT)	⊕◯◯◯ Very low[b,d]	**Rate ratio 0.34** (0.16 to 0.73)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication review/ withdrawal	
						Benefit for medication withdrawal
Rate of falls - Medication review and modification vs usual care	509 (2 RCTs)	⊕⊕⊕⊕ High	**Rate ratio 1.00** (0.81 to 1.25)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - Psychotropic medication withdrawal vs control	93 (1 RCT)	⊕⊕◯◯ Low[a,d]	**RR 0.61** (0.32 to 1.17)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit for medication withdrawal**
Number of fallers - Medication review and modification vs usual care	1460 (5 RCTs)	⊕⊕◯◯ Low[a,c]	**RR 1.09** (0.93 to 1.27)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - GP educational programme + medication review and modification vs control	659 (1 RCT)	⊕◯◯◯ Very low[a,e]	**RR 0.61** (0.41 to 0.91)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit for medication review**
Number of people sustaining fractures - Medication review and modification vs usual care	323 (1 RCT)	⊕◯◯◯ Very low[g,b]	**RR 1.53** (0.26 to 9.2)	12 per 1000	7 more per 1000	MID (precision) = RR 0.80-1.25. MID (clinical importance) 10 per 1,000.

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Medication review/ withdrawal	
						No difference
Quality of life (EQ5D) - Medication review and modification vs usual care	323 (1 RCT)	⊕◯◯◯ Very low[g,h]	-	The mean quality of life (EQ5D) in usual care group was **0.1**	**MD 0** (0.04 lower to 0.04 higher)	MID: EQ-5D = 0.03 (Pragmatic MID agreed by NICE) **No difference**
Quality of life (SF-12 Physical score) - GP educational programme + medication review and modification vs control	659 (1 RCT)	⊕⊕⊕◯ Moderate[f]	-	The mean quality of life in control group was **45.3**	MD **1.7 higher** (0.21 higher to 3.19 higher)	MID: 0.5 x SD = +/- 4.60 **No difference**
Quality of life (SF-12 Mental score) - GP educational programme + medication review and modification vs control	659 (1 RCT)	⊕⊕⊕◯ Moderate[f]	-	The mean quality of life in control group was **54.3**	MD **0.7 higher** (0.33 lower to 1.73 higher)	MID: 0.5 x SD= +/- 7.36 **No difference**

a. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

b. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 1 increment due to lack of information regarding randomisation process.

d. Downgraded by 1 increment due to missing outcome data

e. Downgraded by 2 increments due to missing outcome data and high risk of bias in recall of falls

f. Downgraded by 1 increment due to high risk of bias in recall of falls.

g. Downgraded by 2 increments due to missing outcome data, randomisation process, and subjective outcome with some unblinded participants

h. Downgraded by 1 increment as confidence interval crossed one MID (EQ-5D = 0.03 - Pragmatic MID by NICE)

1.1.16. Economic evidence

1.1.16.1. Included studies

One health economic study with the relevant comparison was included in this review.[51] This is summarised in the health economic evidence profile below (Table 12) and the health economic evidence table in 0.

1.1.16.2. Excluded studies

No relevant health economic studies were excluded due to assessment of limited applicability or methodological limitations.

See also the health economic study selection flow chart in F.1.

1.1.17. Summary of included economic evidence

Table 7: Health economic evidence profile: Medication review versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Polinder 2016[51] (Netherlands)	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Within trial analysis (IMPROveFALL trial), Boye 2017. • Cost-utility analysis (QALYs) • Population: Age 65 years or older, visited the emergency department due to a fall and community dwelling. • Setting: Community • Comparators: 1. Usual care 2. Systematic FRIDs assessment combined with FRIDs withdrawal or modification, if safely possible. Follow-up: 1 year	£34[(c)]	0.05 QALYs	£681 per QALY gained	No bootstrapping undertaken. A secondary analysis was performed of the decline in HRQoL in the participants of the control and intervention group with and without a fall during follow-up. This did not change the conclusions of the analysis, those in the intervention 2 had more QALYs than in intervention 1.

Abbreviations: FRIDs= fall risk increasing drugs; ICER= incremental cost-effectiveness ratio; QALY= quality-adjusted life years; RCT= randomised controlled trial

(a) Dutch healthcare perspective may not reflect UK NHS context.

(b) Based on single RCT, may not reflect full body of evidence (1 of 4 RCTs for this comparison, proportion of fallers similar to pooled estimate). 2012 Dutch costs may not reflect current NHS context. Short time horizon may not capture all downstream effects of intervention. Poor compliance in terms of withdrawal of psychotropic drugs, usual care incorporates falls prevention and therefore effect of intervention may be reduced.

(c) 2012 Euros converted to UK pounds[44]. Cost components incorporated: FRIDs assessment and modification (intervention cost £102), drug consumption (the cost of substitution drugs), and fall-related healthcare consumption (for example: outpatient visits, hospital admissions, General Practitioner consultations, home care, nursing home care).

1.1.18. Economic model

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

1.1.19. Evidence statements

1.1.19.1. Economic

- One cost utility analysis found that medication review was cost effective compared to usual care in community dwelling older adults who had visited A&E due to a fall (ICER: £681 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations.

1.1.20. The committee's discussion and interpretation of the evidence

1.1.20.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The studies on medication provision for falls prevention found evidence for all outcomes (rate of falls, number of people sustaining one or more falls, number of participants sustaining fall related fractures, adverse events and health-related quality of life). The studies on medication review for falls prevention found evidence for rate of falls, number of fallers and quality of life outcomes

1.1.20.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to high. Findings were downgraded due to risk of bias (for example, lack of blinding, risk of bias in recall of falls, and poor reporting of randomisation procedures). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. The evidence was not downgraded for indirectness or inconsistency. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.20.3. Benefits and harms

Medication provision compared to control

Evidence for several outcomes showed a clinical benefit for medication provision compared to control. For example, evidence suggested a clinical benefit for Hormone replacement therapy and calcitriol (low certainty) and donepezil compared to placebo for rate of falls. Both outcomes were derived from only one study and had very low to low certainty of effect. Further clinical benefits were also found for donepezil compared to placebo, chlorthalidone compared to amlodipine, and lisinopril compared to amlodipine for the number of fallers. All of these outcomes were derived from only one study and there was very low to low certainty about the effects. Evidence from one study showed a clinical harm for a lower Vitamin K dosage compared to a higher Vitamin K dosage, a lower Vitamin K dosage compared to control, and a higher Vitamin K dosage compared to control for adverse events, with all outcomes having very low to low certainty of effects. No clinical differences were found for all other outcomes.

Medication review and/or withdrawal compared to control

Further evidence also found some clinical benefits for medication withdrawal for falls prevention. Evidence from one study suggested a clinical benefit for psychotropic medication withdrawal compared to control for the rate of falls and number of fallers with very low and low certainty of the effects. Evidence from one study also showed a clinical benefit of GP educational programme plus medication review and modification compared to control for the

number of fallers with very low certainty of effects. No other clinical benefits or harms were found for medication review or withdrawal compared to control for falls prevention.

Overall discussion

The committee noted the evidence showed a benefit in the withdrawal of psychotropic medication but commented that withdrawal of this type of medication is difficult and needs to be reduced very slowly. The committee agreed in general practice older people are not prescribed long term psychotropic medication and its use is not generally recommended. However, this medication is helpful in addressing depression and levels of distress. They agreed, based on the evidence found there is a higher risk of falls, and decided a recommendation should be made to highlight this risk and to also cross refer to the NICE guideline on Medicines associated with dependence or withdrawal symptoms (NG215).

It is current practice to carry out a review of a person's medication, but this is not specifically to reduce falls. Medication is reviewed and may be changed to reduce symptoms, adverse events or to improve quality of life. The committee agreed conducting a review of a person's medication can have a positive impact on a person's sense of wellbeing and being looked after. They discussed how drugs such as antihypertensives can contribute to a risk of falls due to side effects of dizziness or light-headedness, but there is no standard definition of drugs that can increase risk of falls. How drugs interact with each other can contribute to a risk of falls but is very variable and therefore a personalised approach is required in managing a person's medications. The committee noted the current Falls guideline recommends a medication review and agreed based on their experience and current practice this should be retained in order to identify any medicines that may increase a risk of falls and if any adjustment or withdrawal is needed. They noted the evidence for amlodipine and vitamin K showed a clinical harm, but agreed there was not enough evidence to support not prescribing a particular drug.

The committee also noted the Medicines optimisation and Medicines adherence guidance contained generic principles of good practice recommendations and decided to cross-refer to these.

1.1.20.4. Cost effectiveness and resource use

One health economic study was identified (Polinder 2016) comparing systematic fall risk increasing drugs (FRIDs) assessment combined with FRIDs withdrawal or modification with usual care in community dwelling adults aged 65 years and older. This within trial analysis was assessed as partially applicable with potentially serious limitations. The ICER was £681 per QALY gained, therefore 'medication review and modification' was deemed a cost-effective intervention compared to usual care in this setting. The committee noted that the quality-of-life benefit observed is from a general benefit of a medication review rather than an explicit benefit due to falls reduction. In current practice GPs will do an annual review, sometimes 6 monthly. The frequency can be quite variable. The committee were keen to cross reference to existing guidance on medicines optimisation (NG5) and safe withdrawal (NG215). Given that the recommendations reflect current practice and cross reference to existing guidance, and that no frequency has been specified, these recommendations are not expected to have a significant resource impact.

There were no health economic studies on the provision of medication to prevent falls. Limited clinical evidence was available, and it suggested a potential harm of vitamin K. The committee however did not think it was a large enough evidence base to support a 'do not offer' recommendation. It was agreed to make no recommendations on the provision of medication.

1.1.21. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.14 in the NICE guideline.

Vitamin D interventions for falls prevention in community care settings

1.1.22. Effectiveness evidence

1.1.22.1. Included studies

A total of 24 randomised controlled studies were included in this review. One Cochrane review[21] was identified in the search, which included 16 randomised controlled trials.[5, 6, 16, 18, 20, 22, 27, 36, 38, 48, 49, 53, 54, 61, 63, 66] Eight randomised controlled studies were identified from searching and included in the review to update Gillespie 2012 [1, 7, 8, 30, 64, 68-70] and are summarised in Table 2 below.

Twenty-two studies compared Vitamin D with placebo/control. [1, 6, 8, 16, 18, 20, 22, 27, 30, 36, 38, 48, 49, 53, 54, 61, 63, 64, 66, 68-70] Two studies compared a higher vitamin D dosage (2000IU per day) to a lower vitamin D dosage (800IU per day).[5, 7] Current NICE public health guideline on vitamin D for people over 65 years is 400IU per day. For this reason, a vitamin D dosage of 400IU per day was considered an intervention; however 200IU per day was considered as the control. Evidence from these studies is summarised in the clinical evidence summary below.

See also the study selection flow chart in Appendix C, study evidence tables in Appendix D, forest plots in Appendix E and GRADE tables in Appendix F.

Sixteen studies reported the rate of falls,[5-8, 16, 20, 30, 36, 38, 48, 53, 61, 66, 68-70] 17 studies reported the number of fallers or faller status,[1, 6, 16, 18, 20, 22, 27, 36, 38, 48, 49, 53, 54, 61, 63, 64, 66] 10 studies reported adverse events,[5, 6, 8, 18, 20, 22, 27, 36, 54, 61] and 14 studies reported falls with fractures.[5, 6, 8, 20, 22, 27, 36, 48, 49, 53, 61, 63, 66, 69]

One study[4] reported the number of falls in mean number of falls, which could not be calculated into the rate ratios. Evidence from these studies is summarised in the clinical evidence summary below (Table 3).

See also the study selection flow chart in Appendix C, study evidence tables in 0, forest plots in Appendix E and GRADEpro tables in E.3.

1.1.22.2. Excluded studies

See the excluded studies list in Appendix H.

1.1.23. Summary of studies included in the effectiveness evidence

Table 8: Summary of studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Aloia, 2019[1] RCT	Vitamin D (maintain serum 25(OH)D levels above 30 ng/mL) (n=130) Control (placebo) (n= 130)	Community dwelling adults Median age (IQR): 68.2 (65.4-72.5) Sex: All women	Number of fallers	

Study	Intervention and comparison	Population	Outcomes	Comments
	Interventions orally administered Duration of study: 3 years	Setting: USA		
Bischoff-Ferrari, 2006[6] RCT parallel	Vitamin D (700 IU) 500mg calcium, (n=219) Control: double placebo, (n=226) Interventions orally administered Duration of the study: 3 years	Community dwelling adults Mean age: 71 years Sex: 55% female Setting: Boston, USA	Rate of falls; number of people falling; number sustaining fracture; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse event not meta-analysed in Cochrane: IG: 6/219, CG: 3/216
Bischoff-Ferrari, 2010[5] RCT (2x2 factorial design)	Vitamin D (2000IU per day orally administered), (n=87) Vitamin D (800IU per day orally administered), (n=86) Duration of study: 1 year	Community dwelling adults with previous hip fracture Mean age (range): 84 (65 to 99) years Sex: 79% female Setting: hospital centre, Triemli, Switzerland	Rate of falls; number of people sustaining a fracture (hip fracture); adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events not meta-analysed in Cochrane, IG: 2/87, CG: 3/86 There were 4 arms: Vitamin D3 2000 IU/day + standard physiotherapy; Vitamin D3 2000IU/day + extended physiotherapy; Vitamin D3 800 IU/day + standard physiotherapy; Vitamin D3 800IU/day vs extended physiotherapy

Study	Intervention and comparison	Population	Outcomes	Comments
Bischoff-Ferrari, 2018[7] RCT	Vitamin D (2000IU per day) (n=137) Vitamin D (800IU per day) (n=136) Interventions orally administered Duration of study: 24 months	Community dwelling adults Mean age (SD): 70.3 (6.4) Sex (m/f): 127/146 Setting: Switzerland	Rate of falls	
Bischoff-Ferrari, 2020[8] (DO-HEALTH trial) RCT	Vitamin D (2000 IU/day) (N=1076) Control (placebo) (n=1081) Interventions orally administered Duration of study: 3 years	Community dwelling adults Mean age (SD): IG 75 (4.5), CG 74.9 (4.4) Sex (m/f): IG 409/667, CG 417/664 Setting: Switzerland	Rate of falls; number of fractures; adverse events	Rate of falls taken from Bischoff-Ferrari 2022 2 × 2 × 2 factorial design trial with 3 primary treatment comparisons: 2000 IU/d of vitamin D compared with placebo vitamin D, omegha-3s compared to placebo omega-3s and strength training program compared to attention control exercise program.
Dhesi, 2004[16] RCT (parallel) Falls clinic	Vitamin D (intramuscular 2ml of 600,000IU ergocalciferol injection) (n=70) Control (one placebo injection of 2ml) (n=69)	Community dwelling adults with history of previous falls Mean age (SD): 76.8 (6.2) years Sex: 78% female	Rate of falls; number of people falling	Study identified in Cochrane (Gillespie, 2012)

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of study: 6 months	Setting: United Kingdom		
Dukas, 2004[18] RCT (parallel)	Vitamin D (1 ug/day alfacalcidol D3, n=192)) Control (placebo, n=186)) Interventions administered orally Duration of study: 9 months	Community dwelling adults Mean age (SD): 75 (4.2) years Sex: 52% female Setting: Basel, Switzerland	Number of fallers; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events not meta-analysed in Cochrane, IG: 80/192, CG: 83/186
Gallagher, 2001[20] RCT (parallel)	Vitamin D (Calcitriol 0.25ug x2 daily, n=101) Control (placebo, n=112) Interventions orally administered Duration of study: 3 years	Community dwelling women aged 65-75 years Mean age (SD): 71 (4) years Sex: 100% female Setting: Omaha, USA	Rate of falls; number of people falling; number of people sustaining a fracture; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events not meta-analysed in Cochrane, IG: 60/101, CG: 38/112 NB Cochrane notes: setting presumed community Other arms were HRT/ERT and Calcitriol plus HRT/ERT
Grant, 2005[22] RCT (2x2 factorial design)	Vitamin D (800IU (20ug) vitamin D3 plus placebo calcium, n=2675)) Control (double placebo, n=2643)	Community dwelling adults with recent fracture caused by a fall	Number of people falling; number of people sustaining a fracture; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events not meta-analysed in Cochrane,IG: 363/2675, CG: 386/2643

Study	Intervention and comparison	Population	Outcomes	Comments
21 centres in England and Scotland	Interventions orally administered Duration of study: 60 months	Mean age (SD): 77 (6) Sex: 85% Setting: United Kingdom		Other arms were 800 IU vitamin D3 + 1000mg calcium and 1000mg elemental calcium plus placebo vitamin D
Harwood, 2004[27] RCT (parallel)	Vitamin D (single injection of vitamin D2 300,000 units, n=84) Control (no treatment, n=35) Duration of study: 1 year	Women admitted to orthogeriatric rehabilitation ward within 7 days of surgery for hip fracture Mean age (range): 81.2 (67 to 92) years Sex: 100% female Setting: Nottingham, UK	Number of people falling; number of people sustaining a fracture; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events not meta-analysed in Cochrane, IG: 0 events in both groups Other arms were single injection nof vitamin D2 300, 000 units plus oral calcium carbonate and Oral vitamin D3 + calcium carbonate The Cochrane notes that they were all recruited in hospital but were all community-dwelling and the intervention was designed to prevent falls in the community.
Houston, 2015[30] RCT	Vitamin D (two 50,000IU capsules per month, n=38) Control (Vitamin E 400 IU capsule/month, n=30)	Community dwelling adults Mean age (SD): 77.9 (8.7) Sex: 72.1% female	Rate of falls	

Study	Intervention and comparison	Population	Outcomes	Comments
	Interventions delivered orally Duration of study: 5 months	Setting: USA		
Kärkkäinen, 2010[36] RCT	Vitamin D (800IU + calcium carbonate 1000mg daily, n=1586) Control (no treatment, n=1573) Interventions orally administered Duration of study: 3 years	Community dwelling adults Mean age (SD): 67.3 (1.8) years Sex: 100% female Setting: Kuopio, Finland	Rate of falls; number of people falling; number of people sustaining a fracture; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events only reported for intervention (vitamin D) group: 116/1586
Latham, 2003[38] RCT (factorial design) 5 hospitals	Vitamin D (single oral dose of six 1.25mg calciferol 300,000 IU, n=108) Control (placebo tablets, n=114) Intervention orally administered Duration of study: 6 months	Community dwelling frail adults recently discharged from hospital Mean age: 79 years Sex: 53% female Setting: Auckland, New Zealand and Sydney, Australia	Rate of falls; number of people falling	Study identified in Cochrane (Gillespie, 2012) Other arms included exercise and attention control. Cochrane notes that the population are frail older people recently discharged from hospital
Pfeifer, 2000[48]	Vitamin D (400IU vitamin D plus	Community dwelling adults	Rate of falls; number of people falling;	Study identified in Cochrane (Gillespie, 2012)

Study	Intervention and comparison	Population	Outcomes	Comments
RCT	600mg calcium carbonate, n=70) Control (placebo – 600mg calcium carbonate, n=67) Intervention administered orally Duration of study: 1 year	Mean age (SD): Sex: 100% female Setting: Germany	number of people sustaining a fracture	
Pfeifer, 2009[49] RCT (parallel) 2 centres	Vitamin D (1000mg calcium plus 800 IU of cholecalciferol/day (1 tablet) in 2 divided doses) n=122 Control (placebo – 1000mg calcium/day (1 tablet) in 2 divided doses) n=120 Intervention administered orally Duration of study: 12 months (for fallers outcome) 20 months (for fractures)	Community dwelling adults Mean age (SD): 74 (4) years Sex: 79% female Setting: Bad Pyrmont, Germany and Graz, Austria	Number of people falling; number of people sustaining a fracture	Study identified in Cochrane (Gillespie, 2012)
Porthouse, 2005[53] RCT (parallel)	Vitamin D Control (no treatment)	Community dwelling adults Mean age (SD): 76.9 (5.1)	Rate of falls; number of people falling; number sustaining a fracture	Study identified in Cochrane (Gillespie, 2012)

Study	Intervention and comparison	Population	Outcomes	Comments
Multicentre (107 GP practices in England)	Intervention administered orally Duration of study: 1 year	Sex: 100% female Setting: United Kingdom		
Prince, 2008[54] RCT (parallel)	Vitamin D (100 IU/day ergocalciferol (vitamin D2) n=151 Control (placebo) n=151 Intervention administered orally Duration of study: 1 year	Women attending A&E; receiving home nursing management Mean age (SD): 77.2 (3.6) years Sex: 100% female Setting: Perth, Australia	Number of people falling; adverse events	Study identified in Cochrane (Gillespie, 2012) Adverse events not meta-analysed in Cochrane, IG: 17/151, CG: 18/151
Sanders, 2010[61] RCT (parallel)	Vitamin D (annual oral dose of 500,000IU cholecalciferol) n=1131 Control (placebo) n=1125 Intervention administered orally Duration of study: 5 years	Community dwelling adults Median age (IQR): 76 (70 to 93.9) Sex: 100% female Setting: South Victoria, Australia	Rate of falls; number of people falling; number of people sustaining a fracture;	Study identified in Cochrane (Gillespie, 2012) Adverse events: The study mentions, '. None of the serious adverse events were considered related to study medication'

Study	Intervention and comparison	Population	Outcomes	Comments
Smith, 2007[63] RCT (parallel)	Vitamin D (300,000 IU ergocalciferol (vitamin D2) by intramuscular injection every autumn, n=4727 Control (placebo), n=4713 Duration of study: 3 years	Community dwelling adults Mean age (IQR): 79.1 (76.9 to 82.6) Sex: 54% female Setting: Wessex, UK	Number of people falling; number of people sustaining a fracture	Study identified in Cochrane (Gillespie, 2012) Inclusion criteria: 75 years or over
Smith, 2017[64] RCT	Vitamin D, n=127 Control (placebo) n=19 Intervention administered orally Duration of study: 12 months	Community dwelling adults Mean age (SD): Caucasian women, non-faller: 65.9 (6.4), faller 66.5 (8.2); African American women: non-faller 67 (7.8), faller 65.6 (7.7) Sex: All women Setting: USA	Number of people falling	Block randomisation for Caucasian women and African American women
Trivedi, 2003[66] RCT (stratified by age and sex)	Vitamin D (oral vitamin D3 supplementation (100,000 IU cholecalciferol) every 4 months, n=1027 Control (placebo), n=1011 Intervention administered orally	Community dwelling adults Mean age (SD): 75 (5) years Sex: 24% female Setting: Suffolk, UK	Rate of falls; number of people sustaining a fracture	Study identified in Cochrane (Gillespie, 2012)

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of study: 5 years			
Uusi-Rasi, 2017[68] RCT	Vitamin D 20 µg/day (800 IU), n=102 Control (placebo), n=102 Route of administration not stated Duration of study:48 months	Community dwelling adults Mean age (SD): IG 74.1 (3.0), cg 73.8 (3.1) Sex: All women Setting: Finland	Rate of falls	
Wanigatunga, 2021[69] RCT (secondary publication of Appel 2021)	Vitamin D (pooled higher dose: combined 1000, 2000, and 4000 IU/day), n=349 Control (200IU per day), n=339 Interventions administered orally Duration of study: 2 years	Community dwelling adults Mean age (SD): 77.2 (5.4) Sex: 43.6% female Setting: USA	Rate of falls; rate of falls with fractures	STURDY trial, primary publication: Appel 2021
Waterhouse, 2021[70] RCT	Vitamin D 60 000 IU of colecalciferol n=7729 Control (placebo), n=7687	Community dwelling adults Mean age (SD): 69.3 (5.5) Sex: 46% female	Rate of falls	

Study	Intervention and comparison	Population	Outcomes	Comments
	Intervention administered orally Duration of study: 5 years	Setting: Australia		

(a)IU: International Units

See 0 for full evidence tables.

1.1.24. Summary of the effectiveness evidence

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Rate of falls (overall analysis)	27825 (12 RCTs)	⊕⊕⊕⊕ High	**Rate ratio 0.99** (0.92 to 1.08)	-	-	MID: 0.8 to 1.25 (no imprecision: CI crosses 1 MID) No difference
Rate of falls - Vitamin D3 (by mouth) vs control or placebo	20979 (7 RCTs)	⊕⊕⊕⊕ High	**Rate ratio 1.04** (0.93 to 1.16)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Rate of falls - Vitamin D3 (by mouth) + calcium vs control or placebo	6586 (3 RCTs)	⊕⊕⊕◯ Moderate[b]	**Rate ratio 0.96** (0.89 to 1.04)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Rate of falls - Vitamin D3 (by mouth) + calcium vs calcium	137 (1 RCT)	⊕⊕◯◯ Low[c,d]	**Rate ratio 0.54** (0.30 to 0.98)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of vitamin D

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Rate of falls - Vitamin D2 (by injection) vs placebo	123 (1 RCT)	⊕⊕⊕◯ Moderate[d]	**Rate ratio 0.61** (0.32 to 1.17)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of vitamin D
Number of fallers (overall analysis)	26747 (15 RCTs)	⊕⊕◯◯ Low[a,b]	**RR 0.97** (0.90 to 1.05)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Number of fallers - Vitamin D3 (by mouth) vs control or placebo	4516 (5 RCTs)	⊕⊕◯◯ Low[c,d]	**RR 1.11** (0.98 to 1.27)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of fallers - Vitamin D3 (by mouth) + calcium vs control or placebo	6576 (3 RCTs)	⊕⊕◯◯ Low[e]	**RR 0.98** (0.92 to 1.03)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Number of fallers - Vitamin D3 (by mouth) + calcium vs calcium	379 (2 RCTs)	⊕⊕◯◯ Low[d,f]	**RR 0.70** (0.53 to 0.92)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of vitamin D
Number of fallers - Vitamin D2 (by mouth) + calcium vs placebo + calcium	302 (1 RCT)	⊕⊕◯◯ Low[c,d]	**RR 0.66** (0.41 to 1.05)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of vitamin D

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Number of fallers - Vitamin D2 (by injection) vs placebo	9563 (2 RCTs)	⨁⨁⨁⨁ High	**RR 0.98** (0.92 to 1.04)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Number of fallers - Vitamin D (by mouth or by injection) with or without calcium vs control: studies with multiple arms combined	5411 (2 RCTs)	⨁◯◯◯ Very low[a,g,h]	**RR 0.73** (0.37 to 1.44)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) Benefit of vitamin D
Number of people sustaining a fracture (overall analysis)	27070 (12 RCTs)	⨁⨁⨁◯ Moderate[g]	**RR 0.97** (0.85 to 1.11)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Number of people sustaining a fracture - Vitamin D3 (by mouth) vs control or placebo	4942 (4 RCTs)	⨁⨁◯◯ Low[a,d]	**RR 1.06** (0.80 to 1.41)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of people sustaining a fracture - Vitamin D3 (by mouth) + calcium vs control or placebo	6898 (3 RCTs)	⨁⨁◯◯ Low[b,d]	**RR 0.83** (0.59 to 1.16)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Number of people sustaining a fracture - Vitamin D3 (by mouth) + calcium vs calcium	379 (2 RCTs)	⊕⊕◯◯ Low[c,d]	**RR 0.54** (0.26 to 1.15)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of vitamin D
Number of people sustaining a fracture - Vitamin D2 (by injection) vs placebo	9440 (1 RCT)	⊕⊕◯◯ Low[c,d]	**RR 1.09** (0.94 to 1.28)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of people sustaining a fracture - Vitamin D (by mouth or by injection) with or without calcium vs control: studies with multiple arms combined	5411 (2 RCTs)	⊕◯◯◯ Very low[e,h]	**RR 0.90** (0.53 to 1.53)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) No difference

a. Downgraded by 1 increment for unexplained heterogeneity

b. Serious risk of bias in the evidence due to lack of blinding of participants, lack of blinding outcome assessment, and risk of bias in recall of falls

c. Serious risk of bias in the evidence due to risk of bias in recall of falls

d. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

e. Very serious risk of bias due to lack of blinding participants, lack of blinding outcome assessment, and risk of bias in recall of falls

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	

f. Serious risk of bias due to unknown randomisation process and risk of bias in recall of falls

g. Serious risk of bias in the evidence due to lack of blinding of participants, lack of blinding outcome assessment, incomplete outcome data, and risk of bias in recall of falls

h. Downgraded by 2 increments as confidence interval crossed 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

Table 9: Clinical evidence summary: Vitamin D vs control by subgroup analysis of vitamin D levels at baseline

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Rate of falls - Selected for lower vitamin D levels	948 (3 RCTs)	⊕⊕⊕◯ Very low[a,b,c]	**Rate ratio 0.75** (0.48 to 1.18)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Rate of falls - Not selected for lower vitamin D levels	26877 (9 RCTs)	⊕⊕⊕◯ Moderate[a,h]	**Rate ratio 1.01** (0.93 to 1.08)[g]	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Number of fallers - Selected for lower vitamin D levels	1041 (5 RCTs)	⊕⊕◯◯ Low[a,b]	**RR 0.82** (0.56 to 1.20)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
						No difference
Number of fallers - Not selected for lower vitamin D levels	25943 (9 RCTs)	⊕⊕◯◯ Low[a,c]	RR 1.00 (0.93 to 1.07)	-	-	MID: 0.8 to 1.25 (no imprecision) No difference
Number of people sustaining a fracture - Selected for lower vitamin D levels	688 (1 RCT)	⊕⊕◯◯ Low[d]	Rate ratio 1.02 (0.79 to 1.32)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) No difference
Number of people sustaining a fracture - Not selected for lower vitamin D levels	5630 (3 RCT's)	⊕⊕⊕◯ Moderate[b,h]	Rate ratio 1.13 (0.72 to 1.76)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) No difference
Adverse events - Not selected for lower vitamin D levels	(1 RCT)	⊕⊕◯◯ Low[d,h]	Rate ratio 1.05 (0.57 to 1.93)[h]	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) No difference
Quality of life (Physical component score) – Better	(1 RCT)	⊕⊕⊕◯ Moderate[e]	-	-	MD **3 lower** (6.57 lower	MID: 2 T-score points

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
indicated by higher values					to 0.57 higher)	Benefit for vitamin D
Quality of life (Mental component score) - Better indicated by higher values	(2 RCT s)	⨁⨁◯◯ Low[f]	-	-	MD **0.03 higher** (0.04 lower to 0.1 higher)	MID: 3 T-score points No difference

a. Downgraded by 1 increment for unexplained heterogeneity

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Serious risk of bias in the evidence due to unknown randomisation process, lack of blinding and incomplete outcome data in some studies

d. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

e. 95% CI crosses 1 MID (0.5 x median baseline SD)

f. Very serious heterogeneity unexplained

g. Rate ratio calculated from number of events for Bischoff-Ferrari 2020

h. Serious heterogeneity unexplained

i. Combined adverse events (disorder of mineral metabolism and kidney stones) and rate ratio calculated from number of events for Bischoff-Ferrari 2020

Table 10: Clinical evidence summary: Vitamin D (2000IU per day) vs control (400IU per day)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Rate of falls	173 (2 RCTs)	⊕⊕◯◯ Low[a,b]	Rate ratio 1.09 (0.80 to 1.50)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of people sustaining a fracture	173 (1 RCT)	⊕⊕◯◯ Low[c]	RR 0.51 (0.13 to 1.98)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) Benefit of vitamin D

a. Downgraded by 1 increment for unexplained heterogeneity

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

Table 11: Clinical evidence summary: Medication provision: Vitamin D analogue vs placebo

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
Rate of falls - Calcitriol vs placebo	213 (1 RCT)	⊕⊕◯◯ Low[a,b]	**Rate ratio 0.64**	-	-	MID: 0.8 to 1.25 (precision:

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
			(0.49 to 0.82)			CI crosses 2 MIDs) Benefit of vitamin D
Number of fallers - Calcitriol vs placebo	213 (1 RCT)	⊕⊕◯◯ Low[a,b]	**RR 0.54** (0.31 to 0.93)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) Benefit of vitamin D
Number of fallers - Alfacalcidol vs placebo	378 (1 RCT)	⊕⊕⊕◯ Moderate[b]	**RR 0.69** (0.41 to 1.17)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of vitamin D
Number of people sustaining a fracture - Calcitriol vs placebo	246 (1 RCT)	⊕◯◯◯ Very low[a,c]	**RR 0.60** (0.28 to 1.29)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) Benefit of vitamin D
Number of people developing hypercalcaemia	624 (2 RCTs)	⊕⊕◯◯ Low[a,b]	**RR 2.49** (1.12 to 5.50)	26 per 1,000	**39 more per 1,000** (3 more to 117 more)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Residential care: Exercise	
						Clinical harm for vitamin D

a. Serious risk of bias due to missing information about randomisation and allocation concealment processes and high risk of bias in recall of falls

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

1.1.25. Economic evidence

1.1.25.1. Included studies

One health economic study with the relevant comparison was included in this review.[52] This is summarised in the health economic evidence profile below (Table 12) and the health economic evidence table in Appendix H.

1.1.25.2. Excluded studies

One economic study relating to this review question was identified but was selectively excluded due to a combination of limited applicability and methodological limitations and the availability of more applicable evidence. [47] The study is listed in Appendix H, with reasons for exclusion given.

See also the health economic study selection flow chart in F.1.

(a)Summary of included economic evidence

Table 12: Health economic evidence profile: Vitamin D (colecalciferol) versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Poole 2015[52] (UK)	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Deterministic Markov model based on meta-analysis of RCTs (Bischoff-Ferrari 2009)[5] • Cost-utility analysis (QALYs) • Population: Community dwelling adults 60 years and older in UK • Setting: Community • Comparators: 1. Usual care 2. Colecalciferol 800 iu daily Time horizon: 5 years	Saves £23.52[(c)]	0.00012 QALYs	£19,759 per QALY gained	No probabilistic analysis. Results are presented for different age groups, reflecting different treatment strategies. - Treat all adults ≥65 years: Colecalciferol dominates usual care (less costly and more effective - Treat all adults ≥70 years: Colecalciferol dominates usual care (less costly and more effective - Treat all adults ≥75 years: Colecalciferol dominates usual care (less costly and more effective

Abbreviations: ICER= incremental cost-effectiveness ratio; iu = international units; QALY= quality-adjusted life years; RCT= randomised controlled trial

(a)Includes population outside of scope of guideline (60–64-year-olds). No discounting despite 5-year time horizon. Disutilities not from UK population.

(b) Time horizon may be too short to fully capture downstream effects of intervention on falls and consequences of these. Assumes fall history doesn't impact future risk of falls which is a conservative assumption. The use of all-cause mortality for background death rate which includes unintentional falls, thus reducing 'at risk' population is also a conservative assumption. Based on meta-analysis of 8 RCTs and may not reflect the full body of evidence. RR of falling lower in this model than that found in clinical review.

No probabilistic sensitivity analysis. Potential conflict of interest.

(c) 2014 UK pounds. Cost components incorporated: Cost of intervention, falls, and care.

Economic model

Whilst this area was prioritised for de novo health economic modelling, this treatment was not included.

1.1.25.3. Unit costs

Relevant unit costs are provided below to aid consideration of cost effectiveness.

Table 13: Unit costs for vitamin D

Resource	Unit cost per day	Source
Vitamin D, Colecalciferol (400 units daily)	£0.10	Primary prevention vitamin D deficiency dose, SunVit-D3 (BNF)[33]
Vitamin D, Colecalciferol (800 – 2000 units daily)	£0.11 – £0.16	Vitamin D deficiency maintenance dose, SunVit-D3 (BNF)[33]

1.1.26. Evidence statements

1.1.26.1. Economic

One cost utility analysis found that colecalciferol 800iu daily (vitamin D) was cost effective compared to usual care in community dwelling older adults (ICER: £19,759 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations.

1.1.27. The committee's discussion and interpretation of the evidence

1.1.27.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on Vitamin D for falls prevention found evidence for all outcomes (rate of falls, number of people sustaining one or more falls, number of participants sustaining fall related fractures, and adverse events) except for the outcome of health-related quality of life.

1.1.27.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to high. Findings were downgraded due to risk of bias (for example, lack of blinding, risk of bias in recall of falls, and poor reporting of randomisation procedures). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. Some evidence was also downgraded due to inconsistency with unexplained heterogeneity. The evidence was not downgraded for indirectness. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.27.3. Benefits and harms

Vitamin D (with or without calcium) vs control/placebo/calcium – Rate of falls

Evidence from 12 studies suggested that there was no clinical difference of vitamin D compared to control, placebo, or calcium for the rate of falls and there was high certainty about the effects. When further analysed for subgroups only Vitamin D3 administered by mouth plus calcium compared to calcium showed a clinical benefit of Vitamin D for rate of falls and Vitamin D2 administered by injection compared to placebo showed a benefit of Vitamin D for rate of falls. However, both outcomes were only supported by one study each and certainty about the effects were only low to moderate.

Vitamin D (with or without calcium) vs control/placebo/calcium – Number of fallers

Evidence from 15 studies suggested that there was no clinical difference between Vitamin D (with or without calcium) vs control/placebo/calcium for the number of fallers and there was low certainty about the effect. Only 3 subgroup analysis showed a clinical benefit for Vitamin D for the number of fallers. Evidence from 2 studies showed a clinical benefit of Vitamin D3 administered by mouth including calcium compared to calcium only for number of fallers, however there was low certainty about the effects. Evidence from 1 study showed a benefit for Vitamin D2 administered by mouth including calcium when compared with placebo and calcium, with low certainty of the effect. Lastly, 2 studies showed a benefit for Vitamin D administered by mouth or by injection with or without calcium when compared to control, however there were very low certainty of effects.

Vitamin D (with or without calcium) vs control/placebo/calcium – Number of people sustaining a fracture

Evidence from 12 studies showed no clinical differences for Vitamin D use (with or without calcium) when compared to control, placebo, or calcium for the number of people sustaining a fracture and there was moderate certainty about the effects. When analysed further for subgroups only one outcome showed a clinical benefit of Vitamin D. Evidence from 2 studies found a clinical benefit of Vitamin D3 administered by mouth including calcium when compared to calcium for the number of people sustaining a fracture; however, there was low certainty about the effects.

Vitamin D vs control by subgroup analysis of vitamin D levels at baseline

Evidence showed no clinical differences for Vitamin D when selected for lower Vitamin D levels at baseline compared to control for rate of falls, number of fallers, number of people sustaining a fracture, adverse events and quality of life (mental component). Although there was clinical benefit seen for Vitamin D when compared to control for quality of life (physical component) this was from 1 small RCT of moderate quality due to uncertainty of the effect. There was low certainty about the effects for all the outcomes. Evidence also showed no clinical differences for Vitamin D when not selected for lower Vitamin D levels at baseline compared to control for the rate of falls, number of fallers, number of people sustaining a fracture, and adverse events and there was low to moderate certainty about the effects.

Vitamin D analogues vs placebo

Evidence from 1 study showed a clinical benefit for Calcitriol compared to placebo for the rate of falls, number of fallers, and number of people sustaining a fracture however there was very low to low certainty about the effects. Similarly, evidence from 1 study showed a clinical benefit for alfacalcidol compared to placebo for number of fallers and there was moderate certainty about the effects. Evidence from 2 studies also showed a clinical harm for Vitamin

D compared to placebo for the number of people developing hypercalcaemia, however there was low certainty about the effects.

Vitamin D (2000IU per day) vs control (400IU per day)

Evidence from 2 studies showed no clinical differences for a higher Vitamin D dosage compared to lower Vitamin D dosage for the rate of falls and there was low certainty about the effects. Evidence from 1 study showed a clinical benefit for a higher Vitamin D dosage compared to lower Vitamin D dosage for the number of people sustaining a fracture and there was low certainty about the effects. v

1.1.27.4. Overall discussion

The committee noted the majority of the evidence found across all the subgroups analysed showed no difference in rate or number of falls. Where benefit was demonstrated the committee agreed these were mainly in single studies graded as low quality. The committee agreed the clinical evidence did not support the use of vitamin D as an intervention to prevent falls in an older population. Although in the 65+ age group it did demonstrate the intervention was cost effective, the evidence this was based on was not robust. The committee discussed that vitamin D is not generally prescribed for prevention of falls within primary care. The committee acknowledged vitamin D is part of standard care for people known to be deficient in vitamin D. They also noted the high cost of the test for vitamin D deficiency. The committee discussed the recommended higher dose of 800-2000 units of Vitamin D as a maintenance dose for people with vitamin D deficiency, whereas for primary prevention within the general population the recommended dose is 400 units. The committee agreed the recommendation to follow national public health guidance for vitamin D supplementation was appropriate.

1.1.27.5. Cost effectiveness and resource use

One health economic study was included for falls prevention in a community setting. The study assessed adults aged 60 years and above in the community taking Colecalciferol (Vitamin D) 800 iu daily verses usual care (Poole, 2015). The study was assessed as partially applicable with potentially serious limitations. This study found that vitamin D was cost effective compared to usual care, the incremental cost-effectiveness ratio (ICER) was £19,759 per QALY gained in the base-case results. Results presented for different age groups in the sensitivity analysis found Colecalciferol dominated usual case in adults aged 65 years and above. There was no probabilistic sensitivity analysis conducted in the study, it was noted that any variation in costs or QALYs could increase the ICER to above the NICE threshold for cost effectiveness. The committee agreed that this made the base case results uncertain. Additionally, the clinical meta-analysis conducted for this review found the rate ratio of falling was higher than that used in this economic model. The model therefore may be overestimating benefits of vitamin D on fall preventions.

The committee decided to not make a specific recommendation for vitamin D for falls prevention as the clinical evidence did not support the use of vitamin D as an intervention to prevent falls. Furthermore, as noted above, the available health economic evidence had several limitations which led to a lack of confidence in the results. The committee acknowledged vitamin D is part of standard care for people known to be deficient in vitamin D, and the committee discussed that vitamin D is not generally prescribed for prevention of falls within primary care. The committee agreed the recommendation to follow national guidance for vitamin D supplementation was appropriate. Unit costs for vitamin D were presented to the committee, with costs per year below £60. Given that vitamin D supplementation in people who are deficient is current clinical practice, this consensus recommendation is unlikely to have a significant resource impact.

1.1.28. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.14 in the NICE guideline.

Nutrition therapy interventions for falls prevention in community care settings

1.1.29. Effectiveness evidence

1.1.29.1. Included studies

No randomised controlled trials were identified from searching. Three studies were identified from the Gillespie 2012[21] review. Evidence from these studies is summarised in the clinical evidence summary below.

See also the study selection flow chart in Appendix C, the effective evidence tables in Appendix D, forest plots in Appendix E and GRADE tables in Appendix F.

One Cochrane review (Gillespie 2012[21]) was identified in the search.

The studies identified included the following comparisons:

- Nutritional supplement (vegetable powdered food and 50g of daily of a powdered low-lactose milk-based drink) to control (Dangour, 2011)[14]
- High energy nutrient dense supplements to control (Gray-Donald, 1995)[23]
- Oral nutrition supplementation to control (McMurdo, 2009)[39]

The included studies focused on community-dwelling adults.

One study, McMurdo, 2009[39] reported quality of life data with Euroqol. The group receiving the nutritional supplement intervention reported a baseline Euroqol score, according to the Visual Analogue Scale, of 60, whereas the control group reported a baseline score of 57. The authors do not report the scores at the time of follow-up. However, the authors note no significant differences were observed between the two groups. The mean difference according to the Visual Analogue Scale was 2.62 (95%CI -11.16 to 16.40).

1.1.29.2. Excluded studies

Cochrane reviews were identified but not could not be included due to inappropriate interventions (Sherrington, 2019[62]; Hopewell, 2018[29]).

See the excluded studies list in Appendix J.

1.1.30. Summary of studies included in the effectiveness evidence

Table 14: Summary of identified studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Dangour, 2011[14] Cluster RCT (by health centre, 2x2 factorial design)	Nutritional supplements (50 g daily of a vegetable powdered food and 50 g daily of a powdered low-lactose milk-based drink) (n=502)	People from health centre catchments and health centre registries, aged 70 or over with a recent fracture caused by a fall	Number of fallers	Study identified in Gillespie, 2012[21]

Study	Intervention and comparison	Population	Outcomes	Comments
	Control (n=504) Duration of the study: 24 months	Mean age (SD): years: IG: 66.2 (0.9); CG 66.1 (1.0) Sex: 68% female Setting: Santiago, Chile		
Gray-Donald, 1995[23] Parallel RCT	High energy nutrient dense supplementation (n=22) Control (n=24) Duration of the study: 12 weeks	People receiving long-term home help services, aged 60 and over with excessive weight loss or BMI<24kg/m2 Mean age (SD): 77.5 (8) years Sex: 71% female Setting: Quebec, Canada	Number of fallers	Study identified in Gillespie, 2012[21]
McMurdo, 2009[39] Parallel RCT	Oral nutritional supplementation (400 mL/day of Fresubin, nutritionally complete liquid protein (n=93) Control (n=98) Duration of the study: 24 months	Community-dwelling adults, post-menopausal Mean age (range): 64.5 (60 to 73) years Sex: 100% female Setting: Dundee, UK	Number of fallers; quality of life	Study identified in Gillespie, 2012[21]

See appendix D for full evidence tables.

1.1.31. Summary of the effectiveness evidence

1.1.6.1 Fluid or nutrition therapy versus control

Table 15: Clinical evidence summary: Fluid or nutrition therapy versus control

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Fluid or nutrition therapy	
Number of fallers	1902 (3 RCTs)	⨁⨁◯◯ Low[a,b]	**Risk ratio 0.95** (0.83 to 1.08)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No clinical difference
Quality of life (EuroQoL) (Visual analogue scale, scale 0-100, high is good)	253 (1 RCT)	⨁⨁⨁◯ Moderate[b]	-	-	**MD 2.62 higher** (11.16 lower to 16.4 higher)	MID: 0.5 x 18= 9 (precision: CI crosses 0 MIDs) No clinical difference

a. Downgraded by 1 increment for risk of bias due to issues regarding allocation concealment, blinding of the outcome assessment processes, incomplete outcome data provided, and the impact of recall of falls.

b. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

c. Downgraded by 1 increment for risk of bias due to incomplete outcome data and unclear risk of bias regarding recall of falls.

See appendix F for full GRADE tables.

1.1.32. Economic evidence

1.1.32.1. Included studies

No health economic studies were included.

1.1.32.2. Excluded studies

No relevant health economic studies were excluded due to assessment of limited applicability or methodological limitations.

See also the health economic study selection flow chart in Appendix G.

1.1.33. Summary of included economic evidence

No health economic studies were included.

1.1.34. Economic model

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

1.1.35. Evidence statements

1.1.35.1. Economic

- No relevant economic evaluations were identified.

1.1.36. The committee's discussion and interpretation of the evidence

1.1.36.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on nutrition for falls prevention only found evidence for number of fallers and health-related quality of life. No evidence was found for the other outcomes (rate of falls, number of participants sustaining fall related fractures, and adverse events).

1.1.36.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to moderate. Findings were downgraded due to risk of bias (for example, risk of bias due to issues regarding allocation concealment, blinding of the outcome assessment, incomplete data provided, and bias in the recall of falls). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. The evidence was not downgraded for indirectness or inconsistency. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.36.3. Benefits and harms

The committee noted that there were few studies included, and they demonstrated no clinical difference for number of fallers or quality of life outcomes. They discussed that protein supplements may help build muscle but are not linked to reducing falls. Provision of nutritional supplements are not part of current practice, and the committee agreed the studies were not relevant. As no studies for nutrition or fluid interventions designed to reduce falls had been identified no recommendation could be made. The committee agreed it was important to have a balanced diet and it would be usual practice to discuss maintaining a healthy diet and adequate fluid intake with a person. They noted a lack of hydration may cause a person to fall and it would be good practice to assess a person's nutritional and fluid intake as part of a comprehensive intervention.

1.1.36.4. Cost effectiveness and resource use

No health economic evidence was identified on fluid and or nutrition interventions in a community setting. Clinical evidence was limited and the committee agreed to make no

standalone recommendations for fluid and nutrition, suggesting this could be incorporated in a wider multifactorial intervention recommendation.

1.1.37. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.14 in the NICE guideline.

Psychological interventions for falls prevention in community care settings

1.1.38. Effectiveness evidence

1.1.38.1. Included studies

A total of five randomised controlled studies were included in the reviewDorresteijn, 2016[17]; Huang, 2011[32]; Parry, 2016[45]; Reinsch, 1992[57]; Tuvemo Johnson, 2021[67]. One Cochrane review (Gillespie, 2012)[21] was identified in the search, which included two randomised controlled trials (Huang, 2011; Reinsch, 1992). Studies compared Cognitive behavioural interventions to control (no treatment), except for Tuvemo Johnson 2021[67], which included motivational interviewing compared to standard care. Studies reported rate of falls, number of fallers, number of fall related injuries, adverse events and quality of life.

Please note, Tuvemo Johnson 2021[67] is a subsequent publication of Arkkukangas, 2019[2], for study details please refer to Arkkukangas 2019[2] (Appendix D).

Evidence from these studies is summarised in the clinical evidence summary below (Table 16).

See also the study selection flow chart in Appendix C, study evidence tables in Appendix D, forest plots in E5 **.** and GRADEpro tables in Appendix F.

1.1.38.2. Excluded studies

See the excluded studies list in Appendix J.

1.1.39. Summary of studies included in the effectiveness evidence

Table 16: Summary of studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Dorresteijn 2016[17] Parallel RCT	Cognitive behaviour programme (individual, home-based programme) (n=194) Control (n=195) Duration of study: 12 months (4-month intervention, follow-up at 5 and 12 months)	Community dwelling adults with self-reported concerns about falls, 70 years or over Mean age (SD): IG: 78.35 (5.4); CG: 78.25 (5.3) years Sex: IG: 68%; CG:72.3% female Setting: the Netherlands	Rate of falls, Number of people falling;	

Study	Intervention and comparison	Population	Outcomes	Comments
Huang 2011[32] Parallel RCT	Cognitive behavioural intervention (60-90 minutes session per week for 8 weeks in groups) (n=62) Cognitive behavioural intervention+ Tai Chi (as above plus Tai Chi 60 minutes 5 sessions per week for 8 weeks) (n=62) Control (no intervention) (n=62) Duration of the study: 5 months (3-month follow-up after intervention)	Community dwelling adults, aged 60 and over Mean age (SD): NR Sex: 59% female Setting: Yi-Lan county, Taiwan	Rate of falls; number of people falling; quality of life	Study identified in Cochrane (Gillespie, 2012) Cognitive behavioural intervention + Tai Chi arm is included in the multifactorial/multicomponent review
Parry 2016[45] Parallel RCT	Individualised CBT approach (45 minutes with 15 minutes preparation weekly) for 8 weeks with 6-month booster session (n=210) Usual care (n=205) Duration of the study: 12 months (8 weekly sessions with a	Community dwelling adults, 60 years or over, with excessive or undue fear of falling Mean age: IG 69.5; CG 70.7 years Sex: 75% female Setting: UK	Rate of falls; number of people falling; number of fall-related fractures; number of adverse events, quality of life	

Study	Intervention and comparison	Population	Outcomes	Comments
	single reinforcement session 6 months after the last CBT session. Followed up at 8 weeks, 6 and 12 months)			
Reinsch 1992[57] Cluster-RCT	Cognitive behavioural intervention (n=51) Exercise + CBT (n=72) Control (n=50) Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 74.2 (6) years Gender (m/f): 46/184 Setting: Los Angeles, USA	Number of people falling	Study identified in Cochrane (Gillespie, 2012) Exercise plus Cognitive behavioural intervention vs control comparison is included in the multifactorial/multicomponent review and Exercise vs control comparison is included in the Exercise interventions review.
Tuvemo Johnson 2021[67] (Arkkukangas 2019[2]) Parallel RCT	Motivational interview (n=610) Standard care (N=56) Duration: 12-month interventions with 12 month follow-up post intervention and 24 month follow-up (12 months post intervention)	Community dwelling adults Mean age (SD): 83 (4.7) Sex, female/men: 81/38 Setting: Sweden	Rate of falls, number of fallers, quality of life	Full extraction of trial see Arkkukangas 2019[2] (2 year follow up of the trial). Motivational interview arm has been extracted as multicomponent interventions arm and standard care has been extracted as exercise. This is a 3 arm trial with a control arm that is not relevant for psychological interventions

Study	Intervention and comparison	Population	Outcomes	Comments
				Quality of life data was taken from Arkkukangas 2019[2]

See Appendix D for full evidence tables.

1.1.40. Summary of the effectiveness evidence

See Appendix F for full GRADEpro

Table 17: Clinical evidence summary: Cognitive behavioural interventions versus control

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with CBT	
Rate of falls - Cognitive behavioural intervention vs control	881 (3 RCTs)[a]	⊕⊕◯◯ Low[b,c]	**Rate ratio 0.82** (0.66 to 1.02)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of fallers - Cognitive behavioural intervention vs control	1111 (4 RCTs)	⊕⊕⊕◯ Moderate[b]	**RR 0.98** (0.86 to 1.11)	-	-	MID: 0.8 to 1.25 No difference
Number of fall-related fractures CBT vs control	415 (1 RCT)[a]	⊕◯◯◯ Very low[b,d]	**Rate ratio 0.42** (0.10 to 1.76)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MID's) Benefit of CBT

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with CBT	
Number of adverse events CBT vs control	415 (1 RCT)	⊕⊕◯◯ Low[b,d]	**RR 0.76** (0.44 to 1.30)	132 per 1,000	**32 fewer per 1,000** (74 fewer to 40 more)	MID: 0.8 to 1.25 (precision: CI crosses 2 MID's) Benefit of psychological intervention
Quality of life - Psychological interventions vs control	676 (4 RCTs)	⊕⊕⊕◯ Moderate[e]	-	-	**SMD 0.04 higher** (0.13 lower to 0.21 higher)	MID: -1.79to +1.79 [MD (95% CIs): -0.00 (-0.04 to 0.04)] No difference

a. Rate ratio calculated from number of events for Parry 2016

b. Downgraded by one increment due to lack of blinding of participants

c. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

d. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

e. Downgraded by 1 increment for risk of bias due to attrition

Table 18: Clinical evidence summary: Motivational interviewing versus standard care

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Motivational interviewing	
Rate of falls	119 (1 RCT)	⊕⊕⊕◯ Moderate [a]	**Rate ratio 1.19** (0.81 to 1.74)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No difference
Number of fallers	119 (1 RCT)	⊕⊕⊕◯ Moderate [a]	**RR 1.58** (1.06 to 2.36)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Benefit of control
Quality of life	80 (1 RCT)	⊕⊕⊕◯ Moderate [b]	-	-	**MD 0.0 higher** (0.09 lower to 0.09 higher)	MID: -0.94 to +o.94 No difference

a. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

b. Downgraded by 1 increment for risk of bias due to attrition

1.1.41. Economic evidence

1.1.41.1. Summary of included economic evidence

No health economic studies were included.

1.1.41.2. Excluded studies

No relevant health economic studies were excluded due to assessment of limited applicability or methodological limitations.

See also the health economic study selection flow chart in Appendix G.

1.1.41.3. Economic model

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

1.1.41.4. Unit costs

Relevant unit costs are provided below to aid consideration of cost effectiveness.

Table 19: Unit costs associated with staff providing CBT interventions

Resource	Cost per patient facing hour	CBT duration (hours)	Cost per CBT course per person	Source
Band 4 / 5 / 6 community nurse	£36 / £47 / £58	5hrs 35 mins	£201 / £262 / £324	Unit cost: PSSRU 2022, including qualification costs (excluding individual and productivity costs) CBT resource use: Dorresteijn 2016 (a)
Health care assistant	£26	6 hrs	£156	Unit cost: Calculated based on reported wage from PSSRU 2022 and proportional Salary oncosts, Overheads and Capital used by PSSRU for Community-based social care professionals. CBT resource use: Parry 2016 (b)

(a) The AMB-Home program consists of seven individual sessions, including three home-visits (60, 60 and 75 min, respectively) and four telephone contacts (35 min each). The facilitators were community nurses who were qualified in the field of geriatrics and worked at local home-care agencies.

(b) CBT was performed face-to-face on a one-to-one basis. CBT was delivered by a Health Care Assistant (non-specialist with training in basic CBT skills, formulation and treatment skills). Sessions lasted around 45minutes each for 8 weeks plus a single reinforcement session 6 months after the last CBT session.

1.1.42. Evidence statements

1.1.42.1. Economic

No relevant economic evaluations were identified.

1.1.43. The committee's discussion and interpretation of the evidence

1.1.43.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on psychological intervention for falls prevention found evidence for all outcomes (rate of falls, number of people sustaining one or more falls, number of participants sustaining fall-related fractures, adverse events, and health-related quality of life).

1.1.43.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to moderate. Findings were downgraded due to risk of bias (for example, lack of blinding). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. Some evidence was also downgraded due to inconsistency with unexplained heterogeneity. The evidence was not downgraded for indirectness. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.43.3. Benefits and harms

The evidence demonstrated a reduction in the number of fall-related fractures and number of adverse events; however the quality was rated as low or very low and was limited in amount. All the studies included cognitive behavioural interventions, except for one on Motivational Interviewing and the committee discussed in their experience a small number of people who have a fear of falling may be referred for cognitive behavioural interventions. The review did not include fear of falling as an outcome, but the committee discussed how concerns about falling can have a significant detrimental effect on quality of life, that can result in some people not being able to participate in usual activities of daily living. In current practice people are more likely to be referred for cognitive behavioural interventions when other interventions have failed, and the intensity of the intervention would vary according to the impact on a person's life, but typically they would be over a short period of time around 4-6 sessions. The committee agreed a cognitive behavioural intervention approach may be offered as part of a comprehensive package based on individual needs.

One study on Motivational interviewing, showed limited evidence for motivational interviewing on the outcomes and there was no benefit shown, with it favouring the standard care arm of the trial for number of fallers. However, it should be noted that there were discrepancies in the reporting of the outcome across numerous papers linked to the study.

1.1.43.4. Cost effectiveness and resource use

No health economic studies were identified for psychological interventions. Unit costs were presented for cognitive behavioural therapy (CBT), with the costs based on the resource use reported in the clinical evidence (Parry 2016 and Dorresteijn 2016). Both studies provided up to 6 hours of one-to-one CBT provided over multiple sessions. Parry 2016 was a study devised to demonstrate that CBT could be delivered by a health care assistant with CBT training, the estimated cost was £156, in Dorresteijn 2016, CBT was provided by a nurse, with the estimated cost between £201 to £324, depending on nurse banding. The committee considered these estimates to be low and potentially an underestimate current UK NHS costs. The committee discussed that in current practice CBT is usually provided by either a clinical psychologist (assistant or experienced) or at a minimum a band 6 or 7 nurse. People would receive 4 to 6 one-to-one sessions.

The committee discussed that the clinical evidence showed a reduction in rate of falls but not number of fallers. They noted that fear of falling is reduced but that this was not an outcome specified in the protocol. It was suggested that CBT may be useful in those who don't respond to exercise and as a way of addressing fear of falling. The committee felt there was insufficient clinical evidence to make a practice recommendation of CBT as a standalone intervention. It might be considered as part of a comprehensive intervention.

1.1.44. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.14 in the NICE guideline.

Surgical interventions for falls prevention in community care settings

1.1.45. Effectiveness evidence

1.1.45.1. Included studies

No new randomised controlled trials were identified from searching. Five studies were identified from the Gillespie 2012[21] review. Evidence from these studies is summarised in the clinical evidence summary below.

See also the study selection flow chart in Appendix C, forest plots in Appendix E and GRADE tables in Appendix F.

One Cochrane review (Gillespie 2012)[21] was identified in the search.

The studies identified included the following comparisons:

- Small incision cataract surgery with insertion of intraocular lens under local anaesthetic (2nd eye) to control (waiting list)[19]
- Expedited cataract surgery (1st eye) to routine waiting list[26]
- Pacemaker to no pacemaker (control)[37]
- Dual chamber permanent pacemaker switched on to control[46]
- Pacemaker (Medtronic Kappa 700 (Europe) or Kappa 400 (North America)) to control (implantable loop recorder (Medtronic reveal))[59]

The included studies focused on community-dwelling adults.

Three of the studies included quality of life information (Ryan, 2010[59], Foss, 2006[19], and Harwood, 2005[26]. Ryan, 2010[59] reported quality of life data through both SF-36 and Euroqol, whereas Foss, 2006[19] and Harwood, 2005[26] reported Euroqol data alone. Ryan, 2010[59] reported the SF-36 baseline values 28.7 and 29.6 for the loop recorder and pacemaker groups, respectively. The follow-up data was reported as 30.3 for the loop recorder group and 33.2 for the pacemaker group. The mean Euroqol score reported at baseline was 0.64 for the loop recorder group and 0.68 for the pacemaker group, whereas at follow-up the loop recorder group was reported to have a mean score of 0.57 and the pacemaker group had a score of 0.66.

1.1.45.2. Excluded studies

See the excluded studies list in Appendix J.

1.1.46. Summary of studies included in the effectiveness evidence

Table 20: Summary of identified studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Foss, 2006[19]	Small incision cataract surgery with insertion of intraocular lens under local anaesthetic (2nd	Community-dwelling women referred to an ophthalmology outpatient clinic	Rate of falls, number of fallers; number of people sustaining a fracture; quality of life	Study identified in Gillespie, 2012[21]

Study	Intervention and comparison	Population	Outcomes	Comments
	eye) vs. control (waiting list) Total n=239 Study duration: 1 year	Median age (range): 79.5 (70-92) years Sex: 100% female Country: UK		
Harwood, 2005[26]	Expedited cataract surgery (1st eye) vs. routine waitlist for surgery Total n=306 Study duration: 1 year	Community-dwelling adults referred to an ophthalmologist Age (years): median 78.5 (range 70-95) Sex: 100% female Country: UK	Rate of falls, number of fallers; number of people sustaining a fracture; quality of life	Study identified in Gillespie, 2012[21]
Kenny, 2001)[37]	Pacemaker vs. control (no pacemaker) Total n=175 Study duration: 1 year after randomisation	Community-dwelling adults presenting at A&E with non-accidental fall Age (years): mean 73 (SD 10) Sex: 59% female Country: UK	Rate of falls; number of participants sustaining a fracture	Study identified in Gillespie, 2012[21]
Parry, 2009[46]	Dual chamber permanent pacemaker vs. control	Community-dwelling adults attending specialist fall	Rate of falls; number of fallers	Study identified in Gillespie, 2012[21]

Study	Intervention and comparison	Population	Outcomes	Comments
Crossover RCT	Total n=34 Study duration: 6 months in each mode	and syncope clinics Mean age (SD): 76.8 (9.0) years Sex:79% female Country: UK		
Ryan, 2010[59]	Pacemaker vs. control Total n=141 Study duration: mean 24 months	Adults with carotid sinus hypersensitivity identified from outpatient care Mean age (SD): 78 (7) years Sex: 62% female Country: UK, Europe and North America	Rate of falls, number of fallers, and quality of life	Study identified in Gillespie, 2012[21]

See appendix D for full evidence tables.

1.1.47. Summary of the effectiveness evidence

1.1.6.1 Surgery vs. control

Table 21: Clinical evidence summary: Surgery versus control

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Surgery	
Rate of falls- Cardiac pacing vs. control	349 (3 RCTs)	⊕⊕◯◯ Low[a,b]	**Rate ratio 0.73** (0.57 to 0.93)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Surgery	
						Clinical benefit of cardiac pacing
Rate of falls- Cataract surgery (1st eye) vs. control	306 (1 RCT)	⊕◯◯◯ Very low[b,c]	**Rate ratio 0.66** (0.45 to 0.95)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Clinical benefit of cataract surgery
Rate of falls- Cataract surgery (2nd eye) vs. control	239 (1 RCT)	⊕◯◯◯ Very low[b,c]	**Rate ratio 0.68** (0.39 to 1.17)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Clinical benefit of cataract surgery
Number of fallers- Cardiac pacing vs. control	178 (2 RCTs)	⊕⊕◯◯ Low[b,d]	**RR 1.20** (0.92 to 1.55)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) No clinical difference
Number of fallers- Cataract surgery (1st eye) vs. control	306 (1 RCT)	⊕◯◯◯ Very low[b,c]	**RR 0.95** (0.68 to 1.33)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Surgery	
						No clinical difference
Number of fallers- Cataract surgery (2nd eye) vs. control	239 (1 RCT)	⊕◯◯◯ Very low[b,c]	**RR 1.06** (0.69 to 1.63)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) No clinical difference
Number of people sustaining a fracture- Cardiac pacing vs. control	171 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 0.78** (0.18 to 3.39)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) Clinical benefit of cardiac pacing
Number of people sustaining a fracture- Cataract surgery (1st eye) vs. control)	306 (1 RCT)	⊕◯◯◯ Very low[b,c]	**RR 0.33** (0.10 to 1.05)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) Clinical benefit of cataract surgery
Number of people sustaining a fracture- Cataract surgery (2nd	239 (1 RCT)	⊕◯◯◯ Very low[b,c]	**RR 2.51** (0.50 to 12.52)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Surgery	
eye) vs. control)						Harm of cataract surgery
Quality of life (EuroQoL-score of 0-100 with 0 being the worst health you can imagine and 100 being the best health you can imagine)	535 (2 RCTs)	⊕⊕◯◯ Low[b,e]	-	The mean quality of life (EuroQoL) surgery vs control was 0.21	MD 0.05 higher (0.01 higher to 0.09 higher)	MID: 0.5 x baseline SD= 0.683 (precision: CI crosses 1 MID) No clinical difference

a. Downgraded by 1 increment for risk of bias due to unclear risk of bias regarding randomisation, allocation concealment, blinding of participants, and blind of outcome assessment processes.

b. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

c. Downgraded by 2 increments for risk of bias due to different components of the outcome assessment process not being blinded.

d. Downgraded by 1 increment for risk of bias due to unclear risk of bias regarding allocation concealment and blinding of outcome assessment processes.

e. Downgraded by 1 increment for risk of bias due to blinding of outcome assessment, allocation concealment, and blinding of participants and personnel.

See appendix F for full GRADE tables.

1.1.48. Economic evidence

1.1.48.1. Included studies

Two health economic studies included in this review, one comparing cataract surgery to no surgery;[10], the other comparing cataract surgery to no surgery and cardiac pacing to no

surgery [13]. This is summarised in the health economic evidence profile below (Table 4, Table 5) and the health economic evidence table in Appendix H.

1.1.48.2. Excluded studies

One health economic studies were excluded due to assessment of limited applicability.

See also the health economic study selection flow chart in Appendix G.

1.1.49. Summary of included economic evidence

Table 22: Health economic evidence profile: Routine cataract surgery versus no surgery and expedited cataract surgery versus routine cataract surgery

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Boyd 2020[10] (New Zealand)	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Deterministic Markov model based on a single RCT (Harwood 2005)[26] • Cost-utility analysis (QALYs) • Population: Adults aged 65 to 89 requiring first cataract eye surgery. • Setting: Community • Comparators: 1. No cataract surgery 2. Routine cataract surgery 3. Expedited cataract surgery (additional 1 year of benefit over routine surgery) Time horizon: Lifetime	(2−1): £1,515 (3−2): £283 [(c)]	(2−1): 0.5104 QALYs (3−2): 0.0618 QALYs	(2−1): £2,946 per QALY gained. (3−2): £4,562 per QALY gained.	No probabilistic sensitivity analysis. One way sensitivity analyses to identify drivers of uncertainty were conducted. Results relatively robust to various scenario analyses, with cost effectiveness conclusions remaining unchanged (10 year and 20-year time horizons; discount rate 0% and 6%; subgroups by demographic groups – ethnicity, age and gender and history of previous injurious falls).

Abbreviations: ICER= incremental cost-effectiveness ratio; QALY= quality-adjusted life years; RCT= randomised controlled trial

(a) New Zealand healthcare perspective, with 2011 costs, may not be reflective of current UK context. The comparison of expedited versus routine cataract surgery as defined here may not apply to UK NHS context. QoL assessed using disease weights rather than EQ-5D. Discounting at 3% rather than 3.5% as required by NICE reference case.
(b) Baseline data and resource use from New Zealand, may not be applicable to current NHS context. No probabilistic sensitivity analysis conducted. Relative treatment effect based on a single RCT (no further evidence identified in clinical review). Excludes non-fall injuries and so may underestimate QALY gain of cataract surgery.
(c) 2011 New Zealand Dollars converted to UK pounds[44]. Cost components incorporated: Routine and expedited cataract surgery, injurious falls.

Table 23: Health economic evidence profile: Expedited cataract surgery versus routine cataract surgery and Cardiac pacing versus no surgery

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects (QALYs)	Cost effectiveness (£/QALY gained)	Uncertainty
Church et al. 2012	Partially applicable(a)	Potentially serious limitations(b)	• Decision tree and Markov model. • Cost-utility analysis (QALYs) • Population: Cohort starting age 65 • Setting: Community but can move into residential care in the model • Comparators: General population: 1. No treatment, 2. Group-based exercises, 3.Tai Chi, 4. Exercise and falls advice,	Incremental versus 1: General population 2: £230 3: £240 4: £322 5: £387 6: £465 7: £550 High risk population	Incremental versus 1: General population 2: 0.007 3: 0.011 4: 0.009 5: 0.005 6: 0.010 7: 0.009 High risk population	General population(d): 2: Ex. Dom 3 vs 1: £21,770 4: Dominated 5: Dominated 6: Dominated 7: Dominated High risk population(d):	One way sensitivity analysis shows that removing “fear of falling” from the model, none of the interventions were cost effective. Intervention effectiveness, intervention cost and cohort start age are all drivers in the model. Using probabilistic sensitivity analysis for the general population interventions, at low willingness to pay thresholds ‘no

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects (QALYs)	Cost effectiveness (£/QALY gained)	Uncertainty
			5.Multifactorial interventions; Assessment and referral, 6.Home-based exercise, 7.Multifactorial interventions; Assessment and active intervention, High risk population: 8. Group based exercise, 9. Multifactorial (high risk), 10.Home hazard modification, Specific population: 11. Psychotropic medication withdrawal, 12. Cardiac pacing, 13. Expedited cataract surgery • Time horizon: Lifetime	8: £208 9: £355 10: £417 Specific population 11: £162 12: £4,753 13: saves £30 [c]	8: 0.008 9: 0.008 10: 0.015 Specific population 11: 0.019 12: 0.172 13: 0.010	8 vs 1: £25,086 9: Dominated 10 vs 8: £32,997 Specific population [e]: 11 vs 1: £8,474 12 vs 1: £27,634 13 vs 1: Dominates (less costly and more effective)	intervention' dominates however, above £29,549 threshold Tai Chi dominates.

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects (QALYs)	Cost effectiveness (£/QALY gained)	Uncertainty
			• Cycle length: 1 year				

(a) Australian health care system, discounting at 5% rather than 3.5% as required by NICE reference case.
(b) Outcomes, cost and interventions effectiveness came from 2009 which may not reflect full body of clinical evidence and may not reflect current UK NHS context.
(c) 2009 costs AUD converted to GDP 2009 using PPP
(d) Estimates are all ranked against the next best option in this group to determine cost-effectiveness. Full incremental analysis of available strategies: first strategies are ruled out that are dominated (another strategy is more effective and has lower costs) or subject to extended dominance (the strategy is more effective and more costly but the incremental cost effectiveness ratio is higher than the next most effective option and so it would never be the most cost effective option); incremental costs, incremental effects and incremental cost effectiveness ratios are calculated for the remaining strategies by comparing each to the next most effective option.
(e) Estimates are all compared to the 'no intervention' option as each intervention applies to a different population.

1.1.50. Economic model

Whilst this review question was prioritised for de novo modelling, this intervention was not prioritised.

1.1.51. Evidence statements

1.1.51.1. Economic

One cost utility analysis found that expedited cataract surgery was cost effective compared to routine cataract surgery and no surgery in community dwelling older adults requiring cataract surgery (ICER £4,562 per QALY gained compared to routine cataract surgery). Routine surgery was cost effective compared to no surgery (ICER £2,964 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations.

One cost utility study found that expedited cataract surgery dominated usual care. This analysis was assessed as partially applicable with potentially serious limitations.

1.1.52. The committee's discussion and interpretation of the evidence

1.1.52.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on surgery for falls prevention found evidence for rate of falls, number of fallers, number of people sustaining fall related fractures, and health-related quality of life. No evidence was found for adverse events.

1.1.52.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to low. Findings were downgraded due to risk of bias (for example, risk of bias due to unclear risk of bias regarding randomisation, allocation concealment, blinding of participants and blinding of outcome assessment processes). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. The evidence was not downgraded for indirectness or inconsistency. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.52.3. Benefits and harms

No new evidence for surgery to reduce falls was found since the publication of the Cochrane review and so the committee considered the evidence from the Cochrane. Evidence from 3 studies found a clinical benefit of cardiac pacing compared to control for the rate of falls and number of people sustaining a fracture with low confidence in the effects, however no clinical difference was found for the number of fallers. Evidence from 2 studies found a clinical benefit of cataract surgery compared to control (1st and 2nd eye) for rate of falls with very low confidence in the effects, however no clinical differences again were found for the number of fallers. No clinical differences were found for health-related quality of life outcomes.

The committee discussed the current recommendation for cardiac pacing in the guideline being for a very specific population to address a specific syndrome. They agreed the current recommendation should be retained although they questioned whether this population could have fainted or had transient loss of consciousness (TLOC) rather than a fall and edited the recommendation to indicate the uncertainty. It is important to identify people with this syndrome although testing is variable within current practice and not all centres would carry

out a physical assessment for cardioinhibitory carotid sinus hypersensitivity because of the risk of causing a stroke. The committee commented that very few centres will do the test because of the risk associated with it.

The committee agreed if a person has a visual impairment caused by cataracts they would be referred to an ophthalmologist. They noted that cataract surgery is a simple and effective intervention, and the guideline should cross- refer to the NICE Cataracts in adults guideline. The committee noted the benefit in rate of falls, and number of people having a fracture for expediated cataract surgery and the positive cost-effectiveness evidence. However they acknowledged the health economic evidence was in non-UK health systems, and the clinical evidence was based on one small study rated as very low for these outcomes

1.1.52.4. Cost effectiveness and resource use

One study assessed cardiac surgery for the prevention of falls, this was Church 2012. This study was assessed as partially applicable with potentially serious limitations. The study found that cardiac pacing had an ICER of £27,635. The committee wanted to keep the past recommendation for cardiac pacing for people with cardioinhibitory carotid sinus hypersensitivity. They agreed that it was current practice and therefore unlikely to have a significant resource impact. They discussed that the assessment for cardioinhibitory carotid sinus hypersensitivity has changed and that physical assessments are done less frequently due to the risks associated, but rather electrocardiograms are used instead.

One health economic study was identified comparing routine cataract surgery, expedited cataract surgery and no surgery. This study was assessed as partially applicable with potential serious limitations. The analysis found that expedited cataract surgery was the most cost-effective option (ICER £4,562 per QALY gained versus routine cataract surgery). Routine cataract surgery was more cost effective than no surgery (ICER £2,946 per QALY gained). The committee agreed to include a cross reference to the existing NICE cataract guideline (NG77) which includes recommendations for referral to cataract surgery.

1.1.53. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.14 in the NICE guideline.

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71. Witham MD, Price RJG, Band MM, Hannah MS, Fulton RL, Clarke CL et al. Effect of Vitamin K2 on Postural Sway in Older People Who Fall: A Randomized Controlled Trial. Journal of the American Geriatrics Society. 2019; 67(10):2102-2107

72. Zhou J, Liu B, Qin M-Z, Liu J-P. Fall Prevention and Anti-Osteoporosis in Osteopenia Patients of 80 Years of Age and Older: A Randomized Controlled Study. Orthopaedic Surgery. 2020; 12(3):890-899

Appendices

Appendix A Review protocols

A.1 Review protocol for preventing falls in community care settings

ID	Field	Content
0.	PROSPERO registration number	N/A
1.	Review title	What are the most clinically effective and cost-effective interventions for preventing falls in older people in community settings?
2.	Review question	What are the most clinically and cost-effective methods for falls prevention in older people in community settings?
3.	Objective	To update the existing guideline with new evidence of falls prevention and increase uptake in a range of other settings where NHS health and social care services are delivered, in addition to hospitals.
4.	Searches	The following databases will be searched from the date of the last search of the relevant Cochrane reviews: Cochrane Central Register of Controlled Trials (CENTRAL) Cochrane Database of Systematic Reviews (CDSR) Embase MEDLINE Epistemonikos [Searches will be restricted by: English language studies Human studies The searches may be re-run 6 weeks before the final committee meeting and further studies retrieved for inclusion if relevant. The full search strategies will be published in the final review.

ID	Field	Content
		Medline search strategy to be quality assured using the PRESS evidence-based checklist (see methods chapter for full details).
5.	Condition or domain being studied	Falls in people over 65 years old.
6.	Population	Inclusion: People in the community who are: aged 65 and over. aged 50 to 64 who have a condition or conditions that may put them at higher risk of falling. Exclusion: any age group that does not fit the inclusion criteria; families and carers. If the study includes settings, other than community settings, a 10% cut-off point would be used before the evidence was downgraded.
7.	Intervention	Single interventions Exercise: group and individual Medication: vitamin D; calcium; HRT Medication withdrawal Surgery: cardiac pacemaker insertion; cataract surgery. Fluid or nutrition therapy Psychological interventions: CBT Environment/assistive technology: home safety interventions; aids for personal mobility. Environmental aids for communication, information and signalling e.g. vision improvement. Body worn aids for personal care and protection: footwear modification. Knowledge/education interventions Multiple component interventions: combination of single categories of intervention (receive a fixed combination of 2 or more fall prevention interventions from the different categories above) Multifactorial interventions: more than one main category of intervention (assessment of an individual to determine the presence of 2 or more modifiable risk factors for falling, followed by specific interventions targeting those risk factors).
8.	Comparator	Single interventions' comparators:

ID	Field	Content
		Usual care/placebo Multicomponent or multifactorial interventions' comparators: Usual care/attention control Exercise as a single intervention. Exercise Usual care/control Exercise
9.	Types of study to be included	Randomised controlled trials (RCTs). There are enough RCTs identified within the area so we will not be including non-randomised studies. For a systematic review (SR) to be included it must be conducted in line with the methodological processes described in the NICE manual. If sufficient details are provided, reviewers will either include the SR fully or use it as the basis for further analyses where possible. If sufficient details are not provided to include a relevant SR, the review will only be used for citation searching. Published NMAs and IPDs will be considered for inclusion.
10.	Other exclusion criteria	Non-English language studies Conference abstracts will be excluded as it is expected there will be sufficient full text published studies available.
11.	Context	Community setting, other settings are included in other protocols.
12.	Primary outcomes (critical outcomes)	All outcomes are considered equally important for decision making and therefore have all been rated as critical: Rate of falls Number of people sustaining one or more falls Number of participants sustaining fall-related fractures Adverse effects of the interventions (composite of all) Validated health-related quality of life scores e.g. EQ-5D or similar

ID	Field	Content
13.	Data extraction (selection and coding)	EndNote will be used for reference management, sifting, citations and bibliographies. All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. 10% of the abstracts will be reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. The full text of potentially eligible studies will be retrieved and will be assessed in line with the criteria outlined above. A standardised form will be used to extract data from studies (see Developing NICE guidelines: the manual section 6.4). 10% of all evidence reviews are quality assured by a senior research fellow. This includes checking: papers were included /excluded appropriately. a sample of the data extractions correct methods are used to synthesise data. a sample of the risk of bias assessments Disagreements between the review authors over the risk of bias in particular studies will be resolved by discussion, with involvement of a third review author where necessary. Study investigators may be contacted for missing data where time and resources allow.
14.	Risk of bias (quality) assessment	Risk of bias will be assessed using the appropriate checklist as described in Developing NICE guidelines: the manual. For Intervention reviews Systematic reviews: Risk of Bias in Systematic Reviews (ROBIS) Randomised Controlled Trial: Cochrane RoB (2.0) Non-randomised study, including cohort studies: Cochrane ROBINS-I
15.	Strategy for data synthesis	Where available, outcome data from new studies will be meta-analysed with corresponding data included in CG161 (which was based on Gillespie 2012 Cochrane review) for single interventions. A Cochrane review on multifactorial and multi-component interventions (Hopewell 2018) will be updated and a Cochrane review on exercise (Sherrington 2019) will be updated. Pairwise meta-analyses will be performed using Cochrane Review Manager (RevMan5). Fixed-effects (Mantel-Haenszel) techniques will be used to calculate risk ratios for the binary outcomes where

ID	Field	Content	
		possible. Continuous outcomes will be analysed using an inverse variance method for pooling weighted mean differences. Heterogeneity between the studies in effect measures will be assessed using the I^2 statistic and visually inspected. An I^2 value greater than 50% will be considered indicative of substantial heterogeneity. Sensitivity analyses will be conducted based on pre-specified subgroups using stratified meta-analysis to explore the heterogeneity in effect estimates. If this does not explain the heterogeneity, the results will be presented pooled using random effects. GRADEpro will be used to assess the quality of evidence for each outcome, taking into account individual study quality and the meta-analysis results. The 4 main quality elements (risk of bias, indirectness, inconsistency and imprecision) will be appraised for each outcome. Publication bias will be considered with the guideline committee, and if suspected will be tested for when there are more than 5 studies for that outcome. The risk of bias across all available evidence was evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group http://www.gradeworkinggroup.org/ Where meta-analysis is not possible, data will be presented and quality assessed individually per outcome. WinBUGS will be used for network meta-analysis, if possible, given the data identified. Consider groups identified in the equality impact assessment. Equality issues raised: Disability -People with mental health problems have limited access to physiotherapy services within inpatient mental health. People with learning disabilities are at risk of falls. Tailored education and information may be required for people with learning disabilities to meet their needs. Sex differences in balance outcomes have been reported within the literature in some populations at risk of falls Other definable characteristics (these are examples): - People in Gypsy, Roma and Traveller communities. - People not registered with a GP or in contact with health and social care services	
16.	Analysis of sub-groups	Subgroups that will be investigated if heterogeneity is present: specific type of intervention.	
17.	Type and method of review	x	Intervention
		☐	Diagnostic

ID	Field	Content			
		☐	Prognostic		
		☐	Qualitative		
		☐	Epidemiologic		
		☐	Service Delivery		
		☐	Other (please specify)		
18.	Language	English			
19.	Country	England			
20.	Anticipated or actual start date	[For the purposes of PROSPERO, the date of commencement for the systematic review can be defined as any point after completion of a protocol but before formal screening of the identified studies against the eligibility criteria begins. A protocol can be deemed complete after sign-off by the NICE team with responsibility for quality assurance.]			
21.	Anticipated completion date	21/8/2024			
22.	Stage of review at time of this submission	Review stage	Started	Completed	
		Preliminary searches	☑	☑	
		Piloting of the study selection process	☑	☑	
		Formal screening of search results against eligibility criteria	☑	☑	
		Data extraction	☑	☑	
		Risk of bias (quality) assessment	☑	☑	
		Data analysis	☑	☑	
23.	Named contact	5a. Named contact Julie Neilson Centre for Guidelines, NICE 5b Named contact e-mail Guidelines8@nice.org.uk			

ID	Field	Content
		5e Organisational affiliation of the review National Institute for Health and Care Excellence (NICE)
24.	Review team members	From NICE: Gill Ritchie [Guideline lead] Julie Neilson [Senior systematic reviewer] Annette Chalker [Systematic reviewer] Sophia Kemmis-Betty [Senior Health economist] Steph Armstrong [Health economist] Joseph Runicles [Information specialist] Tamara Diaz [Project Manager]
25.	Funding sources/sponsor	Development of this systematic review is being funded by NICE.
26.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
27.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: [NICE guideline webpage].
28.	Other registration details	N/A
29.	Reference/URL for published protocol	[Give the citation and link for the published protocol, if there is one.]
30.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: notifying registered stakeholders of publication

ID	Field	Content	
		publicising the guideline through NICE's newsletter and alerts issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE. [Add in any additional agree dissemination plans.]	
31.	Keywords	[Give words or phrases that best describe the review.]	
32.	Details of existing review of same topic by same authors	N/A	
33.	Current review status	☐	Ongoing
		x	Completed but not published
		☐	Completed and published
		☐	Completed, published and being updated
		☐	Discontinued
34.	Additional information	N/A	
35.	Details of final publication	www.nice.org.uk	

A.2 Health economic review protocol

Review question	All questions – health economic evidence
Objectives	To identify health economic studies relevant to any of the review questions.
Search criteria	• Populations, interventions and comparators must be as specified in the clinical review protocol above. • Studies must be of a relevant health economic study design (cost–utility analysis, cost-effectiveness analysis, cost–benefit analysis, cost–consequences analysis, comparative cost analysis). • Studies must not be a letter, editorial or commentary, or a review of health economic evaluations. (Recent reviews will be ordered although not reviewed. The bibliographies will be checked for relevant studies, which will then be ordered.) • Unpublished reports will not be considered unless submitted as part of a call for evidence. • Studies must be in English.
Search strategy	A health economic study search will be undertaken using population-specific terms and a health economic study filter – see appendix B below.
Review strategy	Studies not meeting any of the search criteria above will be excluded. Studies published before 2007, abstract-only studies and studies from non-OECD countries or the USA will also be excluded. Studies published after 2007 that were included in the previous guideline(s) will be reassessed for inclusion and may be included or selectively excluded based on their relevance to the questions covered in this update and whether more applicable evidence is also identified. Each remaining study will be assessed for applicability and methodological limitations using the NICE economic evaluation checklist which can be found in appendix H of Developing NICE guidelines: the manual (2014).[43] Inclusion and exclusion criteria • If a study is rated as both 'Directly applicable' and with 'Minor limitations', then it will be included in the guideline. A health economic evidence table will be completed, and it will be included in the health economic evidence profile. • If a study is rated as either 'Not applicable' or with 'Very serious limitations', then it will usually be excluded from the guideline. If it is excluded, then a health economic evidence table will not be completed, and it will not be included in the health economic evidence profile. • If a study is rated as 'Partially applicable', with 'Potentially serious limitations' or both then there is discretion over whether it should be included. Where there is discretion The health economist will make a decision based on the relative applicability and quality of the available evidence for that question, in discussion with the guideline committee if required. The ultimate aim is to include health economic studies that are helpful for decision-making in the context of the guideline and the current NHS setting. If several studies are considered of sufficiently high applicability and methodological quality that they could all be included, then the health economist, in discussion with the committee if required, may decide to include only the most applicable studies and to selectively exclude the remaining studies. All studies excluded on the basis of applicability or methodological limitations will be listed with explanation in the excluded health economic studies appendix below.

The health economist will be guided by the following hierarchies.

Setting:

- UK NHS (most applicable).
- OECD countries with predominantly public health insurance systems (for example, France, Germany, Sweden).
- OECD countries with predominantly private health insurance systems (for example, Switzerland).
- Studies set in non-OECD countries or in the USA will be excluded before being assessed for applicability and methodological limitations.

Health economic study type:

- Cost–utility analysis (most applicable).
- Other type of full economic evaluation (cost–benefit analysis, cost-effectiveness analysis, cost–consequences analysis).
- Comparative cost analysis.
- Non-comparative cost analyses including cost-of-illness studies will be excluded before being assessed for applicability and methodological limitations.

Year of analysis:

- The more recent the study, the more applicable it will be.
- Studies published in 2007 or later (including any such studies included in the previous guideline(s)) but that depend on unit costs and resource data entirely or predominantly from before 2007 will be rated as 'Not applicable'.
- Studies published before 2007 (including any such studies included in the previous guideline(s)) will be excluded before being assessed for applicability and methodological limitations.

Quality and relevance of effectiveness data used in the health economic analysis:

- The more closely the clinical effectiveness data used in the health economic analysis match with the outcomes of the studies included in the clinical review the more useful the analysis will be for decision-making in the guideline.

Appendix B Literature search strategies

The literature searches for this review are detailed below and complied with the methodology outlined in Developing NICE guidelines: the manual (2014)

For more information, please see the Methodology review published as part of the accompanying documents for this guideline.

B.1 Clinical search literature search strategy

Searches were constructed using a PICO framework where population (P) terms were combined with Intervention (I) and in some cases Comparison (C) terms. Outcomes (O) are rarely used in search strategies as these concepts may not be indexed or described in the title or abstract and are therefore difficult to retrieve. Search filters were applied to the search where appropriate.

Table 24: Database parameters, filters and limits applied

Database	Dates searched	Search filter used
Medline ALL (OVID)	01-03-2012 - 07-05-2024	Systematic reviews Randomised controlled trials Exclusions (animal studies, letters, comments, editorials, news, historical articles, anecdotes, case studies/reports) English language
Embase (OVID)	01-03-2012 - 07-05-2024	Systematic reviews Randomised controlled trials Exclusions (animal studies, letters, comments, editorials, case studies/reports, conference abstracts) English language
The Cochrane Library (Wiley)	Cochrane CDSR to 2024 Issue 5 of 12	
Epistemonikos (The Epistemonikos Foundation)	No date limits applied (searched 07/05/2024)	

Medline (Ovid) search terms

1	Accidental Falls/
2	(falls or falling or fallen or faller*1).ti,ab.
3	or/1-2
4	letter/
5	editorial/
6	news/
7	exp historical article/
8	Anecdotes as Topic/
9	comment/
10	case reports/
11	(letter or comment*).ti.
12	or/4-11
13	randomized controlled trial/ or random*.ti,ab.
14	12 not 13
15	animals/ not humans/
16	exp Animals, Laboratory/
17	exp Animal Experimentation/
18	exp Models, Animal/
19	exp Rodentia/
20	(rat or rats or mouse or mice or rodent*).ti.
21	or/14-20
22	3 not 21
23	limit 22 to english language
24	exp Aged/
25	(senior*1 or elder* or old* or aged or ag?ing or geriatric or community dwelling*).ti,ab,kf.
26	24 or 25
27	23 and 26
28	randomized controlled trial.pt.
29	controlled clinical trial.pt.
30	randomi#ed.ti,ab.

31	placebo.ab.
32	randomly.ti,ab.
33	Clinical Trials as topic.sh.
34	trial.ti.
35	or/28-34
36	systematic review/
37	meta-analysis/
38	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
39	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
40	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
41	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
42	(search* adj4 literature).ab.
43	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
44	cochrane.jw.
45	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
46	or/36-45
47	27 and (35 or 46)
48	limit 47 to dt=20120301-20230331
49	limit 47 to ed=20120301-20230331
50	48 or 49

Embase (Ovid) search terms

1	falling/
2	(falls or falling or faller*1 or fallen).ti,ab.
3	or/1-2
4	letter.pt. or letter/
5	note.pt.
6	editorial.pt.
7	case report/ or case study/

8	(letter or comment*).ti.
9	(conference abstract or conference paper).pt.
10	or/4-9
11	randomized controlled trial/ or random*.ti,ab.
12	10 not 11
13	animal/ not human/
14	nonhuman/
15	exp Animal Experiment/
16	exp Experimental Animal/
17	animal model/
18	exp Rodent/
19	(rat or rats or mouse or mice or rodent*).ti.
20	or/12-19
21	3 not 20
22	limit 21 to english language
23	exp *aged/
24	(senior*1 or elder* or old* or aged or ag?ing or geriatric or community dwelling*).ti,ab,kf.
25	23 or 24
26	22 and 25
27	random*.ti,ab.
28	factorial*.ti,ab.
29	(crossover* or cross over*).ti,ab.
30	((doubl* or singl*) adj blind*).ti,ab.
31	(assign* or allocat* or volunteer* or placebo*).ti,ab.
32	crossover procedure/
33	single blind procedure/
34	randomized controlled trial/
35	double blind procedure/
36	or/27-35
37	systematic review/
38	meta-analysis/

39	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
40	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
41	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
42	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
43	(search* adj4 literature).ab.
44	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
45	cochrane.jw.
46	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
47	or/37-46
48	26 and (36 or 47)
49	limit 48 to dc=20120301-20230331

Cochrane CDSR search terms

#1	MeSH descriptor: [Accidental Falls] explode all trees
#2	(fall or falls or falling or faller* or fallen or slip* or trip* or collapse*):ti,ab
#3	#1 or #2
#4	MeSH descriptor: [Aged] explode all trees
#5	(senior*1 or elder* or old* or aged or ag?ing or geriatric or community dwelling*):ti,ab
#6	#4 or #5
#7	#3 and #6 with Cochrane Library publication date Between Mar 2012 and Mar 2023, in Cochrane Reviews

Epistemonikos search terms

(title:((title:((falls OR falling OR fallen OR faller*1)) OR abstract:((falls OR falling OR fallen OR faller*1)))) OR abstract:((title:((falls OR falling OR fallen OR faller*1)) OR abstract:((falls OR falling OR fallen OR faller*1))))) AND (title:((senior*1 OR elder* OR old* OR aged OR ag?ing OR geriatric OR community dwelling*)) OR abstract:((senior*1 OR elder* OR old* OR aged OR ag?ing OR geriatric OR community dwelling*)))

B.2 Health Economics literature search strategy

Health economic evidence was identified by applying economic evaluation and quality of life filters to the clinical literature search strategy in Medline and Embase. The following databases were also searched: NHS Economic Evaluation Database (NHS EED - this ceased to be updated after 31st March 2015), Health Technology Assessment database (HTA - this ceased to be updated from 31st March 2018) and The International Network of Agencies for Health Technology Assessment (INAHTA)

Table 25: Database parameters, filters and limits applied

Database	Dates searched	Search filters and limits applied
Medline (OVID)	Health Economics 1 January 2014 – 8 May 2024	Health economics studies Quality of Life studies Exclusions (animal studies) English language
	Quality of Life 1 January 2004 to – 8 May 2024	
Embase (OVID)	Health Economics 1 January 2014 – 8 May 2024	Health economics studies Quality of Life studies Exclusions (animal studies) English language
	Quality of Life 1 January 2004 to – 8 May 2024	
NHS Economic Evaluation Database (NHS EED) (Centre for Research and Dissemination - CRD)	Inception – 31 March 2015 (database no longer updated as of this date)	
Health Technology Assessment Database (HTA) (Centre for Research and Dissemination – CRD)	Inception – 31 March 2018 (database no longer updated as of this date)	
The International Network of Agencies for Health Technology Assessment (INAHTA)	Inception - 8 May 2024	English language

Medline (Ovid) search terms

1	Accidental Falls/
2	(fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*).ti,ab.
3	or/1-2
4	letter/
5	editorial/
6	news/
7	exp historical article/
8	Anecdotes as Topic/
9	comment/
10	case report/
11	(letter or comment*).ti.
12	or/4-11
13	randomized controlled trial/ or random*.ti,ab.
14	12 not 13
15	animals/ not humans/
16	exp Animals, Laboratory/
17	exp Animal Experimentation/
18	exp Models, Animal/
19	exp Rodentia/
20	(rat or rats or mouse or mice or rodent*).ti.
21	or/14-20
22	3 not 21
23	limit 22 to english language
24	limit 23 to yr="2004 -Current"
25	23 and 24
26	Economics/
27	Value of life/
28	exp "Costs and Cost Analysis"/
29	exp Economics, Hospital/
30	exp Economics, Medical/
31	Economics, Nursing/
32	Economics, Pharmaceutical/

33	exp "Fees and Charges"/
34	exp Budgets/
35	budget*.ti,ab.
36	cost*.ti.
37	(economic* or pharmaco?economic*).ti.
38	(price* or pricing*).ti,ab.
39	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
40	(financ* or fee or fees).ti,ab.
41	(value adj2 (money or monetary)).ti,ab.
42	or/26-41
43	quality-adjusted life years/
44	sickness impact profile/
45	(quality adj2 (wellbeing or well being)).ti,ab.
46	sickness impact profile.ti,ab.
47	disability adjusted life.ti,ab.
48	(qal* or qtime* or qwb* or daly*).ti,ab.
49	(euroqol* or eq5d* or eq 5*).ti,ab.
50	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
51	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
52	(hui or hui1 or hui2 or hui3).ti,ab.
53	(health* year* equivalent* or hye or hyes).ti,ab.
54	discrete choice*.ti,ab.
55	rosser.ti,ab.
56	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
57	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
58	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
59	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
60	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
61	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
62	or/43-61
63	25 and 42
64	limit 63 to yr="2014 -Current"
65	25 and 62

Embase (Ovid) search terms

1	falling/
2	(fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*).ti,ab.
3	or/1-2
4	letter.pt. or letter/
5	note.pt.
6	editorial.pt.
7	case report/ or case study/
8	(letter or comment*).ti.
9	(conference abstract or conference paper).pt.
10	or/4-9
11	randomized controlled trial/ or random*.ti,ab.
12	10 not 11
13	animal/ not human/
14	nonhuman/
15	exp Animal Experiment/
16	exp Experimental Animal/
17	animal model/
18	exp Rodent/
19	(rat or rats or mouse or mice or rodent*).ti.
20	or/12-19
21	3 not 20
22	limit 21 to english language
23	limit 22 to yr="2004 -Current"
24	health economics/
25	exp economic evaluation/
26	exp health care cost/
27	exp fee/
28	budget/
29	funding/
30	budget*.ti,ab.
31	cost*.ti.

32	(economic* or pharmaco?economic*).ti.
33	(price* or pricing*).ti,ab.
34	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
35	(financ* or fee or fees).ti,ab.
36	(value adj2 (money or monetary)).ti,ab.
37	or/24-36
38	quality adjusted life year/
39	"quality of life index"/
40	short form 12/ or short form 20/ or short form 36/ or short form 8/
41	sickness impact profile/
42	(quality adj2 (wellbeing or well being)).ti,ab.
43	sickness impact profile.ti,ab.
44	disability adjusted life.ti,ab.
45	(qal* or qtime* or qwb* or daly*).ti,ab.
46	(euroqol* or eq5d* or eq 5*).ti,ab.
47	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
48	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
49	(hui or hui1 or hui2 or hui3).ti,ab.
50	(health* year* equivalent* or hye or hyes).ti,ab.
51	discrete choice*.ti,ab.
52	rosser.ti,ab.
53	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
54	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
55	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
56	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
57	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
58	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
59	or/38-58
60	23 and 37
61	limit 60 to yr="2014 -Current"
62	23 and 59

NHS EED and HTA (CRD) search terms

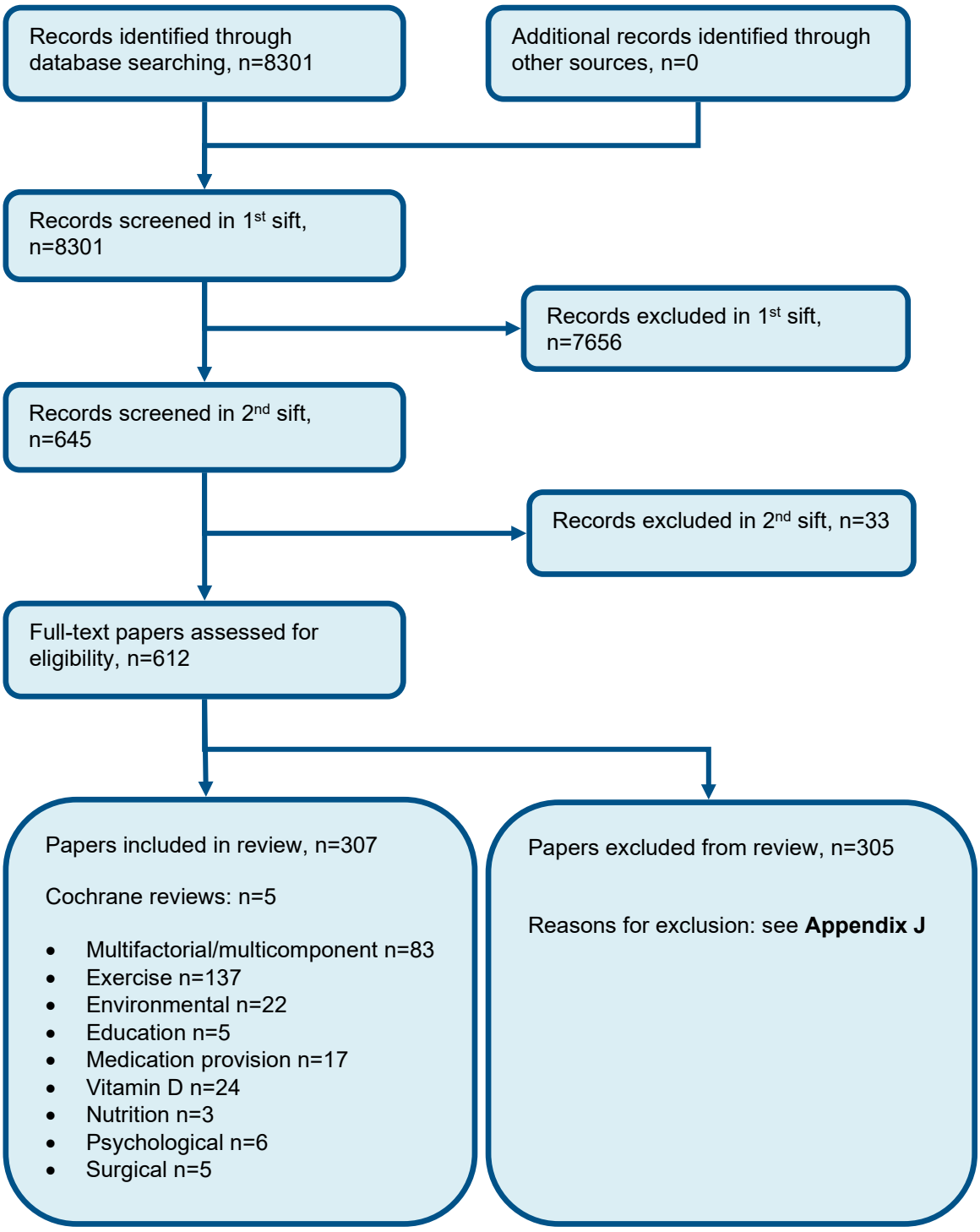
1	MeSH DESCRIPTOR Accidental Falls EXPLODE ALL TREES
2	((fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*))
3	#1 OR #2
4	(#3) IN NHSEED
5	(#3) IN HTA

INAHTA search terms

1	("Accidental Falls"[mh]) OR (fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*)
2	limit to english language
3	2004 - current

Appendix C Effectiveness evidence study selection

Figure 1: Flow chart of clinical study selection for the review of interventions to prevent falls



Appendix D Effectiveness evidence

D.1 Education interventions

Hill, 2019

Bibliographic Reference	Hill, Anne-Marie; McPhail, Steven M; Haines, Terry P; Morris, Meg E; Etherton-Beer, Christopher; Shorr, Ronald; Flicker, Leon; Bulsara, Max; Waldron, Nicholas; Lee, Den-Ching A; Francis-Coad, Jacqueline; Boudville, Amanda; Falls After Hospital Discharge: A Randomized Clinical Trial of Individualized Multimodal Falls Prevention Education.; The journals of gerontology. Series A, Biological sciences and medical sciences; 2019; vol. 74 (no. 9); 1511-1517

Study details

Trial name / registration number	ACTRN12615000784516
Study type	Cluster randomised controlled trial
Study location	Australia
Study setting	3 hospitals
Study dates	August 2015 to September 2017
Sources of funding	Grant awarded from the National Health and Medical Research Council
Inclusion criteria	Patients 60 years or older who were admitted to hospital rehabilitation wards, for new onset stroke or other neurological conditions, orthopaedic diagnoses such as hip fracture, functional decline, general medical conditions or reconditioning after acute surgery. Abbreviated Mental Test Score >7/10, and able to receive telephone calls. Due to be discharged to the community. Participants provided written informed consent.

Exclusion criteria	If hospital admission was short stay (>5 days), if they were receiving palliative care, or had a medical plan for discharge to a nursing home.
Recruitment / selection of participants	Participants were recruited from hospital rehabilitation wards.
Intervention(s)	Experimental Group - Education Intervention Participants received an education intervention while in hospital in addition to usual care. The program used a workbook and digital video to present information about falls and falls prevention specific to the post-discharge period. Therapists had face to face discussions after to tailor the information to participants person medical and social circumstances. A goal-orientated action plan was developed. Monthly phone calls for 3 months after discharge were made to reinforce the education and action plan. The intervention was based on the model of behavioural change. Therapists delivering the interventions were experienced in geriatric treatment and rehabilitation. They were provided with structured training to deliver the intervention. The intervention included 2 to 4 sessions in hospital, and 3 telephone calls after discharge.
Population subgroups	None
Comparator	Control Group - Usual Care Intervention The control group received usual care and a scripted education programme of 45 minutes with a trained health professional to discuss the positive aspects of aging. There were no falls prevention or medical health information. Usual care

	Participants received comprehensive geriatric care from a multidisciplinary team on the hospital ward. This consisted of comprehensive medical and allied health services, 24-hour nursing care, home visiting services, outpatient rehabilitation and a discharge summary.
Number of participants	390
Duration of follow-up	6 months post-discharge
Indirectness	None

Characteristics

Arm-level characteristics

Characteristic	Experimental Group Education Intervention (N = 194)	Control group (N = 188)
% Female No of events	n = 116; % = 59.8	n = 119; % = 63.3
Mean age (SD) Mean (SD)	77.4 (8.8)	78.1 (8.5)

Outcomes

Outcome	Experimental Group Education Intervention N=194 vs Control group N=188,
Falls rate per 1000 patient days (Adjusted IRR) Analyses clustered by site; adjusted for history of falls, requiring assistance with activities of daily living	1.09 (0.78 to 1.52)

Outcome	Experimental Group Education Intervention N=194 vs Control group N=188,
in 6 months prior to admission; sustaining a fall while in hospital; depressed mood, use of a gait aid at baseline. Adjusted IRR/95% CI	
Proportion of participants who fell one or more times (Adjusted odds ratio (95% CI)) Analyses clustered by site; adjusted for history of falls, requiring assistance with activities of daily living in 6 months prior to admission; sustaining a fall while in hospital; depressed mood, use of a gait aid at baseline. Adjusted odds ratio/95% CI	1.37 (0.90 to 2.07)

Outcomes

Outcome	Experimental Group Education Intervention, N = 194	Control group N = 188
Number of participants falling No of events	n = 91	n = 73

Outcomes

Outcome	Experimental Group Education Intervention, N = 194	Control group N = 188
Number of participants sustaining a fall related fracture No of events	n = 9	n = 12

D.2 Medication provision interventions

Barker, 2022

Bibliographic Reference	Barker, Anna L; Morello, Renata; Thao, Le Thi Phuong; Seeman, Ego; Ward, Stephanie A; Sanders, Kerrie M; Cumming, Robert G; Pasco, Julie A; Ebeling, Peter R; Woods, Robyn L; Wolfe, Rory; Khosla, Sundeep; Hussain, Sultana Monira; Ronaldson, Kathlyn; Newman, Anne B; Williamson, Jeff D; McNeil, John J; Daily Low-Dose Aspirin and Risk of Serious Falls and Fractures in Healthy Older People: A Substudy of the ASPREE Randomized Clinical Trial.; JAMA internal medicine; 2022; vol. 182 (no. 12); 1289-1297

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	ACTRN12615000347561; ASPREE-Fracture study
Study location	Australia
Study setting	Community setting
Study dates	March 2010 - June 2017

Sources of funding	Bayer AG
Inclusion criteria	Aged at least 70 years Free from any chronic illness likely to limit survival to less than 5 years Free from documented cardiovascular or cerebrovascular disease
Exclusion criteria	Diagnosis of dementia or significant cognitive impairment (measured by a score equal to or less than 78 on the Modified Mini–Mental State Examination) A substantial physical disability (defined as more than some difficulty with any 1 of 6 basic activities of daily living, including dressing, eating, toileting, transferring, bathing, and walking) Known high risk of bleeding Current indication for antithrombotic medication Contraindication to aspirin
Recruitment / selection of participants	Australian participants were recruited from ASPREE-Fracture study.
Intervention(s)	Daily dose of 100mg enteric-coated aspirin.
Population subgroups	Not reported
Comparator	Placebo
Number of participants	N=16703 Intervention: n=8322

	Placebo: n=8381
Duration of follow-up	Intervention: median follow-up time 4.64 years Control: median follow-up time 4.65 years
Indirectness	None

Study arms

Aspirin (N = 8322)

Placebo (N = 8381)

Characteristics

Study-level characteristics

Characteristic	**Study (N = 16703)**
% Female Nominal	54.95
Osteoarthritis No of events	n = 4255; % = 25.4

Outcomes

Study timepoints

4.5 year

Outcomes

Outcome	Aspirin, 4.5 year, N = 8322	Placebo, 4.5 year, N = 8381
Number of people sustaining a fracture No of events	n = 781	n = 813
Rate of serious falls (total number)	n = 884	n = 804

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Numberoffractures-NoOfEvents-Aspirin-Placebo-t4.5

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Boye, 2017

Bibliographic Reference	Boye, Nicole D A; van der Velde, Nathalie; de Vries, Oscar J; van Lieshout, Esther M M; Hartholt, Klaas A; Mattace-Raso, Francesco U S; Lips, Paul; Patka, Peter; van Beeck, Ed F; van der Cammen, Tischa J M; Effectiveness of medication withdrawal in older fallers: results from the Improving Medication Prescribing to reduce Risk Of FALLs (IMPROveFALL) trial.; Age and ageing; 2017; vol. 46 (no. 1); 142-146

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	IMPROveFALL NTR1593
Study type	Randomised controlled trial (RCT)
Study location	Netherlands
Study setting	Community setting
Study dates	Not reported
Sources of funding	The Netherlands Organization for Health Research and Development
Inclusion criteria	Aged ≥65 years Community-dwelling ED-visit because of a fall

	Use of one or more FRIDs (fall-risk-increasing-drugs)
Exclusion criteria	Not reported
Recruitment / selection of participants	Not reported
Intervention(s)	Following baseline assessment FRIDs were discontinued or reduced where safe to do so.
Population subgroups	Not reported
Comparator	Continued care as usual
Number of participants	N=612 Intervention: n=319 Control: n=293
Duration of follow-up	12 months
Indirectness	None
Additional comments	

Study arms

Intervention (N = 319)

Control (N = 293)

Characteristics

Study-level characteristics

Characteristic	Study (N = 612)
% Female Nominal	62
Mean age (SD) Mean (SD)	76 (NR)

Outcomes

Study timepoints

12 months

Outcomes

Outcome	Intervention, 12-month, N = 319	Control, 12-month, N = 293
Number of fallers Nominal	115	91

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Numberoffallers-Nominal-Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns due to lack of information regarding randomisation process and trial protocol)*
Overall bias and Directness	Overall Directness	Directly applicable

Jungo, 2023

Bibliographic Reference	Jungo, Katharina Tabea; Ansorg, Anna-Katharina; Floriani, Carmen; Rozsnyai, Zsofia; Schwab, Nathalie; Meier, Rahel; Valeri, Fabio; Stalder, Odile; Limacher, Andreas; Schneider, Claudio; Bagattini, Michael; Trelle, Sven; Spruit, Marco; Schwenkglenks, Matthias; Rodondi, Nicolas; Streit, Sven; Optimising prescribing in older adults with multimorbidity and polypharmacy in primary care (OPTICA): cluster randomised clinical trial.; BMJ (Clinical research ed.); 2023; vol. 381; e074054

Study details

Secondary publication of another included study- see primary study for details	NA

Other publications associated with this study included in review	Na
Trial name / registration number	NCT03724539 (OPTICA)
Study type	Cluster randomised controlled trial
Study location	Switzerland
Study setting	Community based primary care
Study dates	2018 - 2021
Sources of funding	The OPTICA trial was funded by the Swiss National Science Foundation, within the framework of the National Research Programme 74 “Smarter Health Care” (NRP74) under contract number 407440_167465 (to SS, NR, and MSchwenkglenks).
Inclusion criteria	Patients were aged ≥65 years, were taking five or more long term medications (≥90 days) and had at least three chronic conditions on the basis of on ICPC-2 (international classification of primary care, 2nd edition) coding or general practitioners’ clinical judgement.
Exclusion criteria	Exclusion criteria were inability to provide consent and participation in a different intervention study.
Recruitment / selection of participants	General practitioners recruited eight to 10 eligible patients by using random screening lists generated from their practice’s electronic health record data. If needed, more than one screening list with 20 patients each was provided to general practitioners.

Intervention(s)	The intervention consisted of a structured six step medication review using STRIPA, a web based electronic clinical decision support system based on the STOPP/ START criteria version 2. For the purpose of the OPTICA trial, STRIPA was adapted to the primary care setting. In addition to detecting potential overuse, underuse, and misuse of drugs, STRIPA generated recommendations to prevent drug-drug interactions and inappropriate dosages. The one time intervention consisted of six steps. (1) Data on medications, chronic conditions, laboratory values, and vital data were imported to STRIPA. (2) General practitioners verified and adapted the recorded information. (3) General practitioners used the drag/ drop function to link medications and conditions. (4) General practitioners ran the medication review. (5) General practitioners decided which recommendations to move forward with. (6) At the next appointment, general practitioners implemented shared decision making with patients.
Population subgroups	NR
Comparator	Patients in the control group had a discussion about medication with their general practitioner in line with usual care. General practitioners were asked not to deviate from their usual practice.
Number of participants	323
Duration of follow-up	12 months
Indirectness	NA
Additional comments	NR

Study arms

Medication review using electronic clinical decision support system (eCDSS) (N = 160)

Medication review intervention centred around an electronic clinical decision support system (eCDSS) on appropriateness of medication and the number of prescribing omissions

Usual care (N = 163)

Discussion about usual care

Characteristics

Study-level characteristics

Characteristic	Study (N = 323)
% Female Sample size	n = NR; % = 45
Mean age (SD) Median (IQR)	88 (73 to 83)

Outcomes

Study timepoints

12 month

Outcome data

Outcome	Medication review using electronic clinical decision support system (eCDSS), 12-month, N = 160	Usual care, 12 month, N = 163
Rate of falls Custom value	0.90	0.90
Number of fallers No of events	n = 18	n = 21
Number of people sustaining fractures No of events	n = 3	n = 2
Health related quality of life (EQ5D) (0.59-1) Mean (SD)	0.1 (0.18)	0.1 (0.18)

Rate of falls - Polarity - Lower values are better

Number of fallers - Polarity - Lower values are better

Number of people sustaining fractures - Polarity - Lower values are better

Health related quality of life (EQ5D) - Polarity - Higher values are better

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcome data-Rate of falls-Custom Value 0 - Medication review using electronic clinical decision support system (eCDSS)-Usual care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Outcome data-Number of fallers-No Of Events-Medication review using electronic clinical decision support system (eCDSS)-Usual care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Outcomedata-Numberofpeoplesustainingfractures-NoOfEvents-Medication review using electronic clinical decision support system (eCDSS)-Usual care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Outcome data -Health related quality of life (EQ5D)-Mean SD-Medication review using electronic clinical decision support system (eCDSS)-Usual care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Juraschek, 2019

Bibliographic Reference	Juraschek, Stephen P; Simpson, Lara M; Davis, Barry R; Beach, Jennifer L; Ishak, Anthony; Mukamal, Kenneth J; Effects of Antihypertensive Class on Falls, Syncope, and Orthostatic Hypotension in Older Adults: The ALLHAT Trial.; Hypertension (Dallas, Tex. : 1979); 2019; vol. 74 (no. 4); 1033-1040

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported

Trial name / registration number	ALLHAT
Study type	Randomised controlled trial (RCT)
Study location	US
Study setting	Community setting
Study dates	1994 - 2006
Sources of funding	NIH/NHLBI K23HL135273 and R21HL144876
Inclusion criteria	55 years and older with hypertension (SBP ≥ 140 mm Hg or a DBP ≥ 90 mm Hg) and at least one other risk factor for coronary heart disease. These risk factors included previous myocardial infarction, previous stroke, left ventricular hypertrophy, type 2 diabetes, current cigarette smoking, or low high density lipoprotein cholesterol.
Exclusion criteria	Myocardial infarction Stroke, or angina within 6 months of the study Symptomatic heart failure or ejection fracture < 35% Elevated serum creatinine (>2 mg/dL) SBP > 180 mm Hg, or a diastolic BP (DBP) > 110 mm Hg
Recruitment / selection of participants	Participants were recruited from centres across the US and Canada
Intervention(s)	Amlodipine, 2.5–10 mg

	Chlorthalidone, 12.5–25 mg Lisinopril, 10–40 mg
Population subgroups	Not reported
Comparator	Interventions compared with each other
Number of participants	N=23964 Chlorthalidone: n=11000 Amlodipine: n=6522 Lisinopril: n=6442
Duration of follow-up	1 year
Indirectness	None

Study arms

Chlorthalidone (N = 11000)

Amlodipine (N = 6522)

Lisinopril (N = 6442)

Characteristics

Arm-level characteristics

Characteristic	Chlorthalidone (N = 11000)	Amlodipine (N = 6522)	Lisinopril (N = 6442)
% Female Nominal	45.1	45.5	44.2
Mean age (SD) Mean (SD)	69.8 (6.8)	69.8 (6.8)	69.9 (6.8)
White, non-Hispanic Sample size	% = 49.5	% = 50.3	% = 49.5
Black non-Hispanic Sample size	% = 31.3	% = 31.3	% = 31
White Hispanic Sample size	% = 12	% = 11.5	% = 12.3
Black (Hispanic) Sample size	% = 3.1	% = 3	% = 3.2
Other	% = 4.4	% = 4	% = 4.1

Characteristic	Chlorthalidone (N = 11000)	Amlodipine (N = 6522)	Lisinopril (N = 6442)
Sample size			

Outcomes

Study timepoints

1 year

Outcomes (HR)

Outcome	Amlodipine vs Chlorthalidone, 1 year, N2 = 11000, N1 = 6522	Lisinopril vs Chlorthalidone, 1 year, N2 = 11000, N1 = 6442	Amlodipine vs Lisinopril, 1 year, N2 = 6522, N1 = 6442
Number of falls Hazard ratio/95% CI	2.24 (1.06 to 4.74)	0.85 (0.32 to 2.27)	2.63 (1.03 to 6.72)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes (HR)-Number of falls-Hazard Ratio Nine Five Percent CI – Chlorthalidone – Amlodipine - Lisinopril-t1

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns due to lack of information regarding randomisation process and unavailability of trial protocol)*
Overall bias and Directness	Overall Directness	Directly applicable

Montero - Odasso, 2019

Bibliographic Reference	Montero-Odasso, M; Speechley, M; Chertkow, H; Sarquis-Adamson, Y; Wells, J; Borrie, M; Vanderhaeghe, L; Zou, G Y; Fraser, S; Bherer, L; Muir-Hunter, S W; Donepezil for gait and falls in mild cognitive impairment: a randomized controlled trial.; European journal of neurology; 2019; vol. 26 (no. 4); 651-659

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported

Trial name / registration number	NCT00934531
Study type	Randomised controlled trial (RCT)
Study location	Canada
Study setting	Community setting
Study dates	Recruitment: June 2009 - November 2015
Sources of funding	Physician Services Incorporated Foundation of Canada
Inclusion criteria	≥65 years of age Able to walk 10 m without a gait aid and having MCI (mild cognitive impairment) Ascertained by scoring 0.5 on the global rating of the Clinical Dementia Rating scale and satisfying Winblad's criteria
Exclusion criteria	Lack of English proficiency Parkinsonism or any neurological or musculoskeletal disorder with residual motor deficits (e.g. stroke, epilepsy) Low body weight (<45 kg) Possible diagnosis of Alzheimer's disease Use of herbal preparations (St John's Wort and Gingko biloba) History of substance abuse Use of anticholinergic agents (e.g. benztropines) Use of other acetylcholinesterase inhibitors or cholinergic agents (e.g. bethanechol)

	Major depression (8/15 on the Geriatric Depression Scale) History of liver diseases (hepatitis or cirrhosis) Bradycardia or sick-sinus syndrome, Previous intolerance/allergy to donepezil Severe chronic obstructive pulmonary disease Asthma History of seizures
Recruitment / selection of participants	Not reported
Intervention(s)	4 weeks of donepezil at daily dose of 5mg per day. Following the 4 weeks dosage was increased to 10mg per day
Population subgroups	Not reported
Comparator	Placebo tablets of identical size and looks of intervention tablets.
Number of participants	N=60 Intervention: n=31 Placebo: n=29
Duration of follow-up	6 months
Indirectness	Participants have mild cognitive impairments

Additional comments	Intention to treat analysis only used for primary outcomes. Falls was a secondary outcome and analysed per protocol analysis.

Study arms

Intervention (N = 31)

Placebo (N = 29)

Characteristics

Study-level characteristics

Characteristic	Study (N = 60)
% Female Nominal	45
Mean age (SD) Mean (SD)	75.28 (7.18)
Comorbidities Mean (SD)	5.6 (3.03)

Outcomes

Study timepoints

6 month

Outcomes

Outcome	Intervention, 6 month, N = 20	Placebo, 6 month, N = 25
Number of falls No of events	n = 13	n = 21
Number of fallers Nominal	7	12

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes -Number of falls -No Of Events – Intervention - Placebo-t6

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to large dropout rate. Per protocol analysis was used for falls outcomes)*
Overall bias and Directness	Overall Directness	Directly applicable

Mott, 2016

Bibliographic Reference	Mott, David A; Martin, Beth; Breslow, Robert; Michaels, Barb; Kirchner, Jeff; Mahoney, Jane; Margolis, Amanda; Impact of a medication therapy management intervention targeting medications associated with falling: Results of a pilot study.; Journal of the American Pharmacists Association: JAPhA; 2016; vol. 56 (no. 1); 22-8

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	Not reported
Study type	Cluster randomised controlled trial
Study location	US
Study setting	Community setting
Study dates	Enrolment: October 2011 - November 2012
Sources of funding	Clinical and Translational Science Award from the NIH

Inclusion criteria	English speaking 65 years or older Fallen in the past 12 months or fear of falling Part of the falls prevention workshop
Exclusion criteria	Not reported
Recruitment / selection of participants	Participants were part of the falls prevention workshop and study recruiters introduced potential participants to the study in the last 2 sessions of the workshop. Prospective study participants were followed up with a phone call and completed a 60-minute pre-intervention survey.
Intervention(s)	One 60-minute face-to-face medication therapy management (MTM) intervention and direct feedback regarding their medication use from one trained community pharmacist in a private consultation room at one independently owned, retail community pharmacy. Pharmacists developed a medication related action plan which included recommendations to modify falls risk-increasing drugs. The pharmacist documented and followed up on all recommendations to determine whether they were accepted or rejected.
Population subgroups	Not reported
Comparator	Received a pamphlet describing medication use and falls.
Number of participants	N=80 Intervention: n=39 Control: n=40
Duration of follow-up	6-months

Indirectness	None

Study arms

MTM (N = 39)

Control (N = 41)

Characteristics

Arm-level characteristics

Characteristic	MTM (N = 39)	Control (N = 41)
% Female Nominal	76.9	80.5
Mean age (SD) Mean (SD)	74.9 (20.2)	76.3 (6.12)
White Sample size	n = 38; % = 97.4	n = 41; % = 100
Non-white Sample size	n = 1; % = 2.6	n = 0; % = 0

Outcomes

Study timepoints

6 months

Outcomes

Outcome	MTM, 6-month, N = 39	Control, 6-month, N = 41
Number of fallers Nominal	11	10

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

Outcomes-Numberoffallers-Nominal-MTM-Control-t6

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Study had some concerns due to lack of information regarding randomisation, analysis, and lack of trial protocol)*
Overall bias and Directness	Overall Directness	Directly applicable

Swart, 2016

Bibliographic Reference	Swart, Karin M A; Ham, Annelies C; van Wijngaarden, Janneke P; Enneman, Anke W; van Dijk, Suzanne C; Sohl, Evelien; Brouwer-Brolsma, Elske M; van der Zwaluw, Nikita L; Zillikens, M Carola; Dhonukshe-Rutten, Rosalie A M; van der Velde, Nathalie; Brug, Johannes; Uitterlinden, Andre G; de Groot, Lisette C P G M; Lips, Paul; van Schoor, Natasja M; A Randomized Controlled Trial to Examine the Effect of 2-Year Vitamin B12 and Folic Acid Supplementation on Physical Performance, Strength, and Falling: Additional Findings from the B-PROOF Study.; Calcified tissue international; 2016; vol. 98 (no. 1); 18-27

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Wijngaarden 2011
Trial name / registration number	B-PROOF NCT 00696514
Study type	Randomised controlled trial (RCT)
Study location	Netherlands
Study setting	Community setting

Study dates	October 2008- March 2013
Sources of funding	The Netherlands Organization for Health Research and Development, unrestricted grant from Dutch Dairy Association (NZO), Zoetermeer; Orthica, Almere; Netherlands Consortium Healthy Ageing (NCHA) Leiden/Rotterdam; Ministry of Economic Affairs, Agriculture and Innovation (Project KB-15-004- 003), the Hague; WAGENINGEN University, Wageningen; VU University Medical Center, Amsterdam; Erasmus MC, Rotterdam
Inclusion criteria	Aged 65 years or older Plasma Hcy concentration of 12–50 micromol/L
Exclusion criteria	History of cancer in the last 5 years, except non-melanoma skin cancer Bedridden or wheelchair bound Serum creatinine concentration >150 micromol/L Currently or recently (<4 months) used supplements with very high doses of vitamin B12 (intramuscular injections) or folic acid (300 mcg/day).
Recruitment / selection of participants	Not reported
Intervention(s)	Daily oral supplementation of 500 mcg vitamin B12, 400 mcg folic acid, and 600 IU vitamin D
Population subgroups	Not reported
Comparator	Daily oral supplementation of 600 IU vitamin D only.
Number of participants	N=2919 Intervention: n=1461

	Placebo: n=1458
Duration of follow-up	2 years
Indirectness	none

Study arms

Intervention (N = 1461)

Placebo (N = 1458)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 1461)	Placebo (N = 1458)
% Female Nominal	49.7	50.4
Mean age (SD) Mean (SD)	74.2 (6.4)	74 (6.6)
Comorbidities (%) cardiovascular disease	24.1	25

Characteristic	Intervention (N = 1461)	Placebo (N = 1458)
Nominal		

Outcomes

Study timepoints

2 years

Outcomes

Outcome	Intervention, 2-year, N = 1461	Placebo, 2-year, N = 1458
Number of falls No of events	n = 1747; % = NR	n = 1663; % = NR
Number of fallers Nominal	683	681

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls – No Of Events – Intervention - Placebo-t2

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Numberoffallers-Nominal-Intervention-Placebo-t2

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Witham, 2019

Bibliographic Reference	Witham, Miles D; Price, Rosemary J G; Band, Margaret M; Hannah, Michael S; Fulton, Roberta L; Clarke, Clare L; Donnan, Peter T; McNamee, Paul; Cvoro, Vera; Soiza, Roy L; Effect of Vitamin K2 on Postural Sway in Older People Who Fall: A Randomized Controlled Trial.; Journal of the American Geriatrics Society; 2019; vol. 67 (no. 10); 2102-2107

Study details

Secondary publication of	Not reported

another included study- see primary study for details	
Other publications associated with this study included in review	Not reported
Trial name / registration number	ISRCTN18436190
Study location	UK
Study setting	Community setting
Study dates	Not reported
Sources of funding	Chief Scientist Office, Scottish Government
Inclusion criteria	Aged 65 and older Either two or more falls in the previous 12 months, or at least one fall resulting in hospitalization in the last 12 months
Exclusion criteria	Inability to give written informed consent Unable to stand without human assistance Atrial fibrillation Taking warfarin or other coumadin derivatives Taking more than 100 µg vitamin K supplement per day

	Known contraindication to vitamin K Currently enrolled in, or within 30 days of completing another trial Currently undertaking physiotherapy or another time-limited supervised nonpharmacologic intervention to reduce falls risk Intolerance to soy products
Recruitment / selection of participants	Participants were recruited via primary care from three boards. Telephone screening was conducted and eligible participants invited for in person screening and baseline visit.
Intervention(s)	Tablets containing 200 µg vitamin K2 (MK7 subtype) Tablets containing 400µg vitamin K2 (MK7 subtype) Participants were asked to take one tablet each day for 12 months. Tablets were identical in size and appearance and participants were blinded to the intervention.
Population subgroups	Not reported
Comparator	Placebo tablet taken once daily for 12 months (identical in appearance to intervention tablets)
Number of participants	N=95 Vitamin K (200µg): n= 32 Vitamin K (400µg): n= 31 Placebo: n= 31
Duration of follow-up	12 months

Indirectness	None

Study arms

Vitamin K (200µg) (N = 32)

Vitamin K (400µg) (N = 31)

Placebo (N = 32)

Characteristics

Arm-level characteristics

Characteristic	Vitamin K (200µg) (N = 32)	Vitamin K (400µg) (N = 31)	Placebo (N = 32)
% Female Nominal	66	61	56
Mean age (SD) Mean (SD)	74.7 (7.4)	75.1 (6.5)	75 (6.9)
previous myocardial infarction Sample size	n = 1; % = 3	n = 1; % = 3	n = 2; % = 6

Characteristic	Vitamin K (200µg) (N = 32)	Vitamin K (400µg) (N = 31)	Placebo (N = 32)
Chronic heart failure Sample size	n = 1; % = 3	n = 0; % = 0	n = 0; % = 0
Parkinson Sample size	n = 0; % = 0	n = 0; % = 0	n = 0; % = 0
previous stroke Sample size	n = 2; % = 6	n = 3; % = 10	n = 2; % = 6
Hypertension Sample size	n = 15; % = 47	n = 18; % = 58	n = 17; % = 53
Diabetes mellitus Sample size	n = 1; % = 3	n = 8; % = 26	n = 6; % = 19
Peripheral neuropathy Sample size	n = 1; % = 3	n = 2; % = 6	n = 4; % = 13
Previous fragility fracture Sample size	n = 14; % = 44	n = 12; % = 39	n = 4; % = 13
Osteoarthritis Sample size	n = 19; % = 59	n = 18; % = 58	n = 8; % = 25
Chronic obstructive pulmonary disease	n = 7; % = 22	n = 2; % = 6	n = 15; % = 47

Characteristic	Vitamin K (200µg) (N = 32)	Vitamin K (400µg) (N = 31)	Placebo (N = 32)
Sample size			
Cataracts Sample size	n = 15; % = 47	n = 12; % = 39	n = 9; % = 28
Retinopathy Sample size	n = 1; % = 3	n = 3; % = 10	n = 2; % = 6

Outcomes

Study timepoints

12 months

Outcome

Outcome	Vitamin K (200µg), 12-month, N = 32	Vitamin K (400µg), 12-month, N = 31	Placebo, 12-month, N = 31
Adverse outcomes No of events	n = 66	n = 49	n = 44

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcome-Adverse outcomes -No Of Events -Vitamin K (200µg)-Vitamin K (400µg)-Placebo -t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(No intention to treat analysis used.)*
Overall bias and Directness	Overall Directness	Directly applicable

Zhou, 2020

Bibliographic Reference	Zhou, Jian; Liu, Bo; Qin, Ming-Zhao; Liu, Jin-Ping; Fall Prevention and Anti-Osteoporosis in Osteopenia Patients of 80 Years of Age and Older: A Randomized Controlled Study.; Orthopaedic surgery; 2020; vol. 12 (no. 3); 890-899

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	Not reported

Study type	Randomised controlled trial (RCT)
Study location	China
Study setting	Community setting
Study dates	Recruitment January 2017 - June 2017
Sources of funding	Research Topics of Health Care in Beijing
Inclusion criteria	Aged 80 years and older Living with Ostopenia Living on their own
Exclusion criteria	Hyperthyroidism or hypothyroidism Primary hyperparathyroidism or hypoparathyroidism Cushing’s disease Malignant tumors Stage 4–5 chronic kidney disease (CKD Cirrhosis Grade 4 chronic obstructive pulmonary disease (COPD Subtotal gastrectomy Chronic diarrhea, Receiving glucocorticoids or anti-osteoporotic drugs in the past 6 months

	History of fragility fracture
Recruitment / selection of participants	Participants who were enrolled in the Outpatient Department of Geriatrics in hospital
Intervention(s)	Orally administered: One tablet per day of calcium D600 (containing 1.5 g of calcium carbonate, and providing 600 mg of elemental calcium and 125 IU of vitamin D3), 0.5 μg/d of alfacalcidol and 70 mg/week of alendronate
Population subgroups	None reported
Comparator	Orally administered: One tablet per day of calcium D600 and 0.5 μg/d of alfacalcidol
Number of participants	N=123 Intervention: n=62 Control: n=61
Duration of follow-up	18-months
Indirectness	None

Study arms

Calcium + alfacalcidol + alendronate (N = 62)

Control (Calcium + alfacalcidol) (N = 61)

Characteristics

Study-level characteristics

Characteristic	Study (N = 123)
% Female Nominal	25.2
Mean age (SD) Mean (SD)	83.54 (2.99)

Arm-level characteristics

Characteristic	Calcium + alfacalcidol + alendronate (N = 62)	Control (Calcium + alfacalcidol) (N = 61)
Coronary heart disease Sample size	n = 22; % = 33.5	n = 34; % = 55.7
Cerebral vascular disease Sample size	n = 19; % = 30.6	n = 21; % = 34.4
Diabetes Sample size	n = 17; % = 27.4	n = 30; % = 49.2
COPD	n = 7; % = 11.3	n = 5; % = 8.2

Characteristic	Calcium + alfacalcidol + alendronate (N = 62)	Control (Calcium + alfacalcidol) (N = 61)
Sample size		
Chronic kidney disease Sample size	n = 11; % = 17.7	n = 15; % = 24.6

Outcomes

Outcomes

Outcome	Calcium + alfacalcidol + alendronate, , N = 62	Control (Calcium + alfacalcidol), , N = 61
Number of falls No of events	n = 21; % = 33.9	n = 22; % = 36.7

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls -No Of Events-Calcium + alfacalcidol + alendronate-Control (Calcium + alfacalcidol)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns due to lack of information provided regarding randomisation process, and lack of blinding of participants)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable

D.3 Vitamin D interventions

Aloia, 2019

Bibliographic Reference	Aloia, John F; Rubinova, Rakhil; Fazzari, Melissa; Islam, Shahidul; Mikhail, Mageda; Ragolia, Louis; Vitamin D and Falls in Older African American Women: The PODA Randomized Clinical Trial.; Journal of the American Geriatrics Society; 2019; vol. 67 (no. 5); 1043-1049

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	NCT01153568
Study location	US
Study setting	Community setting
Study dates	Not reported
Sources of funding	Not reported
Inclusion criteria	Community-dwelling black women

Exclusion criteria	Baseline serum 25(OH)D below 8 ng/mL and above 26 ng/mL History of metabolic bone disease Bone mineral density at total hip below 2.5 standard deviations Vertebral fractures Medical therapy for bone disease during the 6 months before entry, calcium or parathyroid disorders Use of medications known to interfere with vitamin D metabolism
Recruitment / selection of participants	Not reported
Intervention(s)	Participants received vitamin D3 in either dosage (2400 IU, 3600 IU, or 4800 IU).
Population subgroups	Not reported
Comparator	Placebo
Number of participants	N=260 Vitamin D: n=130 Placebo: n=130
Duration of follow-up	36 months
Indirectness	None

Study arms

Vitamin D (N = 130)

Placebo (N = 130)

Characteristics

Study-level characteristics

Characteristic	Study (N = 260)
Mean age (SD) Mean (SD)	68.2 (NR)

Outcomes

Study timepoints

36 months

Outcomes

Outcome	Vitamin D, 36-month, N = 130	Placebo, 36-month, N = 130
Number of fallers No of events	n = 51	n = 50

Bischoff-Ferrari, 2020

Bibliographic Reference	Bischoff-Ferrari HA; Vellas B; Rizzoli R; Kressig RW; da Silva JAP; Blauth M; Felson DT; McCloskey EV; Watzl B; Hofbauer LC; Felsenberg D; Willett WC; Dawson-Hughes B; Manson JE; Siebert U; Theiler R; Staehelin HB; de Godoi Rezende Costa Molino C; Chocano-Bedoya PO; Abderhalden LA; Egli A; Kanis JA; Orav EJ;; Effect of Vitamin D Supplementation, Omega-3 Fatty Acid Supplementation, or a Strength-Training Exercise Program on Clinical Outcomes in Older Adults: The DO-HEALTH Randomized Clinical Trial.; JAMA; 2020; vol. 324 (no. 18)

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	Bischoff-Ferrari 2022
Trial name / registration number	NCT01745263
Study type	Randomised controlled trial (RCT)
Study location	Switzerland, France, Germany, Portugal and Austria
Study setting	Community
Study dates	2020

Sources of funding	Not stated
Inclusion criteria	Participants were at least 70 years old and community dwelling. Inclusion criteria were no major health events (i.e. cancer or myocardial infarction) in the 5 years prior to enrolment, sufficient mobility to come to the study centres without help, and a Mini-Mental State Examination (MMSE) score of at least 24. Recruitment was conducted with the goal of including at least 40% of participants with a history of falling in the prior 12 months to increase representation of older adults at higher risk of frailty.
Exclusion criteria	Individuals who took more than 1000 IU/d of vitamin D in supplements during the 36 months prior to enrolment or who were unwilling to limit vitamin D supplement intake to 800 IU/d and calcium supplementation to 500 mg/d during trial participation were excluded. Individuals who took omega-3 supplements during the 3 months prior to enrolment and/or were unwilling to avoid them during the trial were excluded.
Recruitment / selection of participants	Patients were recruited between December 2012 and November 2014, and final follow-up was in November 2017
Intervention(s)	Participants were randomised to 3 years of intervention in 1 of the following 8 groups: 2000 IU/d of vitamin D3, 1 g/d of omega-3s, and a strength-training exercise program (n = 264); vitamin D3 and omega-3s (n = 265); vitamin D3 and exercise (n = 275); vitamin D3 alone (n = 272); omega-3s and exercise (n = 275); omega-3s alone (n = 269); exercise alone (n = 267); or placebo (n = 270). Each comparison was done combining the appropriate groups.
Comparator	see Interventions description
Number of participants	2157 people randomised
Duration of follow-up	3 years
Indirectness	None

Study arms

Vitamin D (N = 1076)

No vitamin D (N = 1081)

Exercise (N = 1081)

Control exercise (N = 1076)

Characteristics

Arm-level characteristics

Characteristic	Vitamin D (N = 1076)	No vitamin D (N = 1081)	Exercise (N = 1081)	Control exercise (N = 1076)
% Female Nominal	667	664	665	666
Mean age (SD) Mean (SD)	75 (4.5)	74.9 (4.4)	75 (4.5)	74.9 (4.4)
Prior fall number (%) No of events	n = 446; % = 41.4	n = 457; % = 42.3	n = 450; % = 41.6	n = 453; % = 42.1

Outcomes

Study timepoints

3 years

Dichotomous outcomes

Outcome	Vitamin D, 3-year, N = 1076	No vitamin D, 3-year, N = 1081	Exercise, 3-year, N = 1081	Control exercise, 3-year, N = 1076
Number of fractures (Number of fractures) No of events	n = 129; % = NA	n = 127; % = NA	n = 133; % = NA	n = 123; % = NA
Vitamin D adverse events: Disorders of mineral metabolism No of events	n = 15; % = 1.4	n = 13; % = 1.2	n = NA; % = NA	n = NA; % = NA
Vitamin D adverse events: Kidney stones No of events	n = 7; % = 0.7	n = 8; % = 0.7	n = NA; % = NA	n = NA; % = NA
Exercise related adverse events (total events) increased muscle pain, joint pain, dizziness, tendon lesions No of events	n = NA; % = NA	n = NA; % = NA	n = 745; % = NR	n = 361; % = NR
Number of falls taken from Bischoff-Ferrari 2022 No of events	n = 1660; % = NR	n = 1673; % = NR	n = 1755; % = NR	n = 1578; % = NR

Outcome	Vitamin D, 3-year, N = 1076	No vitamin D, 3-year, N = 1081	Exercise, 3-year, N = 1081	Control exercise, 3-year, N = 1076
Number of injurious falls taken from Bischoff-Ferarri 2022 No of events	n = 1073; % = NR	n = 1068; % = NR	n = 1115; % = NR	n = 1026; % = NR

Vitamin D contrast outcomes

Outcome	Vitamin D vs No vitamin D, 3 year, N2 = 1076, N1 = 1081
IRR of falls taken from Bischoff-Ferarri 2022 Odds ratio/95% CI	1.03 (0.92 to 1.14)
IRR of injurious falls taken from Bischoff-Ferarri 2022 Odds ratio/95% CI	1.03 (0.92 to 1.14)

Exercise contrast outcomes

Outcome	Exercise vs Control exercise, 3 year, N2 = 1081, N1 = 1076
Odds of falls taken from Bischoff-Ferarri 2022 Odds ratio/95% CI	1 (0.83 to 1.2)
Odds of injurious falls taken from Bischoff-Ferarri 2022 Odds ratio/95% CI	1.03 (0.86 to 1.24)

Bischoff-Ferrari, 2022

Bibliographic Reference	Bischoff-Ferrari, Heike A; Freystatter, Gregor; Vellas, Bruno; Dawson-Hughes, Bess; Kressig, Reto W; Kanis, John A; Willett, Walter C; Manson, JoAnn E; Rizzoli, Rene; Theiler, Robert; Hofbauer, Lorenz C; Armbrecht, Gabriele; da Silva, Jose A P; Blauth, Michael; de Godoi Rezende Costa Molino, Caroline; Lang, Wei; Siebert, Uwe; Egli, Andreas; Orav, Endel J; Wieczorek, Maud; Effects of vitamin D, omega-3 fatty acids, and a simple home strength exercise program on fall prevention: the DO-HEALTH randomized clinical trial.; The American journal of clinical nutrition; 2022; vol. 115 (no. 5); 1311-1321

Study details

Secondary publication of another included study- see primary study for details	This is a secondary publication for Bischoff-Ferrari 2020, see extraction for Bischoff-Ferrari 2020 for these outcomes
Other publications associated with this study included in review	

Bischoff-Ferrari, 2018

Bibliographic Reference	Bischoff-Ferrari, Heike A; Orav, E John; Egli, Andreas; Dawson-Hughes, Bess; Fischer, Karina; Staehelin, Hannes B; Rizzoli, Rene; Hodler, Juerg; von Eckardstein, Arnold; Freystaetter, Gregor; Meyer, Ursina; Guggi, Thomas; Burckhardt, Peter; Schietzel, Simeon; Chocano-Bedoya, Patricia; Theiler, Robert; Willett, Walter C; Felson, David; Recovery after unilateral knee replacement due to severe osteoarthritis and progression in the contralateral knee: a randomised clinical trial comparing daily 2000 IU versus 800 IU vitamin D.; RMD open; 2018; vol. 4 (no. 2); e000678

Study details

Secondary publication of another included study- see primary study for details	Not stated
Other publications associated with this study included in review	Not stated
Trial name / registration number	NCT00599807
Study type	Randomised controlled trial (RCT)
Study location	Switzerland
Study setting	Home based
Study dates	First enrolment from January 2008 and last patient visits in March 2014. Study published in 2018.
Sources of funding	Swiss National Science Foundation and the VELUC Stiftung.

Inclusion criteria	60 years and older, undergone unilateral total knee replacement (due to severe knee osteoarthritis), no plans of bilateral knee replacement within the next 2 years, willingness to stop current vitamin D and calcium supplements during the trial, fluent in German, and minimum score of 24 points in the Mini-Mental State Examination.
Exclusion criteria	History of inflammatory arthritis and inability to walk at least 3meter with or without walking aid.
Recruitment / selection of participants	Participants were recruited from 2 large hospitals. Participants who met all inclusion criteria were enrolled 6-8 weeks after surgery.
Intervention(s)	Participants were randomised into the intervention and control group. The intervention group received one capsule of 2000IU vitamin D3 per day. All capsules were identical of appearance and taste. All participants also received 500mg of calcium per day.
Comparator	The control group 1 capsule of 800IU vitamin D3 per day.
Number of participants	N= 273
Duration of follow-up	24 months

Study arms

Vitamin D3 (2000IU per day) (N = 137)

Vitamin D3 (800 IU per day, Control) (N = 136)

Characteristics

Arm-level characteristics

Characteristic	Vitamin D3 (2000IU per day) (N = 137)	Vitamin D3 (800 IU per day, Control) (N = 136)
% Female Nominal	50.4	56.6
Mean age (SD) Mean (SD)	70.2 (6.8)	70.5 (6)

Outcomes

Study timepoints

24 month

Outcomes

Outcome	Vitamin D3 (2000IU per day), 24-month, N = 137	Vitamin D3 (800 IU per day, Control), 24-month, N = 136
Rate of falls Standardised Mean (95% CI)	1.05 (0.9 to 1.21)	1.07 (0.92 to 1.23)

Outcomes (RR)

Outcome	Vitamin D3 (2000IU per day) vs Vitamin D3 (800 IU per day, Control), 24 month, N2 = 136, N1 = 137
Rate of falls Relative risk/95% CI	0.94 (0.75 to 1.18)

Houston, 2015

Bibliographic Reference	Houston, Denise K; Tooze, Janet A; Demons, Jamehl L; Davis, Brooke L; Shertzer-Skinner, Rachel; Kearsley, Linda B; Kritchevsky, Stephen B; Williamson, Jeff D; Delivery of a Vitamin D Intervention in Homebound Older Adults Using a Meals-on-Wheels Program: A Pilot Study.; Journal of the American Geriatrics Society; 2015; vol. 63 (no. 9); 1861-7

Study details

Secondary publication of another included study- see primary study for details	Not Stated
Other publications associated with this study included in review	Not stated
Trial name / registration number	NCT01410084
Study location	USA
Study setting	home based
Study dates	Cluster randomisation from December 2010 to March 2011, study published 2012
Sources of funding	Funding details not given

Inclusion criteria	Aged 65 and older, not taking prescription vitamin D2 or more than 1,000 IU/d of vitamin D3, no primary hyperparathyroidism, no history of hypercalcemia or kidney stones (within the past 2 years), not on dialysis, not confined to a wheelchair while inside their home, and willing to be randomized to vitamin D3 or active placebo control. All participants provided written informed consent to participate in the study according to the guidelines set forth by the Wake Forest School of Medicine institutional review board for human research.
Exclusion criteria	Not stated
Recruitment / selection of participants	Forsyth County Senior Services meals on wheels (MOW) staff described the study to potential participants as clients were assessed (or reassessed) for MOW eligibility. Interested MOW clients were initially contacted for a telephone screen during which their willingness to have study staff come to their home for study visits, provide a blood sample, take a monthly vitamin supplement, and complete a monthly fall calendar was ascertained.
Intervention(s)	The vitamin D3 supplement as two 50,000-IU capsules/month were individually packaged, and MOW volunteers delivered them monthly with the home-delivered meal. Up to three attempts during the same week were made on a monthly basis to deliver the supplement to the MOW participant's home. The study coordinator called the participant on the day supplements were delivered to confirm that they had received and taken the supplement and were completing their monthly fall calendars.
Population subgroups	None
Comparator	Vitamin E 400IU/month Vitamin E was chosen as the active placebo because it has not been shown to increase 25(OH)D concentrations or reduce falls. The vitamin E supplement (400 IU capsule/month) were individually packaged, and MOW volunteers delivered them monthly with the home-delivered meal. Up to three attempts during the same week were made on a monthly basis to deliver the supplement to the MOW participant's home. The study coordinator called the participant on the day supplements were delivered to confirm that they had received and taken the supplement and were completing their monthly fall calendars.

Number of participants	68
Duration of follow-up	end of treatment- 5 months of receiving treatment
Indirectness	None

Study arms

Vitamin D 100,000IU (N = 38)

Vitamin D3

Placebo (Vitamin E 400IU) (N = 30)

Given Vit E as a placebo

Characteristics

Arm-level characteristics

Characteristic	Vitamin D 100,000IU (N = 38)	Placebo (Vitamin E 400IU) (N = 30)
% Female Nominal	79	63.3
Mean age (SD) Mean (SD)	77.6 (9)	78.2 (8.4)

Characteristic	Vitamin D 100,000IU (N = 38)	Placebo (Vitamin E 400IU) (N = 30)
Ethnicity % Black Nominal	71	80
Dietary supplement containing vit D (%) Nominal	23.7	20
1 fall in the past year (%) Nominal	15.8	24.1
Equal to or greater than 2 falls in the past year Nominal	47.4	34.5

Outcomes

Study timepoints

5 months

Rate of fall (RR)

Outcome	Vitamin D 100,000IU vs Placebo (Vitamin E 400IU), 5 month, N2 = 37, N1 = 27
rate of fall (RR (95% CIs)) Relative risk/95% CI	0.42 (0.21-0.87)

Smith, 2017

Bibliographic Reference	Smith, Lynette M; Gallagher, J Christopher; Suiter, Corinna; Medium doses of daily vitamin D decrease falls and higher doses of daily vitamin D3 increase falls: A randomized clinical trial.; The Journal of steroid biochemistry and molecular biology; 2017; vol. 173; 317-322

Study details

Secondary publication of another included study- see primary study for details	Not stated
Other publications associated with this study included in review	Not stated
Study type	Randomised controlled trial (RCT)
Study location	USA
Study setting	Home based
Study dates	Screening between January 2008 to January 2010. Study published in 2017.
Sources of funding	National Institute on Aging and Office of Dietary Supplements
Inclusion criteria	Postmenopausal women aged 57-90 years with baseline serum of 25OHD of 20ng/ml or less indicating vitamin D insufficiency.

Exclusion criteria	Any significant conditions or medication that may affect calcium and vitamin D metabolism
Recruitment / selection of participants	Caucasian or African American women who met eligibility criteria were randomly assigned to 1 of 7 vitamin D dose groups or placebo.
Intervention(s)	Pills were custom manufactured for the study. Capsules were either Vitamin D3 400, 800, 1600, 2400, 3200, 4000 and 4800IU and matching placebos. Pre-study 7-day diary estimated dietary intake of calcium and vitamin D. Participants were asked to maintain a total calcium intake of 1200-1400mg/d and given calcium supplements if they were unable to achieve these levels. Other vitamin D supplements were not allowed.
Population subgroups	None
Comparator	See intervention description.
Number of participants	N=237
Duration of follow-up	12 months
Indirectness	None
Additional comments	Participants characteristics were combined in excel.

Study arms

Vitamin D (400-800IU) (N = NA)

Vitamin D (1600-3200) (N = NA)

Vitamin D (4000-4800) (N = NA)

Placebo (N = NA)

Characteristics

Study-level characteristics

Characteristic	Study (N = 237)
Mean age (SD) Mean (SD)	66.4 (7.5)
Caucasian (n) Nominal	163
African American (n) Nominal	110

Outcomes

Study timepoints

12 months

Outcomes

Outcome	Placebo vs Vitamin D (1600-3200), 12 month, N2 = NA, N1 = NA	Vitamin D (400-800IU) vs Vitamin D (1600-3200), 12 month, N2 = NA, N1 = NA	Vitamin D (4000-4800) vs Vitamin D (1600-3200), 12 month, N2 = NA, N1 = NA
Faller status Odds ratio/95% CI	3 (1.24 to 12.04)	3.16 (1.24 to 7.99)	5.63 (2.14 to 14.85)

Outcomes

Outcome	Vitamin D (400-800IU), 12-month, N = NA	Vitamin D (1600-3200), 12-month, N = NA	Vitamin D (4000-4800), 12-month, N = NA	Placebo, 12-month, N = NA
Number of falls Mean (SE)	0.85 (0.19)	0.41 (0.09)	0.79 (0.19)	0.94 (0.23)

Uusi-Rasi, 2017

Bibliographic Reference	Uusi-Rasi, Kirsti; Patil, Radhika; Karinkanta, Saija; Kannus, Pekka; Tokola, Kari; Lamberg-Allardt, Christel; Sievanen, Harri; A 2-Year Follow-Up After a 2-Year RCT with Vitamin D and Exercise: Effects on Falls, Injurious Falls and Physical Functioning Among Older Women.; The journals of gerontology. Series A, Biological sciences and medical sciences; 2017; vol. 72 (no. 9); 1239-1245

Study details

Secondary publication of another included study- see primary study for details	Primary publication: Uusi-Rasi K, Kannus P, Karinkanta S, et al. Study protocol for prevention of falls: a randomized controlled trial of effects of vitamin D and exercise on falls prevention. BMC Geriatr. 2012; 12:12. doi:10.1186/1471-2318-12-12.
Other publications associated with this study included in review	Uusi-Rasi K, Patil R, Karinkanta S, et al. Exercise and vitamin D in fall prevention among older women: a randomized clinical trial. JAMA Intern Med. 2015; 175:703–711. doi:10.1001/jamainternmed.2015.0225 Patil R, Karinkanta S, Tokola K, Kannus P, Sievänen H, Uusi-Rasi K. Effects of vitamin D and exercise on the wellbeing of older community-dwelling women: a randomized controlled trial. Gerontology. 2016;62:401–408. doi:10.1159/000442441.
Trial name / registration number	NCT00986466
Study location	Finland
Study setting	Community
Study dates	2 phases of trial, 201 participants in March 2010 and 208 in March 2011 with follow up in 2012 and 2013 respectively. The results from this study inform data from additional 2 year follow-up.
Sources of funding	This work was supported by the Academy of Finland (grant no. 131524); Juho Vainio Foundation, Helsinki, Finland; and Finnish Cultural Foundation, Pirkanmaa Regional fund, Finland.
Inclusion criteria	Women age between 70-80 years, living at home independently; had fallen at least once during the previous year; no contraindication to exercise; understands the procedures of the study, has been informed of X-ray radiation doses of the DXA and pQCT investigations, and amount of blood samples needed, and voluntarily agrees to undergo all measurements and signs informed consent prior to beginning of the procedure.

Exclusion criteria	Moderate to vigorous exercise more than 2 hours per week; regular use of vitamin D or calcium + vitamin D supplements; a recent fracture (during preceding 12 months); contraindication or inability to participate in the exercise program; a marked decline in the basic activities of daily living (ADL); cognitive impairments (Mini Mental State Examination, MMSE-test); primary hyperthyroidism; and degenerative conditions, such as Parkinson's disease.
Recruitment / selection of participants	All 70- to 80-year-old women living in the city of Tampere, Finland (n = 9370) were invited to participate in the trial. In addition to willingness, history of at least one fall during the last 12 months and no regular use of vitamin D supplements were the two other primary criteria mentioned in the first contact letter.
Intervention(s)	Vitamin D supplements The participants were randomly assigned to receive800 IU (20 µg) of vitamin D per day for two years. Both participants and outcome assessors are blinded to the group assignment during the study. At the start, each participant received a pack of pills for six months, and when arriving to the follow-up measurements at six-month intervals the used packs will be returned, and new full packs will be given. At this time, compliance will be confirmed by remaining pill counts. A questionnaire on side effects will be administered to all participants at six-month intervals to monitor safety. As standard safety markers, S-Ca and S-Pi will be assayed. Exercise programme Participants randomised to the exercise groups (50% of the participants either on vitamin D or placebo) attended supervised training classes 2 times a week for the first 12 months, and once a week for the last 12 months of the 24-month intervention. In addition, they received a home exercise plan to be practised on the rest days. All group training sessions were supervised by 1 or 2 experienced exercise leaders (physiotherapists). The training program is progressive and consists of strength, balance, agility and mobility training. Training sessions are carried out in 8-week periods, either in the exercise hall or gym. Around 10 to 20 participants are expected to attend these training sessions. All training sessions last 60 minutes and include a 10 minute warm-up as well as stretching for major muscle groups. A 4-week familiarizing period precedes the first 8-week training period to accustom the exercisers to the training, and to familiarize them to each other and the exercise leaders.
Population subgroups	None

Comparator	Placebo (for Vit D) The participants were randomly assigned to receive placebo per day for two years. Both participants and outcome assessors are blinded to the group assignment of placebo during the study. At the start, each participant received a pack of pills for six months, and when arriving to the follow-up measurements at six-month intervals the used packs will be returned, and new full packs will be given. At this time, compliance will be confirmed by remaining pill counts. A questionnaire on side effects will be administered to all participants at six-month intervals to monitor safety. As standard safety markers, S-Ca and S-Pi will be assayed.
Number of participants	409 randomised to four arms: 1) exercise + vitamin D (800 IU/d) 2) exercise + placebo 3) no exercise + vitamin D (800 IU/d) 4) no exercise + placebo.
Duration of follow-up	48 months
Indirectness	None
Additional comments	2 year trial was carried out initially and this is a 2 year follow up of that.

Study arms

Vitamin D (N = 102)

Exercise (N = 103)

Exercise with placebo for vitamin D

Vitamin D and exercise (N = 102)

placebo (N = 102)

Placebo for vitamin D and no exercise

Characteristics

Arm-level characteristics

Characteristic	Vitamin D (N = 102)	Exercise (N = 103)	Vitamin D and exercise (N = 102)	placebo (N = 102)
% Female Nominal	100	100	100	100
Mean age (SD) Mean (SD)	74.1 (3)	74.8 (2.9)	74.1 (2.9)	73 (3.1)
Difficulty outdoor mobility (number of people) Nominal	19	17	17	18

Outcomes

Study timepoints

48 months (During 24-48 months follow-up)

Contrast outcomes

Outcome	Vitamin D vs placebo, 48 month, N2 = 88, N1 = 95
All falls (IRR) Hazard ratio/95% CI	0.78 (0.53 to 1.14)

Wanigatunga, 2021

Bibliographic Reference	Wanigatunga, Amal A; Sternberg, Alice L; Blackford, Amanda L; Cai, Yurun; Mitchell, Christine M; Roth, David L; Miller, Edgar R 3rd; Szanton, Sarah L; Juraschek, Stephen P; Michos, Erin D; Schrack, Jennifer A; Appel, Lawrence J; The effects of vitamin D supplementation on types of falls.; Journal of the American Geriatrics Society; 2021; vol. 69 (no. 10); 2851-2864

Study details

Secondary publication of another included study- see primary study for details	Not stated
Other publications associated with this study included in review	Appell 2020, Michos 2018, Michos 2020
Trial name / registration number	STURDY

	NCT02166333
Study type	Randomised controlled trial (RCT)
Study location	US
Study setting	Home based
Study dates	No stated
Sources of funding	National Institute of Aging, Office of Dietary Supplements, Mid-Atlantic Nutrition Obesity Research Center, Johns Hopkins Institute for Clinical and Translation Research.
Inclusion criteria	Community-dwelling adults aged 70 years or older with elevated fall risk, serum 25-hydroxyvitamin D concentration of 10-29ng per ml (elevated fall risk defined as self-reported with at least 1 fall resulting in injury in the past year, at least 2 falls in the past year regardless of injury, a fear of falling due to balance or walking problems, difficulties to maintain balance, or using an assistive device for walking).
Exclusion criteria	Cognitive impairment (Mini-Mental State Examination score of less than 24), hypercalcemia, kidney, bladder or ureteral stone, use of personal vitamin D supplement of more than 1000IU per day or calcium supplementation of more than 1200mg per day.
Recruitment / selection of participants	Each of the higher dose non control groups (1000, 2000, and 4000IU per day) had equal probability of assignment. Participants and study personnel were masked to randomisation dose, occurrence of adaptations and to the end of dose-finding.
Intervention(s)	Participants were randomised into 3 interventions groups: 1000IU per day, 2000IU per day and 4000IU per day (Vitamin D3 cholecalciferol supplement.
Population subgroups	Not stated

Comparator	The control group was assigned 200IU per day of vitamin D3 cholecalciferol supplement.
Number of participants	N=688
Duration of follow-up	2 years

Study arms

Vitamin D (pooled higher doses combined 1000, 2000, and 4000IU per day) (N = 349)

Control (200IU per day) (N = 339)

Characteristics

Arm-level characteristics

Characteristic	Vitamin D (pooled higher doses combined 1000, 2000, and 4000IU per day) (N = 349)	Control (200IU per day) (N = 339)
% Female Nominal	45.6	41.6
Mean age (SD) Mean (SD)	77.2 (5.4)	77.2 (5.4)
Black, African-American (n)	69	55

Characteristic	Vitamin D (pooled higher doses combined 1000, 2000, and 4000IU per day) (N = 349)	Control (200IU per day) (N = 339)
Nominal		
Hispanic (n) Nominal	5	3

Outcomes

Study timepoints

2 years

Outcomes

Outcome	Vitamin D (pooled higher doses combined 1000, 2000, and 4000IU per day) vs Control (200IU per day), 2 year, N2 = 339, N1 = 349
Number of falls Hazard ratio/95% CI	1.11 (0.89 to 1.38)

Outcomes arm based

Outcome	Vitamin D (pooled higher doses combined 1000, 2000, and 4000IU per day), 2-year, N = 339	Control (200IU per day), 2-year, N = 349
All falls	n = 689	n = 670

Outcome	Vitamin D (pooled higher doses combined 1000, 2000, and 4000IU per day), 2-year, N = 339	Control (200IU per day), 2-year, N = 349
No of events		
All falls with fracture No of events	n = 21	n = 10

Waterhouse, 2021

Bibliographic **Reference**	Waterhouse, Mary; Sanguineti, Emma; Baxter, Catherine; Duarte Romero, Briony; McLeod, Donald S A; English, Dallas R; Armstrong, Bruce K; Ebeling, Peter R; Hartel, Gunter; Kimlin, Michael G; O'Connell, Rachel L; Pham, Hai; van der Pols, Jolieke C; Venn, Alison J; Webb, Penelope M; Whiteman, David C; Neale, Rachel E; Vitamin D supplementation and risk of falling: outcomes from the randomized, placebo-controlled D-Health Trial.; Journal of cachexia, sarcopenia and muscle; 2021; vol. 12 (no. 6); 1428-1439

Study details

Secondary publication of another included study- see primary study for details	No stated
Other publications associated with this	Not stated

study included in review	
Trial name / registration number	D-Health trial (ACTRN12613000743763)
Study type	Randomised controlled trial (RCT)
Study location	Australia
Study setting	Home based
Study dates	Randomisation from February 2014 to May 2015. Study published in 2021.
Sources of funding	National Health and Medical Research Council.
Exclusion criteria	Self-reported history of osteomalacia, sarcoidosis, hyperparathyroidism, hypercalcaemia, kidney stones, or taking more than 500IU of supplementary vitamin D per day.
Recruitment / selection of participants	The Commonwealth electoral roll was used a sampling frame. Australians aged between 60 and 79 years were invited to participate. Further volunteer aged between 60 and 84 years were also sought.
Intervention(s)	Pills for Vitamin D and placebo were identical in appearance. Pills were distributed in packs of 12 and mailed annually. Participants were instructed to take 1 pill per month and reminders via text messages and email were sent. Pill were taken for a maximum of 5 years. (Dosage of Vitamin D not mentioned)
Population subgroups	
Comparator	See description in intervention
Duration of follow-up	5 years

Indirectness	None

Study arms

Vitamin D (N = 7729)

Placebo (N = 7687)

Characteristics

Study-level characteristics

Characteristic	Study (N = 15,416)
Mean age (SD) Mean (SD)	69.3 (5.5)

Arm-level characteristics

Characteristic	Vitamin D (N = 7729)	Placebo (N = 7687)
% Female Nominal	46	45.7

Outcomes

Study timepoints

5 year

Outcomes

Outcome	Vitamin D vs Placebo, 5 year, N2 = 7687, N1 = 7729
Incidence of falls IRR/95% CI	1.13 (0.89 to 1.43)

D.4 Nutrition interventions

No effectiveness evidence available.

D.5 Psychological interventions

Arkkukangas, 2019

Bibliographic Reference	Arkkukangas, Marina; Johnson, Susanna Tuvemo; Hellstrom, Karin; Anens, Elisabeth; Tonkonogi, Michail; Larsson, Ulf; Fall Prevention Exercises with or without Behavior Change Support for Community-Dwelling Older Adults: A Two-Year Follow-Up of a Randomized Controlled Trial.; Journal of aging and physical activity; 2019; vol. 28 (no. 1); 34-41

Study details

Secondary publication of another included study- see primary study for details	Secondary publication of: Arkkukangas, M., Soderlund, A., Eriksson, S., & Johansson, A.C. (2019). Fall preventive exercise with or without behavior change support for community-dwelling older adults: A randomized controlled trial with short-term follow-up. Journal of Geriatric Physical Therapy, 42(1), 9–17.
Other publications associated with this study included in review	Tuvemo Johnson 2021
Trial name / registration number	
Additional comments	Complete case analysis including participants who completed the full two-year trial

Study arms

Exercise (N = 61)

Otago Exercise Programme supported by a physiotherapist in addition to safety instructions and recommendations about fall prevention as part of standard care

Multiple Component Intervention (N = 58)

Otago Exercise Programme supported by a physiotherapist (exercise) plus motivational interviewing (psychological intervention) in addition to safety instructions and recommendations about fall prevention as part of standard care

Usual care/control (N = 56)

Safety instructions and recommendations about fall prevention as part of standard care

Outcomes

Study timepoints

Baseline

2 years

Dichotomous Outcomes

Outcome	Exercise, Baseline, N = 60	Exercise, 2-year, N = 60	Multiple Component Intervention, Baseline, N = 58	Multiple Component Intervention, 2-year, N = 58	Usual care/control, Baseline, N = 56	Usual care/control, 2-year, N = 56
Number of people sustaining one or more falls (year 0-1) Final values No of events	n = NA; % = NA	n = 23; % = 38	n = NA; % = NA	n = 32; % = 55	n = NA; % = NA	n = 19; % = 34

Number of people sustaining one or more falls (year 0-1) - Polarity - Higher values are better

Data also reported from years 1-2 following cessation of interventions (proportion of participants with no falls): Exercise= 25/44 (57%), Exercise + Psychological Intervention = 23/47 (47%), Usual care/control = 21/51 (41%)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Dichotomous Outcomes-Number of people sustaining one or more falls (year0-1)-No Of Events -Exercise-Multiple Component Intervention-Usual care/control-t2

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High (22% adherence to protocol-specified physical activity levels and no information on method used to impute missing data)
Overall bias and Directness	Overall Directness	Directly applicable

Dorresteijn, 2016

Bibliographic Reference	Dorresteijn, Tanja A C; Zijlstra, G A Rixt; Ambergen, Antonius W; Delbaere, Kim; Vlaeyen, Johan W S; Kempen, Gertrudis I J M; Effectiveness of a home-based cognitive behavioral program to manage concerns about falls in community-dwelling, frail older people: results of a randomized controlled trial.; BMC geriatrics; 2016; vol. 16; 2

Study details

Secondary publication of another included study- see primary study for details	None stated
Other publications associated with this study included in review	None stated

Trial name / registration number	NCT01358032
Study location	Netherlands
Study setting	Community
Study dates	2016
Sources of funding	This research was funded by ZonMw, The Netherlands Organization for Health Research and Development (grant 120610001). The participation of author JV was supported by a grant from the Research Foundation, Flanders, Belgium (FWO Vlaanderen).
Inclusion criteria	Community-dwelling people aged 70 years or older were included in the study if they reported at least some concerns about falls and associated activity avoidance, perceived their general health as fair or poor, and were willing to participate (signed informed consent form)
Exclusion criteria	Individuals were excluded if they were confined to bed; wheelchair dependent; waiting for nursing home admission; or experienced substantial hearing, vision or cognitive impairments. Individuals were excluded if they scored <17 out of 41 on the TICS. A restriction was applied to couples; only one member of a couple was allowed to participate in the trial to prevent reciprocal influencing if by chance one was allocated to the treatment group and one to the control group. Lots were drawn to determine who of the couple would be included.
Recruitment / selection of participants	NR
Intervention(s)	Cognitive behavioural intervention: The AMB-Home program consists of seven individual sessions, including three home-visits (60, 60 and 75 min, respectively) and four telephone contacts (35 min each). The seven pre-defined themes of the program were concerns about falls; thoughts about falling; physical exercise; asserting oneself; overcoming personal barriers; safe behaviour; and managing concerns about falls. Each session was similarly structured with a review of the previous session (except the first session), a discussion of the main theme, and the formulation of a personalized action plan related to the discussed theme. Session 5 differed slightly from the other sessions in that participants were guided to

	safely execute a daily activity they were afraid to perform independently ('exposure in vivo'). Examples of activities selected by participants included walking down the stairs or crossing a street. The participants received homework assignments between the sessions, including reading informative leaflets, filling in checklists to become aware of their beliefs about falls, and executing personal action plans. In addition, a DVD was used to show how peers address concerns about falls. AMB-Home includes detailed manuals for both the participants and the program facilitators. The facilitators were community nurses (*n* = 8) who were qualified in the field of geriatrics and worked at local home-care agencies. the AMB-Home program was adapted from group to individual use for this trial.
Population subgroups	None
Comparator	The control group received care as usual. Whereas no standard treatment for concerns about falls was available during the study period it is likely they received no treatment.
Number of participants	389 randomised
Duration of follow-up	12 months
Indirectness	None

Study arms

Cognitive behavioural intervention (N = 194)

Usual care (N = 195)

Characteristics

Arm-level characteristics

Characteristic	Cognitive behavioural intervention (N = 194)	Usual care (N = 195)
% Female Nominal	68	73.2
Mean age (SD) Mean (SD)	78.38 (5.4)	78.25 (5.3)
Falls in the past 6 months (%) Nominal	NA	NA
1 Fall Nominal	28.1	28.6
more than one Nominal	38.5	29.2

Outcomes

Study timepoints

12 months

Dichotomous outcomes

Outcome	Cognitive behavioural intervention, 12-month, N = 166	Usual care, 12-month, N = 180
Fallers (number of people) No of events	n = 94; % = 56.6	n = 106; % = 58.9
Recurrent falls (number of people) No of events	n = 55; % = 33.1	n = 67; % = 37.2

Parry, 2016

Bibliographic Reference	Parry, Steve W; Bamford, Claire; Deary, Vincent; Finch, Tracy L; Gray, Jo; MacDonald, Claire; McMeekin, Peter; Sabin, Neil J; Steen, I Nick; Whitney, Sue L; McColl, Elaine M; Cognitive-behavioural therapy-based intervention to reduce fear of falling in older people: therapy development and randomised controlled trial - the Strategies for Increasing Independence, Confidence and Energy (STRIDE) study.; Health technology assessment (Winchester, England); 2016; vol. 20 (no. 56); 1-206

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported

Trial name / registration number	ISRCTN78396615
Study location	England
Study setting	Community setting
Sources of funding	NIHR Health Technology Assessment programme
Inclusion criteria	Falls Efficacy Scale - I (FES-I) score of at least 23 Aged at least 60 years and older
Exclusion criteria	Cognitive impairment (Mini Mental State Examination score of at least 24/30) Life expectancy of less than a year or unlikely to be able to complete follow-up at 1 year Requiring psychosocial interventions that are unrelated to fear of falling Current involvement in other investigational studies or trials, or involvement within 30 days prior to study entry Participants who had taken part in Phase I of this study
Recruitment / selection of participants	Potential participants with significant fear of falling (FES-I score of more than 23) were identified prospectively and retrospectively by staff at participating community falls services. Participants were sent an invitation letter, Information sheet, and expression of interest form and prepaid envelope.
Intervention(s)	Intervention: Cognitive behavioural therapy (CBT) plus usual care. CBT was performed face-to-face on a one-to-one basis. CBT was delivered by a Health Care Assistant (non-specialist with training in basic CBT skills, formulation and treatment skills). Sessions lasted around 45minutes each for 8 weeks plus a single reinforcement session 6 months after the last CBTi session.
Population subgroups	None reported

Comparator	Control: Usual care
Number of participants	N=415 Intervention: n=210 Control: n=205
Duration of follow-up	12 months
Indirectness	None

Study arms

CBT + usual care (N = 210)

Control (N = 205)

Characteristics

Study-level characteristics

Characteristic	Study (N = 415)
% Female Nominal	70.1
Mean age (SD)	75.5 (74.7 to 76.4)

Characteristic	Study (N = 415)
Mean (95% CI)	

Outcomes

Study timepoints

12 month

Outcomes

Outcome	CBT + usual care, 12-month, N = 210	Control, 12-month, N = 205
Number of falls No of events	n = 335	n = 480
Number of fallers No of events	n = 97; % = 46.19	n = 99; % = 48.29
Number of fractures No of events	n = 3	n = 7
Number of adverse events No of events	n = 28	n = 41

Tuvemo Johnson, 2021

Bibliographic Reference	Tuvemo Johnson, S.; Anens, E.; Johansson, A.-C.; Hellstrom, K.; The Otago Exercise Program with or without Motivational Interviewing for Community-Dwelling Older Adults: A 12-Month Follow-Up of a Randomized, Controlled Trial; Journal of Applied Gerontology; 2021; vol. 40 (no. 3); 289-299

Study details

Secondary publication of another included study- see primary study for details	Arkkukangas 2019
Other publications associated with this study included in review	

Study arms

Motivational interviewing (N = 58)

Otago exercise program plus motivational interviewing. Safety instructions and recommendations for falls prevention (extracted as multicomponent intervention in Arkkukangas 2019)

Standard care (N = 61)

Otago exercise program and safety instructions and recommendations for falls prevention

Outcomes

Study timepoints

12 months

24 months

Dichotomous outcomes

Outcome	Motivational interviewing, 12-month, N = 58	Motivational interviewing, 24-month, N =	Standard care, 12-month, N = 61	Standard care, 24-month, N =
Number of falls Nominal	79	empty data	70	empty data
Number of fallers Nominal	33	empty data	22	empty data

Continuous outcomes

Outcome	Motivational interviewing, 12-month, N =	Motivational interviewing, 24-month, N = 42	Standard care, 12-month, N =	Standard care, 24-month, N = 38
EQ-5D Mean (SD)	empty data	0.7 (0.22)	empty data	0.7 (0.21)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Dichotomous outcomes – Number of falls-Nominal-Motivational interviewing -Standard care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low (ITT used and although there was limited adherence to exercise this was balanced between the groups)
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomous outcomes-Number of fallers - Nominal-Motivational interviewing -Standard care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low (ITT used and although there was limited adherence to exercise this was balanced between the groups)
Overall bias and Directness	Overall Directness	Directly applicable

Continuous outcomes - EQ-5D-MeanSD-Motivational interviewing -Standard care-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High (due to attrition bias)
Overall bias and Directness	Overall Directness	Directly applicable

D.6 Surgical interventions

No effectiveness evidence available.

Appendix E Forest plots

E.1 Education interventions

Interventions to prevent falls in the community setting

Figure 2: Education interventions versus control – Rate of falls

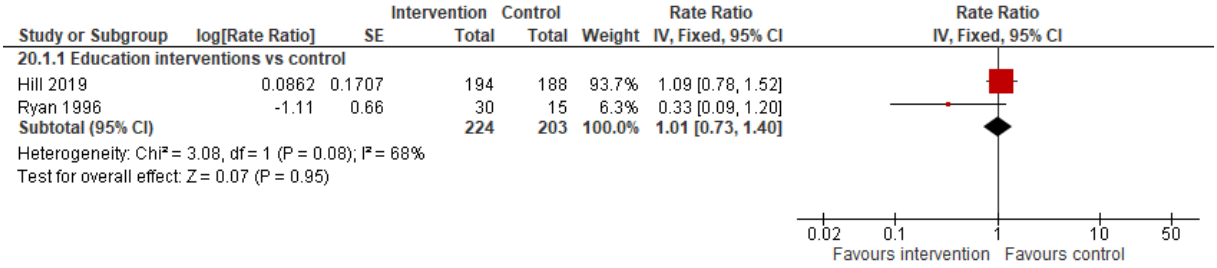
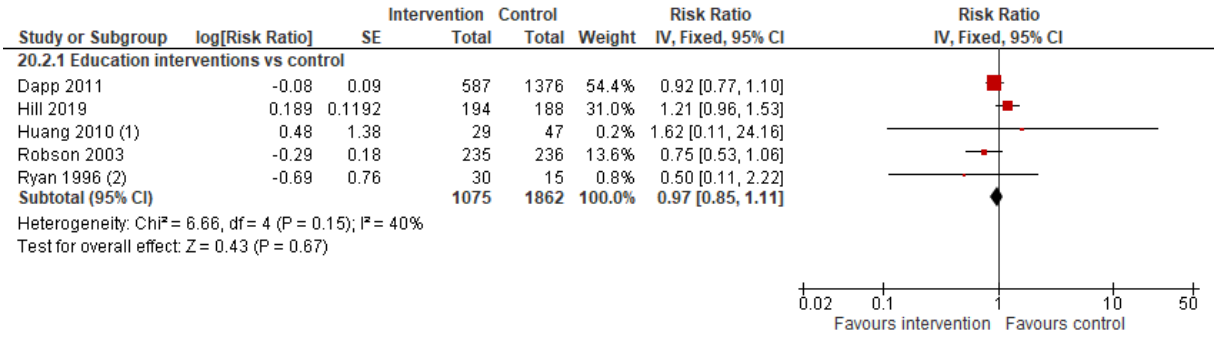
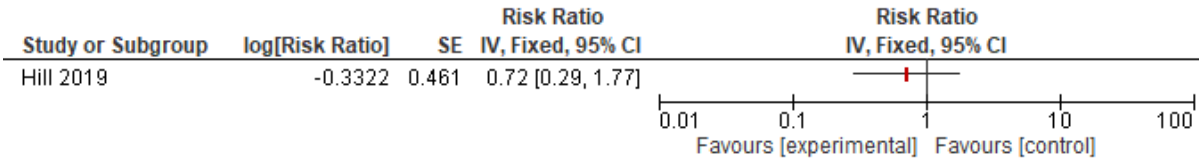


Figure 3: Education interventions versus control – Number of fallers



Footnotes
(1) Results at five months
(2) Two intervention arms combined (group education and one-on-one education)

Figure 4: Education interventions versus control – Number of people sustaining a falls-related fracture



E.2 Medication provision

Figure 5: Medication provision: other medication versus control – Rate of falls

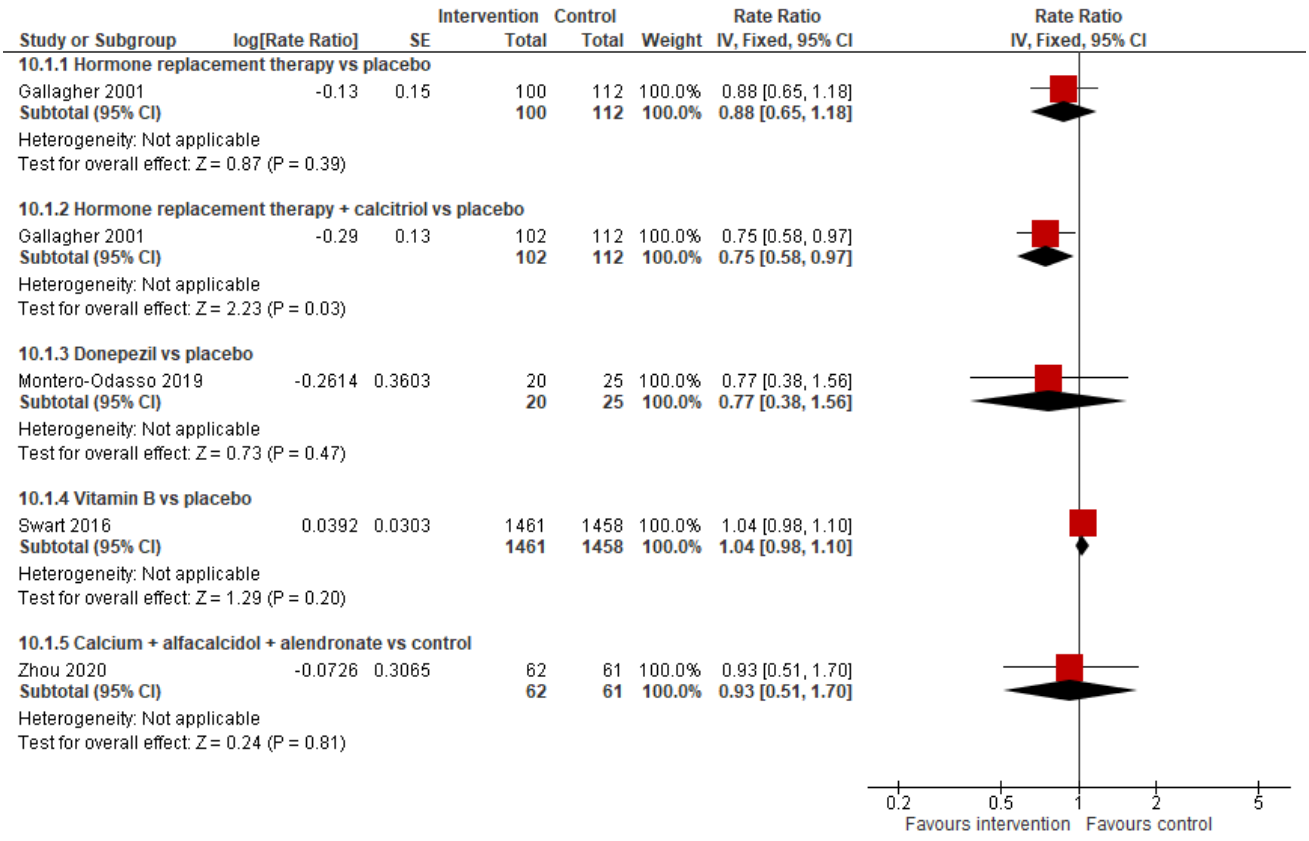
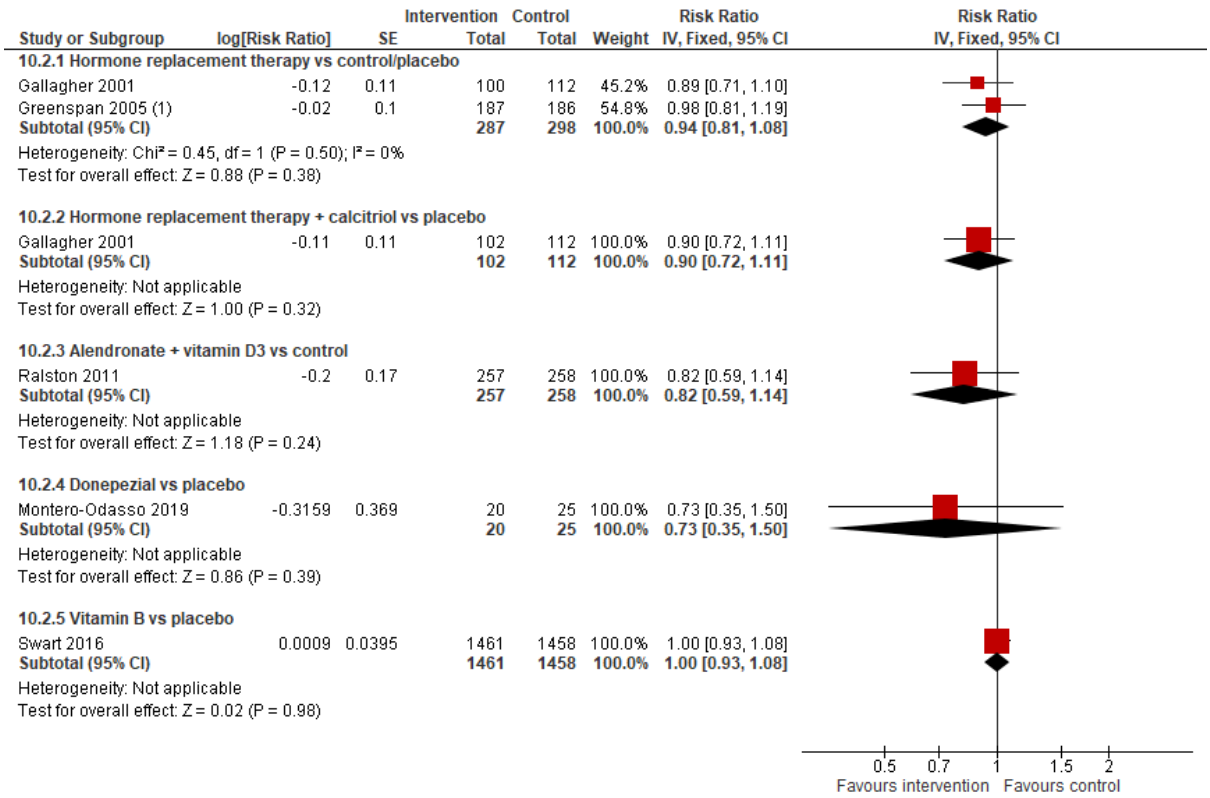


Figure 6: Medication provision: other medication versus control – Number of fallers



Footnotes
(1) Factorial design: HRT versus no HRT

Figure 7: Medication provision: other medication versus control - Number of people with serious falls

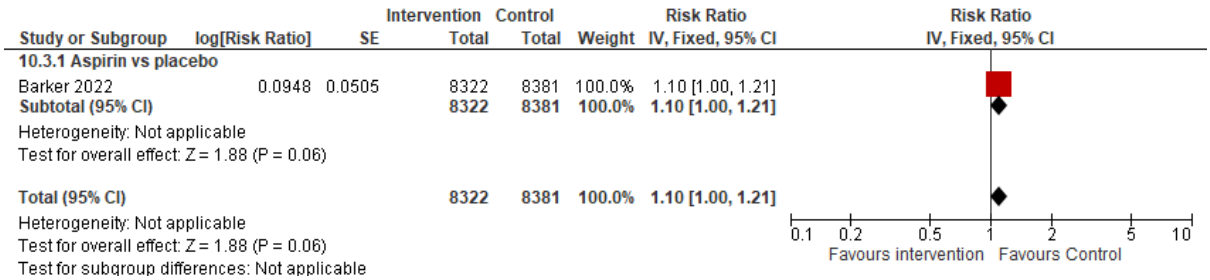


Figure 8: Medication provision: other medication versus control – Rate of serious falls

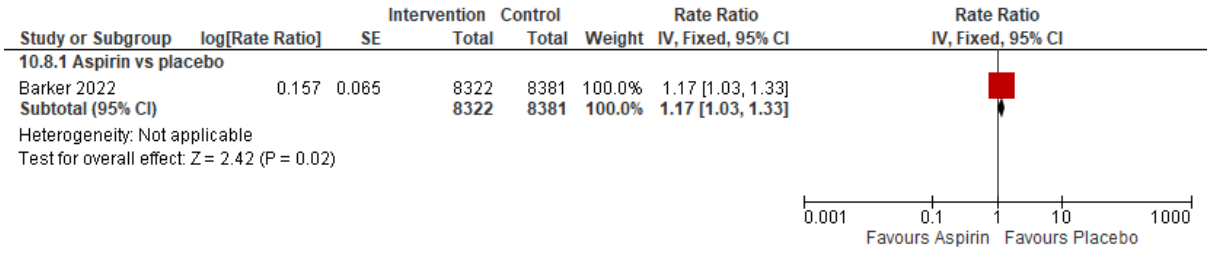


Figure 9: Medication provision: other medication versus control – Number of people sustaining a fracture

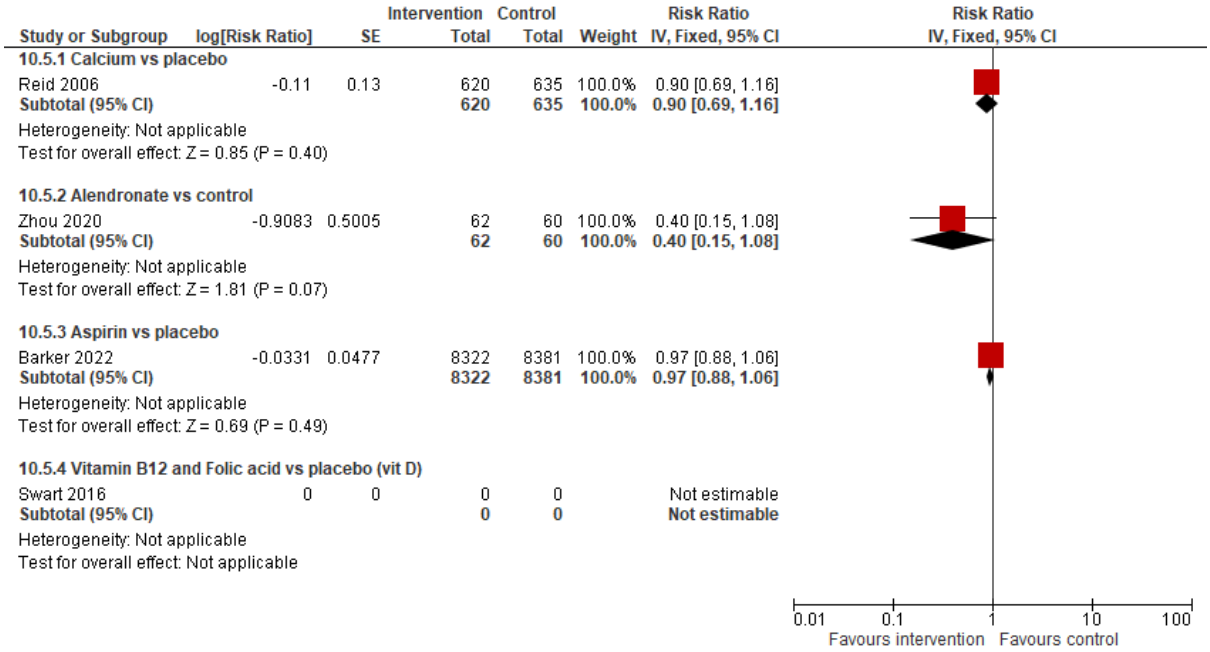


Figure 10: Medication provision: other medication versus control – Rate of falls (HR)

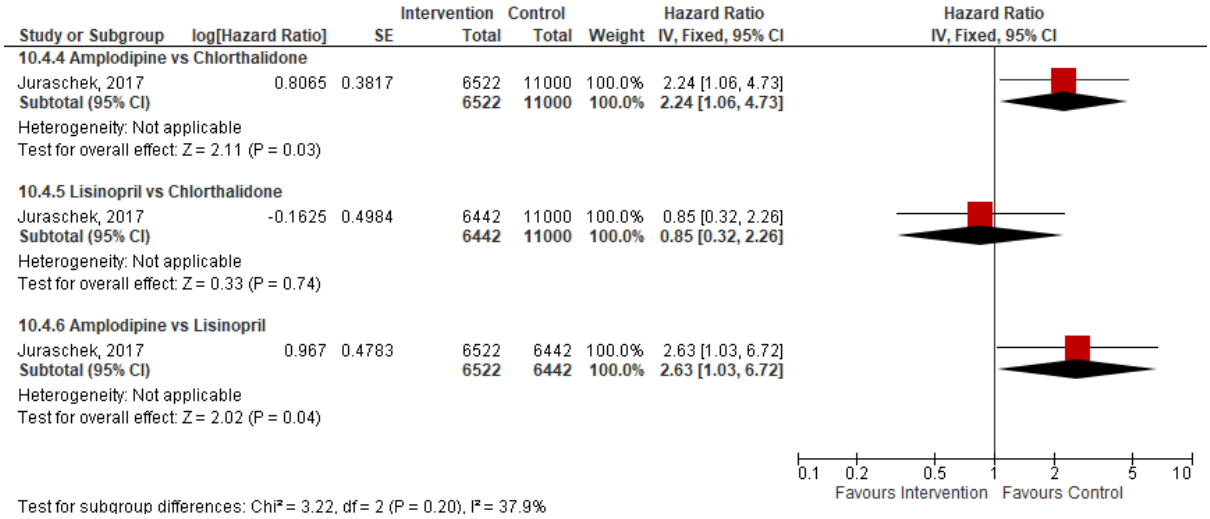
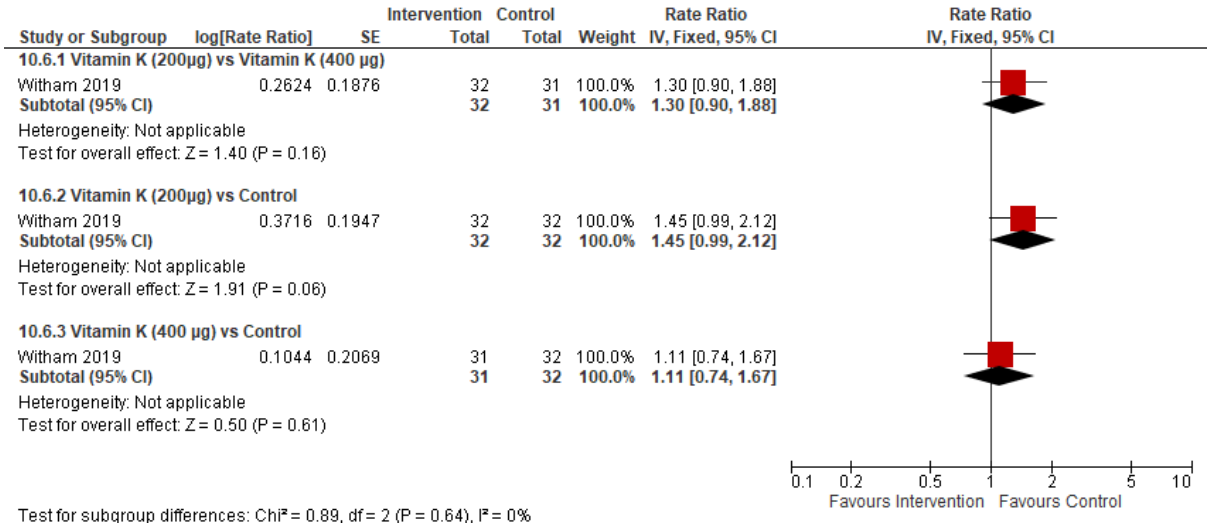
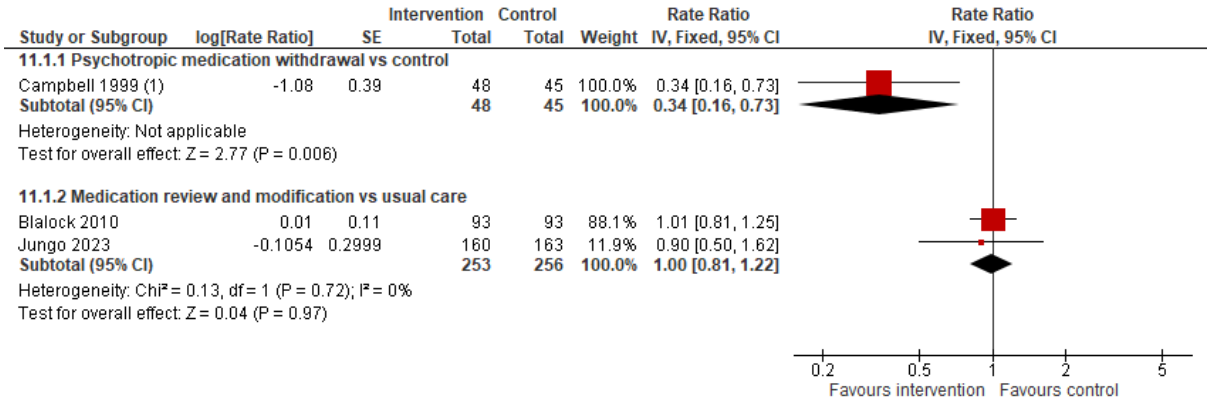


Figure 11: Medication provision: Other medication vs control – Adverse events



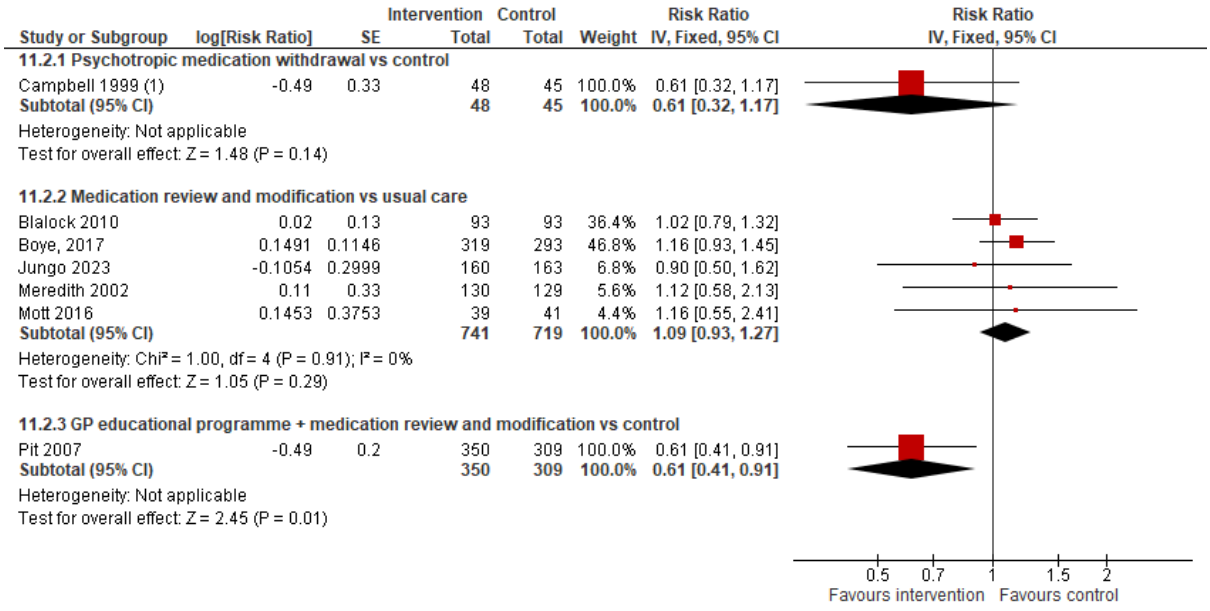
Medication withdrawal

Figure 12: Medication withdrawal versus control – Rate of falls



Footnotes
(1) Factorial design: psychotropic medication withdrawal vs no withdrawal

Figure 13: Medication withdrawal versus control – Number of fallers



Footnotes
(1) Factorial design: psychotropic medication withdrawal vs no withdrawal

Figure 14: Medication withdrawal versus control – Number of people sustaining a fracture

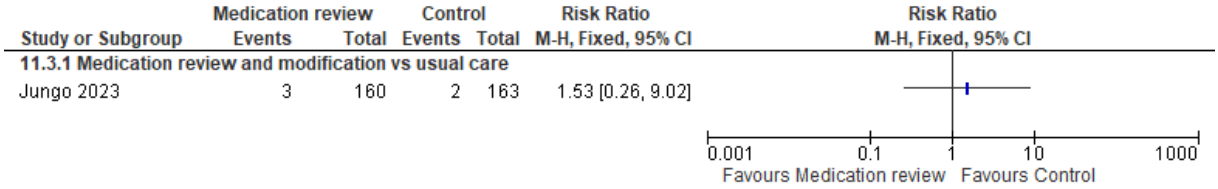


Figure 15: Medication withdrawal versus control – Quality of life (Physical)

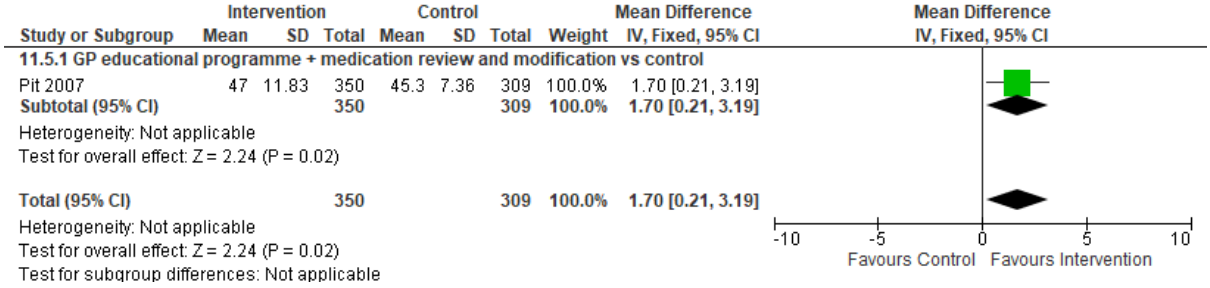


Figure 16: Medication withdrawal versus control – Quality of life (Mental)

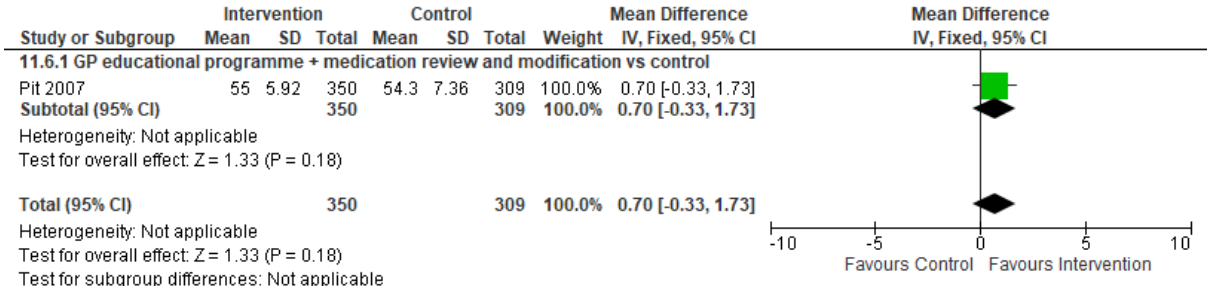
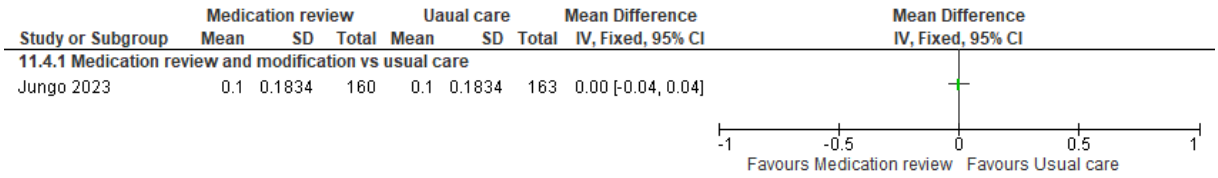


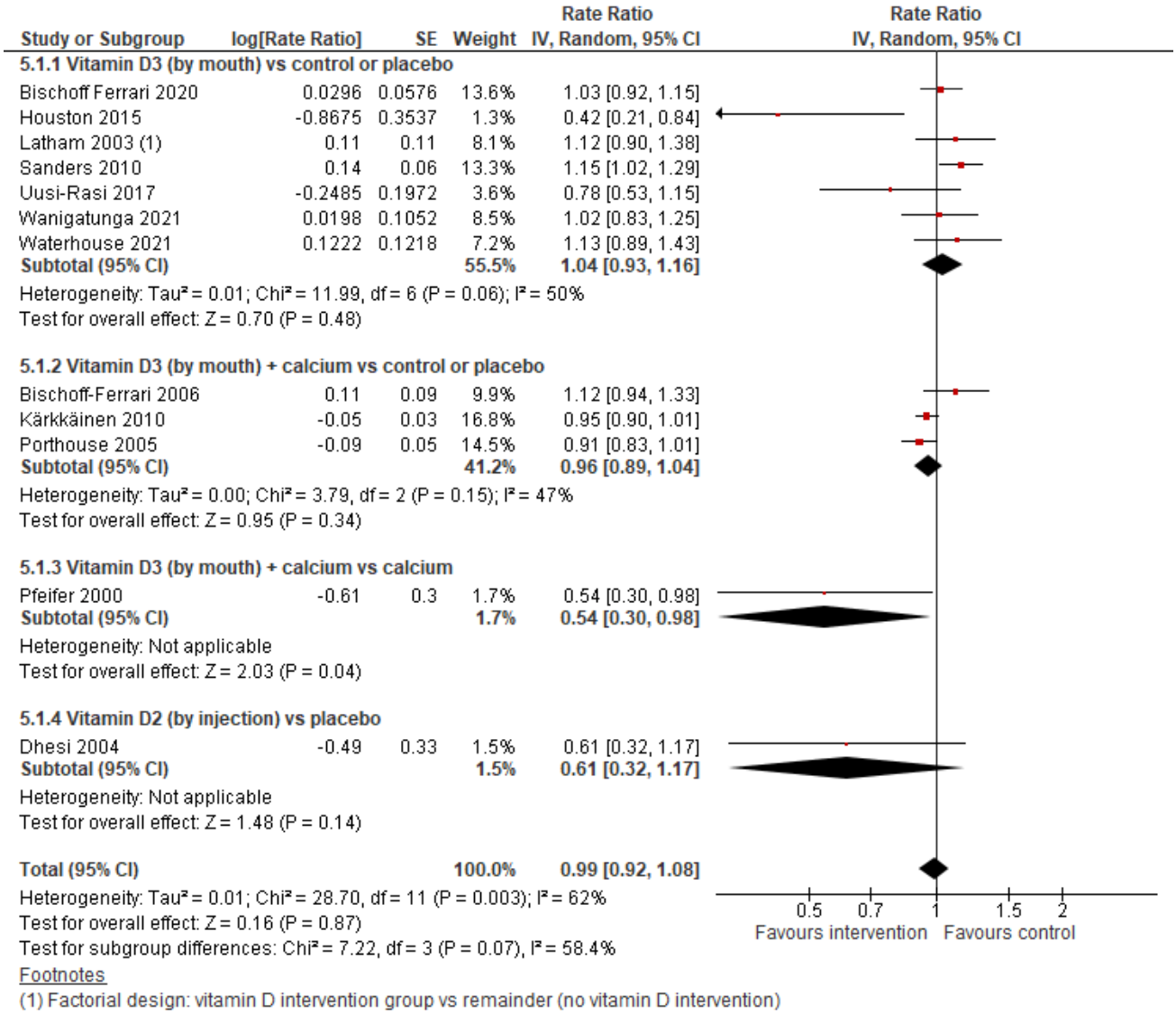
Figure 17:Medication withdrawal versus control – Quality of life (EQ-5D-5L)



E.3 Vitamin D interventions

Interventions to prevent falls in community settings

Figure 18: Medication provision: Vitamin D (with or without calcium) vs control/placebo/calcium– Rate of falls



Footnotes

(1) Factorial design: vitamin D intervention group vs remainder (no vitamin D intervention)

Figure 19: Medication provision: Vitamin D (with or without calcium) vs control/placebo/calcium – Number of fallers

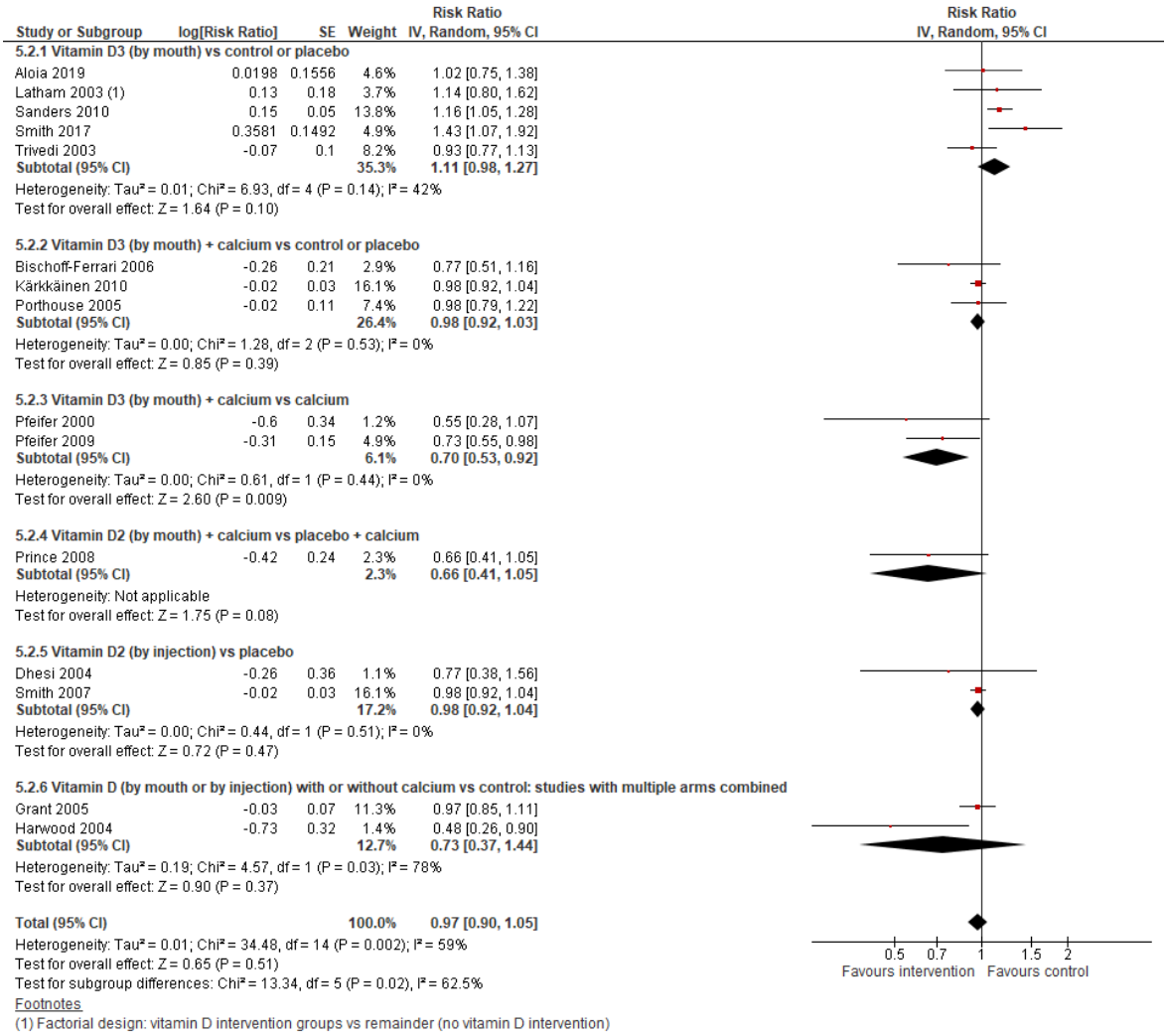


Figure 20: Medication provision: Vitamin D (with or without calcium) vs control/placebo/calcium – number of people sustaining a fracture

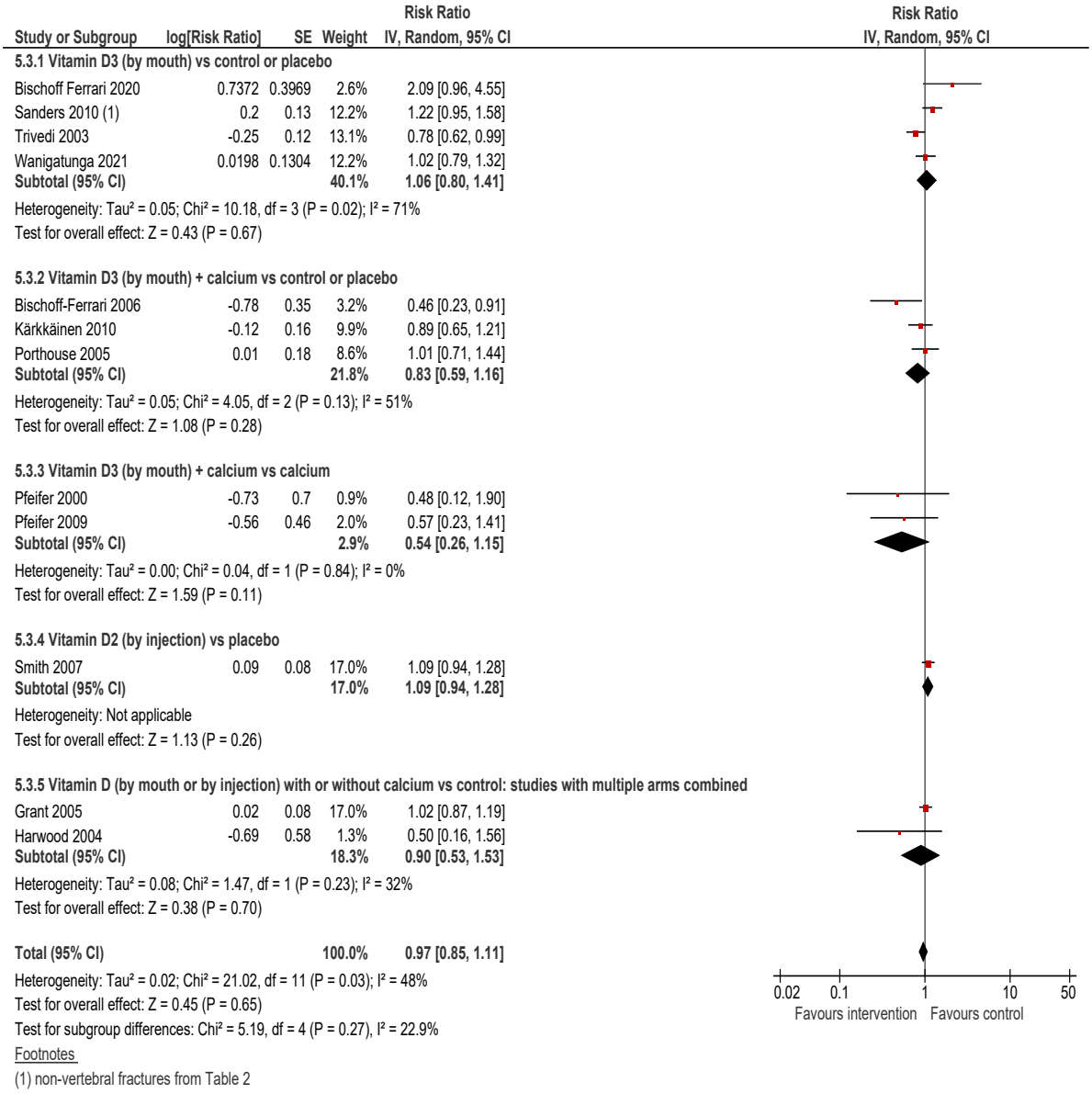


Figure 21: Vitamin D (with or without calcium) versus control: subgroup analysis by vitamin D levels at baseline – Rate of falls

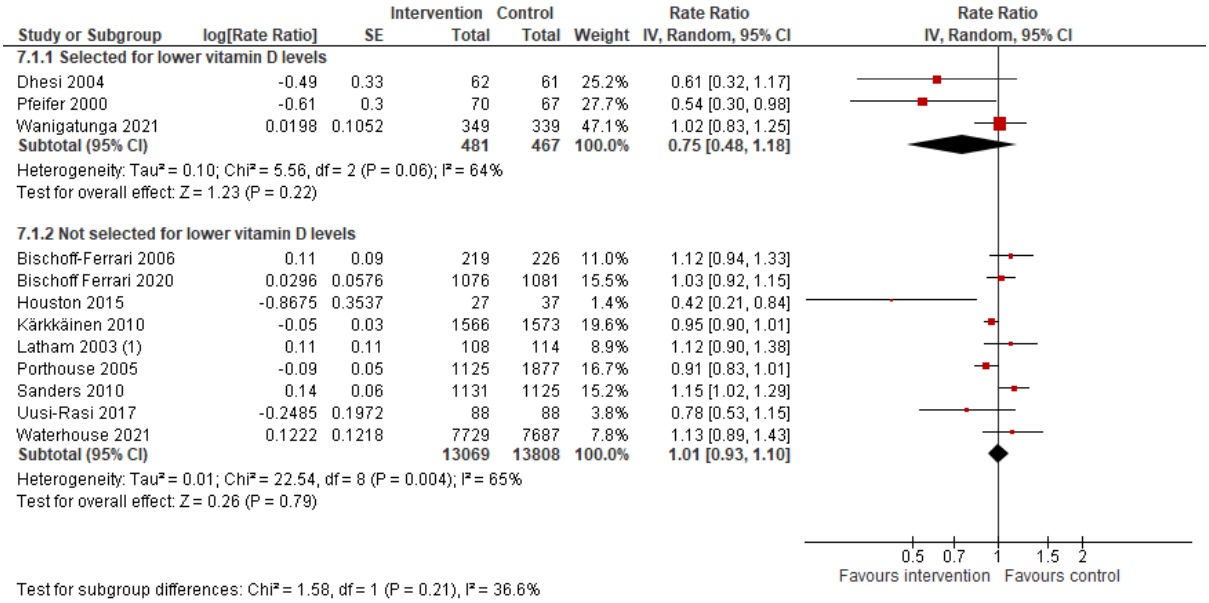


Figure 22: Vitamin D (with or without calcium) versus control: subgroup analysis by vitamin D levels at baseline – Number of fallers

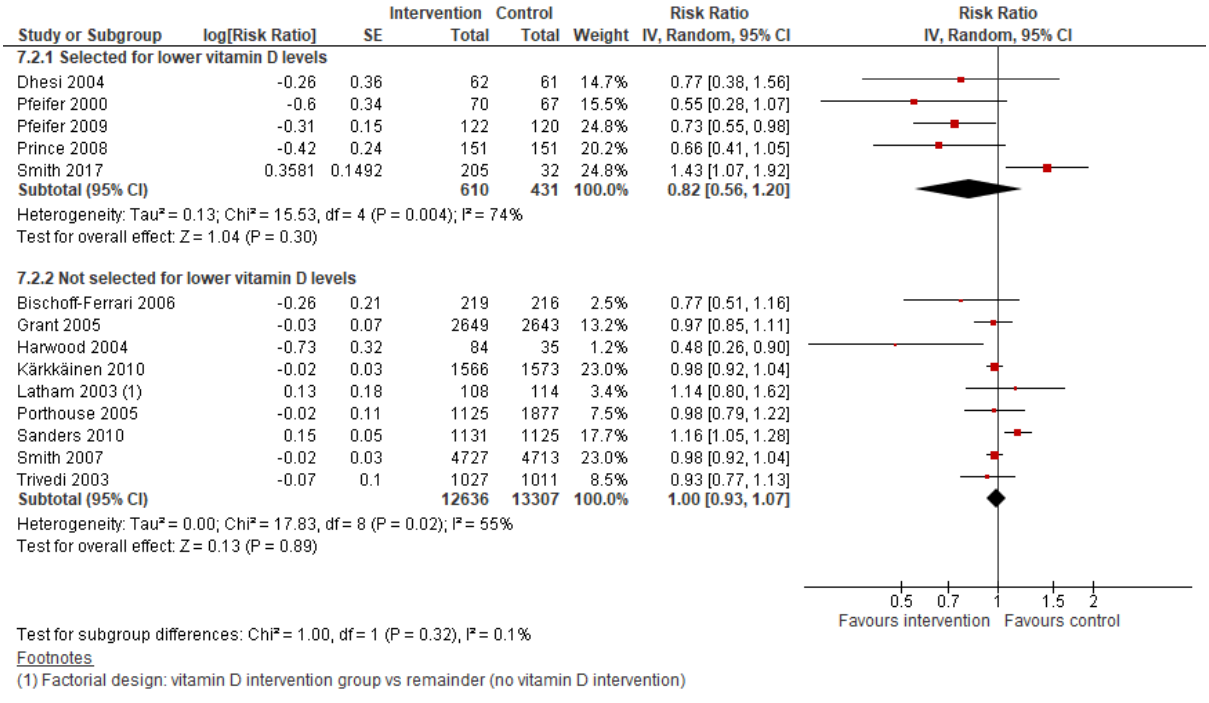


Figure 23: Vitamin D (with or without calcium) versus control: subgroup analysis by vitamin D levels at baseline – Number of people sustaining a fracture

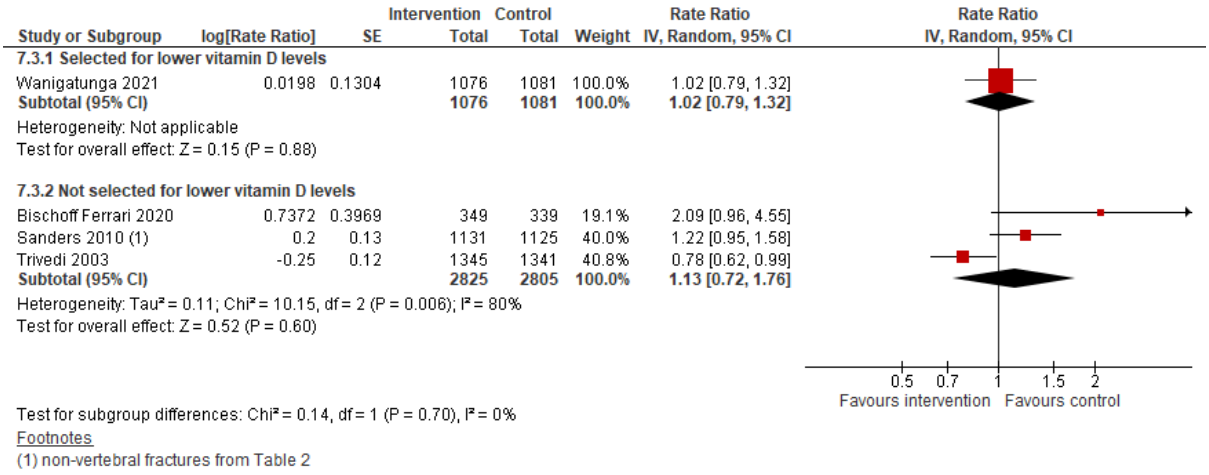


Figure 24: Vitamin D (with or without calcium) versus control: subgroup analysis by vitamin D levels at baseline – Adverse events

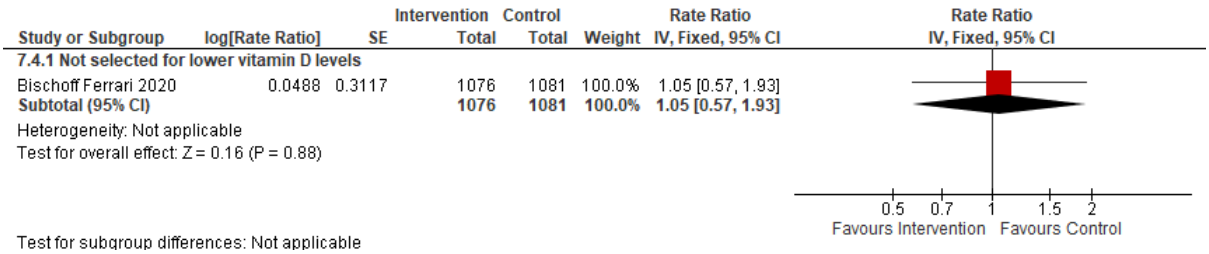


Figure 25: Vitamin D (with or without calcium) versus control: subgroup analysis by vitamin D levels at baseline – Quality of life (physical component score)

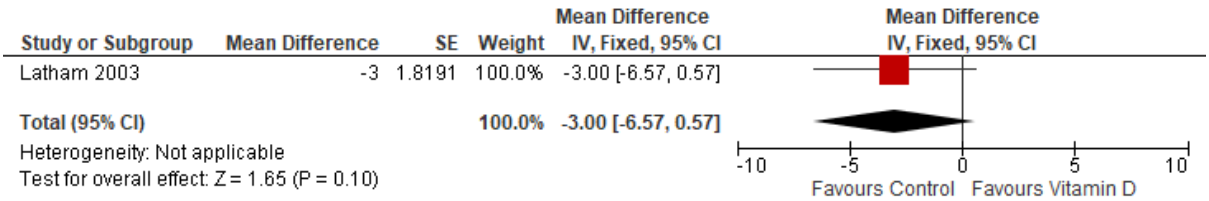


Figure 26: Vitamin D (with or without calcium) versus control: subgroup analysis by vitamin D levels at baseline – Quality of life (mental component score)

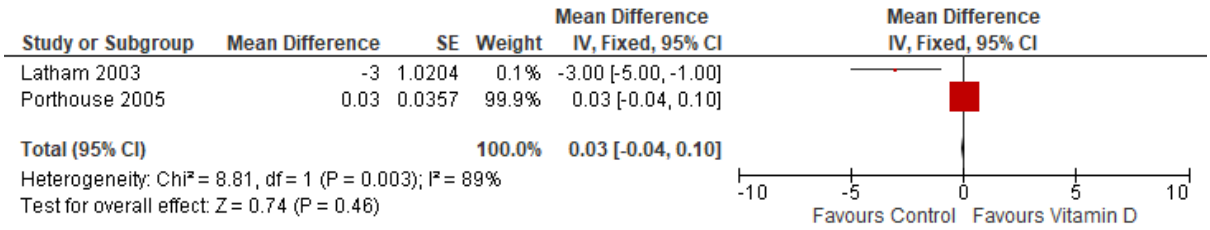
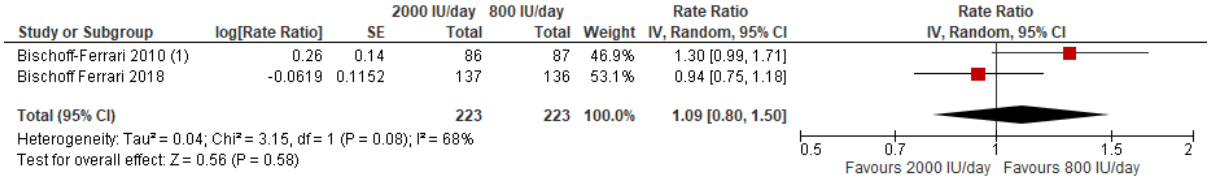
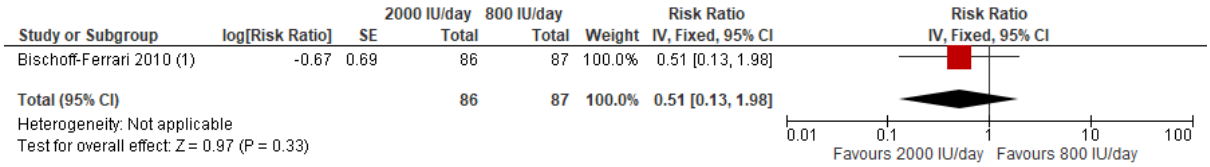


Figure 27: Medication provision: vitamin D 2000IU/day vs vitamin D 800IU/day– rate of falls



Footnotes
(1) Factorial design (post hip fracture): vitamin D3 2000 IU/day groups vs vitamin D3 800 IU/day groups

Figure 28: Medication provision: vitamin D 2000IU/day vs vitamin D 800IU/day– Number of people sustaining a fracture



Footnotes
(1) Number with hip fracture (in people post hip fracture)

Figure 29: Medication provision: vitamin D analogue vs placebo – rate of falls

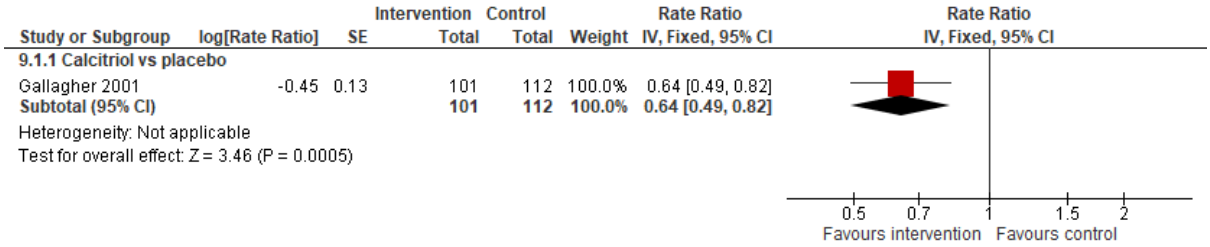


Figure 30: Medication provision: vitamin D analogue vs placebo – number of fallers

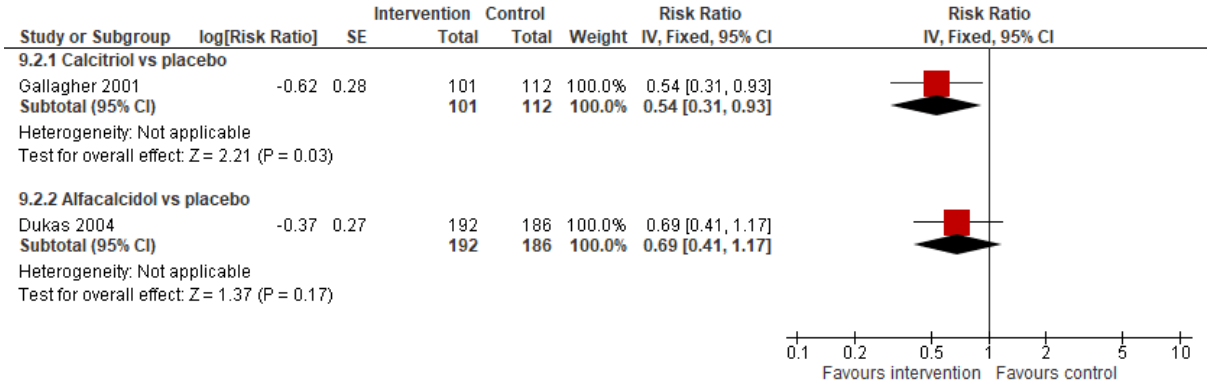


Figure 31: Medication provision: vitamin D analogue vs placebo – number of people sustaining a fracture

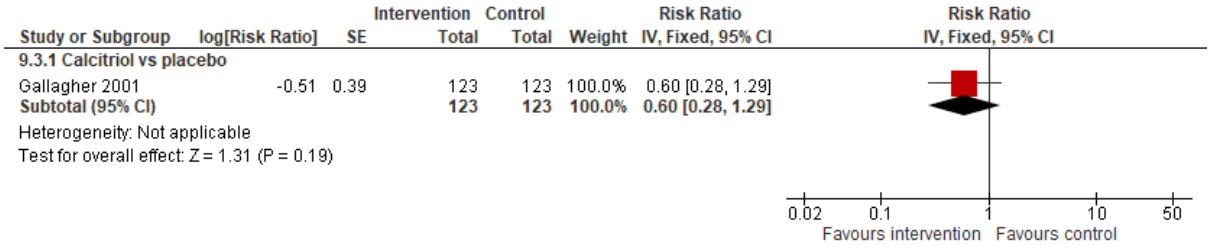
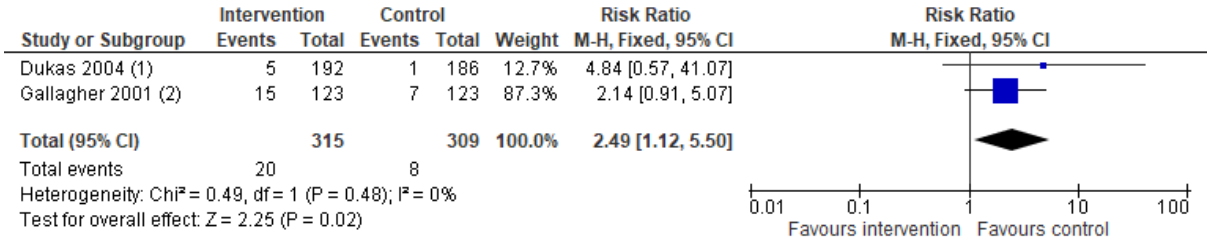


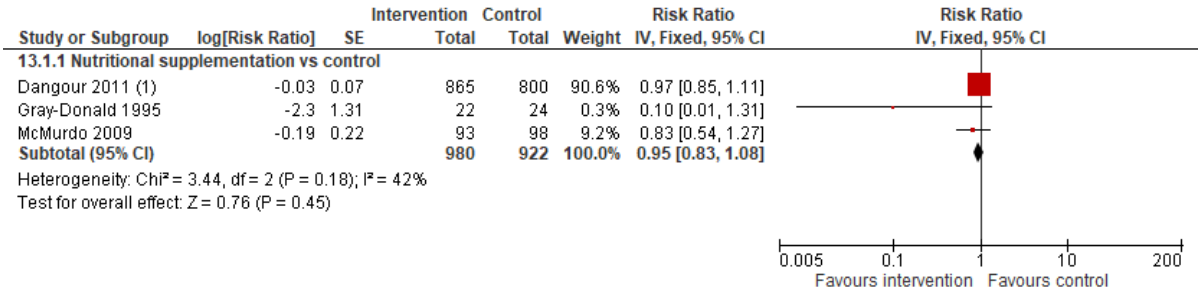
Figure 32: Medication provision: vitamin D analogue vs placebo – number of people developing hypercalcaemia



Footnotes
(1) Alfacalcidol vs placebo
(2) Calcitriol vs placebo

E.4 Nutrition interventions

Figure 33: Fluid or nutrition therapy versus control: Number of fallers



Footnotes
(1) Factorial design: nutritional supplementation group vs remainder (no supplementation)

E.5 Psychological interventions

Figure 34: Cognitive behavioural intervention versus control – Rate of falls

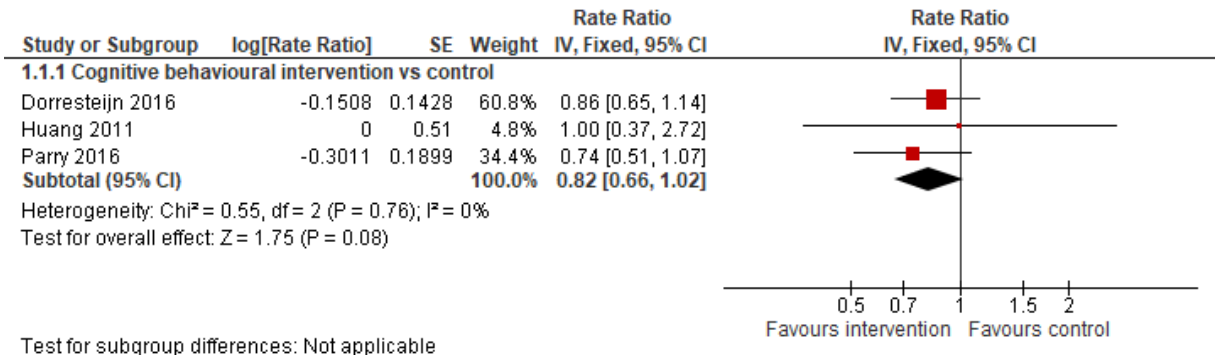


Figure 35: Cognitive behavioural intervention versus control – Number of fallers

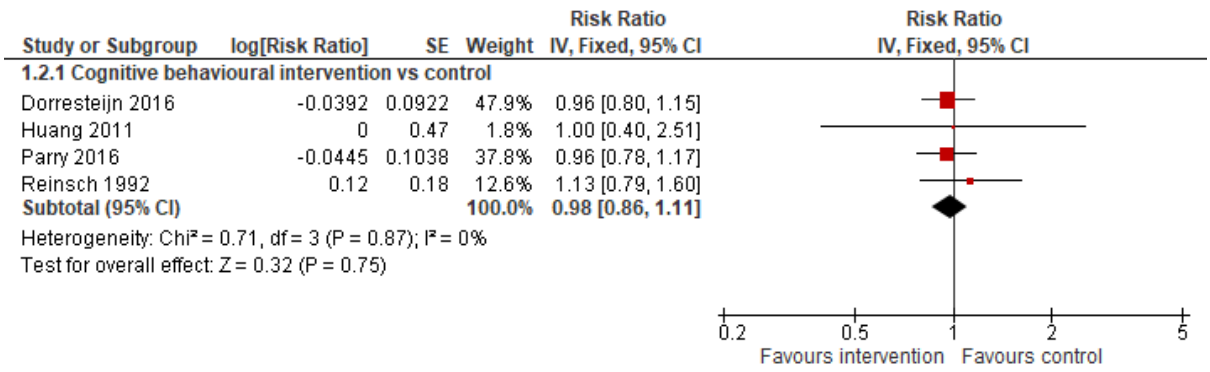


Figure 36: Cognitive behavioural intervention versus control – Number of fall related fractures

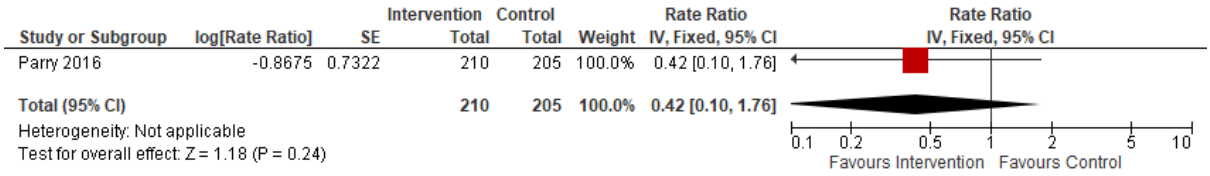


Figure 37: Cognitive behavioural intervention versus control – Number of adverse events

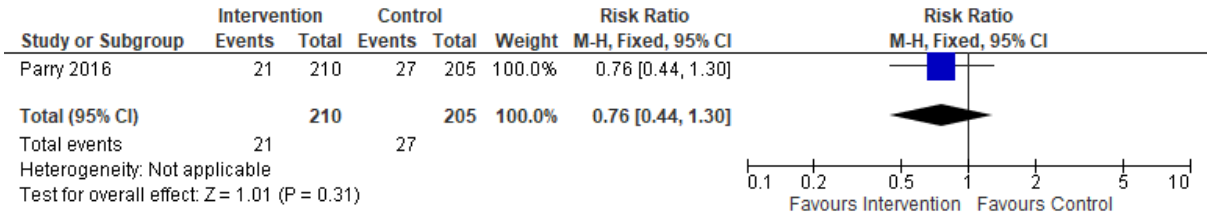
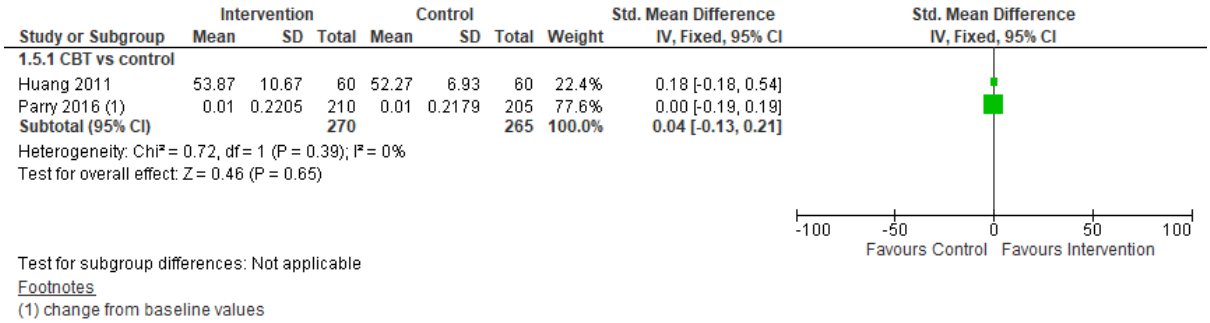


Figure 38: Cognitive behavioural intervention versus control – Quality of life



Test for subgroup differences: Not applicable

Footnotes

(1) change from baseline values

Figure 39: Motivational interviewing versus standard care – Rate of falls

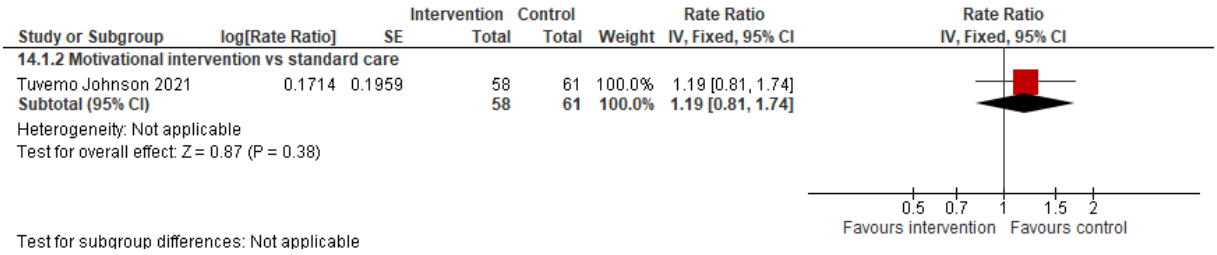


Figure 40: Motivational interviewing versus standard care – Number of fallers

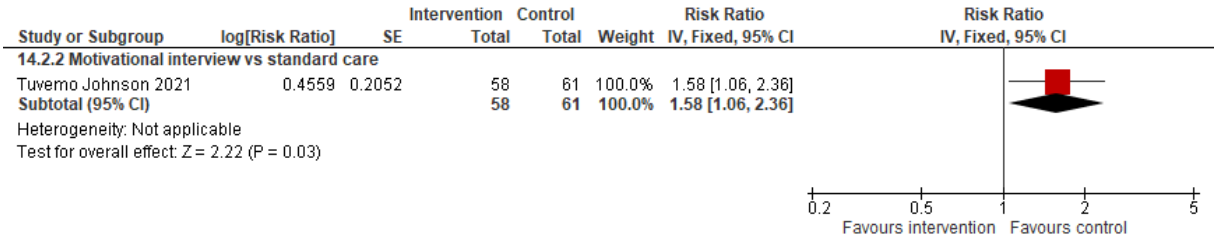
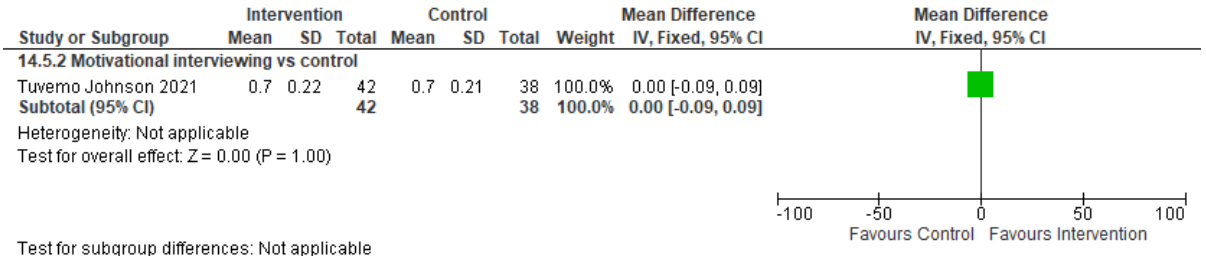
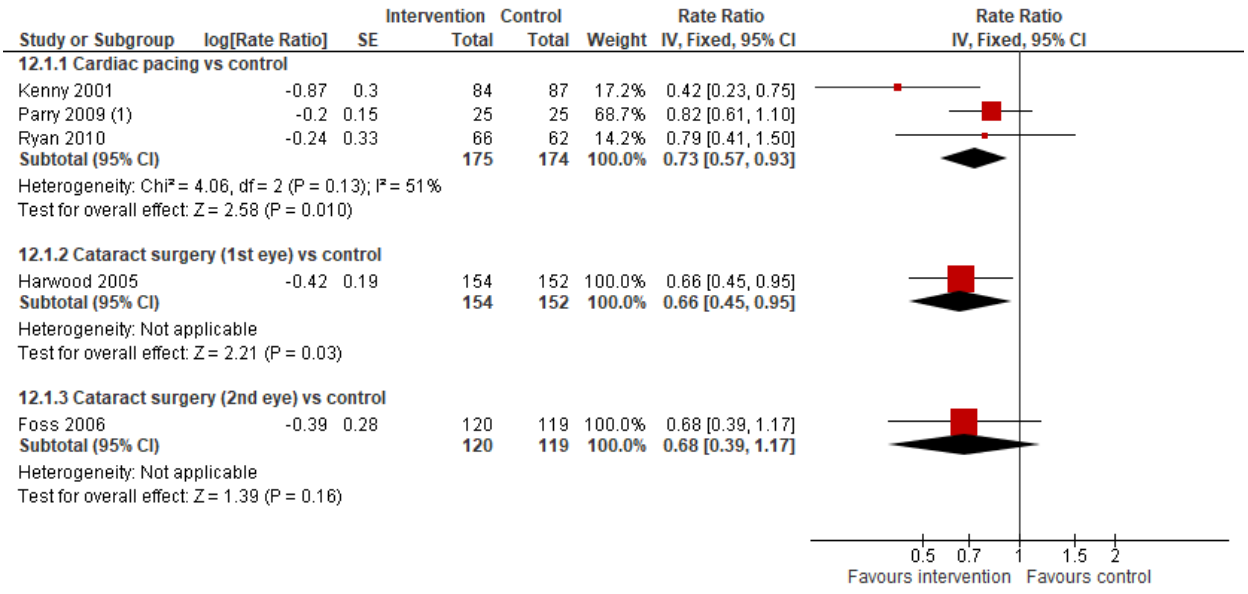


Figure 41: Motivational interviewing versus standard care – Quality of life



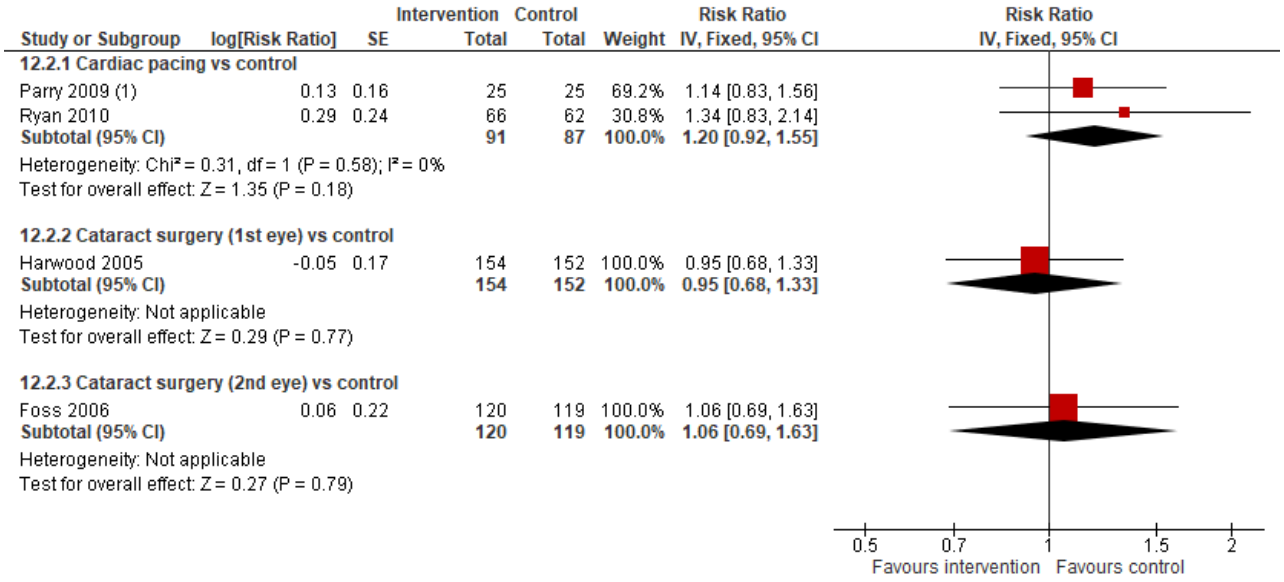
E.6 Surgical intervention

Figure 42: Surgery versus control: Rate of falls



Footnotes
(1) Crossover study (total N = 25)

Figure 43: Surgery versus control: Number of fallers



Footnotes
(1) Crossover study (total N = 25)

Figure 44: Surgery versus control: Number of people sustaining a fracture

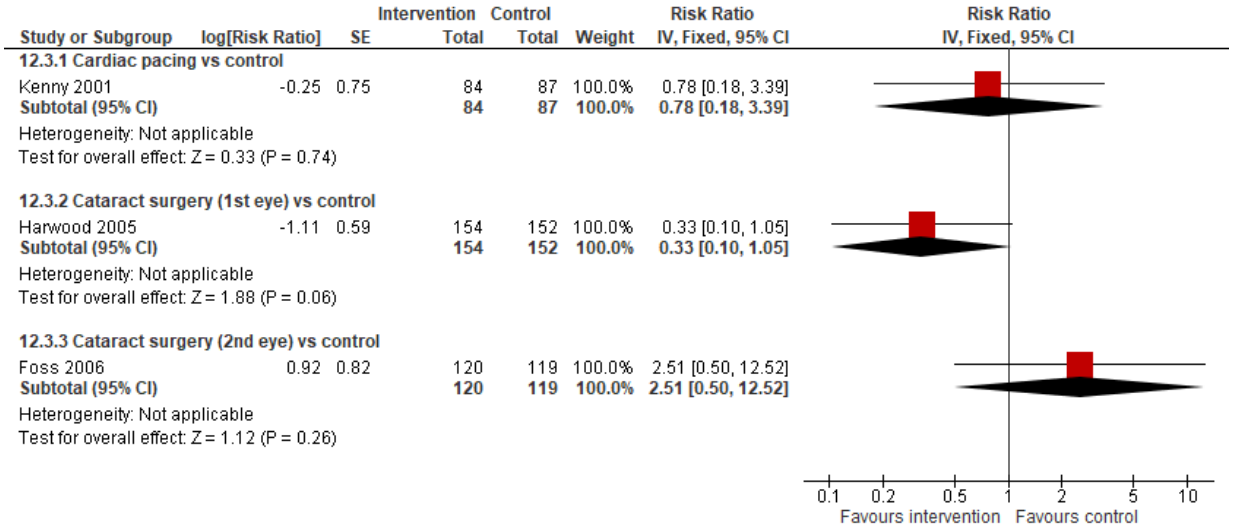
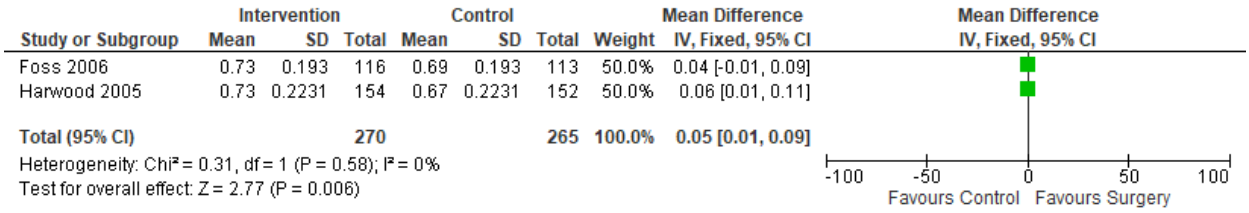


Figure 45: Surgery versus control: Quality of life (EuroQoL) score of 0-100 with 0 being the worst health you can imagine and 100 being the best health you can imagine)



Appendix F GRADEpro tables

F.1 Education interventions

Table 26: Clinical evidence profile: Education interventions vs control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Education	control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls												
2	randomised trials	very serious[a]	serious[b]	not serious	serious[c]	none	224	203	Rate ratio 1.01 (0.73 to 1.40)	-	⊕◯◯◯ Very low	CRITICAL
Number of fallers												
5	randomised trials	very serious[a]	not serious	not serious	not serious	none	1075	1862	RR 0.97 (0.85 to 1.11)	-	⊕◯◯◯ Low	CRITICAL
Number of people sustaining a fall-related fracture												
1	randomised trials	not serious	not serious	not serious	very serious[c]	none	9/194 (4.6%)	12/188 (6.4%)	**RR 0.72 (0.29 to 1.77)**	-	⊕⊕◯◯ Low	CRITICAL

a. Downgraded by 2 increments for risk of bias due to no details about the randomisation process, no details about the allocation concealment process, participants and personnel were not blinded, the outcome assessment process was not blinded, no available protocol, and potential for recall bias.

b. Downgraded by 1 or 2 increments due to heterogeneity, I^2=50%, unexplained by subgroup analysis

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes

F.2 Medication provision

Table 27: Clinical evidence profile: Medication provision – Other medication vs control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication withdrawal	control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Hormone replacement therapy vs placebo												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	100	112	**Rate ratio 0.88** (0.65 to 1.18)	-	⨁⨁◯◯ Low	CRITICAL
Rate of falls - Hormone replacement therapy + calcitriol vs placebo												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	102	112	**Rate ratio 0.75** (0.58 to 0.97)	-	⨁⨁◯◯ Low	CRITICAL
Rate of falls - Donepezil vs placebo												
1[c]	randomised trials	very serious[d]	not serious	not serious	very serious[e]	none	31	29	**Rate ratio 0.77** (0.38 to 1.56)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - Vitamin B vs placebo												
1[c]	randomised trials	not serious	not serious	not serious	not serious	none	1461	1458	**Rate ratio 1.04** (0.98 to 1.10)	-	⨁⨁⨁⨁ High	CRITICAL
Rate of falls - Calcium + alfacalcidol + alendronate vs control												
1[c]	randomised trials	serious[f]	not serious	not serious	very serious[e]	none	62	61	**Rate ratio 0.93** (0.51 to 1.70)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - Hormone replacement therapy vs control/placebo												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication withdrawal	control	Relative (95% CI)	Absolute (95% CI)		
2	randomised trials	serious[a]	not serious	not serious	not serious	none	287	298	**RR 0.94** (0.81 to 1.08)	-	⨁⨁⨁◯ Moderate	CRITICAL
Number of fallers - Hormone replacement therapy + calcitriol vs placebo												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	102	112	**RR 0.90** (0.72 to 1.11)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - Alendronate + vitamin D3 vs control												
1	randomised trials	very serious[g]	not serious	not serious	serious[b]	none	257	258	**RR 0.82** (0.59 to 1.14)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - Donepezial vs placebo												
1	randomised trials	very serious[d]	not serious	not serious	very serious[e]	none	20	25	**RR 0.73** (0.35 to 1.50)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - Vitamin B vs placebo												
1	randomised trials	not serious	not serious	not serious	not serious	none	1461	1458	**RR 1.00** (0.93 to 1.08)	-	⨁⨁⨁⨁ High	CRITICAL
Number of people with serious falls – Aspirin vs placebo												
1	randomised trials	not serious	not serious	not serious	not serious	not serious	8322	8381	**RR 1.10** (1.00 to 1.21)	-	⨁⨁⨁⨁ High	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication withdrawal	control	Relative (95% CI)	Absolute (95% CI)		
Rate of serious falls – Aspirin vs placebo												
1	randomised trials	not serious	not serious	not serious	serious[b]	not serious	884/8322	804/8381	**Rate Ratio[c] 1.17** (1.03 to 1.33)	-	⨁⨁⨁◯ Moderate	CRITICAL
Number of people sustaining a fracture - Calcium vs placebo												
1	randomised trials	not serious	not serious	not serious	serious[b]	none	620	635	**RR 0.90** (0.69 to 1.16)	-	⨁⨁⨁◯ Moderate	CRITICAL
Number of people sustaining a fracture - Alendronate vs placebo												
1	randomised trials	Serious[i]	not serious	not serious	serious[b]	none	620	635	**RR 0.40** (0.15 to 1.08)	-	⨁⨁◯◯ Low	CRITICAL
Number of people sustaining a fracture – Aspirin vs placebo												
1	randomised trials	not serious	not serious	not serious	not serious	none	8322	8381	**RR 0.97** (0.88 to 1.06)	-	⨁⨁⨁⨁ High	CRITICAL
Number of fallers (HR) - Amplodipine vs Chlorthalidone												
1	randomised trials	serious[f]	not serious	not serious	serious[b]	none	6522	11000	**HR 2.24** (1.06 to 4.73)	**2 fewer per 1,000** (from 5 fewer to 1 fewer)	⨁⨁◯◯ Low	CRITICAL
Number of fallers (HR) - Lisinopril vs Chlorthalidone												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication withdrawal	control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[f]	not serious	not serious	very serious[e]	none	6442	11000	**HR 0.85** (0.32 to 2.26)	**1 fewer per 1,000** (from 2 fewer to 0 fewer)	⨁◯◯◯ Very low	CRITICAL
Number of fallers (HR) - Amplodipine vs Lisinopril												
1	randomised trials	serious[f]	not serious	not serious	serious[b]	none	6522	6442	**HR 2.63** (1.03 to 6.72)	**3 fewer per 1,000** (from 7 fewer to 1 fewer)	⨁⨁◯◯ Low	CRITICAL
Adverse events - Vitamin K (200µg) vs Vitamin K (400 µg)												
1	randomised trials	serious[h]	not serious	not serious	serious[b]	none	32	31	**Rate ratio 1.30** (0.90 to 1.88)	-	⨁⨁◯◯ Low	CRITICAL
Adverse events - Vitamin K (200µg) vs Control												
1	randomised trials	serious[h]	not serious	not serious	serious[b]	none	32	32	**Rate ratio 1.45** (0.99 to 2.12)	-	⨁⨁◯◯ Low	CRITICAL
Adverse events - Vitamin K (400 µg) vs Control												
1	randomised trials	serious[h]	not serious	not serious	very serious[e]	none	31	32	**Rate ratio 1.11** (0.74 to 1.67)	-	⨁◯◯◯ Very low	CRITICAL

a. Downgraded by 1 increment due to high risk of bias in recall of falls

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Rate ratio calculated from number of events

d. Downgraded by 2 increments due to high risk of bias in missing outcome data and judgement for selection of the reported result

e. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

f. Downgraded by 1 increment due to lack of information regarding randomisation process.

g. Downgraded by 2 increments due to lack of blinding

h. Downgraded by 1 increment due to missing outcome data

i. Downgraded by 2 increments due to lack of blinding

Table 28: Clinical evidence profile: Medication withdrawal vs control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication withdrawal	control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Psychotropic medication withdrawal vs control												
1	randomised trials	serious[d]	not serious	not serious	very serious[b]	none	48	45	**Rate ratio 0.34** (0.16 to 0.73)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - Medication review and modification vs usual care												
2	randomised trials	not serious	not serious	not serious	not serious	none	253	256	**Rate ratio 1.00** (0.81 to 1.22)	-	⨁⨁⨁⨁ High	CRITICAL
Number of fallers - Psychotropic medication withdrawal vs control												
1	randomised trials	serious[d]	not serious	not serious	serious[a]	none	48	45	**RR 0.61** (0.32 to 1.17)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - Medication review and modification vs usual care												
5	randomised trials	serious[c]	not serious	not serious	serious[a]	none	741	719	**RR 1.09** (0.93 to 1.27)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - GP educational programme + medication review and modification vs control												
1	randomised trials	very serious[e]	not serious	not serious	serious[a]	none	350	309	**RR 0.61** (0.41 to 0.91)	-	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication withdrawal	control	Relative (95% CI)	Absolute (95% CI)		
Number of people sustaining a fracture - medication review and modification vs usual care												
1	randomised trials	very serious[g]	not serious	not serious	serious[b]	none	3/160	2/163	**RR 1.53** (0.26 to 0.02)	**7 more per 1,000** (from 9 fewer to 98 more)	⨁◯◯◯ Very low	CRITICAL
Quality of life (EQ5D) - Medication review and modification vs usual care												
1	randomised trials	very serious[g]	not serious	not serious	serious[h]	none	350	309	-	MD **0 higher** (0.04 lower to 0.04 higher)	⨁◯◯◯ Very low	CRITICAL
Quality of life (SF-12 Physical score) - GP educational programme + medication review and modification vs control												
1	randomised trials	very serious[e]	not serious	not serious	not serious[f]	none	350	309	-	MD **1.7 higher** (0.21 higher to 3.19 higher)	⨁⨁⨁◯ Moderate	CRITICAL
Quality of life (SF-12 Mental score) - GP educational programme + medication review and modification vs control												
1	randomised trials	very serious[e]	not serious	not serious	not serious[f]	none	350	309	-	MD **0.7 higher** (0.33 lower to 1.73 higher)	⨁⨁⨁◯ Moderate	CRITICAL

a. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

b. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 1 increment due to lack of information regarding randomisation process.

d. Downgraded by 1 increment due to missing outcome data

e. Downgraded by 2 increments due to missing outcome data and high risk of bias in recall of falls

f. MID for Quality of life (physical score) 0.5xSD = +/-4.60; MID for Quality of life (mental score) 0.5xSD = +/- 7.36

g. Downgraded by 2 increments due to missing outcome data, randomisation process, and subjective outcome with some unblinded participants

h. Downgraded by 1 increment as confidence interval crossed one MID (EQ-5D = 0.03 - Pragmatic MID by NICE)

F.3 Vitamin D interventions

Table 29: Clinical evidence profile: Medication provision: Vitamin D (with or without calcium) vs control/placebo/calcium (outcomes: rate of falls, number of fallers, number of people sustaining fractures, adverse events)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (overall)												
12	randomised trials	not serious	not serious	not serious	not serious	none	13550	14275	**Rate ratio 0.99** (0.92 to 1.08)	-	⊕⊕⊕⊕ High	CRITICAL
Rate of falls - Vitamin D3 (by mouth) vs control or placebo												
78	randomised trials	not serious	not serious	not serious	not serious	none	10508	10471	**Rate ratio 1.04** (0.94 to 1.16)	-	⊕⊕⊕⊕ High	CRITICAL
Rate of falls - Vitamin D3 (by mouth) + calcium vs control or placebo												
3	randomised trials	serious[b]	not serious	not serious	not serious	none	2910	3676	**Rate ratio 0.96** (0.89 to 1.04)	-	⊕⊕⊕◯ Moderate	CRITICAL
Rate of falls - Vitamin D3 (by mouth) + calcium vs calcium												
1	randomised trials	serious[c]	not serious	not serious	serious[d]	none	70	67	**Rate ratio 0.54** (0.30 to 0.98)	-	⊕⊕◯◯ Low	CRITICAL
Rate of falls - Vitamin D2 (by injection) vs placebo												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	not serious	not serious	not serious	serious[d]	none	62	61	**Rate ratio 0.61** (0.32 to 1.17)	-	⊕⊕⊕◯ Moderate	CRITICAL
Number of fallers (overall)												
15	randomised trials	serious[b]	serious[a]	not serious	not serious	none	13041	13706	**RR 0.97** (0.90 to 1.05)	**-**	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Vitamin D3 (by mouth) vs control or placebo												
5	randomised trials	serious[c]	not serious	not serious	serious[d]	none	2266	2250	**RR 1.11** (0.98 to 1.27)	**-**	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Vitamin D3 (by mouth) + calcium vs control or placebo												
3	randomised trials	very serious[e]	not serious	not serious	not serious	none	2910	3666	**RR 0.98** (0.92 to 1.03)	**-**	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Vitamin D3 (by mouth) + calcium vs calcium												
2	randomised trials	serious[f]	not serious	not serious	serious[d]	none	192	187	**RR 0.70** (0.53 to 0.92)	**-**	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Vitamin D2 (by mouth) + calcium vs placebo + calcium												
1	randomised trials	serious[c]	not serious	not serious	serious[d]	none	151	151	**RR 0.66** (0.41 to 1.05)	**1 fewer per 1,000** (from 1 fewer to 0 fewer)	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Vitamin D2 (by injection) vs placebo												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
2	randomised trials	not serious	not serious	not serious	not serious	none	4789	4774	**RR 0.98** (0.92 to 1.04)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⊕⊕⊕⊕ High	CRITICAL
Number of fallers - Vitamin D (by mouth or by injection) with or without calcium vs control: studies with multiple arms combined												
2	randomised trials	serious[g]	serious[a]	not serious	very serious[h]	none	2733	2678	**RR 0.73** (0.37 to 1.44)	**1 fewer per 1,000** (from 1 fewer to 0 fewer)	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining a fracture												
12	randomised trials	serious[g]	not serious	not serious	not serious	none	13222	13848	**RR 0.97** (0.85 to 1.11)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⊕⊕⊕◯ Moderate	CRITICAL
Number of people sustaining a fracture - Vitamin D3 (by mouth) vs control or placebo												
4	randomised trials	not serious	serious[a]	not serious	serious[d]	none	2476	2466	**RR 1.06** (0.80 to 1.41)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining a fracture - Vitamin D3 (by mouth) + calcium vs control or placebo												
3	randomised trials	serious[b]	not serious	not serious	serious[d]	none	3094	3804	**RR 0.83** (0.59 to 1.16)		⊕⊕◯◯ Low	CRITICAL
Number of people sustaining a fracture - Vitamin D3 (by mouth) + calcium vs calcium												
2	randomised trials	serious[c]	not serious	not serious	serious[d]	none	192	187	**RR 0.54** (0.26 to 1.15)		⊕⊕◯◯ Low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
Number of people sustaining a fracture - Vitamin D2 (by injection) vs placebo												
1	randomised trials	serious[c]	not serious	not serious	serious[d]	none	4727	4713	**RR 1.09** (0.94 to 1.28)		⊕⊕◯◯ Low	CRITICAL
Number of people sustaining a fracture - Vitamin D (by mouth or by injection) with or without calcium vs control: studies with multiple arms combined												
2	randomised trials	very serious[e]	not serious	not serious	very serious[h]	none	2733	2678	**RR 0.90** (0.53 to 1.53)		⊕◯◯◯ Very low	CRITICAL

a. Downgraded by 1 increment for unexplained heterogeneity

b. Serious risk of bias in the evidence due to lack of blinding of participants, lack of blinding outcome assessment, and risk of bias in recall of falls

c. Serious risk of bias in the evidence due to risk of bias in recall of falls

d. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

e. Very serious risk of bias due to lack of blinding participants, lack of blinding outcome assessment, and risk of bias in recall of falls

f. Serious risk of bias due to unknown randomisation process and risk of bias in recall of falls

g. Serious risk of bias in the evidence due to lack of blinding of participants, lack of blinding outcome assessment, incomplete outcome data, and risk of bias in recall of falls

h. Downgraded by 2 increments as confidence interval crossed 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

Table 30: Clinical evidence profile: Vitamin D vs control: subgroup analysis by vitamin D levels at baseline (outcomes: rate of falls, number of fallers, number of people sustaining fractures, adverse events)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Selected for lower vitamin D levels												
3	randomised trials	serious[c]	serious[a]	not serious	serious[b]	none	-	-	**Rate ratio 0.75** (0.48 to 1.18)	-	⊕⊕◯◯ Low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Not selected for lower vitamin D levels												
9	randomised trials	not serious	serious[a]	not serious	not serious	none	-	-	**Rate ratio 1.01**[g] (0.93 to 1.10)	-	⊕⊕⊕◯ Moderate	CRITICAL
Number of fallers - Selected for lower vitamin D levels												
5	randomised trials	not serious	serious[a]	not serious	serious[b]	none	-	-	**RR 0.82** (0.56 to 1.20)	-	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Not selected for lower vitamin D levels												
9	randomised trials	serious[c]	serious[a]	not serious	not serious	none	-	-	**RR 1.00** (0.93 to 1.07)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining a fracture - Selected for lower vitamin D levels												
1	randomised trials	not serious	not serious	not serious	very serious[d]	none	-	-	**Rate ratio 1.02** (0.79 to 1.32)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining a fracture - Not selected for lower vitamin D levels												
3	randomised trials	not serious	serious[h]	not serious	serious[b]	none	-	-	**Rate ratio 1.13** (0.72 to 1.76)	-	⊕⊕◯◯ Low	CRITICAL
Adverse events - Not selected for lower vitamin D levels												
1	randomised trials	not serious	not serious	not serious	very serious[d]	none	-	-	Rate ratio 1.05[i] (0.57 to 1.93)	-	⊕⊕◯◯ Low	CRITICAL

Quality of life (Physical component score) - Better indicated by higher values

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vitamin D (with or without calcium)	control: subgroup analysis by vitamin D level at baseline	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	not serious	not serious	not serious	serious[e]	none	0	0	-	MD **3 lower** (6.57 lower to 0.57 higher)	⊕⊕⊕◯ Moderate	CRITICAL
Quality of life (Mental component score) - Better indicated by higher values												
2	randomised trials	not serious	very serious[f]	not serious	not serious	none	0	0	-	MD **0.03 higher** (0.04 lower to 0.1 higher)	⊕⊕◯◯ Low	CRITICAL

a. Downgraded by 1 increment for unexplained heterogeneity

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Serious risk of bias in the evidence due to unknown randomisation process, lack of blinding and incomplete outcome data in some studies

d. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

e. 95% CI crosses 1 MID (0.5 x median baseline SD)

f. Very serious heterogeneity unexplained

g. Rate ratio calculated from number of events for Bischoff-Ferrari 2020 and Waterhouse 2021

h. Serious heterogeneity unexplained

i. Combined adverse events (disorder of mineral metabolism and kidney stones) and rate ratio calculated from number of events for Bischoff-Ferrari 2020

Table 31 Clinical evidence profile: Vitamin D (2000IU per day) vs vitamin D (400IU per day) - (outcomes: rate of falls, number of people sustaining fractures)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication provision: vitamin D 2000 IU/day	vitamin D 800 IU/day	Relative (95% CI)	Absolute (95% CI)		
Rate of falls												
2	randomised trials	not serious	serious[a]	not serious	serious[b]	none	-	-	**Rate ratio 1.09** (0.80 to 1.50)	-	⊕⊕◯◯ Low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication provision: vitamin D 2000 IU/day	vitamin D 800 IU/day	Relative (95% CI)	Absolute (95% CI)		
Number of people sustaining a fracture												
1	randomised trials	not serious	not serious	not serious	very serious[c]	none	-	-	**RR 0.51** (0.13 to 1.98)	-	⊕⊕◯◯ Low	CRITICAL

a. Downgraded by 1 increment for unexplained heterogeneity

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

Table 32 Clinical evidence profile: Vitamin D analogue vs placebo - (outcomes: rate of falls, number of fallers, number of people sustaining fractures, number of people developing hyperglycaemia)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication provision: vitamin D analogue	placebo	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Calcitriol vs placebo												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	-	-	**Rate ratio 0.64** (0.49 to 0.82)	-	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Calcitriol vs placebo												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	-	-	**RR 0.54** (0.31 to 0.93)	-	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Alfacalcidol vs placebo												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Medication provision: vitamin D analogue	placebo	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	not serious	not serious	not serious	serious[b]	none	-	-	**RR 0.69** (0.41 to 1.17)	-	⊕⊕⊕◯ Moderate	CRITICAL
Number of people sustaining a fracture - Calcitriol vs placebo												
1	randomised trials	serious[a]	not serious	not serious	very serious[c]	none	-	-	**RR 0.60** (0.28 to 1.29)	-	⊕◯◯◯ Very low	CRITICAL
Number of people developing hypercalcaemia												
2	randomised trials	serious[a]	not serious	not serious	serious[b]	none	-	-	**RR 2.49** (1.12 to 5.50)	**39 more per 1,000** (from 3 more to 117 more)	⊕⊕◯◯ Low	CRITICAL

a. Serious risk of bias due to missing information about randomisation and allocation concealment processes and high risk of bias in recall of falls

b. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

F.4 Nutrition interventions

Table 33 : Clinical evidence profile: Nutrition versus control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Fluid or nutrition therapy	control	Relative (95% CI)	Absolute (95% CI)		
Number of fallers												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Fluid or nutrition therapy	control	Relative (95% CI)	Absolute (95% CI)		
3	randomised trials	serious[a]	not serious	not serious	serious[b]	none	N= 980	N= 922	**RR 0.95** (0.83 to 1.08)	**0 fewer per 1,000** (from 0 fewer to 0 fewer)	⨁⨁◯◯ Low	CRITICAL
Quality of life (EuroQoL)												
1	randomised trials	serious[c]	not serious	not serious	not serious	none	N= 126	N= 127	-	MD 2.62 **higher** (11.16 lower to 16.4 higher)	⨁⨁⨁◯ Moderate	CRITICAL

a. Downgraded by 1 increment for risk of bias due to issues regarding allocation concealment, blinding of the outcome assessment processes, incomplete outcome data provided, and the impact of recall of falls.

b. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

c. Downgraded by 1 increment for risk of bias due to incomplete outcome data and unclear risk of bias regarding recall of falls.

F.5 Psychological interventions

Table 34: Clinical evidence profile: Cognitive behavioural intervention versus control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Psychological interventions	control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Cognitive behavioural intervention vs control												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Psychological interventions	control	Relative (95% CI)	Absolute (95% CI)		
3[a]	randomised trials	serious[b]	not serious	not serious	serious[c]	none	436	445	**Rate ratio 0.82** (0.66 to 1.02)	-	⊕⊕◯◯ Low	CRITICAL
Number of fallers - Cognitive behavioural intervention vs control												
4	randomised trials	serious[b]	not serious	not serious	not serious	none	559	552	**RR 0.98** (0.86 to 1.11)	-	⊕⊕⊕◯ Moderate	CRITICAL
Number of fall-related fractures												
1[a]	randomised trials	serious[b]	not serious	not serious	very serious[d]	none	210	205	**Rate ratio 0.42** (0.10 to 1.76)	-	⊕◯◯◯ Very low	CRITICAL
Number of adverse events												
1	randomised trials	serious[b]	not serious	not serious	serious[c]	none	21/210 (10.0%)	27/205 (13.2%)	**RR 0.76** (0.44 to 1.30)	**32 fewer per 1,000** (from 74 fewer to 40 more)	⊕⊕◯◯ Low	CRITICAL
Quality of life - Psychological interventions vs control												
2	randomised trials	serious[e]	not serious	not serious	not serious	none	312	303	-	SMD 0.04 higher (0.13 lower to 0.21 higher)	⊕⊕⊕◯ Moderate	CRITICAL

a. Rate ratio calculated from number of events for Parry 2016

b. Downgraded by one increment due to lack of blinding of participants

c. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

d. Downgraded by 2 increments as confidence interval crossed two MIDs (0.8 and 1.25 for dichotomous outcomes)

e. Downgraded by 1 increment for risk of bias due to attrition

Table 35: Clinical evidence profile: Motivational interviewing versus standard care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Psychological interventions	control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Motivational intervention vs standard care												
1	randomised trials	not serious	not serious	not serious	serious[c]	none	58	61	**Rate ratio 1.19** (0.81 to 1.74)	-	⊕⊕⊕◯ Moderate	CRITICAL
Number of fallers - Motivational interview vs standard care												
1	randomised trials	not serious	not serious	not serious	serious[c]	none	58	61	**RR 1.58** (1.06 to 2.36)	-	⊕⊕⊕◯ Moderate	CRITICAL
Quality of life - Psychological interventions vs control												
1	randomised trials	serious[e]	not serious	not serious	not serious	none	42	38	-	MD 0.00 higher (0.09 lower to 0.09 higher)	⊕⊕⊕◯ Moderate	CRITICAL

a. Downgraded by 1 increment as confidence interval crossed one MID (0.8 and 1.25 for dichotomous outcomes)

b. Downgraded by 1 increment for risk of bias due to attrition

F.6 Surgical interventions

Table 36: Clinical evidence profile: Surgery vs. control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Surgery	control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Cardiac pacing vs control												
3	randomised trials	serious[a]	not serious	not serious	serious[b]	none	N= 175	N= 174	**Rate ratio 0.73** (0.57 to 0.93)	-	⨁⨁◯◯ Low	CRITICAL
Rate of falls - Cataract surgery (1st eye) vs control												
1	randomised trials	very serious[c]	not serious	not serious	serious[b]	none	N= 154	N=152	**Rate ratio 0.66** (0.45 to 0.95)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - Cataract surgery (2nd eye) vs control												
1	randomised trials	very serious[c]	not serious	not serious	serious[b]	none	N=120	N=119	**Rate ratio 0.68** (0.39 to 1.17)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - Cardiac pacing vs control												
2	randomised trials	serious[d]	not serious	not serious	serious[b]	none	N=91	N=87	**RR 1.20** (0.92 to 1.55)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - Cataract surgery (1st eye) vs control												
1	randomised trials	very serious[c]	not serious	not serious	very serious[b]	none	N=154	N=152	**RR 0.95** (0.68 to 1.33)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - Cataract surgery (2nd eye) vs control												
1	randomised trials	very serious[c]	not serious	not serious	very serious[b]	none	N=120	N=119	**RR 1.06** (0.69 to 1.63)	-	⨁◯◯◯ Very low	CRITICAL
Number of people sustaining a fracture - Cardiac pacing vs control												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Surgery	control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[a]	not serious	not serious	very serious[b]	none	N=84	N=87	**RR 0.78** (0.18 to 3.39)	-	⨁◯◯◯ Very low	CRITICAL

Number of people sustaining a fracture - Cataract surgery (1st eye) vs control

1	randomised trials	very serious[c]	not serious	not serious	serious[b]	none	N=154	N=152	**RR 0.33** (0.10 to 1.05)	-	⨁◯◯◯ Very low	CRITICAL

Number of people sustaining a fracture - Cataract surgery (2nd eye) vs control

1	randomised trials	very serious[c]	not serious	not serious	very serious[b]	none	N=120	N=119	**RR 2.51** (0.50 to 12.52)	-	⨁◯◯◯ Very low	CRITICAL

Quality of life (EuroQoL)

2	randomised trials	serious[e]	not serious	not serious	serious[b]	none	N=270	N= 265335	-	MD **0.05 higher** (0.01 higher to 0.09 higher)	⨁⨁◯◯ Low	CRITICAL

a. Downgraded by 1 increment for risk of bias due to unclear risk of bias regarding randomisation, allocation concealment, blinding of participants, and blind of outcome assessment processes.

b. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

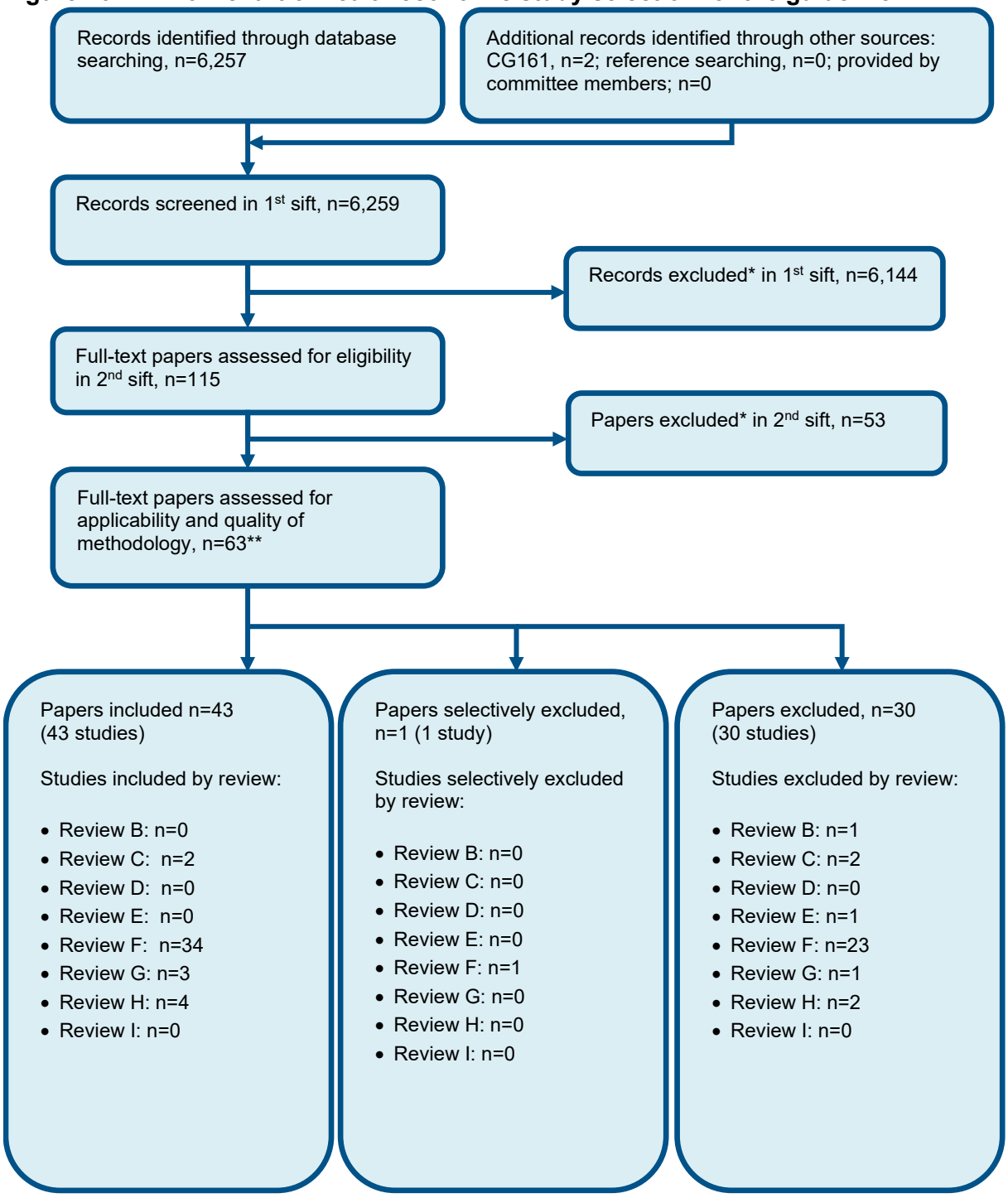
c. Downgraded by 2 increments for risk of bias due to different components of the outcome assessment process not being blinded.

d. Downgraded by 1 increment for risk of bias due to unclear risk of bias regarding allocation concealment and blinding of outcome assessment processes.

e. Downgraded by 1 increment for risk of bias due to blinding of outcome assessment, allocation concealment, and blinding of participants and personnel.

Appendix G Economic evidence study selection

Figure 46: Flow chart of health economic study selection for the guideline



* Non-relevant population, intervention, comparison, design or setting; non-English language
**One paper included in two reviews

Appendix H Economic evidence tables

H.1 Education interventions

No health economic evidence was included in this review question.

H.2 Medication provision

Study	Polinder 2016[51]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Within trial analysis (IMPROveFALL trial). **Approach to analysis:** Within trial analysis of multicentre RCT (IMPROveFALL). QoL, falls and costs for intervention and comparator group measured. **Perspective:** Dutch healthcare payer **Follow-up:** 1 year **Treatment effect duration:**[(a)] n/a	**Population:** Age 65 years or older, visited the emergency department due to a fall, use of one or more fall risk increasing drugs (FRIDs), Mini-Mental State Examination (MMSE) score of at least 21 out of 30 points, ability to walk independently, community dwelling. **Cohort settings:** Start age: 76 years Male: 38% **Intervention 1:** Usual care **Intervention 2:**	**Total costs (mean per patient):** Intervention 1: £1,942 Intervention 2: £1,976 Incremental (2−1): £34 (95% CI: NR; p=NR) Incremental cost reported as not statistically significant. **Currency & cost year:** 2012 Dutch Euros (presented here as 2012 UK pounds[(b)]) **Cost components incorporated:** FRIDs assessment and modification (intervention cost £102), drug consumption (the cost of substitution drugs), and fall-related healthcare	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.05 (95% CI: NR; p=NR) **Proportion with fall or recurrent fall:** Intervention 1: 34% Intervention 2: 37% Incremental (2−1): 3% (95% CI: NR; p=0.33)	**ICER (Intervention 2 versus Intervention 1):** £681 per QALY gained (da) No bootstrapping undertaken. **Analysis of uncertainty:** A secondary analysis was performed of the decline in HRQoL in the participants of the control and intervention group with and without a fall during follow-up. This did not change the conclusions of the analysis, those in the intervention 2 had more QALYs than in intervention 1.

Discounting: Costs: n/a; Outcomes: n/a	All participants received a structured medication assessment. A systematic FRIDs assessment combined with FRIDs withdrawal or modification, if safely possible.	consumption (for example: outpatient visits, hospital admissions, General Practitioner consultations, home care, nursing home care). Indirect costs included patient travel costs, excluded from costs presented here.		
Data sources				
Health outcomes: Within trial data (IMPROveFALL, Boye 2017). This is 1 of 4 RCTs reported in clinical review for this comparison. All participants received a Falls Calendar for reporting falls during a one-year follow-up period. Falls were recorded weekly on the Fall Calendars, which had to be returned every three months. QoL measured at baseline and 12 month follow up. **Quality-of-life weights:** Dutch EQ-5D-3L using UK value set. SF-12 also measured. **Cost sources:** Resource use: questionnaires to GP and participants. Number of injuries precented calculated from data recorded in 3-monthly questionnaire, supplemented by epidemiological data on falls and injury risk. Unit costs: Dutch published sources.				
Comments				
Source of funding: The Netherlands Organization for Health Research and Development **Limitations:** Dutch healthcare perspective may not reflect UK NHS context. Based on single RCT, may not reflect full body of evidence (1 of 4 RCTs for this comparison, proportion with fall similar to pooled effect) 2012 Dutch costs may not reflect current NHS context. Short time horizon may not capture all downstream effects of intervention. Poor compliance in terms of withdrawal of psychotropic drugs, usual care incorporates falls prevention and therefore effect of intervention may be reduced. **Other:** N/A				
Overall applicability:[c] Partially applicable **Overall quality:**[d] Potentially serious limitations.				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Converted using 2012 purchasing power parities[44]

(c) Directly applicable / Partially applicable / Not applicable

(d) Minor limitations / Potentially serious limitations / Very serious limitations

H.3 Vitamin D interventions

Study	**Poole 2015[52]**			
Study details	Population & interventions	Costs	Health outcomes	Cost effectiveness
Economic analysis: CUA (health outcome: QALYs) **Study design:** Decision analytic model Approach to analysis: Markov model with 5 states. 'Well' state living independently in community setting, 'minor fall' necessitating A&E attendance but no admission and either no-follow up, outpatient follow up or GP follow up, 'Major fall' with admission to hospital via A&E and either discharge to home with follow up or transfer to post-acute care or 'Death' (absorbing state). Patients transferred to post-acute care could return to independent living in their first year, thereafter the remainder were assumed to require	Population: Adults aged 60 years and above in the community. Cohort settings: Start age: 60 years and above. Results presented in 5-year age categories. Male: NR Intervention 1: Usual care Intervention 2: Colecalciferol (Vitamin D) 800 iu daily	Total costs (mean per patient): Intervention 1: NR Intervention 2: NR Incremental (2−1): £23.52 (95% CI: NR; p=NR) Currency & cost year: 2014 UK pounds Cost components incorporated: Cost of intervention, falls, and care.	QALYs (mean per patient): Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.0012 (95% CI: NR; p=NR)	ICER (Intervention 2 versus Intervention 1): £19,759 per QALY gained (da) No probabilistic analysis. **Analysis of uncertainty:** Results are presented for different age groups, reflecting different treatment strategies. - Treat all adults ≥65 years: Colecalciferol dominates usual care (less costly and more effective - Treat all adults ≥70 years: Colecalciferol dominates usual care (less costly and more effective - Treat all adults ≥75 years: Colecalciferol dominates usual care (less costly and more effective

'long-term residential or nursing care'. Perspective: UK NHS Time horizon: 5 years Treatment effect duration:[a] 5 years **Discounting:** Costs: None; Outcomes: none				
Data sources				
Health outcomes: Baseline data sources included: annual rates of A&E admission were used to define age-group dependent probability of minor and major unintentional falls. These were derived by Scuffham 2003, from a detailed analysis of UK sentinel databases. ONS data for mortality, published UK evidence for admission to post-acute care. Relative treatment effect based on a published meta-analysis (8 RCTs) by Bischoff-Ferrari 2009 – RR of falling: 0.81 (95% CI 0.71 to 0.92) compared to 0.89 (those with low vitamin D) and 1.00 (those without low vitamin D) in clinical review. **Quality-of-life weights:** EQ-5D-3L using UK tariff for baseline utility (well state). Disutilities unclear, they include a study of Australian older adults for post-acute care (also applied as short term (10 days) disutility for hospital admission following major fall), utility type not reported. Falls were assumed to confer a disutility associated with severe fear of falling using EQ-5D, tariff unclear. **Cost sources:** Resource use from Scuffham 2003 and meta-analysis. Unit cost from national published costs (BNF) and UK analysis for falls related costs: Shuffman 2003.				
Comments				
Source of funding: No specific funding. Of note one author provides medical consultancy and speaker meetings for two manufacturers of vitamin D. **Limitations**: Includes population outside of scope of guideline (60–64-year-olds). No discounting despite 5-year time horizon. Disutilities not from UK population. Time horizon may be too short to fully capture downstream effects of intervention on falls and consequences of these. Assumes fall history doesn't impact future risk of falls which is a conservative assumption. The use of all-cause mortality for background death rate which includes unintentional falls, thus reducing 'at risk' population is also a conservative assumption. Based on meta-analysis of 8 RCTs and may not reflect the full body of evidence. RR of falling lower in this model than that found in clinical review. No probabilistic sensitivity analysis. Potential conflict of interest. **Other**: N/A				
Overall applicability:[c] Partially applicable **Overall quality:**[d] Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; iu = international units; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.
(b) Directly applicable / Partially applicable / Not applicable
(c) Minor limitations / Potentially serious limitations / Very serious limitations

H.4 Nutrition interventions

No health economic studies were included.

H.5 Psychological interventions

No health economic studies were included in this review question.

H.6 Surgical interventions

Study	**Boyd 2020[10]**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs)	**Population:**	**Total costs (mean per patient):** Intervention 1: NR	**QALYs (mean per patient):** Intervention 1: NR	**ICER (Intervention 2 versus Intervention 1):** £2,946 per QALY gained (da)

Study design: Decision analytic model **Approach to analysis:** Adaptation of BODE falls Markov model. Including 'low risk' (no previous injurious fall) and 'high risk' (previous injurious fall) health states. At each cycle people could have or not have an injurious fall event with fallers either injured requiring hospitalisation or non-hospitalisation or have no injurious fall. Death included as absorbing state. Injurious fall risk reduction from cataract surgery and vison improvement following cataract surgery were captured in model. Annual cycles **Perspective:** New Zealand health care **Time horizon:** Lifetime **Treatment effect duration:**[(a)] Lifetime **Discounting:** Costs:3%; Outcomes: 3%	Adults aged 65 to 89 requiring first cataract eye surgery. **Cohort settings:** Start age: 65 years Male: 46.8% **Intervention 1:** No cataract surgery **Intervention 2:** Routine cataract surgery **Intervention 3:** Expedited cataract surgery (additional 1 year of benefit over routine surgery)	Intervention 2: NR Intervention 3: NR Incremental (2−1): £1,515 (95% CI: NR; p=NR) Incremental (3−2): £283 (95% CI: NR; p=NR) **Currency & cost year:** 2011 New Zealand dollars (presented here as 2011 UK pounds[(b)]) **Cost components incorporated:** Routine and expedited cataract surgery, injurious falls.	Intervention 2: NR Intervention 3: NR Incremental (2−1): 0.5104 (95% CI: NR; p=NR) Incremental (3−2): 0.0618 (95% CI: NR; p=NR)	No probabilistic analysis. **ICER (Intervention 3 versus Intervention 2):** £4,562 per QALY gained (da) No probabilistic analysis. **Analysis of uncertainty:** One way sensitivity analyses to identify drivers of uncertainty were conducted. The main drivers were the reduction in falls rate from intervention; disability weight for visual impairment and the extra cost to expedite cataract surgery. Results relatively robust to various scenario analyses, with cost effectiveness conclusions remaining unchanged (10 year and 20-year time horizons; discount rate 0% and 6%; subgroups by demographic groups – ethnicity, age and gender and history of previous injurious falls). Increase in cost effectiveness in younger age groups as compared to older age groups (65-70 versus 85-89 years). Expedited surgery was more cost effective versus routine surgery in people with no history of previous injurious falls than in people with a history of previous injurious falls. A scenario analysis was conducted where the benefits falls prevention were excluded, the ICER for routine surgery

				versus no surgery (2 vs 1) increased to £4,514 per QALY gained, highlighting the importance of capturing the falls prevention benefit.
Data sources				
Health outcomes: New Zealand falls registry and national life tables. Incident cases of newly diagnosed cataracts taken from New Zealand health ministry Risk reduction from cataract surgery for falls taken from Harwood 2005 (this was the only RCT in Cochrane by Gillespie, no further evidence identified in clinical review. **Quality-of-life weights:** QALYs used but based on Global burden of disease study which provides disability weights as opposed to EQ-5D utility values. **Cost sources:** Resource use and unit costs taken from New Zealand national sources and audits as well as expert opinion.				
Comments				
Source of funding: Rapanui Trust, Health Research Council of New Zealand and Ministry of Business, Innovation and Employment. **Limitations:** New Zealand healthcare perspective, with 2011 costs, may not be reflective of current UK context. The comparison of expedited versus routine cataract surgery as defined here may not apply to UK NHS context. QoL assessed using disease weights rather than EQ-5D. Discounting at 3% rather than 3.5% as required by NICE reference case. Baseline data and resource use from New Zealand, may not be applicable to current NHS context. No probabilistic sensitivity analysis conducted. Relative treatment effect based on a single RCT, however no further evidence identified in clinical review. Excludes non-fall injuries and so may underestimate QALY gain of cataract surgery. **Other:**				
Overall applicability:[(c)] Partly applicable **Overall quality:**[(d)] Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Converted using 2011 purchasing power parities[44]

(c) Directly applicable / Partially applicable / Not applicable

(d) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Church et al 2012[13]**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs)	**Population:** People over 65 years of age living in the community. **Cohort settings:**	**Total costs (mean per patient):** NR Incremental versus 1:	**QALYs (mean per patient):** NR Incremental versus 1:	**ICER:** General population[(c)]: 2: Ex. Dom 3 vs 1: £21,770 4: Dominated 5: Dominated

Study design: Decision analytic model **Approach to analysis:** Decision tree and Markov model. Five health states were included: Low risk (never fallen), Medium risk (fallen, no injury), high risk (fallen with injury), residential care, death. Individuals moved between health states following a multiple event decision tree. Cycle length 1 year. Comparators were split into those relevant to general population (Intervention 1 to 7), those for high risk population (interventions 8 to 10) and interventions for specific populations (11-13) **Perspective:** Australian healthcare system **Time horizon:** Lifetime **Treatment effect duration:**[(a)] 1 year (except for int. 12 and 13) **Discounting:** Costs: 5%; Outcomes: 5%	Start age: 65 years Male: NR **Intervention 1:** No treatment General population interventions: **Intervention 2:** Group based exercise (two group classes and one home exercise session per week for 26 weeks) **Intervention 3:** Tai Chi (6-month instructed classes twice a week for 12 participants) **Intervention 4:** Multiple interventions (exercise and falls advice, Two-hour weekly group information sessions on falls prevention run by an occupational therapist for 7 weeks with a follow-up home visit and a 3-month booster) **Intervention 5:** Multifactorial (referral): Assessment and referral, falls risk assessment and	**General population** 2: £230 3: £240 4: £322 5: £387 6: £465 7: £550 **High risk population** 8: £208 9: £355 10: £417 **Specific population** 11: £162 12: £4,753 13: saves £30 **Currency & cost year:** 2009 AUD (presented here as 2009 UK pounds[(b)]) **Cost components incorporated:** Staff cost, classes, surgery, medication, hazard modifications	**General population** 2: 0.007 3: 0.011 4: 0.009 5: 0.005 6: 0.010 7: 0.009 **High risk population** 8: 0.008 9: 0.008 10: 0.015 **Specific population** 11: 0.019 12: 0.172 13: 0.010	6: Dominated 7: Dominated High risk population[(c)]: 8 vs 1: £25,086 9: Dominated 10 vs 8: £32,997 Specific population [(d)]: 11 vs 1: £8,474 12 vs 1: £27,634 13 vs 1: Dominates (less costly and more effective) **Analysis of uncertainty:** One way sensitivity analysis shows that removing “fear of falling” from the model, none of the interventions were cost effective. Intervention effectiveness, intervention cost and cohort start age are all drivers in the model. Using probabilistic sensitivity analysis for the general population interventions, at low willingness to pay thresholds ‘no intervention’ dominates however, above £29,549 threshold Tai Chi dominates.

	follow-up by a physician, 1-hour occupational therapy home visit and a 2-hour nurse interview **Intervention 6:** Home-based exercise (five district nurse home visits in the first week, followed by home visits at week 2, 4 and 8 weeks with a booster at 6 months. Costs include nurse and physiotherapist time) **Intervention 7:** Multifactorial (active): Assessment and active intervention, falls risk assessment plus an exercise program once a week, home hazard modification by an occupational therapist, a vision assessment, a medication review and counselling High risk population: **Intervention 8:** Group based exercise			

	Intervention 9: Multifactorial (high risk) **Intervention 10:** Home hazard modification Specific population **Intervention 11:** Psychotropic medication withdrawal (reduction of medication over 14 weeks with six GP visits and nurse time) **Intervention 12:** Cardiac pacing (screening by carotid sinus massage, cardiovascular assessment, insertion of a pacemaker and post-pacemaker visit) **Intervention 13:** Expedited cataract surgery (patients receive the cataract procedure within 4 weeks versus the usual 12-month waiting period. Costs include a general practitioner (GP) visit, surgery and two specialist visits)			

Data sources
Health outcomes: Effectiveness data based on a systematic review by Cochrane, Gillespie 2012. This included 159 trials with 79,193 participants. Distribution between risk groups and baseline transition probabilities of falling were derived from Lord 1993 and expert opinion (Professor Lord). The transition probabilities to the emergency department, other medical services, hospital, residential care, respite care or death were obtained from Watson 2009. All-cause mortality was obtained from the Australian Bureau of Statistics life tables and the probability of entering a residential care facility for all causes was estimated using Wang 2001. **Quality-of-life weights:** EQ-5D-3L, UK tariff **Cost sources:** Most healthcare costs were taken from Watson et al (2009). The majority of intervention costs were taken from Day et al (2009), other intervention costs were obtained from the studies in the meta-analysis. All costs were applied on a per fall basis in the cycle in which they occurred.
Comments
Source of funding: NSW Health and the Cancer Institute NSW. **Limitations:** Australian health care system, discounting at 5% rather than 3.5% as required by NICE reference case. Outcomes, intervention effectiveness and costs came from 2009 which may not reflect full body of clinical evidence and may not reflect current UK NHS context. **Other:** N/A
Overall applicability: Partially applicable(c) **Overall quality: Potentially serious limitations**(d)

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) 2009 costs AUD converted to GDP 2009 using PPP

(c) Estimates are all ranked against the next best option in this group to determine cost-effectiveness. Full incremental analysis of available strategies: first strategies are ruled out that are dominated (another strategy is more effective and has lower costs) or subject to extended dominance (the strategy is more effective and more costly but the incremental cost effectiveness ratio is higher than the next most effective option and so it would never be the most cost effective option); incremental costs, incremental effects and incremental cost effectiveness ratios are calculated for the remaining strategies by comparing each to the next most effective option.

(d) Estimates are all compared to the 'no intervention' option as each intervention applies to a different population.

(e) Directly applicable/partially applicable/not applicable

(f) Minor Limitations/Potentially serious limitations/Very serious limitations

Appendix I Health economic model

I.1 Education interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

I.2 Medication provision

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

I.3 Vitamin D interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

I.4 Nutrition interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

I.5 Psychological interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

I.6 Surgical interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

Appendix J Excluded studies

J.1 Clinical studies

Study	Code [Reason]
(2023) Comparing effects of Yoga and game based exercises using cell phones to improve balance,speed of walking and reduce falls in older adults. https://trialsearch.who.int/Trial2.aspx?TrialID=CTRI/2023/04/051325	- Trial protocol
(2023) Intervention on Reducing Risk of Falls Among Community Dwelling Older Adults in Selangor. https://clinicaltrials.gov/show/NCT05863143	- No relevant outcomes
Abd El-Kafy, Ehab Mohamed, Alayat, Mohamad Salaheldien, Subahi, Moayad Saleh et al. (2024) C-Mill Virtual Reality/Augmented Reality Treadmill Training for Reducing Risk of Fall in the Elderly: A Randomized Controlled Trial. Games for health journal	- Comparator in study does not match that specified in this review protocol
Abdel-Aal, Nabil Mahmoud, Ibrahim, Amal Hassan, Samaha, Hanan El-Sayed et al. (2023) Adding Weight Shift Training to Weight Reduction Decreases the Risk of Falling in Obese Women: A Prospective Randomized Controlled Trial. American journal of physical medicine & rehabilitation 102(8): 670-675	- Comparator in study does not match that specified in this review protocol
Achison, Marcus, Adamson, Simon, Akpan, Asangaedem et al. (2022) Effect of perindopril or leucine on physical performance in older people with sarcopenia: the LACE randomized controlled trial. Journal of cachexia, sarcopenia and muscle 13(2): 858-871	- Study does not contain an intervention relevant to this review protocol
Adams, Michael, Gordt-Oesterwind, Katharina, Bongartz, Martin et al. (2023) Effects of Physical Activity Interventions on Strength, Balance and Falls in Middle-Aged Adults: A Systematic Review and Meta-Analysis. Sports medicine - open 9(1): 61	- Population not relevant (middle-aged)
Agbangla, Nounagnon Frutueux, Seba, Marie-Philippine, Bunlon, Frederique et al. (2023) Effects of Physical Activity on Physical and Mental Health of Older Adults Living in Care Settings: A Systematic Review of Meta-Analyses. International journal of environmental research and public health 20(13)	- Setting not relevant to this review protocol
Agrawal, A.; Lamichhane, P.; Shakya, Y.L. (2023) AUGMENTED-REALITY TECHNOLOGY IMPROVES BALANCE, MOBILITY AND FALLS RISK IN ELDERLY PATIENTS: A META-ANALYSIS. Aging Clinical and Experimental Research 35(supplement1): 333	- Conference abstract
Allin, Leigh J, Brolinson, P Gunnar, Beach, Briana M et al. (2020) Perturbation-based balance training targeting both slip- and trip-induced falls among older adults: a randomized controlled trial. BMC geriatrics 20(1): 205	- Study does not contain an intervention relevant to this review protocol
Almutairi, Hend, Stafford, Andrew, Etherton-Beer, Christopher et al. (2023) Impact of a Multifaceted, Pharmacist-Led Intervention on Psychotropic Medication Use for Residents of Aged Care Facilities: A Parallel Cluster Randomized Controlled Trial. Journal of the American Medical Directors Association 24(9): 1311e1-1311e8	- Population not relevant to this review protocol

Study	Code [Reason]
Alqahtani, M. (2023) A Comparitive Analysis of Wii Fit Training (Wft) Versus Reactive Balance Training (Rbt) For Among Elderly Population. Journal of Population Therapeutics and Clinical Pharmacology 30(14): e289-e296	- Full text paper not available
Amatachaya, Sugalya, Promkeaw, Donlaya, Arayawichanon, Preeda et al. (2021) Various Surfaces Benefited Functional Outcomes and Fall Incidence in Individuals With Spinal Cord Injury: A Randomized Controlled Trial With Prospective Data Follow-up. Archives of physical medicine and rehabilitation 102(1): 19-26	- Population not relevant to this review protocol
Ambagtsheer, Rachel C, Thompson, Mark Q, Tucker, Graeme R et al. (2023) Does CGA Improve Health Outcomes in the Community? An Umbrella Review. Journal of the American Medical Directors Association 24(6): 782-789e15	- Population not relevant to this review protocol
Ambrens, Meghan, Macniven, Rona, Perram, Amy et al. (2024) How Perceptions of Aging Influence Physical Activity and Exercise in Older Age: Exploring the Behavior of People Aged 70+ Years Engaged in Fall Prevention Activities. Journal of applied gerontology : the official journal of the Southern Gerontological Society: 7334648241238315	- Study does not contain an intervention relevant to this review protocol
Anonymous (2020) Safety and efficacy of fluoxetine on functional outcome after acute stroke (AFFINITY): a randomised, double-blind, placebo-controlled trial. The Lancet. Neurology 19(8): 651-660	- Study does not contain an intervention relevant to this review protocol
Anonymous (2023) Correction to: Guidelines for Falls in Older Adults, Medication reviews and deprescribing as a single intervention in falls prevention: a systematic review and meta-analysis, AND, World guidelines for falls prevention and management for older adults: a global initiative. Age and ageing 52(9)	- Guideline amendment
Anonymous (2023) Aspirin does not reduce fracture and fall risk in healthy older people. Drug and therapeutics bulletin 61(6): 85	- Conference abstract
Appel, Lora, Appel, Eva, Kisonas, Erika et al. (2024) Evaluating the Impact of Virtual Reality on the Behavioral and Psychological Symptoms of Dementia and Quality of Life of Inpatients With Dementia in Acute Care: Randomized Controlled Trial (VRCT). Journal of medical Internet research 26: e51758	- Incorrect setting
Areeudomwong, Pattanasin, Duangyod, Thidarat, Sutalangka, Chatchada et al. (2023) Integrated Effects of Thai Essential Oil and Balance Exercise on Parameters associated with Falls in Older Adults at Risk of Falling: A Randomized Controlled Study. Annals of geriatric medicine and research 27(2): 141-150	- Study does not contain an intervention relevant to this review protocol
Areeudomwong, Pattanasin, Saysalum, Saranrat, Phuttanurattana, Nopchaluk et al. (2019) Balance and functional fitness benefits of a Thai boxing dance program among community-dwelling older adults at risk of falling: A randomized controlled study. Archives of gerontology and geriatrics 83: 231-238	- No relevant outcomes
Arkkukangas, Marina, Stromqvist Baathe, Karin, Ekholm, Anna et al. (2022) High Challenge Exercise and Learning Safe Landing Strategies among Community-Dwelling Older Adults: A Randomized Controlled Trial. International journal of environmental research and public health 19(12)	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Armat, Mohammad Reza, Mortazavi, Hamed, Akbari, Hadi et al. (2024) The Effect of Resistance Exercises Using an Elastic Band on Balance and Fear of Falling in Older Adults With Diabetic Peripheral Neuropathy: A 16-week Randomized Controlled Trial. Archives of physical medicine and rehabilitation 105(4): 733-741	- Comparator in study does not match that specified in this review protocol
Arrieta, Haritz, Astrugue, Cyril, Regueme, Sophie et al. (2019) Effects of a physical activity programme to prevent physical performance decline in onco-geriatric patients: a randomized multicentre trial. Journal of cachexia, sarcopenia and muscle 10(2): 287-297	- Data not reported in an extractable format or a format that can be analysed
Bai, Xue, Han, Bing, Zhang, Man et al. (2023) The association between diuretics and falls in older adults: A systematic review and meta-analysis. Geriatric nursing (New York, N.Y.) 52: 106-114	- Study does not contain an intervention relevant to this review protocol
Bakker, Lisanne B M, Lamoth, Claudine J C, Vetrovsky, Tomas et al. (2024) Neural Correlates of Balance Skill Learning in Young and Older Individuals: A Systematic Review and Meta-analysis. Sports medicine - open 10(1): 3	- No relevant outcomes
Barbosa, P.Y.I., Falconi, A., D'Alencar, M. et al. (2023) Effects of kinesthetic cues supported by physiotherapist during a motor training intervention with virtual reality-based games on functioning in people with Parkinson's disease: A prospective, single-blinded, parallel-group, randomized clinical trial. medRxiv	- Incorrect setting
Bays-Moneo, A B, Izquierdo, M, Anton, M M et al. (2023) Cost-Consequences Analysis Following Different Exercise Interventions in Institutionalized Oldest Old: A Pilot Study of a Randomized Clinical Trial. The journal of nutrition, health & aging 27(11): 1091-1099	- Incorrect setting
Ben Waer, Fatma, Chaari, Fatma, Fendri, Thouraya et al. (2024) The relationship between postural control and cognitive functioning following Zumba dancing in middle-aged women: A randomized clinical trial. Journal of women & aging: 1-13	- Population not relevant to this review protocol
Benitez-Lugo, Maria-Luisa, Vazquez-Marrufo, Manuel, Pinero-Pinto, Elena et al. (2023) Analysis of Physical-Cognitive Tasks Including Feedback-Based Technology for Alzheimer's Disorder in a Randomized Experimental Pilot Study. Journal of clinical medicine 12(17)	- No relevant outcomes
Bhasin, Shalender, Ellenberg, Susan S, Storer, Thomas W et al. (2018) Effect of testosterone replacement on measures of mobility in older men with mobility limitation and low testosterone concentrations: secondary analyses of the Testosterone Trials. The lancet. Diabetes & endocrinology 6(11): 879-890	- Study does not contain an intervention relevant to this review protocol
Bhasin, Shalender, Gill, Thomas M, Reuben, David B et al. (2018) Strategies to Reduce Injuries and Develop Confidence in Elders (STRIDE): A Cluster-Randomized Pragmatic Trial of a Multifactorial Fall Injury Prevention Strategy: Design and Methods. The journals of gerontology. Series A, Biological sciences and medical sciences 73(8): 1053-1061	- Data not reported in an extractable format or a format that can be analysed
Bhatt, Tanvi, Wang, Yiru, Wang, Shuaijie et al. (2021) Perturbation Training for Fall-Risk Reduction in Healthy Older Adults: Interference and Generalization to Opposing Novel Perturbations Post Intervention. Frontiers in sports and active living 3: 697169	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Bischoff-Ferrari, Heike A, Dawson-Hughes, Bess, Orav, E John et al. (2016) Monthly High-Dose Vitamin D Treatment for the Prevention of Functional Decline: A Randomized Clinical Trial. JAMA internal medicine 176(2): 175-83	- Comparator in study does not match that specified in this review protocol
Bischoff-Ferrari, Heike A, de Godoi Rezende Costa Molino, Caroline, Rival, Sandrine et al. (2021) DO-HEALTH: Vitamin D3 - Omega-3 - Home exercise - Healthy aging and longevity trial - Design of a multinational clinical trial on healthy aging among European seniors. Contemporary clinical trials 100: 106124	- Data not reported in an extractable format or a format that can be analysed
Bischoff-Ferrari, Heike A, Kistler-Fischbacher, Melanie, Gaengler, Stephanie et al. (2024) Effects of testosterone and vitamin D on fall risk in pre-frail hypogonadal men: a factorial design RCT. The journal of nutrition, health & aging 28(5): 100217	- Comparator in study does not match that specified in this review protocol
Bjerk, Maria, Brovold, Therese, Davis, Jennifer C et al. (2019) Evaluating a falls prevention intervention in older home care recipients: a comparison of SF-6D and EQ-5D. Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation 28(12): 3187-3195	- Study does not contain an intervention relevant to this review protocol
Bjerk, Maria, Brovold, Therese, Skelton, Dawn A et al. (2019) Effects of a falls prevention exercise programme on health-related quality of life in older home care recipients: a randomised controlled trial. Age and ageing 48(2): 213-219	- Comparator in study does not match that specified in this review protocol
Bjerk, Maria, Flottorp, Signe A, Pripp, Are Hugo et al. (2024) Tailored implementation of national recommendations on fall prevention among older adults in municipalities in Norway (FALLPREVENT trial): a study protocol for a cluster-randomised trial. Implementation science : IS 19(1): 5	- Trial protocol
Bouillon, Roger; LeBoff, Meryl S; Neale, Rachel E (2023) Health Effects of Vitamin D Supplementation: Lessons Learned From Randomized Controlled Trials and Mendelian Randomization Studies. Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research 38(10): 1391-1403	- Systematic review used as source of primary studies
Bouzid, Wafa, Tavassoli, Neda, Berbon, Caroline et al. (2023) Exploring Population Characteristics and Recruitment Challenges in Older People Experiencing Falls at Home without Hospitalization or with an Emergency Department Visit: Insights from the RISING-DOM Experience. Clinical interventions in aging 18: 1995-2008	- Study does not contain an intervention relevant to this review protocol
Bracco, Lucia, Pinto-Carral, Arrate, Hillaert, Linda et al. (2023) Tango-therapy vs physical exercise in older people with dementia; a randomized controlled trial. BMC geriatrics 23(1): 693	- No relevant outcomes
Braithwaite, Eve, Todd, Oliver M, Atkin, Abigail et al. (2023) Interventions for reducing anticholinergic medication burden in older adults-a systematic review and meta-analysis. Age and ageing 52(9)	- Systematic review used as source of primary studies
Brognara, Lorenzo, Luna, Oscar Caballero, Traina, Francesco et al. (2024) Inflammatory Biomarkers and Gait Impairment in Older Adults: A Systematic Review. International journal of molecular sciences 25(3)	- No relevant outcomes

Study	Code [Reason]
Brown, Diane; Simpkins, Caroline; Yang, Feng (2023) A systematic review of perturbation-based balance training on reducing fall risk among individuals with stroke. Clinical biomechanics (Bristol, Avon) 109: 106078	- Comparator in study does not match that specified in this review protocol
Brown, Joshua D, Smith, Steven M, Strotmeyer, Elsa S et al. (2020) Comparative Effects of Angiotensin-Converting Enzyme Inhibitors and Angiotensin Receptor Blockers on Response to a Physical Activity Intervention in Older Adults: Results From the Lifestyle Interventions and Independence for Elders Study. The journals of gerontology. Series A, Biological sciences and medical sciences 75(5): 1010-1016	- Secondary publication of an included study that does not provide any additional relevant information
Brull, Leon, Hezel, Natalie, Arampatzis, Adamantios et al. (2023) Comparing the Effects of Two Perturbation-Based Balance Training Paradigms in Fall-Prone Older Adults: A Randomized Controlled Trial. Gerontology 69(7): 910-922	- No relevant outcomes
Bueno, Guilherme Augusto Santos, do Bomfim, Arthur Dutra, Campos, Lorrane Freitas et al. (2023) Non-invasive neuromodulation in reducing the risk of falls and fear of falling in community-dwelling older adults: systematic review. Frontiers in aging neuroscience 15: 1301790	- Study does not contain an intervention relevant to this review protocol
Bunout, D, Barrera, G, Avendano, M et al. (2005) Results of a community-based weight-bearing resistance training programme for healthy Chilean elderly subjects. Age and ageing 34(1): 80-83	- Population not relevant to this review protocol
Bustamante-Troncoso, C., Herrera-Lopez, L.M., Sanchez, H. et al. (2020) Effect of a multidimensional intervention for prevention of falls in the eldery. Atencion Primaria 52(10): 722-730	- Non English language study
Cameron, Michelle H, Hildebrand, Andrea, Hugos, Cinda L et al. (2022) Free From Falls education and exercise program for reducing falls in people with multiple sclerosis: A randomized controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 28(6): 980-988	- Population not relevant to this review protocol
Candanedo, Maria Juana Beatriz Lima, Gramani-Say, Karina, Gerassi, Renata Carolina et al. (2023) Effects of case management based on preventing falls in older people: A systematic review. Worldviews on evidence-based nursing 20(4): 401-414	- Systematic review used as source of primary studies
Cao, Yu-Ting, Wang, Jian-Jie, Yang, Yi-Ting et al. (2022) Effect of home-based exercise programs with e-devices on falls among community-dwelling older adults: a meta-analysis. Journal of comparative effectiveness research 11(16): 1201-1217	- Systematic review used as source of primary studies
Castelli, L, Iacovelli, C, Loreti, C et al. (2023) Robotic-assisted rehabilitation for balance in stroke patients (ROAR-S): effects of cognitive, motor and functional outcomes. European review for medical and pharmacological sciences 27(17): 8198-8211	- Comparator in study does not match that specified in this review protocol
Chakhtoura, Marlene, Chamoun, Nariman, Rahme, Maya et al. (2020) Impact of vitamin D supplementation on falls and fractures-A critical appraisal of the quality of the evidence and an overview of the available guidelines. Bone 131: 115112	- Systematic review used as source of primary studies
Chan, Karly O W, Yuen, Peter P, Fong, Ben Y F et al. (2023) Effectiveness of telehealth in preventive care: a study protocol for a randomised controlled trial of tele-exercise programme involving	- Trial protocol

Study	Code [Reason]
older people with possible sarcopenia or at risk of fall. BMC geriatrics 23(1): 845	
Chan, Wayne Lap Sun, Chan, Cody Wing Lam, Chan, Howard Ho Wing et al. (2024) A randomised controlled pilot study of a Nintendo Ring Fit Adventure TM balance and strengthening exercise program in community-dwelling older adults with a history of falls. Australasian journal on ageing	- No relevant outcomes
Chan, Wayne Lap Sun, Chan, Cody Wing Lam, Lam, Freddy Man Hin et al. (2024) Feasibility, safety, and effects of a Nintendo Ring Fit Adventure TM balance and strengthening exercise program in community-dwelling older adults with a history of falls: A feasibility randomized controlled trial. Geriatrics & gerontology international 24suppl1: 334-341	- No relevant outcomes
Chantanachai, Thanwarat, Sturnieks, Daina L, Lord, Stephen R et al. (2024) Effect of cognitive training on cognitive function in community-dwelling older people with mild-to-moderate dementia: A single-blind randomised controlled trial. Australasian journal on ageing	- Study does not contain an intervention relevant to this review protocol *Cognitive training not CBT*
Chen, Weidong, Li, Min, Li, Hai et al. (2023) Tai Chi for fall prevention and balance improvement in older adults: a systematic review and meta-analysis of randomized controlled trials. Frontiers in public health 11: 1236050	- Systematic review used as source of primary studies
Cheng, Haiying; Shi, Ming; Pu, Fengyan (2024) Construction of Fall Prevention Exercise Training Scheme for Elderly Discharged Patients Using Self-Efficacy Theory Framework. Alternative therapies in health and medicine 30(2): 56-63	- No relevant outcomes
Cheng, Meichao, Wang, Ya, Wang, Shun et al. (2022) Network meta-analysis of the efficacy of four traditional Chinese physical exercise therapies on the prevention of falls in the elderly. Frontiers in public health 10: 1096599	- No relevant outcomes
Chiu, Huei-Ling, Yeh, Ting-Ting, Lo, Yun-Ting et al. (2021) The effects of the Otago Exercise Programme on actual and perceived balance in older adults: A meta-analysis. PloS one 16(8): e0255780	- Systematic review used as source of primary studies
Chou, Sharon H, Cook, Nancy R, Kotler, Gregory et al. (2024) Effects of Supplemental Vitamin D3, Omega-3 Fatty Acids on Physical Performance Measures in VITamin D and OmegA-3 TriaL. The Journal of clinical endocrinology and metabolism	- No relevant outcomes
Colon-Emeric, Cathleen S, McDermott, Cara L, Lee, Deborah S et al. (2024) Risk Assessment and Prevention of Falls in Older Community-Dwelling Adults: A Review. JAMA 331(16): 1397-1406	- Mixed methods included in review
Correa, Fernanda Ishida, Kunitake, Andre Issao, Segheto, Wellington et al. (2024) The effect of transcranial direct current stimulation associated with video game training on the postural balance of older women in the community: A blind, randomized, clinical trial. Physiotherapy research international : the journal for researchers and clinicians in physical therapy 29(1): e2046	- Comparator in study does not match that specified in this review protocol
Cuadra, Gabriela, Oliveira, Juliana S, Pinheiro, Marina B et al. (2023) Physical Activity Interventions for Adults Aged 60+ Years in Low- and Middle-Income Countries: A Scoping Review. Journal of physical activity & health 20(7): 578-585	- Systematic review used as source of primary studies

Study	Code [Reason]
Dalmas, Ilona, Sciriha, Anabel, Camilleri, Liberato et al. (2023) Effects of core strengthening on balance in patients with hip osteoarthritis: a randomised controlled trial. International journal of rehabilitation research. Internationale Zeitschrift fur Rehabilitationsforschung. Revue internationale de recherches de readaptation 46(3): 252-257	- Comparator in study does not match that specified in this review protocol
Daly, Robin M, Gianoudis, Jenny, Kersh, Mariana E et al. (2020) Effects of a 12-Month Supervised, Community-Based, Multimodal Exercise Program Followed by a 6-Month Research-to-Practice Transition on Bone Mineral Density, Trabecular Microarchitecture, and Physical Function in Older Adults: A Randomized Controlled Trial. Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research 35(3): 419-429	- Duplicate reference
Davis, Jennifer C, Hsu, Chun Liang, Ghag, Cheyenne et al. (2022) Baseline health-related quality of life predicts falls: a secondary analysis of a randomized controlled trial. Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation 31(11): 3211-3220	- Data not reported in an extractable format or a format that can be analysed
Dawson, Rik, Oliveira, Juliana S, Kwok, Wing S et al. (2024) Exercise Interventions Delivered Through Telehealth to Improve Physical Functioning for Older Adults with Frailty, Cognitive, or Mobility Disability: A Systematic Review and Meta-Analysis. Telemedicine journal and e-health : the official journal of the American Telemedicine Association 30(4): 940-950	- No relevant outcomes
Dawson, Rik, Suen, Jenni, Sherrington, Catherine et al. (2024) Effective fall prevention exercise in residential aged care: an intervention component analysis from an updated systematic review. British journal of sports medicine	- No relevant outcomes
de Andrade, Frangie Kallas, Ignacio Nunes, Raziel Prado, Barboza Zanetti, Maria Olivia et al. (2024) Validated medication deprescribing instruments for patients with palliative care needs palliative care: A systematic review. Farmacia hospitalaria : organo oficial de expresion cientifica de la Sociedad Espanola de Farmacia Hospitalaria 48(2): t83-t89	- Study not reported in English
de Rooij, Ilona J M, van de Port, Ingrid G L, Punt, Michiel et al. (2021) Effect of Virtual Reality Gait Training on Participation in Survivors of Subacute Stroke: A Randomized Controlled Trial. Physical therapy 101(5)	- Population not relevant to this review protocol
Deems-Dluhy, Susan, Hoppe-Ludwig, Shenan, Mummidisetty, Chaithanya K et al. (2021) Microprocessor Controlled Knee Ankle Foot Orthosis (KAFO) vs Stance Control vs Locked KAFO: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 102(2): 233-244	- Population not relevant to this review protocol
Denissen, S, Staring, W, Kunkel, D et al. (2019) Interventions for preventing falls in people after stroke. Cochrane Database of Systematic Reviews	- Population not relevant to this review protocol
Devasahayam, Augustine Joshua, Farwell, Kyle, Lim, Bohyung et al. (2022) The Effect of Reactive Balance Training on Falls in Daily Life: An Updated Systematic Review and Meta-Analysis. Physical therapy 103(1)	- Systematic review used as source of primary studies

Study	Code [Reason]
Dominguez, Ligia J, Donat-Vargas, Carolina, Sayon-Orea, Carmen et al. (2023) Rationale of the association between Mediterranean diet and the risk of frailty in older adults and systematic review and meta-analysis. Experimental gerontology 177: 112180	- Systematic review used as source of primary studies
Downey, Rachel, Gagne, Nathan, Mohanathas, Niroshica et al. (2023) At-home computerized executive-function training to improve cognition and mobility in normal-hearing adults and older hearing aid users: a multi-centre, single-blinded randomized controlled trial. BMC neurology 23(1): 378	- No relevant outcomes
Dukas, L, Bischoff, HA, Lindpaintner, LS et al. (2003) Alfacalcidol reduces the number of fallers and falls in community-dwelling elderly provided a mainimum total daily intake of 500mg calcium. Calcified tissue international 72: 371	- Duplicate reference
Dunlap, Pamela M, Crane, Breanna M, Perera, Subashan et al. (2024) Global Positioning System Indicators of Community Mobility and Future Health Outcomes Among Older Adults. The journals of gerontology. Series A, Biological sciences and medical sciences 79(1)	- Study does not contain an intervention relevant to this review protocol
Dyer, S., Suen, J., Dawson, R. et al. (2023) Exercise Interventions for Falls Prevention in Aged Care: Trial Endpoint Meta-Analyses. Geriatric Orthopaedic Surgery and Rehabilitation 14: 15	- Systematic review used as source of primary studies
Dyer, Suzanne M, Suen, Jenni, Kwok, Wing S et al. (2023) Exercise for falls prevention in aged care: systematic review and trial endpoint meta-analyses. Age and ageing 52(12)	- Conference abstract
Emert, Sarah E, Taylor, Daniel J, Gartenberg, Daniel et al. (2023) A non-pharmacological multi-modal therapy to improve sleep and cognition and reduce mild cognitive impairment risk: Design and methodology of a randomized clinical trial. Contemporary clinical trials 132: 107275	- Study does not contain an intervention relevant to this review protocol
Eost-Telling, Charlotte, Yang, Yang, Norman, Gill et al. (2024) Digital technologies to prevent falls in people living with dementia or mild cognitive impairment: a rapid systematic overview of systematic reviews. Age and ageing 53(1)	- Systematic review used as source of primary studies
Feinstein, Anthony, Amato, Maria Pia, Brichetto, Giampaolo et al. (2023) Cognitive rehabilitation and aerobic exercise for cognitive impairment in people with progressive multiple sclerosis (CogEx): a randomised, blinded, sham-controlled trial. The Lancet. Neurology 22(10): 912-924	- Population not relevant to this review protocol
Feng, Feifei, Xu, Haocheng, Sun, Yu et al. (2023) Exercise for prevention of falls and fall-related injuries in neurodegenerative diseases and aging-related risk conditions: a meta-analysis. Frontiers in endocrinology 14: 1187325	- Systematic review used as source of primary studies
Ferreira, Daniela Lemes, Christofoletti, Gustavo, Campos, Dayane Melo et al. (2022) Effects of Aquatic Physical Exercise on Motor Risk Factors for Falls in Older People During the COVID-19 Pandemic: A Randomized Controlled Trial. Journal of manipulative and physiological therapeutics	- No relevant outcomes
Finco, M G, Najafi, Bijan, Zhou, He et al. (2023) Game-based intradialytic non-weight-bearing exercise training on gait speed and	- Incorrect setting

Study	Code [Reason]
balance in older adults with diabetes: a single-blind randomized controlled trial. Scientific reports 13(1): 14225	
Fisher, Steve R, Villasante-Tezanos, Alejandro, Allen, Lindsay M et al. (2024) Comparative effectiveness of pelvic floor muscle training, mirabegron, and trospium among older women with urgency urinary incontinence and high fall risk: a feasibility randomized clinical study. Pilot and feasibility studies 10(1): 1	- Trial protocol
Franzel, Katja, Koschate, Jessica, Freiberger, Ellen et al. (2024) Square-stepping exercise in older inpatients in early geriatric rehabilitation. A randomized controlled pilot study. BMC geriatrics 24(1): 326	- Incorrect setting
Freire, Ivelize and Seixas, Aderito (2024) Effectiveness of a sensorimotor exercise program on proprioception, balance, muscle strength, functional mobility and risk of falls in older people. Frontiers in physiology 15: 1309161	- No relevant outcomes
Gadhvi, Chandini; Bean, Debbie; Rice, David (2023) A systematic review of fear of falling and related constructs after hip fracture: prevalence, measurement, associations with physical function, and interventions. BMC geriatrics 23(1): 385	- Systematic review used as source of primary studies
Gallibois, Molly, Handrigan, Grant, Caissie, Linda et al. (2023) The Effect of a Standing Intervention on Falls in Long Term Care: a Secondary Analysis of a Randomized Controlled Trial. Canadian geriatrics journal : CGJ 26(2): 247-252	- No relevant outcomes
Gallo, Estelle, Stelmach, Maria, Frigeri, Fernanda et al. (2018) Determining Whether a Dosage-Specific and Individualized Home Exercise Program With Consults Reduces Fall Risk and Falls in Community-Dwelling Older Adults With Difficulty Walking: A Randomized Control Trial. Journal of geriatric physical therapy (2001) 41(3): 161-172	- Data not reported in an extractable format or a format that can be analysed
Genc, Fatma Zehra and Bilgili, Naile (2023) The effect of Otago exercises on fear of falling, balance, empowerment and functional mobility in the older people: Randomized controlled trial. International journal of nursing practice 29(6): e13194	- No relevant outcomes
Geohagen, O., Hamer, L., Lowton, A. et al. (2023) The Effectiveness of Rehabilitation Interventions Including Outdoor Mobility on Older Adults' Physical Activity, Endurance, Outdoor Mobility, and Falls-Related Self-Efficacy. Geriatric Orthopaedic Surgery and Rehabilitation 14: 33-34	- Conference abstract
Gerards, Marissa, Marcellis, Rik, Senden, Rachel et al. (2023) The effect of perturbation-based balance training on balance control and fear of falling in older adults: a single-blind randomised controlled trial. BMC geriatrics 23(1): 305	- No relevant outcomes
Gerber, Eryn D, Giraldo, Camilo, Whorley, Brett et al. (2023) Subthreshold white noise vibration alters trembling sway in older adults. Human movement science 90: 103119	- No relevant outcomes
Gholamzadeh, S., Ebrahimi, M., Sharifi, N. et al. (2021) The effectiveness of the stepping-on fall prevention program on the quality of life, fear of fall, and fall-preventive behaviors among community-dwelling older adults: A randomized clinical trial. Shiraz E Medical Journal 22(12): e109363	- No relevant outcomes

Study	Code [Reason]
Gigonzac, Mathilde and Terrier, Philippe (2023) Restoring walking ability in older adults with arm-in-arm gait training: study protocol for the AAGaTT randomized controlled trial. BMC geriatrics 23(1): 542	- Trial protocol
Gill, Thomas M, McGloin, Joanne M, Shelton, Amy et al. (2020) Optimizing Retention in a Pragmatic Trial of Community-Living Older Persons: The STRIDE Study. Journal of the American Geriatrics Society 68(6): 1242-1249	- Study does not contain an intervention relevant to this review protocol
Griffin, James, Lall, Ranjit, Bruce, Julie et al. (2019) Comparison of alternative falls data collection methods in the Prevention of Falls Injury Trial (PreFIT). Journal of clinical epidemiology 106: 32-40	- Study design not relevant to this review protocol
Haeri, N.S.; Perera, S.; Greenspan, S.L. (2023) The association of vitamin D with bone microarchitecture, muscle strength, and mobility performance in older women in long-term care. Bone 176: 116867	- Incorrect setting - No relevant outcomes
Hainline, Garrett, Hainline, Robin D, Handlery, Reed et al. (2023) A Scoping Review of the Predictive Qualities of Walking Speed in Older Adults. Journal of geriatric physical therapy (2001)	- Study does not contain an intervention relevant to this review protocol
Hansen, Karen E, Johnson, R Erin, Chambers, Kaitlin R et al. (2015) Treatment of Vitamin D Insufficiency in Postmenopausal Women: A Randomized Clinical Trial. JAMA internal medicine 175(10): 1612-21	- Population not relevant to this review protocol *Mean age of population is less than 65 years*
Harris, Emily (2023) Systematic Review: What Works to Prevent Falls for Older People. JAMA 329(14): 1142	- Conference abstract
Harris, Tess, Limb, Elizabeth S, Hosking, Fay et al. (2019) Effect of pedometer-based walking interventions on long-term health outcomes: Prospective 4-year follow-up of two randomised controlled trials using routine primary care data. PLoS medicine 16(6): e1002836	- Population not relevant to this review protocol
Harrison, Elinor C, Haussler, Allison M, Tueth, Lauren E et al. (2024) Graceful gait: virtual ballet classes improve mobility and reduce falls more than wellness classes for older women. Frontiers in aging neuroscience 16: 1289368	- Data not reported in an extractable format or a format that can be analysed
Harrison, S. and Ghosh, S. (2023) The Effect of Vitamin D Supplementation on Muscle Mass, Muscle Strength and Muscle Function in the Elderly: A Systematic Review and Meta-Analysis. Aging Medicine and Healthcare 14(4): 172-181	- Systematic review used as source of primary studies
Hars, Melany, Fernandez, Natalia, Herrmann, Francois et al. (2024) Effects of Dalcroze Eurhythmics Exercise Versus Multicomponent Exercise on Physical and Cognitive Function, and Falls in Older Adults: The EPHYCOS Randomized Controlled Trial. Advanced biology: e2400089	- Comparator in study does not match that specified in this review protocol
Harwood, Rowan H, Goldberg, Sarah E, Brand, Andrew et al. (2023) Promoting Activity, Independence, and Stability in Early Dementia and mild cognitive impairment (PrAISED): randomised controlled trial. BMJ (Clinical research ed.) 382: e074787	- Population not relevant to this review protocol
Hayes, S, Galvin, R, Kennedy, C et al. (2019) Interventions for preventing falls in people with multiple sclerosis. Cochrane Database of Systematic Reviews	- Population not relevant to this review protocol

Study	Code [Reason]
Herrinton, Lisa J, Lo, Keras, Alavi, Mubarika et al. (2023) Effectiveness of Bundled Hyperpolypharmacy Deprescribing Compared With Usual Care Among Older Adults: A Randomized Clinical Trial. JAMA network open 6(7): e2322505	- No relevant outcomes
Hirota, Noritake; Okada, Hiroshi; Okamura, Noboru (2023) The effectiveness in preventing frailty of exercise intervention provided by community pharmacists to older persons with chronic conditions: A pragmatic randomized controlled trial. BMC geriatrics 23(1): 225	- No relevant outcomes
Hoang, Phu, Sturnieks, Daina L, Butler, Anna et al. (2024) A custom-built step exergame training programme to prevent falls in people with multiple sclerosis: A multicentre randomised controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 30(45): 571-584	- Population not relevant to this review protocol *Population under age of interest and only have MS which is excluded by the cochrane*
Hofbauer, Lorenz C, Witvrouw, Richard, Varga, Zsuzsanna et al. (2021) Bimagrumab to improve recovery after hip fracture in older adults: a multicentre, double-blind, randomised, parallel-group, placebo-controlled, phase 2a/b trial. The Lancet. Healthy longevity 2(5): e263-e274	- Study does not contain an intervention relevant to this review protocol
Holmes, Matthew D, Vindigni, Dein, Moreland, Ashleigh et al. (2024) What are the temporal and physical characteristics of locally applied vibration that modulate balance in older adults? - A systematic review of the literature. Gait & posture 111: 75-91	- Systematic review used as source of primary studies
Houston, D.K., Marsh, A.P., Neiberg, R.H. et al. (2023) Vitamin D Supplementation and Muscle Power, Strength and Physical Performance in Older Adults: A Randomized Controlled Trial. American Journal of Clinical Nutrition 117(6): 1086-1095	- No relevant outcomes
Hu, Yue, Wang, Kun, Gu, Jiaxin et al. (2024) Effect of combined physical and cognitive intervention on fear of falling in older adults: A systematic review and meta-analysis. Archives of gerontology and geriatrics 117: 105173	- Systematic review used as source of primary studies
Huang, Dunbing, Ke, Xiaohua, Jiang, Cai et al. (2023) Effects of 12 weeks of Tai Chi on neuromuscular responses and postural control in elderly patients with sarcopenia: a randomized controlled trial. Frontiers in neurology 14: 1167957	- No relevant outcomes
Irvine, L, Conroy, SP, Sach, T et al. (2010) Cost-effectiveness of a day hospital falls prevention programme for screened community-dwelling older people at high risk of falls. Age and ageing 39(6): 710-716	- No relevant outcomes
Iuliano, S. (2023) Dairy on the menu for fracture-free ageing. Proceedings of the Nutrition Society 82(oce2): e50	- Conference abstract
Janducci, Ana Luisa, Gramani-Say, Karina, da Silva, Livea Cristina et al. (2023) Treatment fidelity and satisfaction with an intervention based on case management for older people with falls history: Randomized clinical trial. Geriatric nursing (New York, N.Y.) 52: 48-55	- Study does not contain an intervention relevant to this review protocol
Jang, I.-Y., Jung, H.-W., Park, H. et al. (2018) A multicomponent frailty intervention for socioeconomically vulnerable older adults: A designed-delay study. Clinical Interventions in Aging 13: 1799-1814	- Study design not relevant to this review protocol

Study	Code [Reason]
Jansen, Carl-Philipp, Nerz, Corinna, Labudek, Sarah et al. (2021) Lifestyle-integrated functional exercise to prevent falls and promote physical activity: Results from the LiFE-is-LiFE randomized non-inferiority trial. The international journal of behavioral nutrition and physical activity 18(1): 115	- Secondary publication of an included study that does not provide any additional relevant information
Janssens, Wim Henri, Verhoestraete, Pauwelijn, Piers, Ruth D et al. (2024) Short-Term Opioid Treatment of Acute Locomotor Pain in Older Adults: Comparison of Effectiveness and Safety between Tramadol and Oxycodone: A Randomized Trial. Geriatrics (Basel, Switzerland) 9(2)	- Study does not contain an intervention relevant to this review protocol
Juraschek, Stephen P, Taylor, Addison A, Wright, Jackson T Jr et al. (2020) Orthostatic Hypotension, Cardiovascular Outcomes, and Adverse Events: Results From SPRINT. Hypertension (Dallas, Tex. : 1979) 75(3): 660-667	- Study does not contain an intervention relevant to this review protocol
Kannan, Meena, Hildebrand, Andrea, Hugos, Cinda L et al. (2019) Evaluation of a web-based fall prevention program among people with multiple sclerosis. Multiple sclerosis and related disorders 31: 151-156	- Population not relevant to this review protocol
Kashyap, Kritartha, Dhar, Minakshi, Bisht, Khushboo et al. (2023) Yoga therapy on elderly patients with fear of fall: an open-label randomised controlled trial (YOFEAR trial). BMJ open 13(12): e070540	- Trial protocol
Khan, G.; Gupta, M.; Mir, A.H. (2023) Effects of Resistance Exercise Using Theraband with Weighted Cuff Resistance on Fall Risk and Balance among the Geriatric Population: A Randomised Controlled Trial. Journal of Clinical and Diagnostic Research 17(10): yf01-yf06	- Comparator in study does not match that specified in this review protocol
Khaw, Kay-Tee, Stewart, Alistair W, Waayer, Debbie et al. (2017) Effect of monthly high-dose vitamin D supplementation on falls and non-vertebral fractures: secondary and post-hoc outcomes from the randomised, double-blind, placebo-controlled ViDA trial. The lancet. Diabetes & endocrinology 5(6): 438-447	- Study design not relevant to this review protocol
Kiehl, A., Stein, L., Kerling, A. et al. (2021) Sinus-like versus random vibration: Acute effects on elderly people with a high risk of falling. Gait and Posture 90: 36-42	- Study design not relevant to this review protocol
Kim, Chang Yong, Jeong, Hye Won, Baek, Chang Yoon et al. (2024) Effects of Taekkyon-based exercise program on balance, lower extremity strength, and gait parameters in community-dwelling older women: Randomized controlled trial. Medicine 103(11): e37463	- No relevant outcomes
Klaperski-van der Wal, S., Bruton, A., Felton, L. et al. (2023) A mixed-method exploration of the effects and feasibility of an intergenerational fall-prevention gardening programme in older adults at risk of falling: a clinical trial. Journal of Public Health (Germany)	- Not a peer-reviewed publication
Klima, D.W., Rabel, M., Mandelblatt, A. et al. (2021) Community-Based Fall Prevention and Exercise Programs for Older Adults. Current Geriatrics Reports 10(2): 58-65	- Review article but not a systematic review

Study	Code [Reason]
Ko, F. (2019) Long-term exercise training in older adults is associated with reduced injurious falls and fractures. Journal of Clinical Outcomes Management 26(4): 155-157	- Study design not relevant to this review protocol
Kornholt, Jonatan, Feizi, Shafika Tapia, Hansen, Alexandra Storm et al. (2022) Effects of a comprehensive medication review intervention on health-related quality of life and other clinical outcomes in geriatric outpatients with polypharmacy: A pragmatic randomized clinical trial. British journal of clinical pharmacology 88(7): 3360-3369	- Study does not contain an intervention relevant to this review protocol
Kovacic, T, Kovacic, M, Ovsenik, R et al. (2020) The impact of multicomponent programmes on balance and fall reduction in adults with intellectual disabilities: a randomised trial. Journal of intellectual disability research : JIDR 64(5): 381-394	- Population not relevant to this review protocol
Kraiwong, Ratchanok, Vongsirinavarat, Mantana, Rueankam, Maliwan et al. (2021) Effects of physical-cognitive training on physical and psychological functions among older adults with type 2 diabetes and balance impairment: a randomized controlled trial. Journal of exercise rehabilitation 17(2): 120-130	- Data not reported in an extractable format or a format that can be analysed
Krauss, Melissa J, Somerville, Emily, Bollinger, Rebecca M et al. (2024) Removing home hazards for older adults living in affordable housing: A stepped-wedge cluster-randomized trial. Journal of the American Geriatrics Society 72(3): 670-681	- Population not relevant to this review protocol
Kruisbrink, Marlot, Zijlstra, G A Rixt, Crutzen, Rik et al. (2023) Participant Characteristics as Moderators of the Effects of Cognitive Behavioral Interventions on Concerns About Falling: Secondary Analyses of Two Randomized Controlled Trials. Journal of applied gerontology : the official journal of the Southern Gerontological Society 42(8): 1877-1887	- Secondary publication of an included study that does not provide any additional relevant information
Kulkarni, Snehal and Nagarkar, Aarti (2023) Effect of a video-assisted fall prevention program on fall incidence in community-dwelling older adults during COVID. Geriatric nursing (New York, N.Y.) 50: 31-37	- Study design not relevant to this review protocol
Lalani, Mirza; Wytrykowski, Sarah; Hogan, Helen (2023) Approaches to improving patient safety in integrated care: a scoping review. BMJ open 13(4): e067441	- Review article but not a systematic review
Lalor, A, Callaway, L, Koritsas, S et al. (2023) Interventions to reduce falls in community-dwelling adults with intellectual disability: a systematic review. Journal of intellectual disability research : JIDR 67(11): 1073-1095	- Study does not contain an intervention relevant to this review protocol
Lamp, J.D.S., Beraldo, L.M., Vieira dos Santos, W. et al. (2023) Acute effects of different proprioceptive neuromuscular facilitation stabilization techniques on the balance of elderly women. Journal of Bodywork and Movement Therapies 35: 342-347	- Comparator in study does not match that specified in this review protocol
Lauriks, Steve, Meiland, Franka, Oste, Johan P et al. (2020) Effects of Assistive Home Technology on quality of life and falls of people with dementia and job satisfaction of caregivers: Results from a pilot randomized controlled trial. Assistive technology : the official journal of RESNA 32(5): 243-250	- Population not relevant to this review protocol
Law, Waiyan and Kwok, Timothy C Y (2019) Impacts of a multicomponent intervention programme on neuropsychiatric	- No relevant outcomes

Study	Code [Reason]
symptoms in people with dementia and psychological health of caregivers: A feasibility pilot study. International journal of geriatric psychiatry 34(12): 1765-1775	
Le Boff, M., Chou, S., Murata, E. et al. (2019) Effects of vitamin D on the risk of falls in the Vitamin D and OmegA-3 TriaL (VITAL). Journal of Bone and Mineral Research 34(supplement1): 19	- Conference abstract
Leal, Jose Carlos, Belo, Vinicius Silva, Santos, Ingrid Morselli et al. (2023) Exergames in Older Adult Community Centers and Nursing Homes to Improve Balance and Minimize the Risk of Falls in Older Adults: A Systematic Review and Meta-Analysis. Healthcare (Basel, Switzerland) 11(13)	- Systematic review used as source of primary studies
LeBoff, Meryl S and Bischoff-Ferrari, Heike A (2023) The Effects of Vitamin D Supplementation on Musculoskeletal Health: The VITAL and DO-Health Trials. The journals of gerontology. Series A, Biological sciences and medical sciences 78(suppl1): 73-78	- Systematic review used as source of primary studies
LeBoff, Meryl S, Murata, Elle M, Cook, Nancy R et al. (2020) VITamin D and OmegA-3 TriaL (VITAL): Effects of Vitamin D Supplements on Risk of Falls in the US Population. The Journal of clinical endocrinology and metabolism 105(9)	- Population not relevant to this review protocol
Lee, J, Phu, S, Lord, S R et al. (2024) Effects of immersive virtual reality training on balance, gait and mobility in older adults: A systematic review and meta-analysis. Gait & posture 110: 129-137	- Systematic review used as source of primary studies
Lee, Junekyung; Chun, Min Ho; Lee, Jiyeon (2023) The effect of a gait and balance training program on an unstable mudflats surface in older adults: A randomized controlled pilot study. Medicine 102(12): e33272	- Comparator in study does not match that specified in this review protocol
Lee, P.G.; Pokhrel, K.P.; Herman, W.H. (2019) Fall risk in individuals with type 2 diabetes: The look ahead study. Diabetes 68(supplement1)	- Conference abstract
Lektip, Charupa, Chaovalit, Sirawee, Wattanapisit, Apichai et al. (2023) Home hazard modification programs for reducing falls in older adults: a systematic review and meta-analysis. PeerJ 11: e15699	- Systematic review used as source of primary studies
Lenouvel, Eric, Ullrich, Phoebe, Siemens, Waldemar et al. (2023) Cognitive behavioural therapy (CBT) with and without exercise to reduce fear of falling in older people living in the community. The Cochrane database of systematic reviews 11: cd014666	- Systematic review used as source of primary studies
Levinger, Pazit, Goh, Anita M Y, Dunn, Jeremy et al. (2023) Exercise interveNtion outdoor proJect in the cOmmunitY - results from the ENJOY program for independence in dementia: a feasibility pilot randomised controlled trial. BMC geriatrics 23(1): 426	- Population not relevant to this review protocol
Levis, Silvina and Gomez-Marin, Orlando (2017) Vitamin D and Physical Function in Sedentary Older Men. Journal of the American Geriatrics Society 65(2): 323-331	- No relevant outcomes
Li, Fuzhong; Harmer, Peter; Chou, Li-Shan (2019) Dual-Task Walking Capacity Mediates Tai Ji Quan Impact on Physical and Cognitive Function. Medicine and science in sports and exercise 51(11): 2318-2324	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Li, Fuzhong, Harmer, Peter, Eckstrom, Elizabeth et al. (2019) Effectiveness of Tai Ji Quan vs Multimodal and Stretching Exercise Interventions for Reducing Injurious Falls in Older Adults at High Risk of Falling: Follow-up Analysis of a Randomized Clinical Trial. JAMA network open 2(2): e188280	- Data not reported in an extractable format or a format that can be analysed
Li, Liangtao, Cheng, Shihuan, Wang, Guodong et al. (2019) Tai chi chuan exercises improve functional outcomes and quality of life in patients with primary total knee arthroplasty due to knee osteoarthritis. Complementary therapies in clinical practice 35: 121-125	- Study does not contain an intervention relevant to this review protocol
Lim, Mei Ling, Tran, Mymy, van Schooten, Kimberley S et al. (2022) A Self-Guided Online Cognitive Behavioural Therapy to Reduce Fear of Falling in Older People: a Randomised Controlled Trial. International Journal of Behavioral Medicine. 30:455-62.	- No relevant outcomes
Lin, Jiaqi, Ning, Shuaiqi, Lyu, Shaowei et al. (2024) The effects of different types of Tai Chi exercises on preventing falls in older adults: a systematic review and network meta-analysis. Aging clinical and experimental research 36(1): 65	- Systematic review used as source of primary studies
Ling, Yali, Xu, Feng, Xia, Xuedi et al. (2021) Vitamin D supplementation reduces the risk of fall in the vitamin D deficient elderly: An updated meta-analysis. Clinical nutrition (Edinburgh, Scotland) 40(11): 5531-5537	- More recent systematic review included that covers the same topic
Lipsitz, Lewis A, Macklin, Eric A, Travison, Thomas G et al. (2019) A Cluster Randomized Trial of Tai Chi vs Health Education in Subsidized Housing: The MI-WiSH Study. Journal of the American Geriatrics Society 67(9): 1812-1819	- Study does not contain an intervention relevant to this review protocol
Liu, Minhui, Xue, Qian-Li, Gitlin, Laura N et al. (2021) Disability Prevention Program Improves Life-Space and Falls Efficacy: A Randomized Controlled Trial. Journal of the American Geriatrics Society 69(1): 85-90	- Conference abstract
Liu, Yat Wa Justina and Tsui, Chi Man (2014) A randomized trial comparing Tai Chi with and without cognitive-behavioral intervention (CBI) to reduce fear of falling in community-dwelling elderly people. Archives of gerontology and geriatrics 59(2): 317-25	- No relevant outcomes
Liu, S., Zhang, S., Cheng, X. et al. (2024) A meta-analysis on the impact of resistance training on phase angle in middle-aged and older individuals. Archives of Gerontology and Geriatrics 119: 105318	- Systematic review used as source of primary studies
Liu-Ambrose, Teresa, Davis, Jennifer C, Falck, Ryan S et al. (2021) Exercise, Processing Speed, and Subsequent Falls: A Secondary Analysis of a 12-Month Randomized Controlled Trial. The journals of gerontology. Series A, Biological sciences and medical sciences 76(4): 675-682	- Secondary publication of an included study that does not provide any additional relevant information
Lo, On-Yee, Charest, Sarah, Margulis, Heather et al. (2023) Feasibility and Safety of Sequential Transcranial Direct Current Stimulation and Physical Therapy in Older Adults at Risk of Falling: A Randomized Pilot Study. Archives of rehabilitation research and clinical translation 5(4): 100288	- Study does not contain an intervention relevant to this review protocol
Long, Sulan, Nuntaboot, Khanitta, Nakrukamphonphatn, Suvapat et al. (2023) The Value of Sports and Functional Exercise on	- Systematic review used as source of primary studies

Study	Code [Reason]
Preventing Falls in Elderly Patients with Cognitive Impairment: A Systematic Review and Meta-Analysis. Alternative therapies in health and medicine	
Lord, S. and Sturnieks, D. (2023) A 12-Month Randomised Controlled Trial of Step and Seated Cognitive/Motor Training for Preventing Falls in Community-Dwelling Older People. Geriatric Orthopaedic Surgery and Rehabilitation 14: 19	- Conference abstract
Loughran, K.J., Emerson, J., Suri, S. et al. (2023) EXERCISE-BASED INTERVENTIONS TARGETING BALANCE AND FALLS RISK IN PEOPLE WITH COPD: A SYSTEMATIC REVIEW WITH META-ANALYSIS. Thorax 78(supplement4): a123-a124	- Systematic review used as source of primary studies
Lozano-Vicario, Lucia, Zambom-Ferraresi, Fabiola, Zambom-Ferraresi, Fabricio et al. (2024) Effects of Exercise Intervention for the Management of Delirium in Hospitalized Older Adults: A Randomized Clinical Trial. Journal of the American Medical Directors Association: 104980	- Incorrect setting
Magaziner, Jay, Mangione, Kathleen K, Orwig, Denise et al. (2019) Effect of a Multicomponent Home-Based Physical Therapy Intervention on Ambulation After Hip Fracture in Older Adults: The CAP Randomized Clinical Trial. JAMA 322(10): 946-956	- No relevant outcomes
Mahlknecht, Angelika, Wiedermann, Christian J, Sandri, Marco et al. (2021) Expert-based medication reviews to reduce polypharmacy in older patients in primary care: a northern-Italian cluster-randomised controlled trial. BMC geriatrics 21(1): 659	- Study does not contain an intervention relevant to this review protocol
Mahmoudi, Elham, Basu, Tanima, Langa, Kenneth et al. (2019) Can Hearing Aids Delay Time to Diagnosis of Dementia, Depression, or Falls in Older Adults?. Journal of the American Geriatrics Society 67(11): 2362-2369	- Study design not relevant to this review protocol
Mak, Jenson Cs, Mason, Rebecca S, Klein, Linda et al. (2016) An initial loading-dose vitamin D versus placebo after hip fracture surgery: randomized trial. BMC musculoskeletal disorders 17: 336	- No relevant outcomes
Mak, Toby C T, Ng, Shamay S M, Leung, Melody C Y et al. (2024) Examining the role of attention focus walking training on conscious motor processing during rehabilitation by older adults at risk of falling: A randomized controlled trial. Archives of gerontology and geriatrics 121: 105352	- Comparator in study does not match that specified in this review protocol
Malihi, Zarintaj, Lawes, Carlene M M, Wu, Zhenqiang et al. (2019) Monthly high-dose vitamin D supplementation does not increase kidney stone risk or serum calcium: results from a randomized controlled trial. The American journal of clinical nutrition 109(6): 1578-1587	- Data not reported in an extractable format or a format that can be analysed
Mangione, Kathleen K, Darreff, Hope, Welsh, McKenna et al. (2023) Feasibility of a Modified Otago Exercise Program for Older Adults With Cognitive Vulnerability. Journal of applied gerontology : the official journal of the Southern Gerontological Society 42(7): 1445-1455	- Study design not relevant to this review protocol
McGuire, Rita, Honaker, Julie, Pozehl, Bunny et al. (2020) BASIC Training: A Pilot Study of Balance/Strengthening Exercises in Heart Failure. Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses 45(1): 30-38	- Data not reported in an extractable format or a format that can be analysed

Study	Code [Reason]
Melo, Renato S, Cardeira, Caroline Stefany Ferreira, Rezende, Damaris Scarleth A et al. (2023) Effectiveness of the aquatic physical therapy exercises to improve balance, gait, quality of life and reduce fall-related outcomes in healthy community-dwelling older adults: A systematic review and meta-analysis. PloS one 18(9): e0291193	- Systematic review used as source of primary studies
Melo-Alonso, Maria, Murillo-Garcia, Alvaro, Leon-Llamas, Juan Luis et al. (2024) Classification and Definitions of Compensatory Protective Step Strategies in Older Adults: A Scoping Review. Journal of clinical medicine 13(2)	- Systematic review used as source of primary studies
Merchant, R.A., Tsoi, C.T., Tan, W.M. et al. (2021) Community-Based Peer-Led Intervention for Healthy Ageing and Evaluation of the 'HAPPY' Program. Journal of Nutrition, Health and Aging 25(4): 520-527	- Study does not contain an intervention relevant to this review protocol
Meulenbroeks, Isabelle, Mercado, Crisostomo, Gates, Peter et al. (2024) Effectiveness of fall prevention interventions in residential aged care and community settings: an umbrella review. BMC geriatrics 24(1): 75	- Incorrect setting
Meziere, A. (2019) Exercise inerventions with trained carers for preventing loss of autonomy and falls in elderly people at home (T4H): A cluster randomized controlled pilot trial. European Geriatric Medicine 10(supplement1): 177-s178	- Conference abstract
Meziere, Anthony, Oubaya, Nadia, Michel-Pellegrino, Valerie et al. (2021) Exercise Interventions With Trained Home Helpers for Preventing Loss of Autonomy and Falls in Community-Dwelling Older Adults Receiving Home Heath Physical Therapy T4H: A Randomized Controlled Pilot Study. Journal of geriatric physical therapy (2001) 44(3): e138-e149	- No relevant outcomes
Mgbeojedo, Ukamaka Gloria, Akosile, Christopher Olusanjo, Okoye, Emmanuel Chiebuka et al. (2023) Effects of Otago Exercise Program on Physical and Psychosocial Functions Among Community-Dwelling and Institutionalized Older Adults: A Scoping Review. Inquiry : a journal of medical care organization, provision and financing 60: 469580231165858	- Systematic review used as source of primary studies
Michos, Erin D, Mitchell, Christine M, Miller, Edgar R 3rd et al. (2018) Rationale and design of the Study To Understand Fall Reduction and Vitamin D in You (STURDY): A randomized clinical trial of Vitamin D supplement doses for the prevention of falls in older adults. Contemporary clinical trials 73: 111-122	- Data not reported in an extractable format or a format that can be analysed
Millan-Domingo, Fernando, Tarazona-Santabalbina, Francisco Jose, Carretero, Aitor et al. (2022) Real-Life Outcomes of a Multicomponent Exercise Intervention in Community-Dwelling Frail Older Adults and Its Association with Nutritional-Related Factors. Nutrients 14(23)	- Study design not relevant to this review protocol
Milton-Cole, Rhian, Kazeem, Kareema, Gibson, Alexander et al. (2024) Effectiveness of exercise rehabilitation interventions on depressive symptoms in older adults post hip fracture: a systematic review and meta-analysis. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA 35(2): 227-242	- Systematic review used as source of primary studies

Study	Code [Reason]
Mohler, Ralph, Richter, Tanja, Kopke, Sascha et al. (2023) Interventions for preventing and reducing the use of physical restraints for older people in all long-term care settings. The Cochrane database of systematic reviews 7: cd007546	- Systematic review used as source of primary studies
Molla-Casanova, Sara, Page, Alvaro, Lopez-Pascual, Juan et al. (2024) Effects of mirror neuron activation therapies on functionality in older adults: Systematic review and meta-analysis. Geriatric nursing (New York, N.Y.) 56: 115-123	- Study does not contain an intervention relevant to this review protocol
Moniati, F., Costa, C., Chatzimatthaiou, C. et al. (2023) EFFECT OF BALANCE TRAINING AFTER HIP FRACTURE SURGERY: A SYSTEMATIC REVIEW OF RANDOMISED CONTROLLED STUDIES. Age and Ageing 52(supplement1): i1-i2	- Conference abstract
Montero-Alia, Pilar, Miralles-Basseda, Ramon, Lopez-Jimenez, Tomas et al. (2019) Controlled trial of balance training using a video game console in community-dwelling older adults. Age and ageing 48(4): 506-512	- Study design not relevant to this review protocol
Mora Pinzon, Maria, Myers, Shannon, Jacobs, Elizabeth A et al. (2019) "Pisando Fuerte": an evidence-based falls prevention program for Hispanic/Latinos older adults: results of an implementation trial. BMC geriatrics 19(1): 258	- Study design not relevant to this review protocol
Morrison, Steven, Simmons, Rachel, Colberg, Sheri R et al. (2018) Supervised Balance Training and Wii Fit-Based Exercises Lower Falls Risk in Older Adults With Type 2 Diabetes. Journal of the American Medical Directors Association 19(2): 185e7-185e13	- No relevant outcomes
Murali, Sudarsan, Hargreaves, Mathew, Paul, Kyle et al. (2024) Impact of Sling Use on Functional Mobility in a Geriatric Population. Southern medical journal 117(3): 145-149	- Study does not contain an intervention relevant to this review protocol
Nash, Princess, Clark, Valerie, McConnell, Eleanor et al. (2024) Improving safety and preventing falls using an evidence-based, front-line staff huddling practice: protocol for a pragmatic trial to increase quality of care in State Veterans Homes. BMJ open 14(2): e084011	- Incorrect setting
NCT02774889. KOSO (keep on stepping on)/ stepping online. www.clinicaltrials.gov/ct2/show/NCT02774889	- Publication not available
Neil-Sztramko, Sarah, Coletta, Giulia, Teggart, Kylie et al. (2022) Community-based physical activity and/or nutrition interventions to promote mobility in older adults: An umbrella review. Annals of family medicine	- Systematic review used as source of primary studies
Nguyen, Natalie, Thalhammer, Regina, Meyer, Gabriele et al. (2023) Effectiveness of an individually tailored complex intervention to improve activities and participation in nursing home residents with joint contractures (JointConEval): a multicentre pragmatic cluster-randomised controlled trial. BMJ open 13(10): e073363	- Incorrect setting
Nikamp, Corien D M, Hobbelink, Marte S H, van der Palen, Job et al. (2019) The effect of ankle-foot orthoses on fall/near fall incidence in patients with (sub-)acute stroke: A randomized controlled trial. PloS one 14(3): e0213538	- Population not relevant to this review protocol

Study	Code [Reason]
Norgaard, Jens Eg, Andersen, Stig, Ryg, Jesper et al. (2023) Effect of Treadmill Perturbation-Based Balance Training on Fall Rates in Community-Dwelling Older Adults: A Randomized Clinical Trial. JAMA network open 6(4): e238422	- Comparator in study does not match that specified in this review protocol
Nouredanesh, Mina, Godfrey, Alan, Howcroft, Jennifer et al. (2021) Fall risk assessment in the wild: A critical examination of wearable sensor use in free-living conditions. Gait & posture 85: 178-190	- Review article but not a systematic review
O'Neil, Helen, Todd, Adam, Pearce, Mark et al. (2024) What are the consequences of over and undertreatment of type 2 diabetes mellitus in a frail population? A systematic review. Endocrinology, diabetes & metabolism 7(2): e00470	- Systematic review used as source of primary studies
Octary, Tiara; Gautama, Made Satya Nugraha; Duong, Hai (2023) Effectiveness of Vitamin D Supplements in Reducing the Risk of Falls among Older Adults: A Meta-Analysis of Randomized Controlled Trials. Annals of geriatric medicine and research 27(3): 192-203	- Systematic review used as source of primary studies
Oh, Se Jun and Lee, Sang Heon (2021) Comparing durability of water- and land-based exercise benefits among older adults in South Korea: A randomized controlled trial with 1-year follow-up. Journal of back and musculoskeletal rehabilitation 34(5): 745-755	- Study does not contain an intervention relevant to this review protocol
Okkersen, Kees, Jimenez-Moreno, Cecilia, Wenninger, Stephan et al. (2018) Cognitive behavioural therapy with optional graded exercise therapy in patients with severe fatigue with myotonic dystrophy type 1: a multicentre, single-blind, randomised trial. The Lancet. Neurology 17(8): 671-680	- Population not relevant to this review protocol
Okubo, Yoshiro, Sturnieks, Daina L, Brodie, Matthew A et al. (2019) Effect of Reactive Balance Training Involving Repeated Slips and Trips on Balance Recovery Among Older Adults: A Blinded Randomized Controlled Trial. The journals of gerontology. Series A, Biological sciences and medical sciences 74(9): 1489-1496	- Study does not contain an intervention relevant to this review protocol
Omuya, Helen, Nickel, Clara, Wilson, Paije et al. (2023) A systematic review of randomised-controlled trials on deprescribing outcomes in older adults with polypharmacy. The International journal of pharmacy practice 31(4): 349-368	- Study does not contain an intervention relevant to this review protocol
Orts-Cortes, Maria Isabel, Cabanero-Martinez, Maria Jose, Meseguer-Liza, Cristobal et al. (2024) Effectiveness of nursing interventions in the prevention of falls in older adults in the community and in health care settings: A systematic review and meta-analysis of RCT. Enfermeria clinica (English Edition) 34(1): 4-13	- Systematic review used as source of primary studies
Osuka, Yosuke, Nofuji, Yu, Seino, Satoshi et al. (2022) The effect of a multicomponent intervention on occupational fall-related factors in older workers: A pilot randomized controlled trial. Journal of occupational health 64(1): e12374	- Data not reported in an extractable format or a format that can be analysed
Pajewski, Nicholas M, Berlowitz, Dan R, Bress, Adam P et al. (2020) Intensive vs Standard Blood Pressure Control in Adults 80Years or Older: A Secondary Analysis of the Systolic Blood Pressure Intervention Trial. Journal of the American Geriatrics Society 68(3): 496-504	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Pantouvaki, Anna, Patelarou, Evridiki, Kastanis, Grigorios et al. (2023) The effect of an exercise-based rehabilitation programme in functional recovery and prevention of secondary falls after a hip fracture in older adults: A systematic review. Journal of frailty, sarcopenia and falls 8(2): 118-126	- Systematic review used as source of primary studies
Pekkarinen, T; Loyttyniemi, E; Valimaki, M (2013) Hip fracture prevention with a multifactorial educational program in elderly community-dwelling Finnish women. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA 24(12): 2983-92	- No useable outcomes
Percy, David, Phillips, Tyler, Torres, Fabian et al. (2023) Effectiveness of virtual reality-based balance and gait in older adults with fear of movement: A systematic review and meta-analysis. Physiotherapy research international : the journal for researchers and clinicians in physical therapy 28(4): e2037	- Systematic review used as source of primary studies
Perttila, Niko M, Ohman, Hanna, Strandberg, Timo E et al. (2018) Effect of Exercise on Drug-Related Falls Among Persons with Alzheimer's Disease: A Secondary Analysis of the FINALEX Study. Drugs & aging 35(11): 1017-1023	- Study does not contain an intervention relevant to this review protocol
Petriceks, Aldis H, Appel, Lawrence J, Miller, Edgar R 3rd et al. (2023) Timing of orthostatic hypotension and its relationship with falls in older adults. Journal of the American Geriatrics Society 71(12): 3711-3720	- Study does not contain an intervention relevant to this review protocol
Pettersson, Beatrice, Lundell, Sara, Lundin-Olsson, Lillemor et al. (2023) 'Maintaining balance in life'-exploring older adults' long-term engagement in self-managed digital fall prevention exercise. European review of aging and physical activity : official journal of the European Group for Research into Elderly and Physical Activity 20(1): 12	- No relevant outcomes
Phang, Jie Kie, Lim, Zhui Ying, Yee, Wan Qi et al. (2023) Post-surgery interventions for hip fracture: a systematic review of randomized controlled trials. BMC musculoskeletal disorders 24(1): 417	- Systematic review used as source of primary studies
Phu, Steven, Persiani, Michela, Tan, Brandon et al. (2023) The effects of optic flow on postural stability: Influence of age and fall risk. Experimental gerontology 175: 112146	- Study design not relevant to this review protocol
Piper, Katrine Storm, Suetta, Charlotte, Schou, Jakob Vasehus et al. (2024) The SaVe project - Sarcopenia and Vertigo in aging patients with colorectal cancer: A study protocol for three randomized controlled trials. Journal of geriatric oncology 15(4): 101770	- Trial protocol
Poorcheraghi, Hossein, Negarandeh, Reza, Pashaeypoor, Shahzad et al. (2023) Effect of using a mobile drug management application on medication adherence and hospital readmission among elderly patients with polypharmacy: a randomized controlled trial. BMC health services research 23(1): 1192	- Study does not contain an intervention relevant to this review protocol
Potter, Patricia, Pion, Sarah, Klinkenberg, Dean et al. (2014) An instructional DVD fall-prevention program for patients with cancer and family caregivers. Oncology nursing forum 41(5): 486-94	- Population not relevant to this review protocol

Study	Code [Reason]
Rahmati, Masoud, Keshvari, Maryam, Koyanagi, Ai et al. (2023) The effectiveness of community ageing in place, advancing better living for elders as a biobehavioural environmental approach for disability among low-income older adults: a systematic review and meta-analysis. Age and ageing 52(4)	- Systematic review used as source of primary studies
Rangon, Flavia Belavenuto, Marinho, Isabella Lopo, Cuviena, Cristina Faustino et al. (2024) Effects of the Anchor System on Postural Balance of Women Undergoing Breast Cancer Treatment: A Clinical, Randomized, Controlled, and Crossover Trial. Archives of physical medicine and rehabilitation 105(2): 258-267	- No relevant outcomes
Reeve, Emily, Jordan, Vanessa, Thompson, Wade et al. (2020) Withdrawal of antihypertensive drugs in older people. The Cochrane database of systematic reviews 6: cd012572	- No relevant outcomes
Reilmann, Ralf, McGarry, Andrew, Grachev, Igor D et al. (2019) Safety and efficacy of pridopidine in patients with Huntington's disease (PRIDE-HD): a phase 2, randomised, placebo-controlled, multicentre, dose-ranging study. The Lancet. Neurology 18(2): 165-176	- Study does not contain an intervention relevant to this review protocol
Rieger, Markus M, Papegaaij, Selma, Steenbrink, Frans et al. (2024) Effects of Perturbation-Based Treadmill Training on Balance Performance, Daily Life Gait, and Falls in Older Adults: REACT Randomized Controlled Trial. Physical therapy 104(1)	- Study does not contain an intervention relevant to this review protocol
Rocha, Paula, Baixinho, Cristina Lavareda, Marques, Andrea et al. (2024) Safety-promoting interventions for the older person with hip fracture on returning home: A systematic review. International journal of orthopaedic and trauma nursing 52: 101063	- Systematic review used as source of primary studies
Roger, H., Nicolas, M., Alice, B. et al. (2023) Pain in participants of a Swiss fall prevention study. Swiss Medical Weekly 153(supplement271): 21s	- Not a peer-reviewed publication
Roman, Eva, Kaur, Naujot, Sanchez, Elisabet et al. (2024) Home exercise, branched-chain amino acids, and probiotics improve frailty in cirrhosis: A randomized clinical trial. Hepatology communications 8(5)	- Population not relevant to this review protocol
Roncal-Belzunce, Victoria, Gutierrez-Valencia, Marta, Leache, Leire et al. (2024) Title: Systematic review and meta-analysis on the effectiveness of multidisciplinary interventions to address polypharmacy in community-dwelling older adults. Ageing research reviews: 102317	- Systematic review used as source of primary studies
Rooijackers, Teuni H, Kempen, Gertrudis I J M, Zijlstra, G A Rixt et al. (2021) Effectiveness of a reablement training program for homecare staff on older adults' sedentary behavior: A cluster randomized controlled trial. Journal of the American Geriatrics Society 69(9): 2566-2578	- Study does not contain an intervention relevant to this review protocol
Rooth, Vera, van der Aa, Hilde, Wisse, Robert P L et al. (2024) Health economic evaluation of a nurse-assisted online eye screening in home healthcare to reduce avoidable vision impairment (iScreen): study protocol for a cluster randomized controlled trial. Trials 25(1): 102	- Study does not contain an intervention relevant to this review protocol
Rosado, Hugo, Bravo, Jorge, Raimundo, Armando et al. (2022) Can two multimodal psychomotor exercise programs improve attention,	- Secondary publication of an included study that does not

Study	Code [Reason]
affordance perception, and balance in community dwellings at risk of falling? A randomized controlled trial. BMC public health 21(suppl2): 2336	provide any additional relevant information
Sabat, S., Sharma, S., Saini, P. et al. (2024) Comparing the Effect of Balance and Coordination Exercise on Different Platforms as on Floor, Swiss Ball & Foam in Geriatric Population - A Randomized Control Trial. Aging Medicine and Healthcare 15(1): 28-35	- Comparator in study does not match that specified in this review protocol
Sadaqa, Munseef, Debes, Wesam A, Nemeth, Zsanett et al. (2024) Multicomponent Exercise Intervention for Preventing Falls and Improving Physical Functioning in Older Nursing Home Residents: A Single-Blinded Pilot Randomised Controlled Trial. Journal of clinical medicine 13(6)	- Incorrect setting
Sadaqa, Munseef, Nemeth, Zsanett, Makai, Alexandra et al. (2023) Effectiveness of exercise interventions on fall prevention in ambulatory community-dwelling older adults: a systematic review with narrative synthesis. Frontiers in public health 11: 1209319	- Systematic review used as source of primary studies
Sadura-Sieklucka, Teresa, Czerwosz, Leszek Tomasz, Kadalska, Ewa et al. (2023) Is Balance Training Using Biofeedback Effective in the Prophylaxis of Falls in Women over the Age of 65?. Brain sciences 13(4)	- Comparator in study does not match that specified in this review protocol
Sam, Rui Ying, Lau, Yue Fang Patricia, Lau, Ying et al. (2023) Types, functions and mechanisms of robot-assisted intervention for fall prevention: A systematic scoping review. Archives of gerontology and geriatrics 115: 105117	- Systematic review used as source of primary studies
Sampaio, Tatiana, Encarnacao, Samuel, Santos, Olga et al. (2023) The Effectiveness of Pilates Training Interventions on Older Adults' Balance: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Healthcare (Basel, Switzerland) 11(23)	- Systematic review used as source of primary studies
Santos, Isis Kelly Dos, Cobucci, Ricardo Ney, Medeiros, Jason Azevedo de et al. (2024) Home-Based Indoor Physical Activity Programs for Community-Dwelling Older Adults: A Systematic Review. Sports health 16(3): 377-382	- Systematic review used as source of primary studies
Satoh, Atsuko, Kudoh, Yukoh, Lee, Sangun et al. (2021) Toe Clearance Rehabilitative Slippers for Older Adults With Fall Risk: A Randomized Controlled Trial. Geriatric orthopaedic surgery & rehabilitation 12: 21514593211029102	- No relevant outcomes
Saucedo, F, Chavez, E A, Vanderhoof, H R et al. (2021) Effects of Controlled Whole-Body Vibration Training on Functional Performance Among Healthy Older Adults: A 6-Week Pilot Study. JAR life 10: 39-44	- No relevant outcomes
Saucedo, F, Chavez, E A, Vanderhoof, H R et al. (2022) Effects of Controlled Whole-body Vibration Training on Balance and Fall Outcomes Among Healthy Older Adults: A 6-Week Pilot Study. JAR life 11: 31-37	- No relevant outcomes
Scarmagnan, Gabriella Simoes, Lino, Tayla Borges, Pimentel, Daniel Espindola et al. (2024) Benefits of a Dual-Task Training on Motor and Cognitive Functions in Community-Dwelling Older Adults: A Controlled Clinical Trial. American journal of physical medicine & rehabilitation 103(5): 377-383	- No relevant outcomes

Study	Code [Reason]
Schafer, Zoe A; Perry, John L; Vanicek, Natalie (2018) A personalised exercise programme for individuals with lower limb amputation reduces falls and improves gait biomechanics: A block randomised controlled trial. Gait & posture 63: 282-289	- Population not relevant to this review protocol
Schinzel, Eileen, Kast, Stephanie, Kohl, Matthias et al. (2023) The effect of aquatic exercise on bone mineral density in older adults. A systematic review and meta-analysis. Frontiers in physiology 14: 1135663	- Systematic review used as source of primary studies
Schwarzbach, Christopher J, Eichner, Felizitas Anna, Rucker, Viktoria et al. (2023) The structured ambulatory post-stroke care program for outpatient aftercare in patients with ischaemic stroke in Germany (SANO): an open-label, cluster-randomised controlled trial. The Lancet. Neurology 22(9): 787-799	- No relevant outcomes
Schwenk, Michael, Bergquist, Ronny, Boulton, Elisabeth et al. (2019) The Adapted Lifestyle-Integrated Functional Exercise Program for Preventing Functional Decline in Young Seniors: Development and Initial Evaluation. Gerontology 65(4): 362-374	- Study design not relevant to this review protocol
Scragg, R K R (2019) Overview of results from the Vitamin D Assessment (ViDA) study. Journal of endocrinological investigation 42(12): 1391-1399	- Population not relevant to this review protocol
Seppala, Lotta J, Kamkar, Nellie, van Poelgeest, Eveline P et al. (2022) Medication reviews and deprescribing as a single intervention in falls prevention: a systematic review and meta-analysis. Age and ageing 51(9)	- Systematic review used as source of primary studies
Siegrist, M, Schaller, N, Weis, M et al. (2023) Study protocol of a cluster-randomised controlled trial assessing a multimodal machine-based exercise training programme in senior care facilities over 6 months - the bestform study (best function of range of motion). BMC geriatrics 23(1): 505	- Trial protocol
Smith, Sherri L, Francis, Howard W, Witsell, David L et al. (2024) A Pragmatic Clinical Trial of Hearing Screening in Primary Care Clinics: Effect of Setting and Provider Encouragement. Ear and hearing 45(1): 23-34	- Comparator in study does not match that specified in this review protocol
Sprague, Briana N; Ross, Lesley A; Ball, Karlene K (2023) Does Cognitive Training Reduce Falls across Ten Years?: Data from the ACTIVE Trial. International journal of environmental research and public health 20(6)	- Study does not contain an intervention relevant to this review protocol
Squires, Patrick J, Pahor, Marco, Manini, Todd M et al. (2019) Effect of Gastric Acid Suppressants on Response to a Physical Activity Intervention and Major Mobility Disability in Older Adults: Results from the Lifestyle Interventions for Elders (LIFE) Study. Pharmacotherapy 39(8): 816-826	- Data not reported in an extractable format or a format that can be analysed
Squires, Patrick, Pahor, Marco, Manini, Todd M et al. (2020) Impact of Anticholinergic Medication Burden on Mobility and Falls in the Lifestyle Interventions for Elders (LIFE) Study. Journal of clinical medicine 9(9)	- Study design not relevant to this review protocol
Stahl, J. and Belisle, S. (2019) Medical qigong intervention for improved balance & stability. Journal of Alternative and Complementary Medicine 25(10): a26	- Population not relevant to this review protocol

Study	Code [Reason]
Stasi, Sophia, Tsekoura, Maria, Gliatis, John et al. (2021) Motor Control and Ergonomic Intervention Home-Based Program: A Pilot Trial Performed in the Framework of the Motor Control Home Ergonomics Elderlies' Prevention of Falls (McHeELP) Project. Cureus 13(4): e14336	- No relevant outcomes
Stevens-Lapsley, Jennifer E, Derlein, Danielle, Churchill, Laura et al. (2023) High-intensity home health physical therapy among older adult Veterans: A randomized controlled trial. Journal of the American Geriatrics Society 71(9): 2855-2864	- Systematic review used as source of primary studies - Comparator in study does not match that specified in this review protocol
Sun, Mingyu, Min, Leizi, Xu, Na et al. (2021) The Effect of Exercise Intervention on Reducing the Fall Risk in Older Adults: A Meta-Analysis of Randomized Controlled Trials. International journal of environmental research and public health 18(23)	- Systematic review used as source of primary studies
Sung, Chien-Mei, Jen, Hsiu-Ju, Liu, Doresses et al. (2023) The effect of cognitive training on domains of attention in older adults with mild cognitive impairment and mild dementia: A meta-analysis of randomised controlled trials. Journal of global health 13: 04078	- Systematic review used as source of primary studies
Szanton, Sarah L, Clemson, Lindy, Liu, Minhui et al. (2021) Pilot Outcomes of a Multicomponent Fall Risk Program Integrated Into Daily Lives of Community-Dwelling Older Adults. Journal of applied gerontology : the official journal of the Southern Gerontological Society 40(3): 320-327	- No relevant outcomes
Tan, Long; He, Ruiqian; Zheng, Xiaoxue (2024) Effect of vitamin D, calcium, or combined supplementation on fall prevention: a systematic review and updated network meta-analysis. BMC geriatrics 24(1): 390	- Systematic review used as source of primary studies
Tanhamira, Lesley-Anne; Randhawa, Gurch; Hewson, David (2024) The effects of adapted mind-body exercises on physical function, quality of life and wellbeing for older people: a systematic review and meta-analysis. The journal of nutrition, health & aging 28(4): 100186	- Systematic review used as source of primary studies
Tao, Xiaoyang, Yang, Wupeng, Zhang, Qinxin et al. (2024) Effects of intermittent overload doses of oral vitamin D3 on serum 25(OH)D concentrations and the incidence rates of fractures, falls, and mortality in elderly individuals: A systematic review and meta-analysis. Biomolecules & biomedicine	- Systematic review used as source of primary studies
Taylor, Lynne M, Parsons, John, Moyes, Simon A et al. (2024) Effects of an Exercise Program to Reduce Falls in Older People Living in Long-Term Care: A Randomized Controlled Trial. Journal of the American Medical Directors Association 25(2): 201-208e6	- Incorrect setting
Tekkus, Bagdat and Mutluay, Fatma (2023) Effect of community-based group exercises combined with action observation on physical and cognitive performance in older adults during the Covid-19 pandemic: A randomized controlled trial. PloS one 18(12): e0295057	- Comparator in study does not match that specified in this review protocol

Study	Code [Reason]
Temporiti, Federico, Galbiati, Elena, Bianchi, Francesco et al. (2024) Early sleep after action observation plus motor imagery improves gait and balance abilities in older adults. Scientific reports 14(1): 3179	- Comparator in study does not match that specified in this review protocol
Thomas, E., Battaglia, G., Patti, A. et al. (2019) Physical activity programs for balance and fall prevention in elderly. Medicine (United States) 98(27): 1-9	- Systematic review used as source of primary studies
Tol, Maria C J M, Willigenburg, Nienke W, Rasker, Ariena J et al. (2024) Posterolateral or Direct Lateral Surgical Approach for Hemiarthroplasty After a Hip Fracture: A Randomized Clinical Trial Alongside a Natural Experiment. JAMA network open 7(1): e2350765	- Comparator in study does not match that specified in this review protocol
Tomita, Machiko R, Fisher, Nadine M, Ramsey, Dan et al. (2019) Follow-Up of a Virtual-Group-Exercise at Home Program to Reduce Fall Risks. Journal of the American Geriatrics Society 67(9): 1981-1983	- Secondary publication of an included study that does not provide any additional relevant information
Tousignant, Michel, Corriveau, Helene, Roy, Pierre-Michel et al. (2013) Efficacy of supervised Tai Chi exercises versus conventional physical therapy exercises in fall prevention for frail older adults: a randomized controlled trial. Disability and rehabilitation 35(17): 1429-35	- No relevant outcomes
Tsekoura, M, Kastrinis, A, Nomikou, E et al. (2023) Telerehabilitation and Fall Prevention in Older Adults. Advances in experimental medicine and biology 1425: 485-489	- Systematic review used as source of primary studies
Tsekoura, Maria, Stasi, Sophia, Gliatis, John et al. (2021) Methodology of a home-based motor control exercise and ergonomic intervention programme for community-dwelling older people: The McHeELP study. Journal of frailty, sarcopenia and falls 6(3): 153-162	- Study design not relevant to this review protocol
Tuena, Cosimo, Borghesi, Francesca, Bruni, Francesca et al. (2023) Technology-Assisted Cognitive Motor Dual-Task Rehabilitation in Chronic Age-Related Conditions: Systematic Review. Journal of medical Internet research 25: e44484	- Systematic review used as source of primary studies
Usta Ozdemir, Hande; Kitis, Ali; Ardic, Fazil Necdet (2024) Dual- and Single-Task Training in Older Adults With Age-Related Hearing Loss: A Randomized Controlled Study. Journal of aging and physical activity: 1-12	- Study does not contain an intervention relevant to this review protocol
Uusi-Rasi, K, Patil, R, Karinkanta, S et al. (2019) Serum 25-hydroxyvitamin D levels and incident falls in older women. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA 30(1): 93-101	- Study design not relevant to this review protocol
Veronese, Nicola, Gallo, Umberto, Boccardi, Virginia et al. (2024) Efficacy of deprescribing on health outcomes: An umbrella review of systematic reviews with meta-analysis of randomized controlled trials. Ageing research reviews 95: 102237	- Systematic review used as source of primary studies
Walsh, Gregory S; Delextrat, Anne; Bibbey, Adam (2023) The comparative effect of exercise interventions on balance in perimenopausal and early postmenopausal women: A systematic	- Systematic review used as source of primary studies

Study	Code [Reason]
review and network meta-analysis of randomised, controlled trials. Maturitas 175: 107790	
Wang, Belinda Y, Sherrington, Catherine, Fairhall, Nicola et al. (2023) Exercise for fall prevention in community-dwelling people aged 60+: more effective in trials with higher fall rates in control groups. Journal of clinical epidemiology 159: 116-127	- Secondary publication of an included study that does not provide any additional relevant information
Wang, Yiru, Bhatt, Tanvi, Liu, Xuan et al. (2019) Can treadmill-slip perturbation training reduce immediate risk of over-ground-slip induced fall among community-dwelling older adults?. Journal of biomechanics 84: 58-66	- Data not reported in an extractable format or a format that can be analysed
Watanabe, Kumi, Kamijo, Yuka, Yanagi, Mai et al. (2021) Home-based exercise and bone mineral density in peritoneal dialysis patients: a randomized pilot study. BMC nephrology 22(1): 98	- No relevant outcomes
Waters, Debra L, Popp, Janet, Herman, Carla et al. (2022) The Otago Exercise Program compared to falls prevention education in Zuni elders: a randomized controlled trial. BMC geriatrics 22(1): 652	- Data not reported in an extractable format or a format that can be analysed
Wegener, Emilie Kauffeldt and Kayser, Lars (2023) Smart health technologies used to support physical activity and nutritional intake in fall prevention among older adults: A scoping review. Experimental gerontology 181: 112282	- Systematic review used as source of primary studies
Wei, Fei-Long, Li, Tian, Gao, Quan-You et al. (2022) Association Between Vitamin D Supplementation and Fall Prevention. Frontiers in endocrinology 13: 919839	- Population not relevant to this review protocol
Wesselink, Elsbeth J, van der Vegt, Marinus, Remmelzwaal, Sharon et al. (2024) The impact of mental state altering medications on preventable falls after total hip or total knee arthroplasty: a systematic review and meta-analysis. Patient safety in surgery 18(1): 6	- Comparator in study does not match that specified in this review protocol
Western, Max J, Welsh, Tomas, Keen, Kristen et al. (2023) Exercise snacking to improve physical function in pre-frail older adult memory clinic patients: a 28-day pilot study. BMC geriatrics 23(1): 471	- Study design not relevant to this review protocol
White, William B, Wakefield, Dorothy B, Moscufo, Nicola et al. (2019) Effects of Intensive Versus Standard Ambulatory Blood Pressure Control on Cerebrovascular Outcomes in Older People (INFINITY). Circulation 140(20): 1626-1635	- Study does not contain an intervention relevant to this review protocol
Whitehead, Phillip J, Belshaw, Stuart, Brady, Samantha et al. (2024) Bathing Adaptations in the Homes of Older Adults (BATH-OUT-2): study protocol for a randomised controlled trial, economic evaluation and process evaluation. Trials 25(1): 75	- Trial protocol
Wieczorek, Maud, Isler, Marlis, Landau, Klara et al. (2024) Association Between Visual Acuity and Prospective Fall Risk in Generally Healthy and Active Older Adults: The 3-Year DO-HEALTH Study. Journal of the American Medical Directors Association 25(5): 789-795e2	- Study design not relevant to this review protocol
Williamson, Esther, Boniface, Graham, Marian, Ioana R et al. (2022) The Clinical Effectiveness of a Physiotherapy Delivered Physical and Psychological Group Intervention for Older Adults With Neurogenic Claudication: The BOOST Randomized Controlled	- Duplicate reference

Study	Code [Reason]
Trial. The journals of gerontology. Series A, Biological sciences and medical sciences 77(8): 1654-1664	
Williamson, Esther, Sanchez-Santos, Maria T, Marian, Ioana R et al. (2023) Improving the understanding and management of back pain in older adults: the BOOST research programme including RCT and OPAL cohort.	- Review article but not a systematic review
Witham, M.D., Price, R.J.G., Band, M.M. et al. (2019) Effect of oral vitamin K2 supplementation on postural sway and physical function in older people with a history of falls: A pilot randomised controlled trial. Age and Ageing 48(supplement2)	- Conference abstract
Wong, R.M.Y., Ho, W.T., Tso, C.Y. et al. (2019) Vibration therapyas an intervention for postural training and fall prevention after distal radius fracture in elderly patients: A randomized controlled trial. Osteoporosis International 30(suppl2): 766	- Conference abstract
Wood, A D, Secombes, K R, Thies, F et al. (2014) A parallel group double-blind RCT of vitamin D3 assessing physical function: is the biochemical response to treatment affected by overweight and obesity?. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA 25(1): 305-15	- Population not relevant to this review protocol *Mean age of population is less than 65 years*
Xiong, An, Li, Haibo, Lin, Miaoying et al. (2024) Effects of active vitamin D analogues on muscle strength and falls in elderly people: an updated meta-analysis. Frontiers in endocrinology 15: 1327623	- Systematic review used as source of primary studies
Xu, Fan, Soh, Kim Geok, Chan, Yoke Mun et al. (2023) Effects of tai chi on postural balance and quality of life among the elderly with gait disorders: A systematic review. PloS one 18(9): e0287035	- Systematic review used as source of primary studies
Yaacob, Nor Liana Che, Loganathan, Mathumalar, Hisham, Nur Azwa et al. (2024) The Impact of Pharmacist Medication Reviews on Geriatric Patients: A Scoping Review. Korean journal of family medicine	- Systematic review used as source of primary studies
Yadav, A. and Jain, A. (2022) Effect of Strength Training and Fall Prevention Guide on Balance in Community Dwelling Elderly Population. NeuroQuantology 20(7): 269-274	- Data not reported in an extractable format or a format that can be analysed
Yang, Feng, Su, Xiaogang, Sanchez, Maria Cristal et al. (2023) Vibration training reducing falls in community-living older adults: a pilot randomized controlled trial. Aging clinical and experimental research	- Data not reported in an extractable format or a format that can be analysed
Yang, Yiyi, Ma, Guifen, Wei, Suhong et al. (2024) Adverse outcomes of intrinsic capacity in older adults: A scoping review. Archives of gerontology and geriatrics 120: 105335	- Systematic review used as source of primary studies
You, T., Koren, Y., Butts, W.J. et al. (2023) Pilot studies of recruitment and feasibility of remote Tai Chi in racially diverse older adults with multisite pain. Contemporary Clinical Trials 128: 107164	- Study design not relevant to this review protocol
Zadro, Joshua R, Shirley, Debra, Simic, Milena et al. (2019) Video-Game-Based Exercises for Older People With Chronic Low Back Pain: A Randomized Controlledtable Trial (GAMEBACK). Physical therapy 99(1): 14-27	- No relevant outcomes
Zareipour M, Mazloomy Mahmoodabad SS. (2020) The effect of educational intervention on promoting knowledge and self-efficacy	- Non-English language study

Study	Code [Reason]
of elderly in preventing falling. Journal of Safety Promotion and Injury Prevention. 7(4):226-33.	
Zhang, Wenyu, Sun, Juan, Feng, Xinghui et al. (2023) Effectiveness of Tai Chi exercise on fear of falling and balance in older adults: A meta-analysis. Geriatric nursing (New York, N.Y.) 51: 194-201	- Systematic review used as source of primary studies
Zhao, Rui, Zhao, Xiangdi, Guan, Jianzhong et al. (2023) The effect of virtual reality technology on anti-fall ability and bone mineral density of the elderly with osteoporosis in an elderly care institution. European journal of medical research 28(1): 204	- Comparator in study does not match that specified in this review protocol
Zheng, Yuxin, Wang, Xuezong, Zhang, Zong-Kang et al. (2019) Bushen Yijing Fang Reduces Fall Risk in Late Postmenopausal Women with Osteopenia: A Randomized Double-blind and Placebo-controlled Trial. Scientific reports 9(1): 2089	- Study does not contain an intervention relevant to this review protocol
Zhou, Dan; Chen, Zhaoyan; Tian, Fangyuan (2023) Deprescribing Interventions for Older Patients: A Systematic Review and Meta-Analysis. Journal of the American Medical Directors Association 24(11): 1718-1725	- Systematic review used as source of primary studies
Zhou, Shuang, Li, Rui, Zhang, Xiaolin et al. (2023) The effects of pharmaceutical interventions on potentially inappropriate medications in older patients: a systematic review and meta-analysis. Frontiers in public health 11: 1154048	- Systematic review used as source of primary studies

J.2 Health Economic studies

Published health economic studies that met the inclusion criteria (relevant population, comparators, economic study design, published 2007 or later and not from non-OECD country or USA) but that were excluded following appraisal of applicability and methodological quality are listed below. See the health economic protocol for more details.

J.2.1 Education

Table 37: Studies excluded from the health economic review

Reference	Reason for exclusion
Harper 2019[25]. Education intervention compared to usual care in community setting.	Excluded as rated partially applicable with very serious limitations. No QoL and therefore no QALYs. Short time horizon, based on single study excluded from clinical review (quasi-randomised trial) and so may not reflect the full body of evidence. Based on Australian 2015-unit costs which may not reflect current NHS context.
Harper KJ, Arendts G, Geelhoed EA, et al. (2019). Cost analysis of a brief intervention for the prevention of falls after discharge from an emergency department Journal of Evaluation in	Education intervention compared to usual care in community setting. Excluded as rated partially applicable with very serious limitations. No QoL and therefore no QALYs. Short time horizon, based on single study excluded from clinical review (quasi-randomised trial) and so may not reflect the full body of evidence. Based on Australian 2015 unit costs which may not reflect current NHS context.

Reference	Reason for exclusion
Clinical Practice 25 (2): 244-250.	

J.2.2 Medication provision

Table 38: Studies excluded from the health economic review

Reference	Reason for exclusion
None	

J.2.3 Vitamin D interventions

Table 39: Studies excluded from the health economic review

Reference	Reason for exclusion
Patil 2016[47]	Vitamin D in community setting. This study was assessed as partially applicable (Finnish healthcare perspective, with 2011 costs, no QoL and therefore no QALYs, discounting not reported) and judged to have potentially serious limitations (within trial analysis based on single RCT, may not reflect full body of evidence and short time horizon). However, given that a more applicable UK model exploring the cost effectiveness of Vitamin D, which included QALYs and was based on a meta-analysis of 8 RCTs was available (Poole 2015 [52]) this study was selectively excluded.

J.2.4 Nutrition interventions

Table 40: Studies excluded from the health economic review

Reference	Reason for exclusion
None	

J.2.5 Psychological interventions

Table 41: Studies excluded from the health economic review

Reference	Reason for exclusion
None	

J.2.6 Surgical interventions

Table 42: Studies excluded from the health economic review

Reference	Reason for exclusion
Huang-Lung, Jessie, Chun Ho, Kam, Lung, Thomas et al. (2023) Healthcare costs following falls and cataract surgery in older adults using	- Wrong intervention/comparator *[Investigates the cost of falls while waiting for surgery, there is no comparator]*

Reference	Reason for exclusion
Australian linked health data from 2012-2019. Public health research & practice	

Appendix K Research recommendations

K.1 Education interventions

None.

K.2 Medication provision

None.

K.3 Vitamin D interventions

None.

K.4 Nutrition interventions

None

K.5 Psychological interventions

None.

K.6 Surgical interventions

None.