National Institute for Health and Care Excellence

Final

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

Evidence review G: Interventions for prevention of falls in hospital settings

NICE guideline NG249

Evidence reviews underpinning recommendations 1.3.15 to 1.3.19 and recommendations for research in the NICE guideline

April 2025

Final

This evidence review was developed by NICE

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1.1. Review question

What are the most clinically and cost-effective methods for falls prevention in older people in hospital?

1.1.1. Introduction

Falls in older people often leads to poor outcomes, preventable admissions and costs the NHS approximately £2.3 billion per year (NICE, 2013). Comprising a large percentage of this figure, are the unplanned conveyances and admissions that many of these falls result in. In the year 2017-2018, there were 220,160 emergency admissions of people over 65 caused by a fall. These figures are likely to have increased significantly due to the impact of the pandemic on the older population, while simultaneously NHS spending on the care of older people reduces (Gentry, Jopling & Reeves, 2023; OHID, 2022).

Older patients admitted to hospital, particularly those over 65 and living with frailty, are a high risk of an extended length of stay, functional deterioration, reduced mobility, impaired quality of life, shortened life span and a multitude of additional complications (OHID, 2022; Hopper, 2021). According to current national guidance, the most clinically and cost-effective method for falls prevention for older people in hospital is proactive care, ideally commenced prior to the occurrence of a fall, with early risk identification, initiation of a good quality multifactorial assessment and the implementation of actions generated from this process. All people over 65 or those with a condition that puts them at high risk of falls, on any ward, should have this multifactorial assessment followed by personalised interventions. The details of this should be accessible by other relevant health and social care services (Royal College of Physicians, 2022; NICE, 2013).

In current practice, however, this may not always be occurring, largely due to increasing demand and pressures on NHS services, workforce challenges and funding (Stokel-Walker, 2023). Since the previous release of NICE CG161, there is some new research and data reviewing the impacts and/or quality of current interventions and recommendations, which will be reviewed in this guideline update.

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 hospital 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 hospital. Interventions grouped by combination (single, multiple, or multifactorial); then by type of intervention (descriptors). Possible descriptors include: • Exercises: group and individual • Medication: drug target (i.e. withdrawal, dose reduction or increase, substitution, provision, etc). • Surgery • Management of urinary incontinence, fluid, or nutrition therapy

	• Psychological interventions • Environment/ assistive technology • Social environment • Interventions to increase knowledge
Comparison(s)	• Any other intervention • Usual care • Placebo
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 events 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.

This review includes a Cochrane review,[4] which matched the protocol for our question. Cameron 2018[4] included older people in residential care and in hospitals, of which we included the hospital population within this review. Please see review H for the residential care population review. We have updated the Cochrane review[4] to include all recent papers, which were identified in the search, that matched the protocol for Review G. Extractions for studies included in the Cameron 2018[4] can be found within the Cochrane review, and any studies updating it can be found in the study extractions in this review.

Population

Cameron 2018[4] included studies where the majority of participants were over 65 years, or the mean age was over 65 years and were patients in hospital. This may not have included the population of under 65 years with conditions that put them at increased risk of falls, however no studies were excluded on this basis.

Cameron 2018[4] excluded participants post-stroke, as interventions to prevent falls in this population are reviewed in a separate Cochrane Review (Verheyden 2013)[42]. Focusing on specific populations was outside of our scope, therefore, Verheyden 2013[42] was not included within this review. Cameron 2018[4] excluded interventions within emergency departments, outpatient departments or where hospital services were provided in community settings. We also excluded these settings from this review as they are included in a separate review on the Interventions to prevent falls in the community. Cameron 2018[4] subdivided hospitals into those providing acute and sub-acute care, however this was not a subgroup within our protocol.

Interventions

The Cameron 2018[4] review grouped interventions using a fall-prevention classification system according to the Prevention of Falls Network Europe (ProFaNE). Under this system, interventions were further grouped by subtype of intervention, such as for types of exercise. This was completed in order to minimise heterogeneity

Outcomes

The Cameron 2018[4] review reported the treatment effect for rate of falls as a 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). Where studies continued to monitor falls after discharge Cameron 2018[4] used the results reported at discharge from hospital. We have followed this methodology for any studies added as part of the update of this review.

Rate of falls

The Cameron 2018 review[4] used a rate ratio (incidence rate ratio or hazard ratio) and 95% CI if these were reported in the paper. If adjusted and unadjusted results were given, they used the unadjusted estimate unless the adjustment was for clustering. If a rate ratio was not reported but appropriate raw data was available, they calculated the rate ratio. They used the reported rate of falls (falls per person year) in each group, and the total number of falls for participants within the study or calculated the rate of falls in each group from the total number of falls and the actual total length of times falls were monitored (person years) for participants contributing data. Likewise, where rate ratio was not provided, we calculated the rate ratio, using an excel spreadsheet calculator. Cameron 2018[4] reported that where there were no falls in one arm of a study, and a low total number of falls and/or participants, the rate of falls could not be determined and therefore not included in the meta-analyses.

Risk of falling

Cameron 2018[4] states that for number of fallers a risk ratio was used for number of people who fell once or more. They used an estimate of risk (hazard ratio for first fall, risk ratio (relative risk), or odds ratio) and 95% CI, if they were reported. If both adjusted and unadjusted estimates were reported, they used an unadjusted estimate unless the adjustment was for clustering. This differs from NICE methodology, so we used adjusted estimates where they were available in studies.

Missing data

Only the available data were used in Cameron 2018[4], no missing data were imputed.

Meta-analysis and GRADE

We added studies from the update searches to the Cameron 2018[4] Cochrane review 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 the other components according to NICE methodology. Cameron 2018[4] mentions *'for all comparisons where there were two or more trials, GRADE assessment was performed independently by two review authors and disagreement was resolved by discussion, or by adjudication with a third review author. We adopted a different approach for single trial comparisons, where we started with the assumption that the quality of evidence was likely to be very low*'. NICE methodology does not make this assumption and conducts GRADE on all evidence. The Cameron review selected certain comparisons for presentation in summary of findings tables, whereas for the studies added as part of the update all comparisons are reported in the review.

The Cameron 2018 Cochrane review used the generic inverse variance method in Revman. This enabled pooling of the adjusted and unadjusted treatment effect estimates for rate ratios or risk ratios. They report that where the total number of patients, rather than admissions, could not be determined, they did not pool the data with other studies. In order for our results

from the new studies added 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 Cameron 2018[4] so the studies identified within it were checked for this data and included in this analysis.

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

1.1.4. Effectiveness evidence

1.1.4.1. Included studies

Thirty-four randomised controlled trials were included in the review. Twelve randomised controlled studies were identified from searching and were included in the review and are summarised in Table 2: Summary of studies included in the evidence review below [6, 7, 10, 16, 22, 23, 25, 26, 29, 30, 32, 35]. Twenty-two studies were identified from the Cameron review [1-3, 8, 9, 11, 12, 14, 17, 18, 20, 24, 28, 31, 33, 37-39, 41, 43, 44]. 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 Appendix D, forest plots in Appendix E and GRADE tables in Appendix F.

One Cochrane review[4] was identified in the search.

The studies identified included the following comparisons:

- Resistance and balance exercise to resistance exercise alone.[26]
- Simple supervised exercise to usual care.[35]
- HELP intervention to usual care.[25]
- STOPPFrail-guiding deprescribing in combination with usual care to usual care alone.[6]
- Digitally enabled rehabilitation in addition to usual care to usual care alone.[16]
- Simulation education program to written education program.[7]
- STOPP/START to Potentially Inappropriate Medication (PIM)check.[10]
- Motivational interviewing to routine hospital falls prevention protocol.[23]
- Tailored exercise to usual care.[30]
- Individualised exercise to usual care.[29]
- Tailored strength and balance exercise to stretching and exercise.[32]
- Nutritional support to usual care.[22]

The included studies focused on hospitalised patients. However, one study[30] specifically focused on hospitalised patients with diabetes.

1.1.4.2. Excluded studies

Cochrane reviews were identified but could not be included due to study designs that we would not include, such as quasi-randomised controlled trials.[15] The studies included in these were checked for relevance to the review.

See the excluded studies list in Appendix J.

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
Ang, 2011[1] Parallel RCT	Individualised education session plus usual care (n=910) Usual care (n=912) Duration of the study: 8 months	Patients at a high risk of falling in an acute care hospital, aged 21 or over with a Hendrich II Fall Risk Model score of 5 or above Mean age (SD): IG: 70.3 (14.2); CG 69.7 (14.7) years Sex: 50% women Setting: Acute care hospital, Singapore	Number of fallers	Study identified in Cochrane (Cameron, 2018)[4]
Barker, 2016[2] Cluster RCT	Multifactorial intervention (risk assessment and up to 6 interventions for high-risk patients plus staff education) (n=17698) Usual care (n=17566) Duration of the study: 6 months intervention, follow-up to 12 months	Patients in medical and surgical wards Median age (IQR): IG 68 (51-80); CG 67 (51-79) years Sex: IG: 50.6%; CG: 48.5% women Setting: 24 acute medical and surgical wards from 6 hospitals, Australia	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018)[4]
Burleigh, 2007[3] Parallel RCT	Vitamin D supplements (800IU oral cholecalciferol) plus calcium (1200mg) daily (n=101) Calcium alone (1200mg daily) (n=104) Duration of the study: approx. 9 months	Hospitalised adults in subacute care Mean age (SD): IG: 82.3 (7.6); CG: 83.7 (7.6) Sex: 59% women Setting: acute geriatric unit, Glasgow, UK	Number of fallers; number of people sustaining a fracture; adverse events (gastrointestinal complaints)	Study identified in Cochrane (Cameron, 2018)[4]
Cumming, 2008[5] Cluster RCT (12	Multifactorial intervention (risk assessment, staff and patient education, drug	Hospitalised adults in acute and subacute care	Rate of falls; number of fallers; number of people sustaining a fracture	Study identified in Cochrane (Cameron, 2018)[4]

Study	Intervention and comparison	Population	Outcomes	Comments
matched pairs of wards)	review, environmental modifications, and exercise) (12 clusters; n=2047) Usual care (12 clusters; n=1952) Duration of the study: 3 months	Mean age (SD): 79 (12.8) years Sex: 59% women Setting: 12 hospitals, Sydney, Australia		
Curtin, 2020[6]	De-prescribing plan (STOPPFrail-guided) and usual care (n=65) Usual care alone (n=65) Duration of study: 3 months follow-up	Hospitalised older adults with advanced frailty and polypharmacy, 75 or over Mean age (SD): IG: 85.68 (5.87); CG: 84.49 (5.60) years Sex: IG: 58%; CG: 65% women Setting: two acute hospitals in Ireland	Rate of falls; number of fallers; number of people sustaining a fracture (non-vertebral)	The participants were transferring to long-term nursing home care
DeWalt, 2023[7] Parallel RCT One hospital	Simulation falls education (n=38) Written falls education handout (N=45) Duration of study: 6 months follow-up	Hospitalised adults, 65 years or over Mean age (SD): 78.4 (8.2) years Sex: 67.5% women Setting: Teaching hospital, USA	Number of fallers	Three timepoints were reported (1 week, 3 months and 6 months post-discharge)
Donald, 2000[8] RCT (2x2 factorial design)	Multifactorial study of supervised exercises and flooring types (n=30) Usual care (n=24) Duration of the study: 9 months	Hospitalised adults in subacute care Mean age: 83 years Sex: 81% women Setting: on elderly care rehabilitation ward, Gloucester, UK	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018)[4]
Dykes, 2010[9] Cluster RCT	Fall prevention tool kit software (n=5160) Usual care (n=5104)	Hospitalised adults in acute care, aged 65 and over Mean age (SD): 78.8 (8.4) years	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018)[4]

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of the study: 6 months	Sex: NR Setting: 8 acute medical units, Boston, USA		
Farhat, 2022[10] Parallel RCT	Potentially Inappropriate Medication checklist (PIM check) (n=60) Screening Tool of Older Persons' potentially inappropriate Prescriptions/Screening Tool to Alert doctors to the Right Team (STOPP/START) (n=63) Duration of study: 3 months follow-up for hospital readmission	Older hospitalised patients Mean age (SD): 86.3 (6.6) years Sex: 74.8% women Setting: Lausanne University hospital, Switzerland	Number of fallers	Falls reported at discharge.
Haines, 2004[12] Parallel RCT	Multifactorial intervention (risk assessment and targeted interventions (exercise, educational sessions, and hip protectors)) (n=310) Usual care (n=316) Duration of study: NR	Hospitalised adults in subacute care Mean age (SD): 80 (9) years Sex: 67% women Setting: one hospital (3 subacute wards), Melbourne, Australia	Rate of falls; number of fallers; number of people sustaining a fracture	Study identified in Cochrane (Cameron, 2018) [4]
Haines, 2010[11] Cluster RCT (pairs of hospital wards matched on rate of falls in last 6 months)	Environment (Low-low beds) (9 clusters) Usual care (9 clusters) Duration of study: 6 months	Hospitalised adults in subacute care Mean age (SD): NR Sex: NR Setting: 18 hospital wards, Queensland, Australia	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]

Study	Intervention and comparison	Population	Outcomes	Comments
Haines, 2011[14] Parallel RCT	Educational materials (with health professional follow-up or alone) (n=825) Usual care (n=381) Duration of study: 22 months	Patients from a mix of acute and subacute wards, aged 60 and over Mean age (SD): IG: 75.3 (11); CG: 75.3 (10.1) years Sex: 53% women Setting: 2 hospitals, Brisbane and Perth, Australia	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018) [4]
Hassett, 2020[16] Parallel RCT	Digitally enabled rehabilitation in addition to usual care (AMOUNT) (n=149) Usual care alone (n=151) Duration of study: 6 months follow-up	Hospitalised patients Mean age (SD): 74 (14) years Sex: 50% women Setting: 3 hospitals in Sydney, Australia	Number of falls; number of injurious falls; participants with injurious falls; quality of life	
Healey, 2004[17] Cluster RCT (by ward in matched pairs)	Multifactorial intervention (risk factor screening and targeted care plan in at-risk patients) (n=776) Usual care (n=956) Duration of the study: 6 months	Hospitalised adults in subacute care Mean age (range): 81.3 (63 to 102) years Sex: 60% women Setting: 8 elderly care wards in 1 hospital, York, UK	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]
Hill, 2015[19] Cluster RCT (stepped wedge design)	Multifactorial intervention (multimedia falls education with follow-up for patients plus staff education and feedback) (n=1402) Usual care (n=1719) Duration of the study: 50 weeks	Hospitalised adults in subacute care Mean age: 82 years Sex: 62% women Setting: 24 wards in hospitals, Western Australia	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]
Jarvis, 2007[20] Parallel RCT	Additional exercise (physiotherapy 10 sessions per week; 8 weeks at home once a week after discharge (n=14)	Hospitalised adults in subacute care Mean age (SD): NR	Number of fallers	Study identified in Cochrane (Cameron, 2018) [4]

Study	Intervention and comparison	Population	Outcomes	Comments
	Physiotherapy (3 sessions per week) (n=15) Total n=29 Duration of the study: 8 weeks	Sex: 100% women Setting: 1 elderly care rehabilitation ward, Leicester, UK		
Kaegi-Braun, 2021[22] Parallel RCT	Individualised nutrition support (n=1050) Hospital food as usual (n=1038) Duration of study: 6 months follow-up	Patients hospitalised for 5 days or longer Mean age (SD): IG:73 (13.9); CG: 27.7 (13.9) years Sex: IG: 57%; CG: 49% women Setting: 8 hospitals in Switzerland	Falls; falls with fracture; and quality of life (EQ-5D)	This is a secondary analysis of an RCT (Schuetz 2019) which reported outcomes at 30 days, and did not report falls outcomes
Kiyoshi-Teo, 2019[23] Pilot RCT	Motivational interviewing (n=37) Fall prevention intervention usual to hospital stay (n=34) Duration of study: 3 months	High fall risk hospitalised patients, 65 years and over Mean age (SD): 73.13 (6.35) years Sex: 3% women Setting: 3 medical-surgical units at a Veterans Affairs hospital in northwestern USA	Rate of falls	
Koh, 2009[24] Cluster RCT	Organisational service model change (fall prevention guideline implementation) (n=311) Control (n=278) Duration of the study: 6 months	Hospitalised adults in acute care Mean age: 68 years Sex: NR Setting: 2 hospitals, Singapore	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]
Kojaie-Bidgoli, 2021[25] Parallel RCT, stratified by delirium risk	Modified Hospital Elder Life Programme (HELP) intervention (cognitive, vision/hearing, sleep, mobility, feeding and	Hospitalised patients, 70 years and over Mean age (SD): 78.53 (5.87) years Sex: 44% women	Number of fallers	Participants were stratified by delirium risk factors

Study	Intervention and comparison	Population	Outcomes	Comments
	hydration protocols) (n=84) Usual medical care (n=111) Duration of study: NR	Setting: Internal medicine wards of a university hospital in Iran		
Liang, 2020[26] Parallel RCT	Mixed exercise program including balance and resistance exercise (12 weeks) (n=30) Resistance exercise program (12 weeks) (n=30) Duration of study: 12 weeks	Hospitalised older patients with Sarcopenia, 80 years or over Mean age (SD): 87.3 (5.4) years Sex: 43.3% women Setting: post-acute care unit in hospital in Chengdu, China	Number of fallers; adverse events	
Lozano-Vicario 2024[27] Parallel RCT	Individualised multicomponent physical exercise in addition to physiotherapist care (n=18) Usual care (physiotherapist care) (n=18) Duration of study: 3-month follow-up	Hospitalised older patients with delirium, 75 years and over Mean age (SD): 87 years Sex: Setting: acute geriatric unit,	Number of fallers	
Mador, 2004[28] Parallel RCT	Behaviour advisory service (n=36) Usual care (n=35) Duration of the study: 11 months	Hospitalised adults in acute care Mean age: 82.5 years Sex: 48% women Setting: 2 metropolitan hospitals, South Australia	Number of fallers	Study identified in Cochrane (Cameron, 2018) [4]
Martinez-Velilla, 2019[29] Parallel RCT	Exercise intervention (n=185) Usual care (physical rehabilitation when required) (n=185)	Hospitalised elderly patients Mean age (SD): 87.3 (4.9) years Sex: 56.5% women Setting: hospital in Spain	Falls during hospitalisation; quality of life;	

Study	Intervention and comparison	Population	Outcomes	Comments
Mayo, 1994[31] Parallel RCT	Environment (blue identification bracelet) (n=65) Usual care (no bracelet) (n=69) Duration of the study: 12 months	Hospitalised adults in subacute care Mean age (SD): IG: 70.9 (12.6); CG: 72.9 (11.8) years Sex: 46% women Setting: rehabilitation hospital, Canada	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018) [4]
McCullagh, 2020[32] Parallel RCT	Tailored strengthening and balance exercises (n=95) Stretching and relaxation exercises (n=95) Duration of study: 2-3 months follow-up	Hospitalised patients, 65 years and over Mean age (SD): 80 (7.5) years Sex: IG: 64%; CG: 41% women Setting: teaching hospital, Ireland	Number of fallers at discharge; number of fallers at follow-up; deaths in hospital; death during follow-up; quality of life (EQ-5D5L)	We have only reported the results for number of fallers at discharge, in line with the Cameron Cochrane (2018) [4] methods.
Michalek, 2014[33] Pilot RCT (pseudo-randomised to one of 2 clusters)	Medication review (n=58) Usual care (n=46) Duration of the study: until discharge (median hospital stay 20 days)	Hospitalised adults in subacute care Median age (IQR): IG: 84 (81-87); CG: 83 (79-87) Sex: 79% women Setting: hospital in Germany	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018) [4]
Ortiz-Alonso, 2020[35] Parallel RCT	Simple supervised exercise and usual care (n=150) Usual care alone (n=131) Duration of study: 3 months follow-up	Hospitalised patients on acute care for older patient units Mean age (range): 88 (75-102) years Sex: Not reported Setting: Acute care hospital in Spain	Number of fallers	
Shorr, 2012[37] Cluster RCT (16 clusters)	Environment (bed alarm) (n=11115) Usual care (n=17436)	Hospitalised adults in acute care Mean age (SD): NR Sex: NR	Rate of falls; number of fallers	Study identified in Cochrane (Cameron, 2018) [4]

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of study: NR	Setting: 16 nursing units in an urban community hospital, USA		
Stenvall, 2007[38] Parallel RCT	Post-operative orthogeriatric service after hip fracture (n=102) Control (n=97) Duration of the study: 32 months	Hospitalised adults in acute care, 70 years and over admitted with femoral neck fracture Mean age (SD): 82.2 (6.3) Sex: 74% women Setting: geriatric and orthopaedic hospital wards, Umea, Sweden	Rate of falls; number of fallers; number of people sustaining a fracture	Study identified in Cochrane (Cameron, 2018) [4]
Treacy, 2015[39] Parallel RCT	Additional exercise (n=81) Physiotherapy (n=81) Duration of study: 3 months follow-up	Hospitalised adults in subacute care, 18 years and above Mean age (SD): IG: 82.6 (7.3); CG: 81.4 (7.8) years Sex: IG: 62%; CG: 65% female Setting: general rehabilitation ward at a hospital in Australia	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]
Van Gaal, 2011b[40] Cluster RCT	Organisation service model change (falls prevention, incontinence, and ulcer guideline implementation) (5 clusters; n=438) Control (usual care) (5 clusters; n=429) Duration of the study: 23 months	Hospitalised adults in acute care Mean age (SD): IG: 66 (14.5); CG: 64 (16.9) years Sex: 55% women Setting: 10 wards in 4 hospitals in the Netherlands	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]
Wald, 2011[43] Controlled clinical trial (odd vs even medical	Acute care service (n=122) Usual care (n=95) Duration of the study: 22 weeks	Hospitalised adults in acute care, aged 70 years or over Mean age (SD): IG: 80.5 (6.5); CG: 80.7 (7.0)	Rate of falls	Study identified in Cochrane (Cameron, 2018) [4]

Study	Intervention and comparison	Population	Outcomes	Comments
record number)		Sex: 55% women Setting: acute medical units in 1 hospital, Colorado, USA		
Wolf, 2013[44] Parallel RCT	Environment (bed alarm) (n=48) Usual care (n=50) Duration of the study: NR	Hospitalised adults in subacute care Mean age: 76.1 years Sex: 65% women Setting: Single geriatric ward Germany	Fall rates; number of fallers	Study identified in Cochrane (Cameron, 2018) [4]

See Appendix D for full evidence tables.

1.1.6. Summary of the effectiveness evidence

1.1.6.1. Exercise versus usual care

Table 3: Clinical evidence summary: Exercise versus usual care

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 Hospitals: Exercise	
Number of fallers - Simple supervised exercise vs usual care	231 (1 RCT)	⊕⊕◯◯ Low[a,c]	RD 0.00 (-0.02 to 0.02)	0 per 1000	0 fewer per 1000 (from 20 fewer to 20 more)	MID: 0.8 to 1.25 (precision: CI did not cross MIDs) **No difference**
Number of fallers - Individual exercise vs usual care	285 (1 RCT)	⊕⊕⊕⊕ High	RD 0.03 (-0.00 to 0.06)	0 per 1000	30 more per 1000 from (0 fewer to 60 more)	MID: 0.8 to 1.25 (precision: CI crossed 2 MIDs) **No difference**
Quality of life (EuroQol-5D) (scale 0-100, high is good) - Individualised exercise vs usual care	370 (1 RCT)	⊕⊕⊕◯ Moderate[b]	-	The mean quality of life (EuroQol-5D) - Individualised exercise vs usual care was 4.6	MD **13.2 higher** (8.2 higher to 18.2 higher)	MID: 0.5 x baseline SD = 10.75 (CI crosses one MID) **Clinical benefit of exercise**

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 Hospitals: Exercise	

a. Downgraded by 1 increment as the evidence was at high risk of bias.
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 because there were zero events in both arms and the sample size was under 350.

1.1.6.2. Exercise versus other type of exercise

Table 4: Clinical evidence summary: Exercise versus other type of exercise

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Hospitals: exercise	
Number of fallers - Resistance + balance vs resistance	60 (1 RCT)	⊕⊕◯◯ Low[b]	**RR 0.57** (0.19 to 1.75)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of resistance + balance**
Number of fallers - Tailored strength and balance exercise vs stretching and exercise	190 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 1.00** (0.21 to 4.83)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Quality of life (EQ-5D) (scale 0-100, high is good)	175 (1 RCT)	⊕⊕◯◯ Low[b]	-	The mean quality of life (EQ-5D) was 62.4	MD **5.3 higher** (0.59 lower to 11.19 higher)	MID: 0.5 x SMD (no baseline values given) (precision: CI crosses 1 MID) **No clinical difference**
Adverse events	60 (1 RCT)	⊕⊕◯◯ Low[b]	**RD 0.00** (-0.06 to 0.06)	0 per 1,000	0 fewer per 1,000 (60 fewer to 60 more)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical difference**
Deaths in hospital	190 (1 RCT)	⊕◯◯◯ Very low [a,b]	**RR 1.00** (0.21 to 4.83)	32 per 1,000	**0 fewer per 1,000** (25 fewer to 121 more)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical difference**

a. Downgraded by 1 increment as the evidence was at high risk of bias.

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

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 as sample size <70.

1.1.6.3. Additional exercise versus usual physiotherapy

Table 5: Clinical evidence summary: additional exercise versus usual physiotherapy

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with physiotherapy	Risk difference with Hospitals: Additional exercise	
Rate of falls	215 (2 RCTs)	⨁◯◯◯ Very low[a,b]	**Rate ratio 0.59** (0.26 to 1.34)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of additional exercise**
Number of fallers	119 (3 RCTs)	⨁◯◯◯ Very low[b,c,d]	**RR 0.46** (0.19 to 1.11)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of additional exercise**

a. Downgraded by 1 increment as the evidence was at high risk of bias (including unclear risk of selection bias and method of ascertaining falls in one study).
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.
c. Downgraded by 1 increment as the evidence was at high risk of bias (including unclear risk of bias in two trials for selection bias and high risk of attrition bias for largest study).
d. The quality of the evidence was downgraded one level due to the possibly limited applicability as two trials conducted in UK rehabilitation settings.

1.1.6.4. Medication review versus usual care

Table 6: Clinical evidence summary: Medication review versus usual care

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 Hospitals: Medication review	
Rate of falls	213 (2 RCTs)	⨁⨁◯◯ Low[a, b]	**RR** 0.66 (0.39 to 1.11)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of medication review**
Number of fallers	213 (2 RCTs)	⨁◯◯◯ Very low[a,b]	**RR 0.84** (0.46 to 1.55)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Number of people sustaining a non-vertebral fracture	130 (1 RCT)	⨁◯◯◯ Very low[a, b]	**RR 0.25** (0.03 to 2.18)	-	-	MID: 0.8 to 1.25 (precision CI crosses 2 MIDs) **Benefit of medication review**

a. 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.

b. Downgraded by 1 increment for high risk of bias due to the effect of adhering to the intervention and the effect of assignment to intervention and potentially inappropriate methods for recording the number of falls.

1.1.6.5. Medication review (PIM-check) versus medication review (STOPP/START)

Table 7: Clinical evidence summary: Medication review (PIM-check) versus usual care (STOPP/START)

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with medication review (STOPP/START)	Risk difference with Hospitals: Medication review (PIM-check)	
Number of fallers	122 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 1.03** (0.22 to 4.92)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**

a. Downgraded by 1 increment for high risk of bias due to methodology utilized for the analysis and there being limited available information regarding the analysis performed.
b. Downgraded by 2 increments as the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes

1.1.6.6. Vitamin D supplements versus no vitamin D supplements

Table 8: Clinical evidence summary: Vitamin D supplements versus no Vitamin D supplements.

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with no Vitamin D supplements	Risk difference with Hospitals: Vitamin D supplements	
Number of fallers - Vitamin D + calcium vs calcium	203 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 0.82** (0.59 to 1.14)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of people sustaining a fracture - Vitamin D + calcium vs calcium	203 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 0.34** (0.04 to 3.05)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of vitamin D supplement**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with no Vitamin D supplements	Risk difference with Hospitals: Vitamin D supplements	
Adverse events - Gastrointestinal complaints (nausea, vomiting, diarrhoea)	203 (1 RCT)	⊕◯◯◯ Very low[a,b]	RR 1.37 (0.32 to 5.98)	29 per 1,000	11 more per 1,000 (20 fewer to 145 more)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of no vitamin D supplement**

a. 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.
b. Downgraded by 1 increment for high risk of bias due to a noted imbalance at baseline between participants.

1.1.6.7. Nutritional support versus usual care

Table 9: Clinical evidence summary: Nutritional support versus Usual care

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 Hospitals: Nutritional support	
Rate of falls	1993 (1 RCT)	⊕⊕◯◯ Low[a]	**Rate ratio** 0.96 (0.72 to 1.28)	-	-	MID: 0.8 to 1.25 (precision CI crosses 2 MIDs) **No difference**
Number of fallers	1993 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 0.97** (0.76 to 1.24)	-	-	MID: 0.8 to 1.25 (precision CI crosses 1 MID) **No clinical difference**
Falls with fracture	1993 (1 RCT)	⊕◯◯◯ Very low[a,b]	**RR 1.29** (0.65 to 2.58)	-	-	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 Hospitals: Nutritional support	
						No difference
Quality of life (EQ-5D-visual analogue scale) (scale 0-100, high is good)	1993 (1 RCT)	⊕⊕⊕◯ Moderate[b]	-	The mean quality of life (EQ-5D-visual analogue scale) was 50.7 (35.5)	MD 0.2 higher (2.89 lower to 3.29 higher)	MID: 0.5 x SMD as baseline values not given (precision: CI did not cross MIDs) **No clinical difference**
Quality of life (EQ-5D-index) (scale 0-100, high is good)	1993 (1 RCT)	⊕⊕⊕◯ Moderate[b]	-	The mean quality of life (EQ-5D-index) was 0.83 (0.21)	MD 0 (0.02 lower to 0.02 higher)	MID: 0.5 x SMD as baseline values not given (precision: CI did not cross MIDs) **No clinical difference**

a. 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.
b. Downgraded by 1 increment for high risk of bias due to considerations regarding patient adherence.

1.1.6.8. Environmental interventions versus usual care

Table 10: Clinical evidence summary: Environmental interventions versus usual care

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 Hospitals: Environmental interventions	
Rate of falls - Carpet flooring vs vinyl flooring	54 (1 RCT)	⊕◯◯◯ Very low[a,b]	**Rate ratio** 14.73 (1.88 to 115.35)	-	-	MID: 0.8 to 1.25 (precision: CI did not cross 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 Hospitals: Environmental interventions	
						Benefit of vinyl flooring
Rate of falls - Low-low beds vs usual care	11099 (1 RCT)	⨁◯◯◯ Very low[b,c,]	**Rate ratio** 1.39 (0.22 to 8.78)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of usual care**
Rate of falls - Blue identification bracelet vs usual care (no bracelet)	134 (1 RCT)	⨁◯◯◯ Very low[b,d]	**Rate ratio** 1.15 (0.72 to 1.84	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls - Bed alarms vs usual care	28649 (2 RCTs)	⨁◯◯◯ Very low[b,e,f]	**Rate ratio** 0.60 (0.27 to 1.34)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of bed alarms**
Number of fallers - Carpet flooring vs vinyl flooring	54 (1 RCT)	⨁◯◯◯ Very low[a,b]	**RR 8.33** (0.95 to 73.37)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of vinyl flooring**
Number of fallers - Blue identification bracelet vs usual care (no bracelet)	134 (1 RCT)	⨁◯◯◯ Very low[d,b]	**RR 1.34** (0.76 to 2.36)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of usual care (no bracelet)**

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 Hospitals: Environmental interventions	
Number of fallers - Bed alarms vs usual care	28649 (2 RCTs)	⨁◯◯◯ Very low[b,g,h]	**RR 0.93** (0.38 to 2.24)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**

a. Downgraded by 1 increment for risk of bias due to outcome assessors and participants were not blinded.
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 c. Downgraded by 1 increment for high risk of bias due to patient characteristics at baseline were not reported and outcome assessors were not blinded.
d. Downgraded by 1 increment for high risk of bias due to patient imbalances at baseline regarding walking ability and outcome assessments were not blinded.
e. Downgraded 1 increment for high risk of bias (including high risk of selection bias and unclear risk of bias for balance in baseline characteristics in the larger trial, a cluster RCT, Shorr 2012; unclear or high risk of bias for all domains for trial with greatest weighting; risk of performance and detection bias due to lack of blinding although this is not feasible).
f. Downgraded 1 increment for indirectness (the larger trial, Shorr 2012, is of education and support on using bed alarms, rather than directly implementing bed alarms).
g. Downgraded 1 increment for risk of bias (including high risk of selection bias and unclear risk of bias for balance of baseline characteristics in the larger trial, Shorr 2012),
h. Downgraded 1 increment for indirectness (the larger trial, Shorr 2012, is of education and support on using bed alarms, directly implementing bed alarms) harm).

1.1.6.9. Social environment vs. control

Table 11: Clinical evidence summary: Social environment 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 Hospitals: Social environment	
Rate of falls - Organisational service model change (fall prevention guideline implementation)	1122 (1 RCT)	⨁◯◯◯ Very low[a,b]	**Rate ratio** 1.82 (0.23 to 14.55)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of control**
Rate of falls - Organisation service model change (falls prevention, incontinence and ulcer guideline	2201 (1 RCT)	⨁◯◯◯ Very low[a,c]	**Rate ratio** 0.67 (0.17 to 2.59)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of organisation**

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 Hospitals: Social environment	
implementation)						**service model change**
Rate of falls - Organisational service model change (fall prevention toolkit software)	5264 (1 RCT)	⨁◯◯◯ Very low[a,d]	**Rate ratio** 0.55 (0.02 to 16.29)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of organisational service model change**
Rate of falls - Acute care service for elderly patients vs usual care	217 (1 RCT)	⨁◯◯◯ Very low[a,b]	**Rate ratio** 0.72 (0.10 to 5.10)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of acute care service**
Rate of falls - post-operative orthogeriatric service after hip fracture	199 (1 RCT)	⨁⨁⨁◯ Moderate[e]	**Rate ratio** 0.38 (0.19 to 0.74)	-	**-**	MID: 0.8 to 1.25 (precision: CI did not cross MID) **Benefit of posts-operative orthogeriatric service after hip fracture**
Rate of falls - Digitally enabled rehabilitation in addition to usual care vs usual care	289 (1 RCT)	⨁◯◯◯ Very low[a,f]	**Rate ratio** 1.19 (0.78 to 1.82)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Number of fallers - Fall prevention tool kit software vs usual care	5264 (1 RCT)	⨁◯◯◯ Very low[a,d]	**RR 0.91** (0.06 to 14.21)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **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 Hospitals: Social environment	
Number of fallers - Behaviour advisory service vs usual care	71 (1 RCT)	⊕◯◯◯ Very low[a,e]	**RR 2.44** (0.85 to 7.02)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of usual care**
Number of fallers - post-operative orthogeriatric service after hip fracture	199 (1 RCT)	⊕⊕◯◯ Low[a,e]	**RR 0.41** (0.20 to 0.83)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of post-operative orthogeriatric service after hip fracture**
Number of fallers - Digitally enabled rehabilitation in addition to usual care vs usual care	289 (1 RCT)	⊕◯◯◯ Very low[a,f]	**RR 0.99** (0.73 to 1.34)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Number of people sustaining a fracture - post-operative orthogeriatric service after hip fracture	199 (1 RCT)	⊕◯◯◯ Very low[a]	**RR 0.11** (0.01 to 1.52)	-	-	MID: 0.8 to 1.25(precision: CI crosses 2 MIDs) **Benefit of post-operative orthogeriatric service after hip fracture**
Quality of life (EuroQol-5D VAS) (scale 0-100, high is good)	258 (1 RCT)	⊕⊕⊕◯ Moderate[f]	-	The mean quality of life (EuroQol -5D VAS) was 0	MD 1.3 higher (3.47 lower to 6.07 higher)	MID: 0.5 x SD = 10.95 (precision: CI does not cross MID) **No difference**

a. 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.
b. Downgraded by 2 for risk of bias due to the allocation was not concealed, outcome assessors were not blinded, participants were not blinded, and the method utilized to ascertain falls.
c. Downgraded by 2 for risk of bias due to participants and personnel were not blinded, the outcome assessment was not blinded, outcome data was incomplete, the method utilized to ascertain falls, and the reported baseline imbalance.

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 Hospitals: Social environment	
d. Downgraded by 1 for allocation concealment, blinding of participants and personnel, and outcome assessment was not blinded. e. Downgraded by 1 for risk of bias due to the participants not being blinded. f. Downgraded by 1 for risk of bias due to deviation from the intervention.						

1.1.6.10. Knowledge/education interventions versus usual care

Table 12: Clinical evidence summary: Knowledge/education versus usual care

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 Hospitals: Knowledge/ education interventions	
Rate of falls - educational materials + health professional follow-up vs usual care	782 (1 RCT)	⨁◯◯◯ Very low[a,b]	**Rate ratio** 0.83 (0.54 to 1.27)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls - educational materials only vs usual care	805 (1 RCT)	⨁◯◯◯ Very low[a,b]	**Rate ratio** 0.91 (0.62 to 1.35)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Number of fallers - Individualised educational session vs usual care	1822 (1 RCT)	⨁⨁⨁◯ Moderate[c]	**RR 0.29** (0.11 to 0.74)	-	-	MID: 0.8 to 1.25 (precision: CI did not cross MID) **Benefit of individualised educational session**
Number of fallers - educational materials + health professional follow-up vs usual care	782 (1 RCT)	⨁⨁◯◯ Low[a,b]	**RR 0.74** (0.48 to 1.14)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of educational materials +**

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 Hospitals: Knowledge/ education interventions	
						health professional follow-up
Number of fallers - educational materials only vs usual care	805 (1 RCT)	⨁◯◯◯ Very low[a,b]	**RR 0.84** (0.56 to 1.27)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**

a. Downgraded by 1 increment for risk of bias due to the participants and outcome assessors not being blinded.
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.
c. Downgraded by 1 increment for risk of bias due to selective reporting of the outcomes and due to the participants and outcome assessors not being blinded.

1.1.6.11. Education intervention versus education intervention

Table 13: Clinical evidence summary: Education intervention versus education intervention

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with Education interventions	Risk difference with Hospitals: education interventions	
Number of fallers	77 (1 RCT)	⨁◯◯◯ Very low[a,b]	**RR 0.68** (0.18 to 2.66)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of education intervention.**

a. Downgraded by 1 increment for risk of bias due to the protocol not being specified and the method of analysis did not appear to be appropriate.
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

1.1.6.12. Multifactorial interventions versus usual care

Table 14: Clinical evidence summary: Multifactorial intervention versus usual care

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 Hospitals: Multifactorial interventions	
Rate of falls	44664 (5 RCTs)[f]	⊕◯◯◯ Very low[a,b,c]	**Rate ratio** 0.80 (0.64 to 1.01)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference/ benefit**
Number of fallers	40073 (4 RCTs)[g]	⊕⊕◯◯ Low[c,d]	**RR 0.81** (0.62 to 1.08)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of people sustaining a fracture	4615 (2 RCTs)[h]	⊕◯◯◯ Very low[c,e]	**RR 0.76** (0.14 to 4.10)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of multifactorial intervention**

a. Downgraded by 1 increment for risk of bias due to issues with allocation concealment, blinding, and no definition of fall provided.
b. Downgraded by 1 increment for inconsistency due to the I^2 value of 52% suggesting substantial variation.
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.
d. Downgraded by 1 increment for risk of bias due to issues with allocation concealment, blinding, and participant adherence.
e. The quality of the evidence was downgraded by 1 increment for risk of bias due to issues with allocation concealment and blinding.

1.1.6.13. Psychological interventions versus usual care

Table 15: Clinical evidence summary: motivational interviewing versus usual care

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 Hospitals: Psychological interventions	
Rate of falls	67 (1 RCT)	⊕◯◯◯ Very low[a,b]	Rate ratio 1.26 (0.66 to 2.40)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of usual care**

a. Downgraded by 1 increment for risk of bias due to selection of the reported result and missing outcome data.

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 Hospitals: Psychological interventions	

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.

See Appendix F for full GRADE tables.

1.1.7. Economic evidence

1.1.7.1. Included studies

Three health economic studies were included in this review. The first compared multifactorial falls prevention intervention to usual care. This was the model built for the previous iteration of the guideline, CG161. The second compared bed and bedside chair sensors to standard care. The third compared multifactorial falls prevention intervention to usual care. These are summarised in the health economic evidence profiles below (Table 16, Table 17 and **Health economic evidence profile: Falls prevention program vs. usual care** Table 18) and the health economic evidence tables in Appendix H. No studies comparing other comparators were identified.

1.1.7.2. Excluded studies

One economic study comparing patient education to usual care in an Australian hospital setting was identified but was excluded due to a combination of limited applicability and methodological limitations.[13] This study is listed in Appendix J, with reasons for exclusion given.

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

1.1.8. Summary of included economic evidence

Table 16: Health economic evidence profile: Multifactorial fall prevention versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
CG161	Directly applicable[(a)]	Potentially serious limitations[(b)]	• Analysis developed alongside a NICE guideline update (GC161) • Patient level simulation • Cost-utility analysis (QALYs) • Population: People over 65 years • Setting: Hospital; acute and non-acute setting • Comparators: Usual care (1), multifactorial fall prevention (2) Time horizon: lifetime	2-1 (acute): -£238[(c)] 2-1 (non-acute): -£128[(c)]	2-1 (acute): 0.002 2-1 (non-acute): 0.003 QALYs	Multifactorial fall prevention dominated usual care (less costly and more effective)	Probability exercise cost effective (£20/£30K threshold): NR/NR (due to serious computational burden). The only parameter that impacted cost effectiveness (changing the result to make usual care the preferred option) was the intervention effect (the relative risk for falls with intervention compared with control).

Abbreviations: Dom=Dominated, one option is less costly and more effective than another option; ICER= incremental cost-effectiveness ratio; NR= not reported; PSA=Probabilistic sensitivity analysis; QALY= quality-adjusted life years; RCT= randomised controlled trial

(a) People in hospital over 65 years of age

(b) There was a lack of utility evidence or decrement for patients in hospital with a fall. Costs of interventions are generic, rather than specific to interventions provided to individuals. No analysis of different multifactorial interventions conducted. The falls risk of a patient does not change while in hospital, there is no adaptation benefit, Costs and outcomes are from 2008 to 2012. Probabilistic analysis not feasible due to model approach selected and subsequent computational burden. Very complex model and potential for coding and calculation errors.

(c) 2011 costs. Cost components: Staff cost, Postage, exercise booklet, ankle weights, day centre, nursing home, special aids or equipment, family support.

Table 17: Health economic evidence profile: Bed and bedside chair sensors versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Sahota 2014[36] (UK)	Directly applicable	Potentially serious limitations[(a)]	• Within-RCT analysis based on REFINE trial (Same paper) • Cost-utility analysis (QALYs) • Population: Hospital admitted (acute, general medical elderly care wards) adults with mean age 85 years (Queen's hospital Nottingham England). • Setting: Hospital • Comparators: 1. Standard care 2. Bed and bedside chair sensors using radio pagers. Follow-up: Variable, until discharge (median length of stay: 9 days for non-fallers and 20 days for fallers)	(2−1): £799 [(b)]	(2−1): 0.0001 QALYs Note other clinical outcomes reported: Bedside falls: adjusted IRR: 0.90 (95% CI: 0.66–1.22; P = 0.50). Falls resulting in minor injury: adjusted IRR, 1.60; (95% CI: 0.83–3.08; P = 0.15)	(2−1): £7,990,000 per QALY gained	No sensitivity analyses conducted.

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

(a) Based on a single trial which was excluded from the clinical review due to not reporting correct outcome. Short follow up (until discharge), may not fully capture downstream impact of intervention or consequences of falls. 2010/11 costs may not represent current NHS context. No sensitivity analyses undertaken.

(b) 2010/11 UK pounds. Cost components incorporated: Cost of the intervention, cost of injurious falls and hospitalisation (length of stay).

Table 18: Health economic evidence profile: Falls prevention program vs. usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Baris 2023 Turkey	Partly applicable [(a)]	Potentially serious limitations[(b)]	• Analytic decision tree based on a RCT • Cost-effectiveness analysis (fall prevented) • Population: Older people in palliative care ward • Comparators: Usual care (1), falls prevention program (2) Time horizon: 1 year	£0.11[(c)]	0.000395 QALYs	£278 per QALY gained	In the best case scenario the ICER was £640, in the worst case scenario the falls prevention program was still dominant

Abbreviations: ICER= incremental cost-effectiveness ratio; QALY= quality-adjusted life years; RCT= randomised controlled trial NR = Not reported
(a) Turkish study based in a palliative clinic.
(b) Based on a single RCT so may not represent the full body of evidence, time horizon is 1 year reported values are incorrect so corrected values are reported here.
(c) 2023 USD

1.1.9. Economic model

Whilst this review question was prioritised for de novo health economic modelling, it was for people in the community not hospitals.

1.1.10. Evidence statements

1.1.10.1. Economic

One cost utility analysis found that multifactorial fall prevention dominated (less costly and more effective) usual care in both acute and non-acute hospital settings. This analysis was assessed as directly applicable with potentially serious limitations.

One cost utility analysis found that bed and beside chair alarms were not cost effective compared to standard care for preventing falls in a hospital setting (ICER: £7,990,000 per QALY gained). This analysis was assessed as directly applicable with potentially serious limitations.

One cost effectiveness study found that multifactorial falls prevention dominated (less costly and more effective). This analysis was assessed as partly applicable with potentially serious limitations.

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 are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. Falls prevention in hospital settings 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).

1.1.11.2. 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, with the majority of the evidence of low to very low quality. Findings were downgraded due to risk of bias (for example, unclear risk of selection bias, method of ascertaining falls, the effect of adhering to the intervention and the effect of assignment to intervention and potentially inappropriate methods for recording the number of falls). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. Where meta-analysis was possible, 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.

Although for the sake of consistency the committee decided to apply the default MID to guide their decision making, they discussed whether the selection of the default MID was appropriate for this question as such a large effect size would be difficult to achieve and a smaller difference could still be relevant for this population and within this setting.

1.1.11.3. Benefits and harms

Exercise

The evidence for the benefit of exercise within a hospital setting is limited because most people would not be in hospital long enough to have an effect on preventing falls.

The committee noted the benefit of exercise on quality of life may be due to people having more confidence in their walking and balance and less fear of falling.

One of the studies was over 12 weeks and therefore unlikely to reflect inpatients in an NHS setting. There was also variation in the intensity of exercise across the studies, some with 2-3 sessions per day. The committee noted this did not reflect what people would receive in a UK hospital and was more reflective of community-based settings.

Delivery of exercise interventions described within the studies would require considerable staff resource. The committee concluded there was not enough evidence of exercise as a single intervention demonstrating it prevented falls in inpatients to support a recommendation. However, the committee agreed it was important to encourage people to remain as active as possible when they were in hospital to prevent deconditioning and an increase in risk of falls, but this could be simply through usual movement activity, such as getting out of bed, standing or walking around, rather than structured exercise.

The committee agreed a consensus recommendation should be made to encourage older people to be active whilst in hospital. They also agreed referral to a structured intervention, such as a community falls prevention service when the person is discharged from hospital can be beneficial to address any falls risk factors identified in hospital that would transfer to the home environment. .

Medication review

There was very limited evidence identified within a hospital setting. The committee agreed there was more evidence available in residential and community settings because people are in these settings for a longer period of time. They noted the lower rate of falls and non-vertebral fracture in the medication review groups, but the quality of the evidence was low.

The committee agreed medication review is an assessment, they discussed that a medication review would typically be carried out if a person was prescribed medicines known to increase a risk of falls, or the person had a condition such as low BP that could increase risk of falling. This would include psychotropic medicines. Adjustments to a person's medication may be made as a result of a review, and this would usually be part of a comprehensive risk assessment. The committee discussed the withdrawal of psychotropic medicines. They agreed that is would be considered as part of the medication review. Any planned withdrawal would need to happen in the community setting as withdrawal would need to happen over several weeks and would not be managed by the hospital team. Therefore, the committee did not include a specific recommendation on withdrawal of psychotropic medicines as they did for the community and residential settings.

The committee. agreed to make a consensus recommendation based on some evidence, albeit with low certainty that making appropriate adjustments to medication after medication review may result in falls reduction. They acknowledged that older people in hospital would be at an increased risk of falls and would meet the criteria for falls management tailored to their individual needs.

The committee noted the Medicines optimisation and Medicines adherence guidance includes medication review and provides generic recommendations that would be appliable.

Vitamin D & nutritional support

Only one study was identified on vitamin D supplementation in people in hospital. The committee agreed most people would not be an inpatient long enough for the intervention to have any affect. They did note that if a person is found to be vitamin D deficient whilst in hospital, they should be prescribed it but could not recommend it to reduce falls. Similarly,

the one study included on nutritional support for people in hospital demonstrated no difference to usual care, and the committee concluded this would be for similar reasons.

There was consensus that good nutrition and fluid intake was important, and education on this was of value, but there was no evidence to recommend the intervention for falls prevention.

Environmental interventions

The committee noted the range of interventions included type of flooring, low beds, identification bracelets and bed alarms all from single studies graded as very low.

No benefit was found for identification bracelets that indicate if a person has previously fallen, but the committee acknowledged 'tagging' was commonly used in hospital now, to enable staff to closely observe people identified at risk of falls, and provide more support with eating, getting out of bed, going to the bathroom etc. The committee acknowledged staff observations and knowledge of a patient's history and assessment of risk of falls are probably more important in preventing further falls in hospital.

The evidence from one study did not support the use of low-low beds to reduce falls, and the committee agreed the use of low beds or bed alarms would not prevent falls but might reduce the level of injury sustained if a person fell out of bed or result in a quicker response if an alarm was activated. Bed alarms are sometimes used for certain patients such as those unable to stand. The committee discussed these interventions could give a false reassurance that falls would be prevented. Although one small study showed a benefit of vinyl flooring over carpet in reducing falls, it was agreed that the use of vinyl flooring is standard practice in UK hospitals.

The committee agreed risk factors related to the ward environment needs to be taken into account during a person's stay and discussed the need for further research in the use of alarms, observation of patients, how wards are set up, such as the lighting, flooring and signage and the use of tagging as interventions to address risk factors in the ward environment and agreed to make a research recommendation.

Social environment

The committee noted the diversity of organisation service models evaluated within the included studies, most of which were graded as low or very low and showed mixed results. The committee observed that one study evaluating a post-operative orthogeriatric service after hip fracture of moderate quality did demonstrate a benefit in rate and reduction of falls. However, the committee agreed this service would already be usual care within a geriatric service.

Knowledge/Education

The committee noted the reduction in the number of fallers in one study comparing individualised education session with usual care. There was also some evidence to support educational materials with health professional follow up in reducing the number of falls. The committee discussed the positive outcomes shown in the studies were in line with their own experience of education and knowledge helping people to avoid falling. Consideration of people with delirium or cognitive impairment and their ability to fully participate in educational interventions would need to be addressed when assessing a person for falls management interventions within any recommendations, noting that the one study where this was effective only included patients with intact cognition.

Multifactorial interventions

The committee discussed the diversity of interventions across the studies. They questioned the inclusion of one study included in the Cameron Cochrane review that was an education

intervention comprising of multimedia falls education with follow-up for patients and staff education. The review protocol used the ProFaNE falls prevention taxonomy for classification which placed staff and patient education in different categories and was not provided to all patients but to those with basic cognition, hence it met the criteria as a multifactorial intervention. However, the committee took a different view and concluded that it was not overtly multifactorial and would be more appropriate within the education and knowledge interventions meta-analysis, which would then strengthen the evidence to support this intervention.

The committee discussed the evidence overall and agreed the risk ratio of 0.8 was borderline for demonstrating effectiveness of the interventions compared to usual care. Three studies showed a benefit in rate of falls outcome and one in reducing the number of falls. The committee noted the Cameron review split studies by setting and the results for multifactorial interventions in the studies showing a benefit were in the sub-acute rather than the acute setting. The committee agreed the focus for people in subacute hospital settings would be on optimising a person's functioning where a multifactorial approach would be more suitable. The committee discussed the current falls guideline recommendations for multifactorial interventions to prevent falls in hospital setting. They commented that they provide general principles rather than any specific intervention and remain applicable as part of a comprehensive falls management approach to ensure interventions address a person's individual falls risk factors.

1.1.11.4. Cost effectiveness and resource use

Three health economic studies were included for falls prevention interventions in a hospital setting. The first was from the last iteration of the guideline which analysed multifactorial fall prevention versus usual care. This study found that multifactorial fall prevention dominated (less costly and more effective) usual care over a lifetime horizon in both acute and non-acute hospital setting. The committee noted that the difference between the two interventions, in both the cost and effectiveness, was very small. The committee acknowledged that the study had potentially serious limitations which included no probabilistic sensitivity analyses being completed, the cost of the interventions was generic rather than specific to the interventions provided to each person and the costs and clinical effectiveness data used were from 2008 to 2012. The committee noted that the intervention effect used in the model (relative risk of 0.75 in acute hospitals and 0.77 in non-acute hospitals) was not that different to the clinical evidence review that was found in this update (relative risk of 0.8). This relative risk was tested in the previous model and multifactorial falls prevention was still found to dominate usual care.

Another economic study that was included was Baris 2023 which assessed a falls prevention program versus usual care. This study found that the falls prevention program dominated usual care (the falls prevention program was less costly and more effective than usual care. This study was assessed as being partly applicable with potentially serious limitations.

Given all these points the committee decided to adapt the recommendations that were in the previous iteration of the guideline. Therefore, the recommendations are unlikely to have a resource impact.

The second health economic study that was included in this review was Sahota 2014 which analysed bed and bedside chair sensors versus usual care. The study found that bed and bedside chair sensors had an incremental cost effectiveness ratio (ICER) of £7,990,000 per QALY gained which is not cost effective at NICE's threshold of £20,000 per QALY. Therefore, based on this health economic study and the very limited clinical evidence review, the committee agreed to not make any recommendation for bed and bedside chair sensors. As they are currently not regularly used in the NHS, this lack of recommendation is unlikely to have a resource impact.

For all the other interventions in the clinical evidence review there was no health economic evidence however, the committee assessed the likelihood of cost effectiveness for each of the interventions.

For exercise, the committee acknowledged that there is evidence to support exercise in people who are at a risk of falling but they did not see evidence that a single type of exercise is better than another. Therefore, they recommended that people who are at a risk of falling be encouraged to keep moving. This may mean that there is extra nurse time needed for helping people get out of bed or get moving but this is unlikely to be a significant increase amount of work for the nurses are they are likely to be doing this already. Therefore, it is unlikely that this will result in a significant resource impact.

For a medication review, the committee felt that this comprises of an assessment and an intervention with some people not receiving a change in medication. The committee also acknowledged that a medication review is often part of a comprehensive falls assessment and therefore may already form part of clinical practice. The committee felt that there was enough clinical evidence review to make a recommendation about a medication review. However, the committee felt that it was important to refer to the Medicines optimisation guideline (NG5). When assessing the cost effectiveness, the committee acknowledged that this would require additional clinical time however, it may mean that there is a change in medication that may be cheaper or more expensive. So, for some people this may be cost saving and for others it may increase costs. Therefore, the committee felt that overall, there may be a slight increase in costs, but it is unlikely to be a significant resource impact.

For vitamin D, the committee acknowledged that there was only one clinical trial, and it demonstrated there was no benefit from prescribing vitamin D. The committee felt that this may be due to the vitamin D not having a clinical benefit in a short period of time. Therefore, the committee agreed that patients with vitamin D deficiency should be prescribed it but there was not enough evidence to support a general recommendation for vitamin D in all people who are at a risk of falls. This means that there is unlikely to be a change in practice and therefore the recommendation should not have a resource impact.

For nutritional support, the committee had a similar discussion as vitamin D. They acknowledged that good nutrition and fluid intake is important however there was not enough evidence to make a recommendation. Therefore, there is unlikely to be a resource impact. For environment, the committee also discussed other environmental changes other than bed and bedside chair sensors, this included low beds, carpets versus vinyl floor and bracelets. The committee acknowledged that carpet is rarely used and therefore a recommendation was not needed. The committee also questioned whether low beds was a fall prevention intervention. The committee decided not to make any recommendations about the environment and therefore there is unlikely to be a resource impact.

For psychological interventions, the committee acknowledged that there was only one clinical study. The committee therefore felt that there was not enough evidence to support a recommendation for a psychological intervention to prevent falls. This means that there is unlikely to be a change in practice and therefore the recommendation should not have a resource impact.

1.1.11.5. Other factors the committee took into account

The committee discussed the importance of staff understanding fall risk assessment and having the required competencies in delivering interventions for people in hospital.

The committee agreed the recommendations on medication review in the Medicines optimisations guideline were relevant for this population and decided to cross refer to this section of the guideline.

1.1.12. Recommendations supported by this evidence review

This evidence review supports recommendations1.3.15 – 1.3.19 and recommendations for research in the NICE guideline.

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Appendices

Appendix A Review protocols

A.1.1 Review protocol for what are the most clinically effective and cost-effective interventions for preventing falls in older people in hospital?

ID	Field	Content
1.	Review title	What are the most clinically effective and cost-effective interventions for preventing falls in older people in hospital?
2.	Review question	What are the most clinically and cost-effective methods for falls prevention in older people in hospital?
3.	Objective	The objective of this review is to update the previous guideline review of the same name with new evidence of falls prevention in people in hospital.
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. 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 hospital 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.
7.	Intervention	Any intervention designed to reduce falls in older people in hospital. Interventions grouped by combination (single, multiple or multifactorial); then by type of intervention (descriptors). Possible descriptors include: Exercises: group and individual Medication (drug target, i.e. withdrawal, dose reduction or increase, substitution, provision); Surgery Management of urinary incontinence, fluid or nutrition therapy Psychological interventions Environment/assistive technology Social environment

		Interventions to increase knowledge
8.	Comparator	Any other intervention Usual care Placebo
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	Hospital
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 events of the interventions (composite of all) • Validated health-related quality of life scores e.g. EQ-5D or similar
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) • Nonrandomised 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 the Cochrane review (Cameron 2018).

		• 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 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. 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: none.			
17.	Type and method of review	x	Intervention		
		☐	Diagnostic		
		☐	Prognostic		
		☐	Qualitative		
		☐	Epidemiologic		
		☐	Service Delivery		
		☐	Other (please specify)		
18.	Language	English			
19.	Country	England			
20.	Anticipated or actual start date				
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 5e Organisational affiliation of the review National Institute for Health and Care Excellence (NICE)		
24.	Review team members	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 • 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.	
31.	Keywords		
32.	Details of existing review of same topic by same authors	N/A	
33.	Current review status	☐	Ongoing
		☐	Completed but not published
		☐	Completed and published
		☐	Completed, published and being updated

		☐	Discontinued
34.	Additional information		
35.	Details of final publication	www.nice.org.uk	

A.1.2 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).[34] **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. f 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.1.1 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 19: Database parameters, filters and limits applied

Database	Dates searched	Search filter used
Medline ALL (OVID)	**01-08-2017 - 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)	**01-08-2017 - 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	(fall or falls or falling or faller* or fallen or slip* or trip* or collapse*).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 Residential Facilities/
25	Long-Term Care/
26	Institutionalization/
27	Hospitalization/
28	Subacute Care/
29	exp Hospitals/
30	Hospital Units/
31	Rehabilitation Centers/
32	Inpatient/
33	Geriatric Assessment/
34	((long stay or long term or acute or sub-acute or subacute or residential) adj3 (care or ward*1 or hospital*)).ti,ab,kf.

35	(hospital* adj3 (care or ward*1)).ti,ab,kf.
36	(rehabilitation adj2 (ward*1 or hospital* or unit*1 or department*1)).ti,ab,kf.
37	(hostel*1 or nursing home*1 or inpatient* or residen* or institution*).ti,ab,kf.
38	or/24-37
39	exp aged/
40	(senior*1 or elder* or old* or aged or ag?ing or geriatric).ti,ab,kf.
41	or/39-40
42	23 and 38 and 41
43	randomized controlled trial.pt.
44	controlled clinical trial.pt.
45	randomi#ed.ti,ab.
46	placebo.ab.
47	randomly.ti,ab.
48	Clinical Trials as topic.sh.
49	trial.ti.
50	or/43-49
51	Meta-Analysis/
52	exp Meta-Analysis as Topic/
53	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
54	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
55	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
56	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
57	(search* adj4 literature).ab.
58	(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.
59	cochrane.jw.
60	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
61	or/51-60
62	42 and (50 or 61)
63	limit 62 to dt=20170801-20230331
64	limit 62 to ed=20170801-20230331

65	63 or 64

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	Residential Home/ or Nursing Home/ or Assisted Living Facility/
24	Hospitalization/
25	Institutional Care/ or Residential Care/ or Home For The Aged/ or Institutionalization/
26	exp Hospital/ or Hospital Patient/
27	Rehabilitation Center/

28	((long stay or long term or acute or sub-acute or subacute or residential) adj3 (care or ward*1 or hospital*)).ti,ab,kf.
29	(hospital* adj3 (care or ward*1)).ti,ab,kf.
30	(rehabilitation adj2 (ward*1 or hospital* or unit*1 or department*1)).ti,ab,kf.
31	(hostel*1 or nursing home*1 or inpatient* or residen* or institution*).ti,ab,kf.
32	or/23-31
33	exp aged/
34	(senior*1 or elder* or old* or aged or ag?ing or geriatric).ti,ab,kf.
35	or/33-34
36	22 and 32 and 35
37	random*.ti,ab.
38	factorial*.ti,ab.
39	(crossover* or cross over*).ti,ab.
40	((doubl* or singl*) adj blind*).ti,ab.
41	(assign* or allocat* or volunteer* or placebo*).ti,ab.
42	crossover procedure/
43	single blind procedure/
44	randomized controlled trial/
45	double blind procedure/
46	or/37-45
47	systematic review/
48	meta-analysis/
49	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
50	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
51	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
52	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
53	(search* adj4 literature).ab.
54	(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.
55	cochrane.jw.
56	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.

57	or/47-56
58	36 and (46 or 57)
59	limit 58 to dc=20170801-20230331

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):ti,ab
#6	#4 or #5
#7	MeSH descriptor: [Residential Facilities] explode all trees
#8	MeSH descriptor: [Long-Term Care] explode all trees
#9	MeSH descriptor: [Institutionalization] explode all trees
#10	MeSH descriptor: [Hospitalization] explode all trees
#11	MeSH descriptor: [Subacute Care] explode all trees
#12	MeSH descriptor: [Hospitalization] explode all trees
#13	MeSH descriptor: [Hospital Units] explode all trees
#14	MeSH descriptor: [Rehabilitation Centers] explode all trees
#15	MeSH descriptor: [Inpatients] explode all trees
#16	MeSH descriptor: [Geriatric Assessment] explode all trees
#17	((long stay or long term or acute or sub-acute or subacute or residential) near/3 (care or ward*1 or hospital*)):ti,ab
#18	(hospital* near/3 (care or ward*1)):ti,ab
#19	(rehabilitation near/2 (ward*1 or hospital* or unit*1 or department*1)):ti,ab
#20	(hostel*1 or nursing home*1 or inpatient* or residen* or institution*):ti,ab
#21	21-#20
#22	#2 and #6 and #21 with Cochrane Library publication date Between Aug 2017 and Mar 2023, in Cochrane Reviews

Epistemonikos search terms

(title:((fall OR falls OR falling OR faller* OR fallen OR slip* OR trip* OR collapse*)) OR abstract:((fall OR falls OR falling OR faller* OR fallen OR slip* OR trip* OR collapse*))) AND (title:((senior* OR elder* OR old* OR aged OR aging OR ageing OR geriatric)) OR abstract:((senior* OR elder* OR old* OR aged OR aging OR ageing OR geriatric))) AND (title:((title:(((long stay OR long term OR acute OR sub-acute OR subacute OR residential) AND (care OR ward* OR hospital*))) OR abstract:(((long stay OR long term OR acute OR sub-acute OR subacute OR residential) AND (care OR ward* OR hospital*)))) OR (title:((hospital* AND (care OR ward*))) OR abstract:((hospital* AND (care OR ward*)))) OR (title:((rehabilitation adj2 (ward* OR hospital* OR unit* OR department*))) OR abstract:((rehabilitation adj2 (ward* OR hospital* OR unit* OR department*)))) OR (title:((hostel* OR nursing home* OR inpatient* OR residen* OR institution*)) OR abstract:((hostel* OR nursing home* OR inpatient* OR residen* OR institution*)))) OR abstract:((title:(((long stay OR long term OR acute OR sub-acute OR subacute OR residential) AND (care OR ward* OR hospital*))) OR abstract:(((long stay OR long term OR acute OR sub-acute OR subacute OR residential) AND (care OR ward* OR hospital*)))) OR (title:((hospital* AND (care OR ward*))) OR abstract:((hospital* AND (care OR ward*)))) OR (title:((rehabilitation adj2 (ward* OR hospital* OR unit* OR department*))) OR abstract:((rehabilitation adj2 (ward* OR hospital* OR unit* OR department*)))) OR (title:((hostel* OR nursing home* OR inpatient* OR residen* OR institution*)) OR abstract:((hostel* OR nursing home* OR inpatient* OR residen* OR institution*)))))

B.1.2 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 20: 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)	

Database	Dates searched	Search filters and limits applied
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

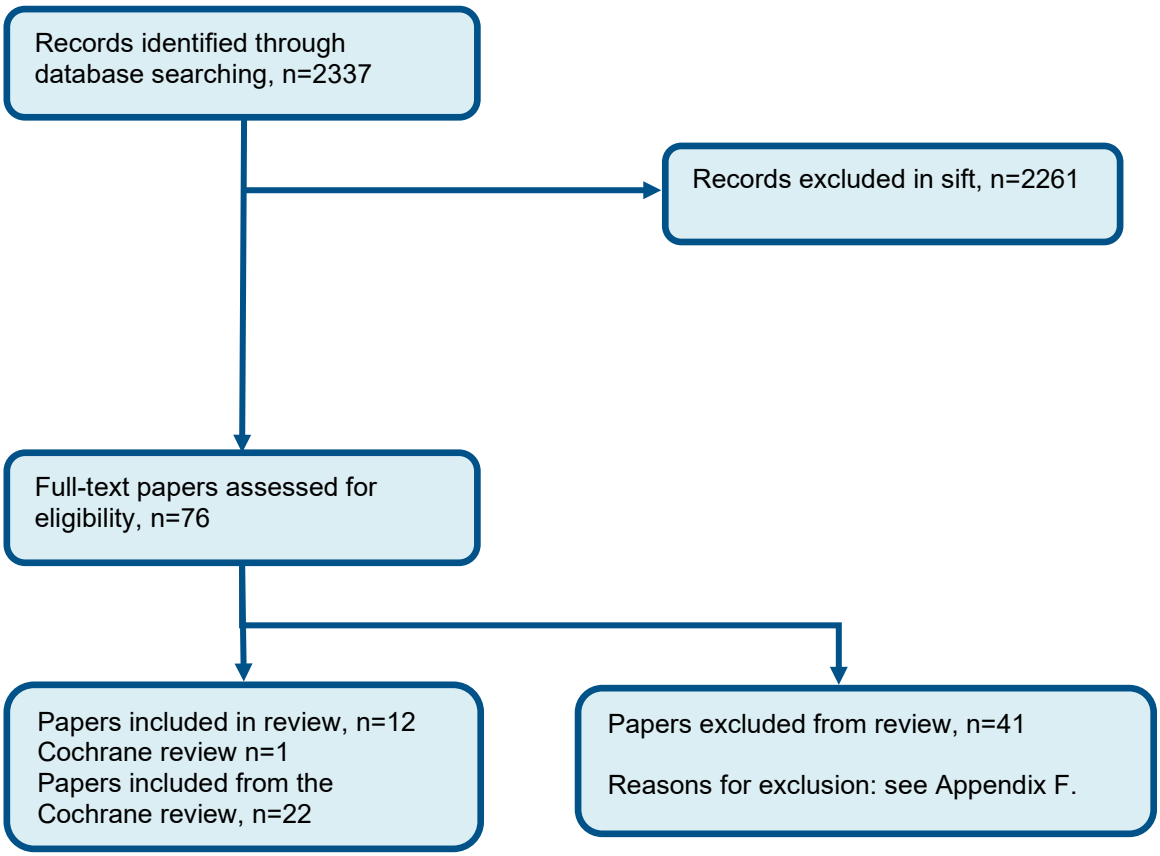
1	MeSH DESCRIPTOR Accidental Falls EXPLODE ALL TREES
2	((fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*))
3	#1 OR #2
4	(#3) IN NHSEED
5	(#3) IN HTA

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 the interventions to prevent falls in people within hospital settings



Appendix D Effectiveness evidence

Curtin, 2020

Bibliographic Reference	**Curtin, Denis; Jennings, Emma; Daunt, Ruth; Curtin, Sara; Randles, Mary; Gallagher, Paul; O'Mahony, Denis; Deprescribing in Older People Approaching End of Life: A Randomized Controlled Trial Using STOPPFrail Criteria.; Journal of the American Geriatrics Society; 2020; vol. 68 (no. 4); 762-769**

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	(NCT03501108)
Study type	Randomised controlled trial (RCT)
Study location	Ireland
Study setting	Hospital
Study dates	Not specified

Sources of funding	Individual authors are supported by the European Union’s Horizon 2020 research and innovation program (grant number 634238).
Inclusion criteria	Hospitalised older adults (aged ≥75 years), admitted from the community with acute unselected medical or surgical illness, who following treatment were unable to return home to independent living and consequently required long-term nursing home care. Participants were prescribed 5 or more log-term medications and were severely frail as defined by a Clinical Frailty Scale score of 7 or higher and the treating physician indicating that he or she "would not be surprised if the patient died in the next 12 months."
Exclusion criteria	Under 75 years in age, less than 5 drugs, SQ negative, SFS <7, final stages of a terminal illness, or did not provide informed consent.
Recruitment / selection of participants	Adults with advanced frailty and polypharmacy (5 or more drugs) transferring to long-term nursing home care.
Intervention(s)	STOPPFrail-guided deprescribing
Population subgroups	NA
Comparator	Usual pharmaceutical care
Number of participants	130 participants
Duration of follow-up	3 months
Indirectness	Indirectness was not a concern for this study

Study arms

STOPPFrail guiding deprescribing and usual pharmaceutical care (N = 65)

Usual pharmaceutical care (N = 65)

Characteristics

Study-level characteristics

Characteristic	Study (N = 130)
% Female Sample size	n = NA; % = NA
STOPP-Frail-guided deprescribing Sample size	n = 42; % = 64.61
Usual pharmaceutical care Sample size	n = 38; % = 58.46
Mean age (SD) Mean (SD)	NA (NA)
STOPP/Frail Mean (SD)	84.89 (5.6)
Usual pharmaceutical care Mean (SD)	85.68 (5.87)
Comorbidities	n = NA; % = NA

Characteristic	Study (N = 130)
Sample size	
STOPP-Frail-guided deprescribing- Dementia Sample size	n = 49; % = 75.4
Usual Pharmaceutical care- Dementia Sample size	n = 48; % = 73.8
STOPP-Frail-guided deprescribing- Heart failure Sample size	n = 16; % = 24.6
Usual pharmaceutical care- Heart failure Sample size	n = 10; % = 15.4
STOPP-Frail-guided deprescribing- Atrial fibrillation Sample size	n = 24; % = 36.9
Usual pharmaceutical care- atrial fibrillation Sample size	n = 27; % = 41.5
STOPP-Frail-guided deprescribing- chronic kidney disease Sample size	n = 16; % = 24.6
Usual pharmaceutical care- chronic kidney disease Sample size	n = 15; % = 23.1

Characteristic	Study (N = 130)
STOPP-Frail-guided deprescribing- active cancer Sample size	n = 5; % = 7.7
Usual pharmaceutical care- Active cancer Sample size	n = 6; % = 9.2
STOPP-Frail-guided deprescribing- Osteoporosis Sample size	n = 19; % = 29.2
Usual pharmaceutical care- Osteoporosis Sample size	n = 18; % = 27.7

Outcomes

Falls

Outcome	STOPPFrail guiding deprescribing and usual pharmaceutical care, N = 52	Usual pharmaceutical care, N = 47
Falls No of events	n = 24; % = NA	n = 32; % = NA
Falls Custom value	Relative risk 0.90 (0.48, 1.69)	*empty data*

Non-vertebral fractures

Outcome	STOPPFrail guiding deprescribing and usual pharmaceutical care, N = 65	Usual pharmaceutical care, N = 65
Non-vertebral fractures No of events	n = 1; % = NA	n = 5; % = NA
Non-vertebral fractures Custom value	Relative risk: 0.23 (0.03, 1.95)	*empty data*

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

Falls-Falls-No Of Events-STOPPFrail guiding deprescribing and usual pharmaceutical care -Usual pharmaceutical care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to the effect of adhering to the intervention and the effect of assignment to intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Non-vertebralfractures-Non-vertebralfractures-No of Events-STOPPFrail guiding deprescribing and usual pharmaceutical care -Usual pharmaceutical care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to the effect of adhering to the intervention and the effect of assignment to intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

DeWalt, 2023

Bibliographic Reference	**DeWalt, Nancy C; Stahorsky, Kenneth A; Sturges, Susan; Bena, James F; Morrison, Shannon L; Drobnich Sulak, Laura; Szczepinski, Lynn; Albert, Nancy M; Simulation Versus Written Fall Prevention Education in Older Hospitalized Adults: A Randomized Controlled Study.; Clinical nursing research; 2023; vol. 32 (no. 2); 278-287**

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	Not specified
Study location	Not specified
Study setting	Hospital
Study dates	Not specified
Sources of funding	No financial support
Inclusion criteria	Patients enrolled at a community-based, mid-size hospital, history of a fall event within the last 12 months, aged 65 years or older, ability to answer questions and participate in an education intervention.
Exclusion criteria	History of cerebrovascular accident and does not speak or read in the English language

Recruitment / selection of participants	Stable patients from a medical-surgical inpatient units were recruited.
Intervention(s)	Simulation education program
Population subgroups	NA
Comparator	Written education program
Number of participants	77
Duration of follow-up	1-week to 6 months
Indirectness	Directness was not a concern for this study
Additional comments	

Study arms

Simulation education program (N = 36)

Written education program (N = 41)

Characteristics

Study-level characteristics

Characteristic	Study (N = 77)
% Female Sample size	n = 52; % = 67.5
Simulation education program Sample size	n = 23; % = 63.9
Written education program Sample size	n = 29; % = 70.7
Mean age (SD) Mean (SD)	78.4 (8.2)
Simulation education program Mean (SD)	78.5 (7.3)
Written education program Mean (SD)	78.3 (8.9)

Ethnicity White Sample size	n = 68; % = 89.5
Simulation education program Sample size	n = 33; % = 91.7
Written education program Sample size	n = 35; % = 87.5

Outcomes

Fallers

Outcome	Simulation education program, N = 36	Written education program, N = 41
Number of fallers (post-discharge) 1-week post-discharge No of events	n = 3; % = 9.1	n = 5; % = 14.3

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

Fallers-Number of fallers (post-discharge)-No of Events-Simulation education program -Written education program

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to no specified protocol and the utilised method of analysis)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly appliable)*

Farhat, 2022

Bibliographic Reference	**Farhat, Akram; Al-Hajje, Amal; Lang, Pierre-Olivier; Csajka, Chantal; Impact of Pharmaceutical Interventions with STOPP/START and PIM-Check in Older Hospitalized Patients: A Randomized Controlled Trial.; Drugs & aging; 2022; vol. 39 (no. 11); 899-910**

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	(NCT04028583) and (SNCTP000002784)
Study type	Randomised controlled trial (RCT)
Study location	Switzerland
Study setting	Hospital
Study dates	February 2018 to April 2019
Sources of funding	Open access funding provided by University of Lausanne

Inclusion criteria	Patients aged ≥65 years with at least one geriatric syndrome (i.e. cognitive impairment, malnutrition, urinary incontinence, history of falls, risk of falling, multiple comorbidities and/or polypharmacy), with acute illnesses and/or exacerbated chronic conditions and requiring acute hospitalisation. Same criteria as for admission into the Acute Care for Elders (ACE) unit.
Exclusion criteria	Patients transferred to surgery divisions, intermediate or intensive care units, and patients without informed consent or with a stay <3 days.
Recruitment / selection of participants	Not specified
Intervention(s)	PIM-Check
Comparator	STOPP/START
Number of participants	123 patients
Duration of follow-up	Not specified
Indirectness	PIM-check has been identified as being an inferior comparator against STOPP/START
Additional comments	Not specified

Study arms

STOPP/ START criteria (N = 63)

PIM check (N = 60)

Characteristics

Study-level characteristics

Characteristic	Study (N = 123)
% Female Sample size	n = 92; % = 74.8
PIM-Check Sample size	n = 46; % = 76.7
STOPP/START Sample size	n = 46; % = 73
Mean age (SD) Standardised Mean (SD)	86.25 (6.63)
PIM-Check Standardised Mean (SD)	87.15 (6.44)
STOPP/START Standardised Mean (SD)	85.44 (6.76)
Comorbidities	n = NA; % = NA

Characteristic	Study (N = 123)
Sample size	
PIM-Check Hypertension Sample size	n = 43; % = NA
STOPP/START Hypertension Sample size	n = 43; % = NA
PIM-Check Osteoporosis Sample size	n = 15; % = NA
STOPP/START Osteoporosis Sample size	n = 26; % = NA
PIM-Check Kidney failure Sample size	n = 13; % = NA
STOPP/START Kidney failure Sample size	n = 24; % = NA
PIM-Check Dyslipidaemia Sample size	n = 12; % = NA
STOPP/START Dyslipidaemia Sample size	n = 18; % = NA

Characteristic	Study (N = 123)
PIM-Check Diabetes mellitus (type 2) Sample size	n = 12; % = NA
STOPP/START Diabetes mellitus (type 2) Sample size	n = 10; % = NA
PIM-Check Ischemic heart disease Sample size	n = 10; % = NA
STOPP/START Ischemic heart disease Sample size	n = 11; % = NA
PIM-Check Heart failure Sample size	n = 1; % = NA
STOPP/START Heart failure Sample size	n = 17; % = NA
PIM-Check Hypothyroidism Sample size	n = 7; % = NA
STOPP/START Hypothyroidism Sample size	n = 8; % = NA
PIM-Check Other	n = 76; % = NA

Characteristic	Study (N = 123)
Sample size	
STOPP/START Other Sample size	n = 51; % = NA
PIM-Check Atrial fibrillation Sample size	n = 16; % = NA
STOPP/START Atrial fibrillation Sample size	n = 12; % = NA

Outcomes: Falls

Outcome	STOPP/ START criteria, N = 62	PIM check, N = 60
At least 1 fall during hospitalisation No of events	n = 3; % = 5	n = 3; % = 4.8

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT: Falls-At least 1 fall during hospitalisation -No of Events-STOPP/ START criteria-PIM check

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due analysis methodology)*
Overall bias and Directness	Overall Directness	Partially applicable *(Partially applicable)*

Hassett, 2020

Bibliographic Reference	**Hassett, Leanne; van den Berg, Maayken; Lindley, Richard I; Crotty, Maria; McCluskey, Annie; van der Ploeg, Hidde P; Smith, Stuart T; Schurr, Karl; Howard, Kirsten; Hackett, Maree L; Killington, Maggie; Bongers, Bert; Togher, Leanne; Treacy, Daniel; Dorsch, Simone; Wong, Siobhan; Scrivener, Katharine; Chagpar, Sakina; Weber, Heather; Pinheiro, Marina; Heritier, Stephane; Sherrington, Catherine; Digitally enabled aged care and neurological rehabilitation to enhance outcomes with Activity and MObility UsiNg Technology (AMOUNT) in Australia: A randomised controlled trial.; PLoS medicine; 2020; vol. 17 (no. 2); e1003029**

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	ACTRN12614000936628
Study location	Australia
Study setting	Hospitals
Study dates	22 September 2014 to 10 November 2016
Sources of funding	Australian National Health and Medical Research Council Project Grant (APP1063751)

Inclusion criteria	≥18 years old, reduced mobility (Short Physical Performance Battery score <12) with clinician-assessed capacity for improvement (based on the usual care physiotherapists' clinical experience and their assessment and treatment experience with the patient), life expectancy >12 months, anticipated length of stay ≥10 days from randomisation and able to maintain a standing position (with assistance of 1 person if necessary).
Exclusion criteria	Cognitive impairment likely to interfere with device use, insufficient English language skills with no available interpreter, inadequate vision to use devices, medical conditions precluding exercise, no interest in using devices, anticipated discharge to high care residential facility (nursing home), or discharge location too distant for follow-up
Recruitment / selection of participants	Adults aged 18 to 101 years old with mobility limitations undertaking aged care and neurological inpatient rehabilitation were recruited.
Intervention(s)	Digitally enabled rehabilitation in combination with usual care
Population subgroups	NA
Comparator	Usual care alone
Number of participants	300 participants
Duration of follow-up	6 months
Indirectness	Not a concern for this study
Additional comments	Intention-to-treat principles. Adults between the ages of 18-101 years old with mobility limitations undertaking aged care and neurological inpatient rehabilitation were recruited from 3 Australian hospitals.

Characteristics

Study-level characteristics

Characteristic	Study (N = 300)
% Female Sample size	n = NA; % = NA
Intervention group Sample size	n = 72; % = 48
Control group Sample size	n = 77; % = 51
Mean age (SD) Mean (SD)	NA (NA)
Intervention group Mean (SD)	70 (18)
Control group Mean (SD)	73 (15)
Comorbidities No of events	n = NA; % = NA
Intervention group- Neurological	n = 72; % = 48

Characteristic	Study (N = 300)
No of events	
Control group- Neurological No of events	n = 77; % = 51
Intervention group- Cardiopulmonary No of events	n = 16; % = 11
Control group- Cardiopulmonary No of events	n = 9; % = 6
Intervention group- Musculoskeletal No of events	n = 41; % = 28
Control group- Musculoskeletal No of events	n = 48; % = 32

Outcomes

EuroQOL-5D

Outcome	Study, N = 300
Mobility domain Baseline Custom value	NA
Intervention group Custom value	3.0 (1.0)
Control group Custom value	2.9 (1.1)
Mobility domain at 6 months Custom value	NA
Intervention group Custom value	2.0 (1.0)
Control group Custom value	2.2 (1.0)
Self-care domain Baseline Custom value	NA

Outcome	Study, N = 300
Intervention group Custom value	2.4 (1.2.)
Control group Custom value	2.5 (1.1)
Self-care domain at 6 months Custom value	NA
Intervention group Custom value	1.5 (0.9)
Control group Custom value	1.7 (1.1)
Usual activities domain Baseline Custom value	NA
Intervention group Custom value	3.2 (1.4)
Control group Custom value	3.5 (1.3)

Outcome	Study, N = 300
Usual activities domain at 6 months Custom value	NA
Intervention group Custom value	1.9 (0.9)
Control group Custom value	2.1 (1.2)
Pain or discomfort domain Baseline Custom value	NA
Intervention group Custom value	2.4 (1.1)
Control group Custom value	2.6 (1.1)
Pain or discomfort domain at 6 months Custom value	NA
Intervention group	2.0 (0.9)

Outcome	Study, N = 300
Custom value	
Control group Custom value	2.1 (1.0)
Anxiety or depression domain Baseline Custom value	NA
Intervention group Custom value	1.8 (1.0)
Control group Custom value	1.8 (0.9)
Anxiety or depression domain at 6 months Custom value	NA
Intervention group Custom value	1.6 (0.9)
Control group Custom value	1.6 (0.8)

Outcome	Study, N = 300
VAS score Baseline Custom value	NA
Intervention group Custom value	54.5 (21.9)
Control group Custom value	55.0 (20.7)
VAS score at 6 months Custom value	NA
Intervention group Custom value	71.5 (18.3)
Control group Custom value	70.2 (20.7)

Falls

Outcome	Study, N = 300
Number of falls Custom value	NR
Intervention group Custom value	117
Control group Custom value	97
Participants with at least 1 fall No of events	n = NR; % = NR
Intervention group No of events	n = 53; % = 37
Control group No of events	n = 53; % = 27
Participants with 2 or more falls No of events	n = NR; % = NR
Intervention group No of events	n = 26; % = 18

Outcome	Study, N = 300
Control group No of events	n = 21; % = 15
Participants with 3 or more falls No of events	n = NR; % = NR
Intervention group No of events	n = 15; % = 10
Control group No of events	n = 12; % = 8
Participants with 4 or more falls No of events	n = NR; % = NR
Intervention group No of events	n = 9; % = 6
Control group No of events	n = 6; % = 4
Number of injurious falls Custom value	NR
Intervention group	27

Outcome	Study, N = 300
Custom value	
Control group Custom value	30
Participants with injurious falls No of events	n = NR; % = NR
Intervention group No of events	n = 21; % = 14
Control group No of events	n = 19; % = 13

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

Falls-Number of falls -Intervention group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Mobility domain-Intervention group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Mobility domain - Control group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Mobility domain -Intervention group -6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Mobility domain -Control group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Self-care domain - Intervention group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Self-caredomain-Controlgroup

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Self-care domain – Intervention group - 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Self-care domain – Control group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Usual activities domain – Intervention group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Usual activities domain – Control group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D- Usual activities domain - Intervention group - 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Usual activities domain – Control group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Pain or discomfort domain – Intervention group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D- Pain or discomfort domain – Control group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Pain or discomfort domain – Intervention group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Pain or discomfort domain – Control group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Anxiety or depression domain – Intervention group -

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Anxiety or depression domain – Control group -

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Anxietyordepressiondomain-Interventiongroup-6months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-Anxietyordepressiondomain-Controlgroup-6months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-VAS score – Intervention group -

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-VAS score – Control group -

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-VAS score – Intervention group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

EuroQOL-5D-VAS score – Control group – 6 months

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Number of falls - Control group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with at least 1 fall – Intervention group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with at least 1 fall – Control group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with 2 or more falls – Intervention group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with 2 or more falls – Control group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participantswith3ormorefalls-Interventiongroup-No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls - Participants with 3 or more falls - Control group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with 4 or more falls – Intervention group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with 4 or more falls – Control group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Number of injurious falls - Intervention group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Number of injurious falls -Control group-

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with injurious falls – Intervention group - No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Participants with injurious falls -Control Group-No of Events

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias regarding deviation from the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Kaegi-Braun, 2021

Bibliographic Reference	**Kaegi-Braun, Nina; Tribolet, Pascal; Gomes, Filomena; Fehr, Rebecca; Baechli, Valerie; Geiser, Martina; Deiss, Manuela; Kutz, Alexander; Bregenzer, Thomas; Hoess, Claus; Pavlicek, Vojtech; Schmid, Sarah; Bilz, Stefan; Sigrist, Sarah; Brandle, Michael; Benz, Carmen; Henzen, Christoph; Mattmann, Silvia; Thomann, Robert; Rutishauser, Jonas; Aujesky, Drahomir; Rodondi, Nicolas; Donze, Jacques; Stanga, Zeno; Mueller, Beat; Schuetz, Philipp; Six-month outcomes after individualized nutritional support during the hospital stay in medical patients at nutritional risk: Secondary analysis of a prospective randomized trial.; Clinical nutrition (Edinburgh, Scotland); 2021; vol. 40 (no. 3); 812-819**

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	EFFORT trial (NCG02517476)
Study location	Switzerland
Study setting	Hospitals
Study dates	NR
Sources of funding	The Swiss National Science Foundation (SNSF) (PP00)3_150531) and the Research Council of the Cantonsspital Aarau (1410.000.058 and 1410.000.044)

Inclusion criteria	- NRS ≥3 points -expected hospital length of stay ≥5 days (as estimated by the treating physician team) -willingness to provide informed consent Provided from clinicaltria.gov registry (NCG02517476)
Exclusion criteria	-Initially admitted to critical care units (except intermediate care) -scheduled for surgery or in an immediate post-operative state -unable to ingest oral nutrition and thus need for enteral or parenteral nutrition -admitted with, or scheduled for, total parenteral nutrition or tube feeding -currently under nutritional therapy (defined by at least 1 visit with a dietician in the last month) -who are hospitalised because of anorexia nervosa -in terminal condition (end of life situation) -hospitalised due to acute pancreatitis -hospitalised due to acute liver failure -earlier inclusion to this trial -cystic fibrosis -patients after gastric bypass operations -stem cell transplantation -any contraindication against nutritional therapy (i.e. enteral or parenteral)

	Provided from clinicaltria.gov registry (NCG02517476)
Recruitment / selection of participants	Participants at secondary and tertiary care hospitals.
Intervention(s)	Nutritional support- Nutritional support which included individualised nutrition support within 48 hours of after admission to reach protein and energy goals (stated in accordance with a previously published protocol and in accordance with international guidelines). Individualised energy and protein goals were defined by the hospital dietician and the Harris-Benedict equation was used to estimate energy requirements. Protein intake goals were set to 1.2-1.5g/kg body weight (or lower if the patient experienced renal failure – 0.8g/kg body weight). The intervention was comprised of hospital food and oral nutritional supplements. Enteral tube feeding or parenteral feeding was recommended if at least 75% of energy and protein targets could not be reached through oral feeding within 5 days. Nutritional intake was reassessed every 24-48 hours.
Population subgroups	N/A
Comparator	Usual care - patients received hospital food as usual according to their ability and desire to eat with no nutritional counselling and no recommendation for additional support.
Number of participants	2028 patients
Duration of follow-up	6 months
Indirectness	Not a concern for this study
Additional comments	All analyses were performed according to the intention-to-treat principle.

Study arms

Individualised nutrition support (N = 994)

Usual care (N = 999)

Characteristics

Study-level characteristics

Characteristic	Study (N = 2028)
Mean age (SD) Standardised Mean (SD)	NA (NA)
Intervention group Standardised Mean (SD)	72.7 (13.9)
Control group Standardised Mean (SD)	73 (13.9)
Comorbidities Sample size	n = NA; % = NA
Intervention group- coronary heart disease Sample size	n = 285; % = 28.7
Control group- coronary heart disease Sample size	n = 276; % = 27.6
Intervention group- Chronic heart failure	n = 174; % = 17.5

Characteristic	Study (N = 2028)
Sample size	
Control group- Chronic heart failure Sample size	n = 179; % = 17.9
Intervention group- Hypertension Sample size	n = 553; % = 55.6
Control group- Hypertension Sample size	n = 546; % = 54.7
Intervention group- Cerebrovascular disease Sample size	n = 74; % = 7.4
Control group- Cerebrovascular disease Sample size	n = 87; % = 8.7
Intervention group- Peripheral arterial disease Sample size	n = 79; % = 7.9
Control group- Peripheral arterial disease Sample size	n = 104; % = 10.4
Intervention group- Chronic renal failure Sample size	n = 317; % = 21.3

Characteristic	Study (N = 2028)
Control group- Chronic renal failure Sample size	n = 210; % = 21
Intervention group- Diabetes Sample size	n = 212; % = 21.3
Control group- Diabetes Sample size	n = 210; % = 21
Intervention group- COPD Sample size	n = 145; % = 14.6
Control group- COPD Sample size	n = 155; % = 15.5
Intervention group- Dementia Sample size	n = 38; % = 3.8
Control group- Dementia Sample size	n = 36; % = 3.6
Intervention group- Malignant disease Sample size	n = 333; % = 33.5
Control group- Malignant disease	n = 327; % = 32.7

Characteristic	Study (N = 2028)
Sample size	

Outcomes

Outcome of interest

Outcome	Individualised nutrition support, N = 994	Usual care, N = 999
Falls No of events	n = 108; % = 10.9	n = 112; % = 11.2
Falls Custom value	Regression analysis: 0.96 (0.72-1.27)	NA
Falls with fracture No of events	n = 18; % = 1.8	n = 14; % = 1.4
Falls with fracture Custom value	Regression analysis: 1.27 (0.63-2.58_	NA
Quality of life EQ-5D Visual-analogue scale- points Custom value	50.9 (±34.9)	50.7 (±35.5)
Quality of life EQ-5D Visual-analogue scale- points Custom value	Regression analysis: -1.16 (-3.34 to 1.02)	NA
Quality of life EQ-5D index Custom value	0.83 (±0.21)	0.83 (±0.21)

Outcome	Individualised nutrition support, N = 994	Usual care, N = 999
Quality of life EQ-5D index Custom value	Regression analysis: 0.00 (-0.02 to 0.02)	NA

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

Outcome of interest-Falls-No of Events-Individualised nutrition support-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns regarding patient adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcome of interest-Falls with fracture-No of Events-Individualised nutrition support-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns regarding patient adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcome of interest -Quality of life-Custom Value 0-Individualised nutrition support-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns regarding patient adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcome of interest -Quality of life-Individualised nutrition support-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns regarding patient adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Kojaie-Bidgoli, 2021

Bibliographic Reference	**Kojaie-Bidgoli, A; Sharifi, F; Maghsoud, F; Alizadeh-Khoei, M; Jafari, F; Sadeghi, F; The Modified Hospital Elder Life Program (HELP) in geriatric hospitalized patients in internal wards: A double-blind randomized control trial.; BMC geriatrics; 2021; vol. 21 (no. 1); 599**

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	IRCT20180910040995N1
Study location	Iran
Study setting	University hospital- internal medicine wards
Study dates	October 2019 to October 2020
Sources of funding	No funding for this study
Inclusion criteria	Being 70 years old and over, being admitted into one of the Internal Medicine wards, not being delirious at admission time, having at least one of the delirium risk factors at the time of admission (cognitive impairment, vision/hearing impairments, immobilization, sleep deprivation, dehydration: BUN/Cr ratio >18), being willing to participate in the study, and being able to communicate verbally or in writing.

Exclusion criteria	Coma, mechanical ventilation, aphasia (expressive and/or receptive), severely impaired communication ability, terminal/end stage conditions, imminent death, combative or dangerous behaviours, a severe psychotic disorder that prevent patients from participating in interventions, severe dementia (being unable to communicate based on SPMSQ 10 errors), airborne precautions (i.e. tuberculosis), being isolated, droplet precautions (i.e. influenza), neutropenic precautions, being discharged around 48 hours after admission, patient's refusal to participate in the study, and patient's family members or physician's refusal to let the patient participate in the study in the case of incompetent patients.
Recruitment / selection of participants	Participants were selected using the allocation stratified block random sampling method.
Intervention(s)	HELP interventions. Protocols included cognitive protocol, vision/ hearing protocol, sleep protocol, mobility, hydration, and feeding assistance. Cognitive protocol covers patient orientation, cognitive stimulation, and therapeutic activities. Vision/ hearing protocol involves reminding patients to use their glasses or hearing aids, training caregivers to communicate with the patients suffering from vision/ hearing impairment. The sleep protocol included interventions such as using individual considerations for normal routines, doing additional sleep promoting activities, using strategies to reduce the noise in the wards, and adjusting schedules to facilitate sleep uninterrupted. The mobility protocol includes doing active range of motion exercises three times daily and minimizing the use of immobilizing equipment. The hydration protocol included fluid repletion interventions such as early recognition of dehydration and oral volume repletion.
Population subgroups	NA
Comparator	Usual care
Number of participants	195 participants
Duration of follow-up	Not specified
Indirectness	Not a concern for this study
Additional comments	Intention to treat approach: Geriatric hospitalised patients

Study arms

HELP intervention (N = 84)

Control group (N = 111)

Characteristics

Study-level characteristics

Characteristic	Study (N = 195)
Mean age (SD) Mean (SD)	78.53 (5.87)
HELP program Mean (SD)	77.75 (6.01)
Usual Care Mean (SD)	79.12 (5.72)
Comorbidities Sample size	n = NA; % = NA
HELP Program- Parkinson's Sample size	n = 1; % = 1.9
Usual care- Parkinson's Sample size	n = 3; % = 2.7
HELP Program- History of dementia	n = 6; % = 7.15

Characteristic	Study (N = 195)
Sample size	
Usual care- History of dementia Sample size	n = 12; % = 10.81
HELP Program- Kidney failure Sample size	n = 13; % = 15.48
Usual care- Kidney failure Sample size	n = 18; % = 16.22
HELP Program- Liver failure Sample size	n = 2; % = 2.38
Usual care- Liver failure Sample size	n = 5; % = 4.5
HELP Program- COPD Sample size	n = 16; % = 19.05
Usual care- COPD Sample size	n = 12; % = 10.81
HELP Program- Depression Sample size	n = 8; % = 9.53

Characteristic	Study (N = 195)
Usual care- Depression Sample size	n = 7; % = 6.31
HELP Program- Cancer Sample size	n = 3; % = 3.57
Usual care- Cancer Sample size	n = 5; % = 4.5

Outcomes

Falls

Outcome	HELP intervention, N = 82	Control group, N = 102
Experienced a fall No of events	n = 2; % = 2.5	n = 4; % = 4

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

Falls-Experienced a fall-No of Events-HELP intervention-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns due to no specified study protocol)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Liang, 2020

Bibliographic Reference	**Liang, Yuxiang; Wang, Renjie; Jiang, Jiaojiao; Tan, Lingling; Yang, Ming; A randomized controlled trial of resistance and balance exercise for sarcopenic patients aged 80-99 years.; Scientific reports; 2020; vol. 10 (no. 1); 18756**

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	ClinicalTrials.gov (ID: NCT04216368)
Study location	China
Study setting	Hospital
Study dates	Not specified
Sources of funding	Not reported
Inclusion criteria	Aged 80 years or older with sarcopenia defined by the recommendation from the Asian Working Group for Sarcopenia (AGWS), ambulate capabilities (assistance was allowed if necessary), and ability to communicate and collaborate with medical staff.

Exclusion criteria	Terminal illness, acute lower respiratory infection, uncontrolled arrhythmias, uncontrolled heart failure, recent myocardial infarction, uncontrolled respiratory failure, acute pulmonary embolism, recent major surgery, recent dialysis, a bone fracture in the past 3 months, or expected length of stay less than 12 weeks.
Recruitment / selection of participants	Not specified
Intervention(s)	Mixed exercise program including balance and resistance exercise. Including light 5-minute warm-up, 20 minutes of targeted balance training, 5-minute rest, 20 minutes of resistance training and 5-minute cool down.
Population subgroups	NA
Comparator	Resistance exercise program
Number of participants	221 participants
Duration of follow-up	Not specified
Indirectness	Not a concern for this study
Additional comments	Intention-to-treat approach. Sarcopenic patients in a post-acute care unit of the centre of gerontology and geriatrics in a tertiary public hospital in Chengdu, China

Characteristics

Study-level characteristics

Characteristic	Study (N = 221)
Resistance and balance group Sample size	n = 15; % = 50
Resistance alone group Sample size	n = 11; % = 36.7
Mean age (SD) Mean (SD)	NA (NA)
Resistance and balance group Mean (SD)	87.3 (6)
Resistance alone group Mean (SD)	86.8 (4.7)
Comorbidities No of events	n = NA; % = NA
Resistance and balance - Diabetes No of events	n = 4; % = 13.3
Resistance group Diabetes	n = 8; % = 26.7

Characteristic	Study (N = 221)
No of events	
Resistance and balance group Hypertension No of events	n = 18; % = 60
Resistance group Hypertension No of events	n = 15; % = 50
Resistance and Balance group COPD No of events	n = 8; % = 26.7
Resistance group COPD No of events	n = 6; % = 20
Resistance and balance group CHD No of events	n = 4; % = 13.3
Resistance group CHD No of events	n = 10; % = 13.3

Outcomes

Falls

Outcome	Study, N = 60
Number of fallers No of events	n = NA; % = NA
Resistance and balance group No of events	n = 4; % = 13.3
Resistance group No of events	n = 7; % = 23.3

Adverse events

Outcome	Study, N = 60
Resistance and balance group No of events	n = 0; % = 0
Resistance group No of events	n = 0; % = 0

Adverse events - Polarity - Lower values are better

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

Falls-Number of fallers-Resistance and balance group-No of Events

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

Falls-Number of fallers-Resistance Group-No of Events

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

Adverse events-Adverse events-Resistance and balance group-No of Events

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

Adverse Events-Adverse Events-Resistance Group-No of Events

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

Lozano-Vicario, 2024

Bibliographic Reference	**Lozano-Vicario, Lucia; Zambom-Ferraresi, Fabiola; Zambom-Ferraresi, Fabricio; L Saez de Asteasu, Mikel; Galbete-Jimenez, Arkaitz; Munoz-Vazquez, Angel Javier; Cedeno-Veloz, Bernardo Abel; De la Casa-Marin, Anton; Ollo-Martinez, Iranzu; Fernandez-Irigoyen, Joaquin; Santamaria, Enrique; San Miguel Elcano, Ramon; Ortiz-Gomez, Jose Ramon; Romero-Ortuno, Roman; Izquierdo, Mikel; Martinez-Velilla, Nicolas; Effects of Exercise Intervention for the Management of Delirium in Hospitalized Older Adults: A Randomized Clinical Trial.; Journal of the American Medical Directors Association; 2024; 104980**

Study details

Secondary publication of another included study- see primary study for details	
Trial name / registration number	NCT05442892
Study type	Randomised controlled trial (RCT)
Study location	Spain and Ireland
Study setting	Tertiary hospital
Study dates	Feb 2022 to May 2023, published 2024
Sources of funding	funded by a research grant PI17/01814 from the Ministerio de Economía, Industria y Competitividad (ISCIII, FEDER).
Inclusion criteria	Inclusion criteria were hospitalised older adults in an acute geriatric unit, aged ≥75 years with delirium and able to ambulate (Barthel Index >45 points before admission).

Exclusion criteria	People were excluded if they had (1) expected length of stay <5 days, (2) severe dementia, (3) terminal illness (life expectancy less than 3 months), and (4) contraindications to exercise including acute myocardial infarction in the past 3 months or unstable angina, severe heart valve insufficiency, arrhythmia or uncontrolled arterial hypertension, pulmonary embolism in the past 3 months, or hemodynamic instability.
Recruitment / selection of participants	All people in an acute geriatric unit were evaluated by geriatricians
Intervention(s)	People were trained for 1-week in a 30-minute morning session for 3 consecutive days (including weekends). An experienced fitness specialist led each session, providing instructions and encouragement. Each session was conducted in a room equipped with variable resistance strength machines (Matrix; Johnson Health Tech and Exercycle S.L., BH Group). The multicomponent program adapted from Vivifrail (www.vivifrail.com/resources) comprised resistance training, balance exercises, and walking tailored to each patient's baseline functional capacity. Adjustable resistance training machines targeted major muscle groups through 2 to 3 sets of 8 to 10 repetitions at 50% to 70% of the 1- repetition maximum (1 RM). Exercises focused on lower limbs (rise up from the chair, leg press, knee extension) and upper body (chest press).
Comparator	Usual care: receive care from the physiotherapist if the attending physician deems it necessary. The physiotherapist's care consists of standing, static walking, and walking a couple of corridors (25 to 50 meters maximum), at low intensity.
Number of participants	36
Duration of follow-up	3 months
Indirectness	

Study arms

Individualized physical exercise (N = 18)

Usual care (N = 18)

Characteristics

Arm-level characteristics

Characteristic	Individualized physical exercise (N = 18)	Usual care (N = 18)
% Female % Nominal	66.7	50
Mean age (SD) Mean (SD)	87.3 (5.5)	87.6 (7.8)

Outcomes

Study timepoints

3-month

Dichotomous outcome

Outcome	Individualized physical exercise, 3-month, N = 18	Usual care, 3-month, N = 18
In hospital falls Nominal	2	1

Continuous outcome

Outcome	Individualized physical exercise, 3-month, N = 18	Usual care, 3-month, N = 18
EQ-5D change score Mean (95% CI)	1.48 (-8.41 to 11.42)	-11.3 (-21 to -1.6)

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

Dichotomous outcome-In hospital falls-Nominal-Individualized physical exercise-Usual care-t3

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

Continuousoutcome-EQ-5D-MeanNineFivePercentCI-Individualized physical exercise-Usual care-t3

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

Martinez-Velilla, 2019

Bibliographic Reference	Martinez-Velilla, Nicolas; Casas-Herrero, Alvaro; Zambom-Ferraresi, Fabricio; Saez de Asteasu, Mikel L; Lucia, Alejandro; Galbete, Arkaitz; Garcia-Baztan, Agurne; Alonso-Renedo, Javier; Gonzalez-Glaria, Belen; Gonzalo-Lazaro, Maria; Apezteguia Iraizoz, Itziar; Gutierrez-Valencia, Marta; Rodriguez-Manas, Leocadio; Izquierdo, Mikel; Effect of Exercise Intervention on Functional Decline in Very Elderly Patients During Acute Hospitalization: A Randomized Clinical Trial.; JAMA internal medicine; 2019; vol. 179 (no. 1); 28-36

Study details

Secondary publication of another included study- see primary study for details	
Trial name / registration number	SPIRIT 2013
Study location	Spain
Study setting	ACE unit of tertiary public hospital
Study dates	1 February 2015 to 30 August 2017
Sources of funding	This study was funded by a Gobierno de Navarra project Resolución grant 2186/2014 and acknowledged with the “Beca Ortiz de Landázuri” as the best research clinical project in 2014, as well as by a research grant PI17/01814 of the Ministerio de Economía, Industria y Competitividad (ISCIII, FEDER).
Inclusion criteria	Aged 75 years or older, Barthel Index score of 60 or more, being able to ambulate (with/ without assistance), and being able to communicate and collaborate with the research team.
Exclusion criteria	Expected length of stay less than 6 days, very severe cognitive decline, terminal illness, uncontrolled arrhythmias, acute pulmonary embolism, recent myocardial infarction, recent major surgery, or extremity bone fracture in the past 3 months.

Recruitment / selection of participants	Acutely hospitalised patients who were admitted to the ACE unit.
Intervention(s)	Individualised moderate-intensity resistance, balance, and walking sessions (2 daily sessions)
Population subgroups	NA
Comparator	Usual care (in-hospital rehabilitation when needed)
Number of participants	370 patients
Duration of follow-up	Not specified
Indirectness	Not a concern for this study
Additional comments	Very elderly patients undergoing acute-care hospitalization

Characteristics

Study-level characteristics

Characteristic	Study (N = 370)
% Female Sample size	n = NA; % = NA
Individualised exercise Sample size	n = 100; % = 54.1
Usual Care Sample size	n = 109; % = 58.9
Mean age (SD) Mean (SD)	NA (NA)
Individualised exercise Mean (SD)	87.6 (4.6)
Usual Care Mean (SD)	87.1 (5.2)

Outcomes

Quality of Life

Outcome	Study, N = 370
EuroQoL-5D Custom value	NA
Individualised exercise Custom value	11.0 (7.5 to 14.5)
Usual Care Custom value	-2.2 (-5.8 to 1.3)

Falls

Outcome	Study, N = 370
Falls during hospitalisation No of events	n = NA; % = NA
Individualised exercise No of events	n = 4; % = 2.7
Usual care No of events	n = 0; % = 0

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

Quality of life - EuroQoL-5D - Individualised exercise

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

Quality of life - EuroQoL-5D – Usual Care-

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

Falls-Falls during hospitalisation-Individualised exercise - No of Events

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

Falls-Falls during hospitalisation-Usual Care-No of Events

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

McCullagh, 2020

Bibliographic Reference	**McCullagh, Ruth; O'Connell, Eimear; O'Meara, Sarah; Dahly, Darren; O'Reilly, Eilis; O'Connor, Kieran; Horgan, N Frances; Timmons, Suzanne; Augmented exercise in hospital improves physical performance and reduces negative post hospitalization events: a randomized controlled trial.; BMC geriatrics; 2020; vol. 20 (no. 1); 46**

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	APEP trial
Study location	Not specified
Study setting	General teaching hospital
Study dates	Not specified
Sources of funding	Funded by the Health Research board of Ireland as a Research Fellowship Training Grant
Inclusion criteria	Medical inpatients aged 65 and over, needing an aid/or assistance to walk on admission, and admitted from and planned for discharge home (rather than for institutional care), with an anticipated hospital stay ≥3 days.

Exclusion criteria	Inpatients >48 hours prior to screening, unable to follow simple commands in the English language, admitted with an acute psychiatric condition, requiring end-of-life or critical care, ordered bedrest, or contraindications to walking (i.e. hip fracture or high ventricular rate atrial fibrillation), baseline Short Physical Performance Battery (SPPB) score 0/1, participated in the trial within the previous 12 months.
Recruitment / selection of participants	Patients were identified using the electronic hospital management system.
Intervention(s)	Tailored strength and balance exercise
Population subgroups	NA
Comparator	Breathing/ relaxation and stretching exercises
Number of participants	199 patients
Duration of follow-up	3-month follow-up
Indirectness	Not a concern for this study
Additional comments	Intention-to-treat analysis was employed on the length of stay, death, and readmission rates. Quality of life (at discharge and follow-up) were estimated using linear regression. Logistic regression was used to estimate the effects of the intervention. Sample: frail older medical patients in the acute setting

Study arms

Tailored strength and balance exercise (N = 95)

Stretching and relaxation exercise (N = 95)

Characteristics

Study-level characteristics

Characteristic	Study (N = 199)
% Female Sample size	n = NA; % = NA
Control group Sample size	n = 39; % = 41
Intervention group Sample size	n = 61; % = 64
Mean age (SD) Mean (SD)	NA (NA)
Control group Mean (SD)	81.7 (7.3)
Intervention group Mean (SD)	79.7 (7.5)

Outcomes

Adverse events

Outcome	Tailored strength and balance exercise, N = 95	Stretching and relaxation exercise, N = 95
Deaths in hospital Custom value	3	3
Death during follow-up Custom value	5	12
Falls at discharge Custom value	3	3
Falls at follow-up Custom value	12	18

Quality of Life

Outcome	Tailored strength and balance exercise, N = 95	Stretching and relaxation exercise, N = 95
EQ-5D-5L VAS SR Health at Discharge Custom value	67.7 (±18.38)	62.4(±21.31)
EQ-5D-5L VAS SR Health at Follow-up Custom value	65.2 (±21.2)	58.5 (±21.6)

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

Adverse events-Deaths in hospital – Custom Value 0 - Tailored strength and balance exercise - Stretching and relaxation exercise

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants not adhering to the assigned intervention and identified baseline differences)*
Overall bias and Directness	Overall Directness	*Low*

Adverse events-Death during follow-up-Tailored strength and balance exercise-Stretching and relaxation exercise

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants not adhering to the assigned intervention and identified baseline differences)*
Overall bias and Directness	Overall Directness	*Low*

Adverse events-Falls at discharge-Tailored strength and balance exercise-Stretching and relaxation exercise

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants not adhering to the assigned intervention and identified baseline differences)*
Overall bias and Directness	Overall Directness	*Low*

Adverse events-Falls at follow-up-Tailored strength and balance exercise-Stretching and relaxation exercise

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants not adhering to the assigned intervention and identified baseline differences)*
Overall bias and Directness	Overall Directness	*Low*

Quality of life-EQ-5D-5L-Tailored strength and balance exercise-Stretching and relaxation exercise

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants not adhering to the assigned intervention and identified baseline differences)*
Overall bias and Directness	Overall Directness	*Low*

Quality of life-EQ-5D-5LFollowup-Tailored strength and balance exercise - Stretching and relaxation exercise

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants not adhering to the assigned intervention and identified baseline differences)*
Overall bias and Directness	Overall Directness	*Low*

Ortiz-Alonso, 2020

Bibliographic Reference	**Ortiz-Alonso, Javier; Bustamante-Ara, Natalia; Valenzuela, Pedro L; Vidan-Astiz, Maite; Rodriguez-Romo, Gabriel; Mayordomo-Cava, Jennifer; Javier-Gonzalez, Marianna; Hidalgo-Gamarra, Mercedes; Lopez-Tatis, Myriel; Valades-Malagon, Maria Isabel; Santos-Lozano, Alejandro; Lucia, Alejandro; Serra-Rexach, Jose Antonio; Effect of a Simple Exercise Program on Hospitalization-Associated Disability in Older Patients: A Randomized Controlled Trial.; Journal of the American Medical Directors Association; 2020; vol. 21 (no. 4); 531-537e1**

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	NCT01374893
Study location	Spain
Study setting	Acute care for older patients unit of a public hospital
Study dates	
Sources of funding	This study was supported by the Instituto de Salud Carlos III (Ministerio de Ciencia, Innovación y Universidades, Spain) (RD12/0043/0025, PI12/02852, PI15/ 00558 and PI18/00139); Biomedical Research Networking Center on Frailty and Healthy Aging (CIBERFES, Spain); and FEDER funds from the European Union

Inclusion criteria	Patients (>75 years) admitted to our ACE unit from June 2012 to June 2014 and hospitalised for 3 or more days and alive at discharge.
Exclusion criteria	Those who were non-ambulatory or dependent in all basic ADLs at baseline (i.e. 2 weeks before admission, as assessed by retrospective interview), had unstable cardiovascular disease or any other major medical condition contraindicating exercise, terminal illness, severe dementia (i.e. ≥8 errors in the Spanish version of the short portable mental status questionnaire (SPMSQ) also known as the Pfeiffer test), an expected length of hospitalisation <3 days, were transferred from another hospital unit or had a scheduled admission.
Recruitment / selection of participants	Not specified
Intervention(s)	Supervised simple exercises involving 1-3 sessions per day (total duration was about 20 minutes per day). Consisted of solely rising from a seated to an upright position (using armrests/ assistances if necessary) in the patient's room and supervised walking exercises along the corridor of the ward. Standing and walking exercises were separated by a rest period of up to 5-minutes. Combined with usual care.
Population subgroups	NA
Comparator	Usual care
Number of participants	268 participants
Duration of follow-up	3 months
Indirectness	Not a concern
Additional comments	Sample: acutely hospitalized very old patients

Study arms

Simple supervised exercises (N = 143)

Usual care (N = 125)

Characteristics

Study-level characteristics

Characteristic	Study (N = 268)
% Female Sample size	n = NA; % = NA
Supervised simple exercises Sample size	n = NA; % = 60
Usual Care Sample size	n = NA; % = 54
Mean age (SD) Mean (SD)	NA (NA)
Supervised simple exercises Mean (SD)	88 (5)
Usual Care Mean (SD)	88 (5)
Comorbidities	n = NA; % = NA

Characteristic	Study (N = 268)
No of events	
Supervised simple exercises- Dementia No of events	n = NA; % = 27
Usual care- Dementia No of events	n = NA; % = 12
Supervised simple exercises- Depression No of events	n = NA; % = 32
Usual care- Depression No of events	n = NA; % = 18
Supervised simple exercises- Falls No of events	n = NA; % = 36
Usual care- Falls No of events	n = NA; % = 16
Supervised simple exercises- Chronic pain No of events	n = NA; % = 35
Usual care- Chronic pain No of events	n = NA; % = 30

Characteristic	Study (N = 268)
Supervised simple exercises- Malnutrition No of events	n = NA; % = 22
Usual care- Malnutrition No of events	n = NA; % = 14
Supervised simple exercises- Urinary incontinence No of events	n = NA; % = 49
Usual care- Urinary incontinence No of events	n = NA; % = 39
Supervised simple exercises- Frailty phenotype No of events	n = NA; % = 74
Usual care- Frailty phenotype No of events	n = NA; % = 65
Supervised simple exercises- Incident delirium No of events	n = NA; % = 28
Usual care- Incident delirium No of events	n = NA; % = 18

Outcomes

Falls

Outcome	Simple supervised exercises, N = 125	Usual care, N = 106
Number of fallers Custom value	0	0

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

Falls-Number of falls-Simple supervised exercises-Usual care

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

Kiyoshi-Teo, 2019

Bibliographic Reference	**Kiyoshi-Teo, Hiroko; Northup-Snyder, Kathlynn; Cohen, Deborah J; Dieckmann, Nathan; Stoyles, Sydnee; Eckstrom, Elizabeth; Winters-Stone, Kerri; Feasibility of Motivational Interviewing to Engage Older Inpatients in Fall Prevention: A Pilot Randomized Controlled Trial.; Journal of gerontological nursing; 2019; vol. 45 (no. 9); 19-29**

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	NA
Study type	Randomised controlled trial (RCT)
Study location	United States
Study setting	Veterans Affairs hospital- medical surgical units
Study dates	Not specified
Sources of funding	Not specified

Inclusion criteria	Aged ≥65 years, high fall risk as indicated by Morse Fall Scale (MFS) score (≥45 on the most recent nursing documentation) and hospitalised for at least 24 hours on medical-surgical units. Patients had to be alert and oriented to time, place, and person, and able to carry on a verbal conversation in English.
Exclusion criteria	Critical care and psychiatric units were excluded.
Recruitment / selection of participants	All newly admitted patients to the study units received a study invitation letter by hospital staff as part of their hospital admission process.
Intervention(s)	Motivational interviewing
Population subgroups	NA
Comparator	Hospital falls prevention protocol
Number of participants	67
Duration of follow-up	Follow-up between Baseline to 2 days and 2 days to 3 months.
Indirectness	Not a concern for this study
Additional comments	High fall risk hospitalized older adults (age >=65) were contacted, and 67 participants were enrolled

Study arms

Motivational interviewing (N = 31)

Routine hospital falls prevention protocol (N = 36)

Characteristics

Study-level characteristics

Characteristic	Study (N = 67)
% Female Nominal	3
Mean age (SD) Mean (SD)	73.13 (6.35)
Intervention Mean (SD)	72.83 (6)
Control Mean (SD)	73.43 (6.78)

Outcomes

Fall Incident

Outcome	Motivational interviewing, N = 31	Routine hospital falls prevention protocol, N = 36
Fall incidents Custom value	NA	NA
Between baseline and 2 day follow-up Custom value	1	1
Between 2 day and 1-week follow-up Custom value	2	1
Between 1-week and 1 month follow-up Custom value	4	2
Between 1 month and 3-month follow-up Custom value	6	8
Incidents rate (month) Custom value	0.2029	0.2098

Fall Incident

Outcome	Motivational interviewing, N = 31	Routine hospital falls prevention protocol, N = 36
Fall incidents Custom value	NA	NA
Between baseline and 2-day follow-up Custom value	1	1
Between 2 day and 1-week follow-up Custom value	2	1
Between 1-week and 1 month follow-up Custom value	4	2
Between 1 month and 3-month follow-up Custom value	6	8
Incidents rate (month) Custom value	0.2029	0.2098

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

Fall incidents- Between baseline and 2-day follow-up - Motivational interviewing - Routine hospital falls prevention protocol

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Some concerns of bias regarding selection of the reported result and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fall Incident – Fall incidents – Between 2 day and 1-week follow-up – Motivational interviewing - Routine hospital falls prevention protocol

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Some concerns of bias regarding selection of the reported result and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fall Incident – Fall incidents – Between 1week and 1month follow-up - Motivational interviewing - Routine hospital falls prevention protocol

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Some concerns of bias regarding selection of the reported result and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fall Incident – Fall incidents – Between 1 month and 3-month follow-up - Motivational interviewing - Routine hospital falls prevention protocol

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Some concerns of bias regarding selection of the reported result and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fall Incident – Incidents rate (month) - Motivational interviewing - Routine hospital falls prevention protocol

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Some concerns of bias regarding selection of the reported result and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fall Incident – Fall incidents - Motivational interviewing - Routine hospital falls prevention protocol

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Some concerns of bias regarding selection of the reported result and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Appendix E Forest plots

Interventions to prevent falls in hospitals

Figure 2: Exercise versus usual care: number of fallers

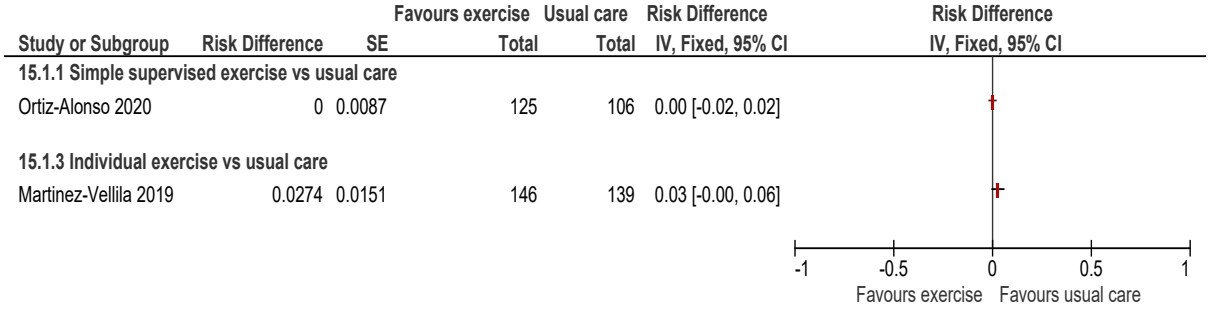


Figure 3: Exercise versus usual care: quality of life (EuroQol-5D)

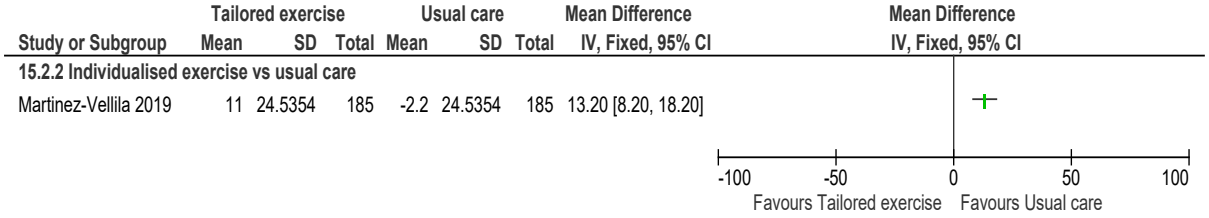


Figure 4: Exercise versus exercise: number of fallers

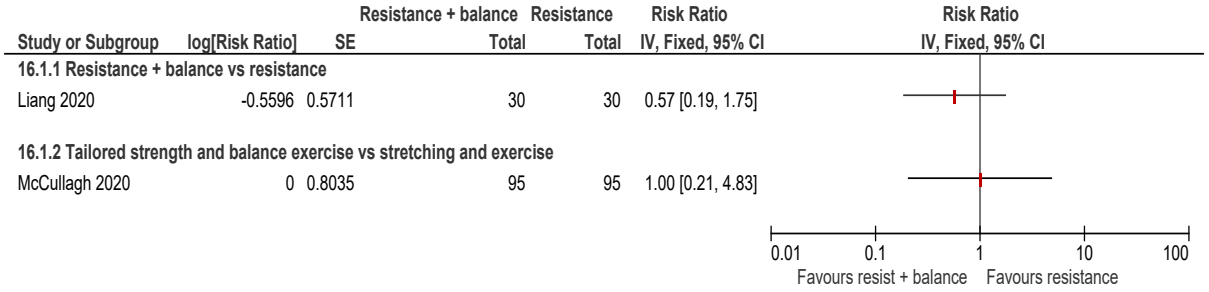


Figure 5: Exercise versus exercise: quality of life (EQ-5D)

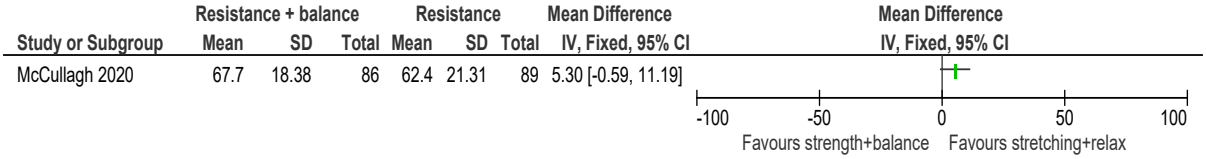


Figure 6: Exercise versus exercise: adverse events

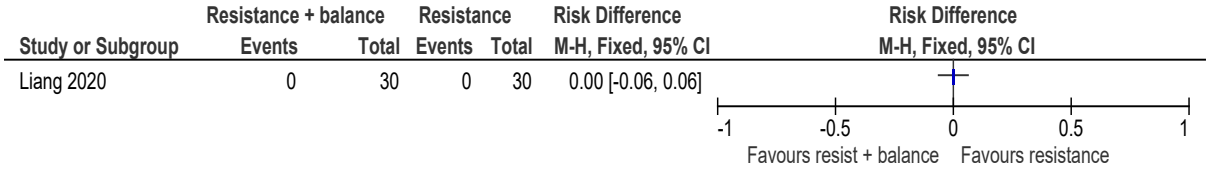


Figure 7: Exercise versus exercise: deaths in hospital

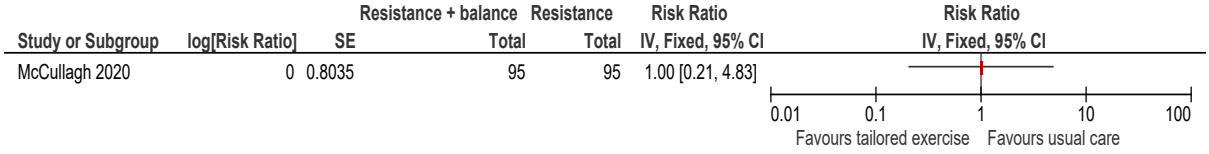
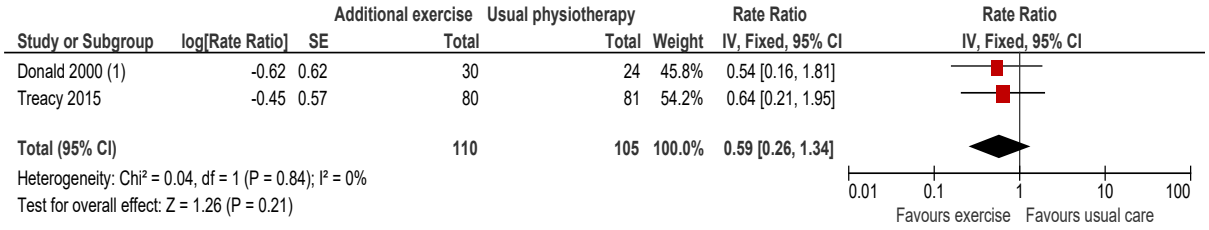


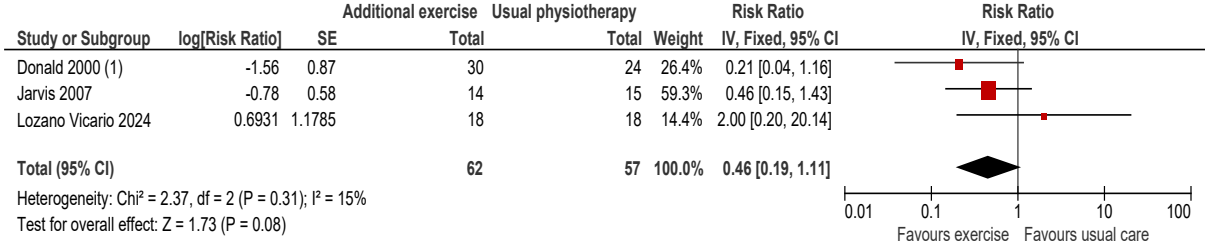
Figure 8: Additional exercises versus usual physiotherapy: rate of falls



Footnotes

(1) Factorial design: additional exercises with carpet or vinyl flooring vs conventional physiotherapy with carpet or vinyl flooring

Figure 9: Additional exercises versus usual physiotherapy: number of fallers



Footnotes

(1) Factorial design: additional exercises with carpet or vinyl flooring vs conventional physiotherapy with carpet or vinyl flooring

Figure 10: Medication review versus usual care: rate of falls

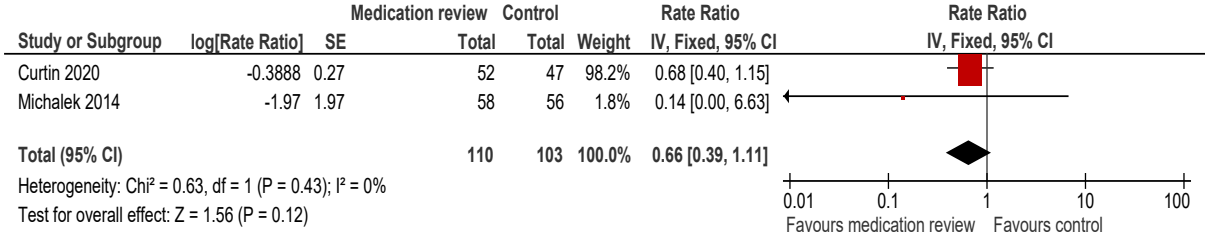


Figure 11: Medication review versus usual care: number of fallers

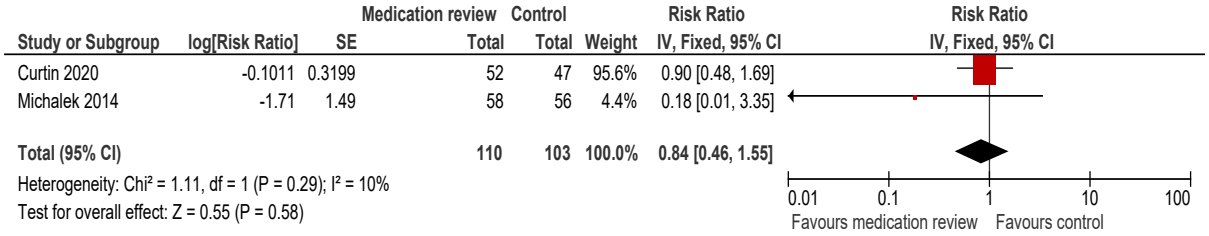


Figure 12: Medication review versus usual care: number of people sustaining a non-vertebral fracture

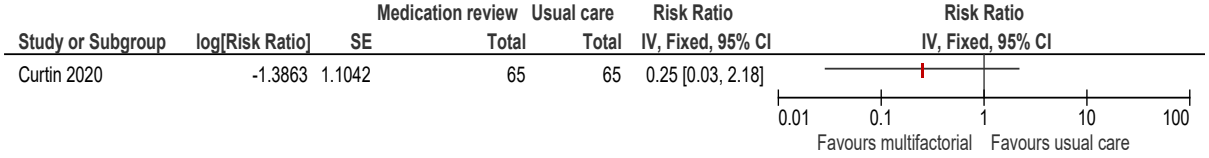


Figure 13: Medication review (PIM-check) versus medication review (STOPP/START): number of fallers

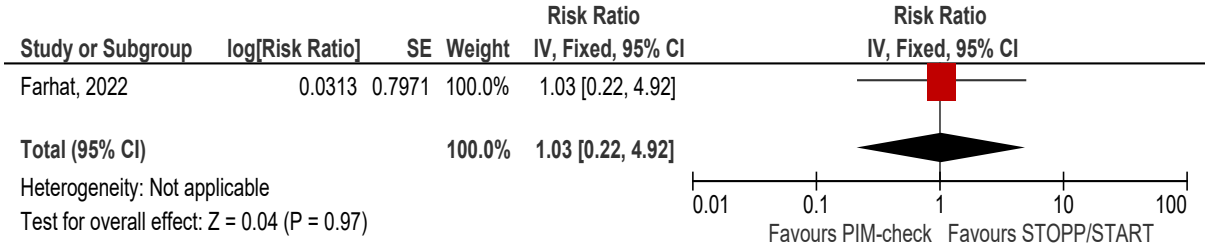


Figure 14: Vitamin D plus calcium versus calcium: number of fallers

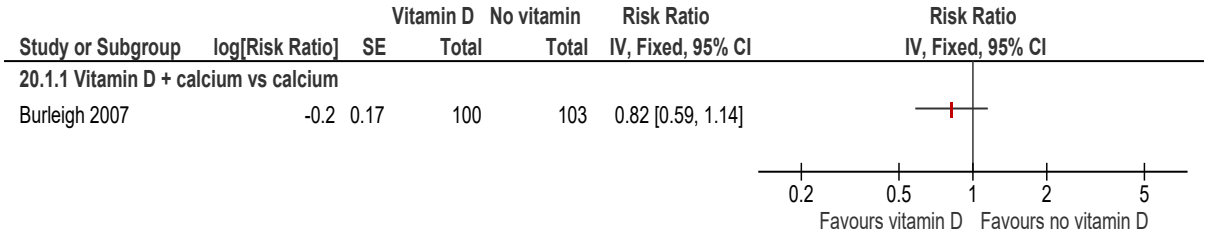


Figure 15: Vitamin D plus calcium versus calcium: number of people sustaining a fracture

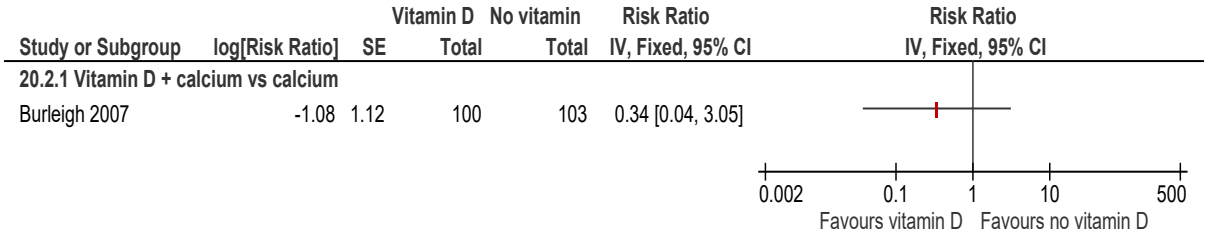


Figure 16: Vitamin D plus calcium versus calcium: gastro-intestinal complaints (nausea, vomiting, diarrhoea)

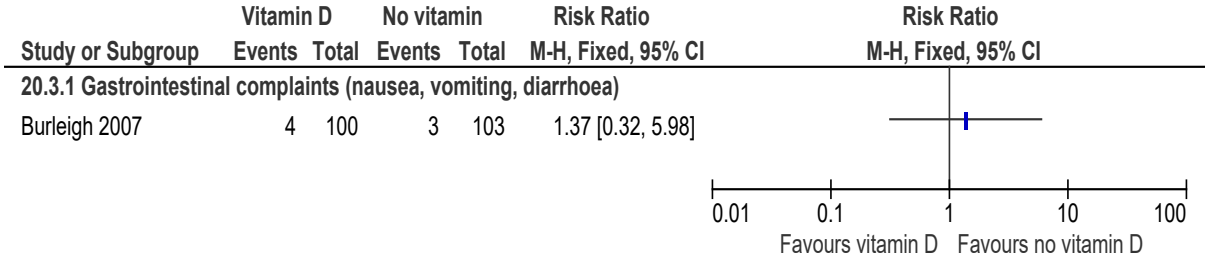


Figure 17: Nutritional support versus usual care: fall rates

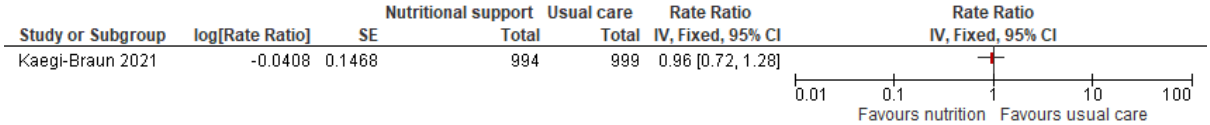


Figure 18: Nutritional support versus usual care: number of fallers

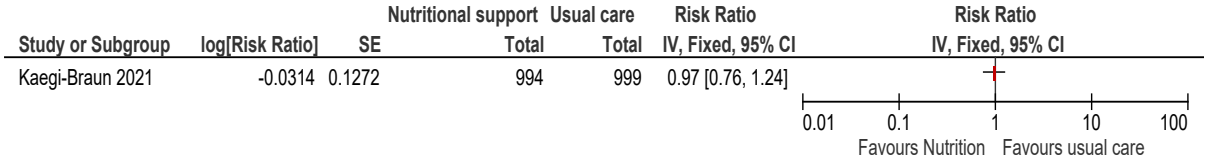


Figure 19: Nutritional support versus usual care: falls with fracture

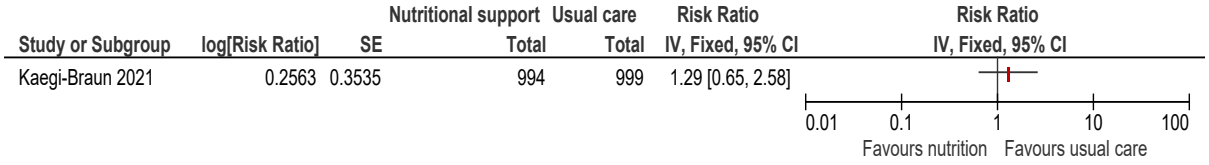


Figure 20: Nutritional support versus usual care: Quality of life (EQ-5D VAS)

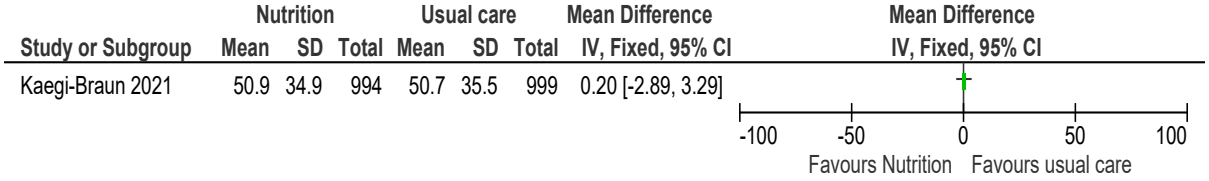


Figure 21: Nutritional support versus usual care: Quality of life (EQ-5D-index)

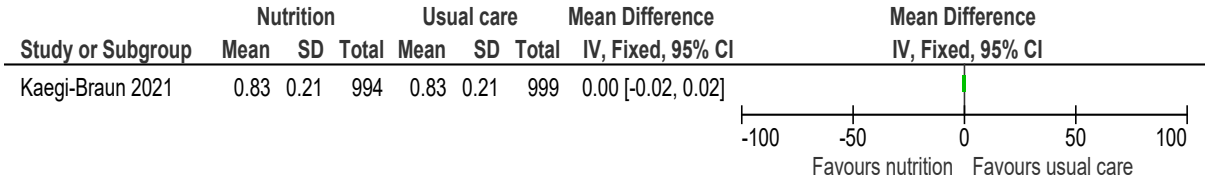
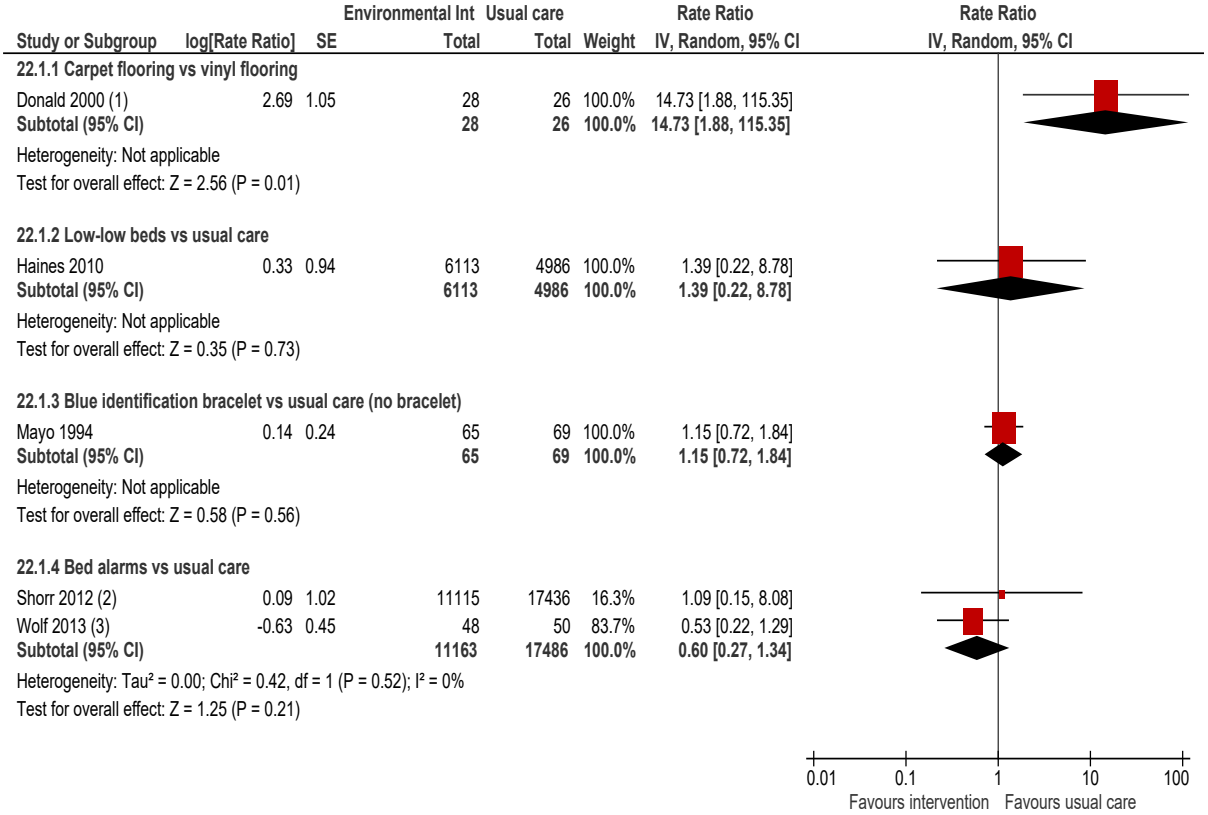


Figure 22: Environmental interventions versus usual care: rate of falls



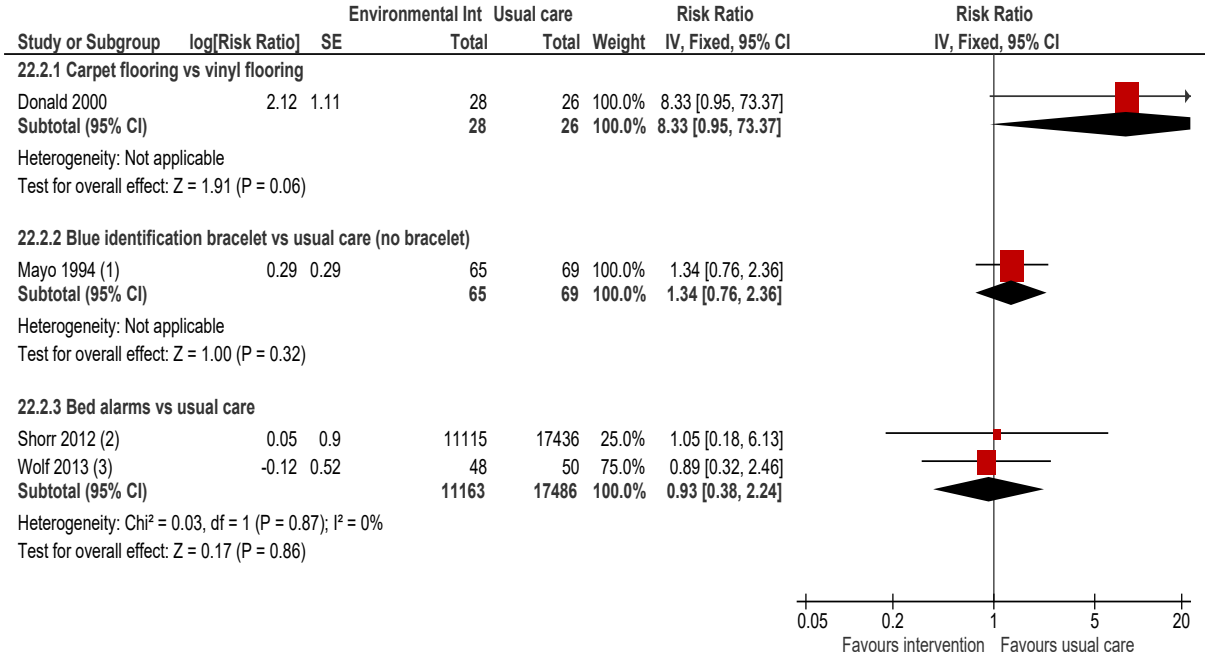
Footnotes

(1) Factorial design: carpet flooring with or without additional exercises vs vinyl flooring with or without additional exercises

(2) Education and support on use of sensor pads applied to the bed, chair or commode

(3) Sensor alarm fitted to patients upper leg at rest time

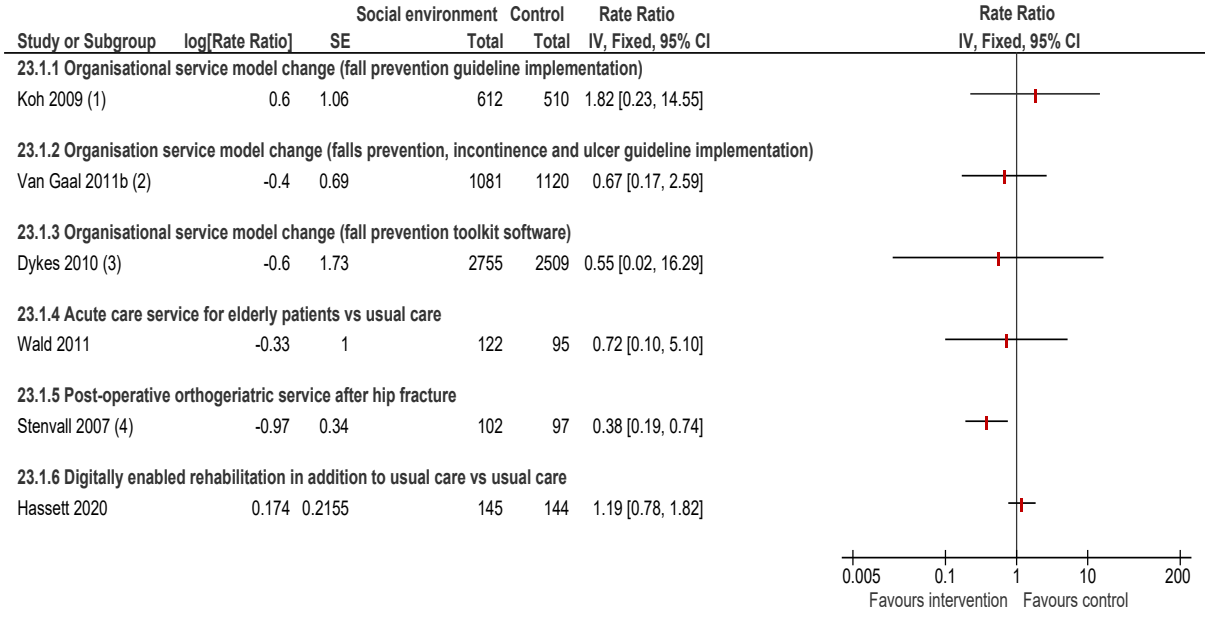
Figure 23: Environmental interventions versus usual care: number of fallers



Footnotes

(1) Blue identification bracelet vs usual care (no bracelet)
(2) Education and support on bed alarm use
(3) Bec and chair sensor alarm

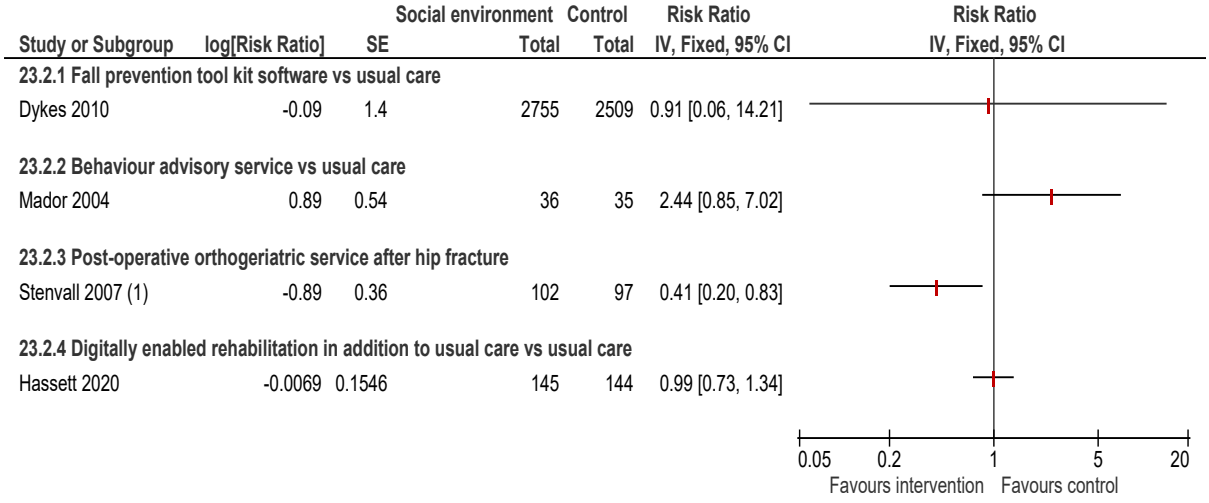
Figure 24: Social environment versus control: rate of falls



Footnotes

(1) Multifaceted fall prevention guideline implementation vs routine dissemination
(2) Guideline implementation (falls, urinary tract infection, pressure ulcers) programme vs control
(3) Fall prevention tool kit software vs usual care
(4) Acute care: unit specialising in geriatric orthopaedic care versus conventional orthopaedic care after proximal femoral fracture surgery

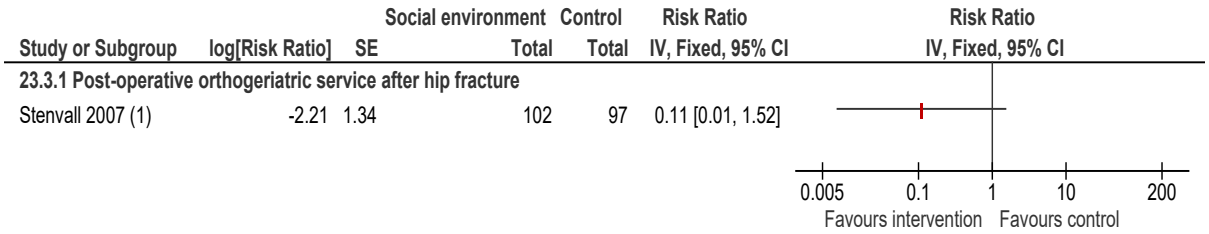
Figure 25: Social environment versus control: number of fallers



Footnotes

(1) Acute care: unit specialising in geriatric orthopaedic care versus conventional orthopaedic care after proximal femoral fracture surgery

Figure 26: Social environment versus control: number of people sustaining a fracture



Footnotes

(1) Acute care: unit specialising in geriatric orthopaedic care versus conventional orthopaedic care after proximal femoral fracture surgery

Figure 27: Social environment versus control: quality of life (EuroQol-5D VAS)

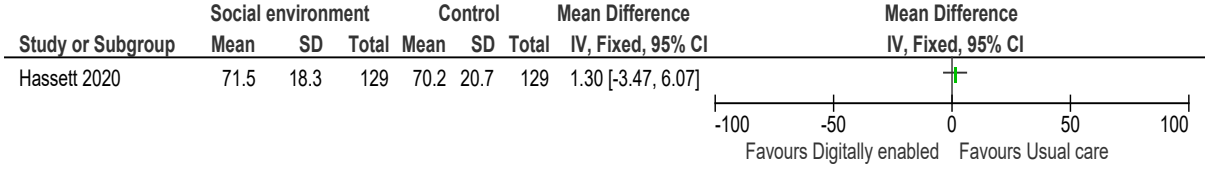


Figure 28: Knowledge/education versus usual care: rate of falls

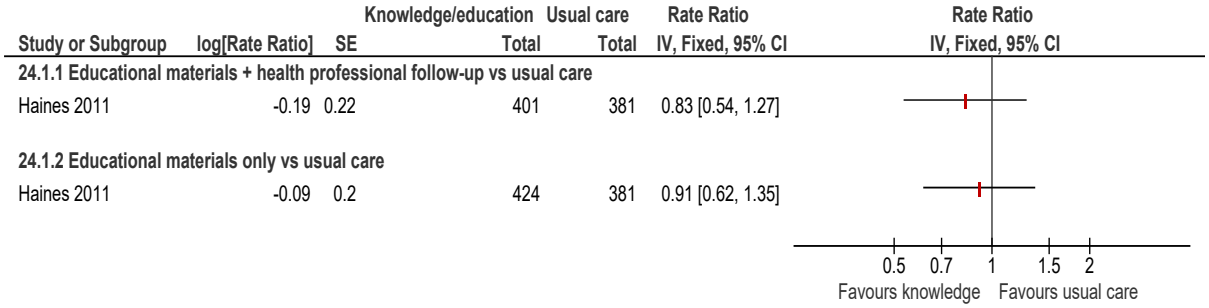


Figure 29: Knowledge/education versus usual care: number of fallers

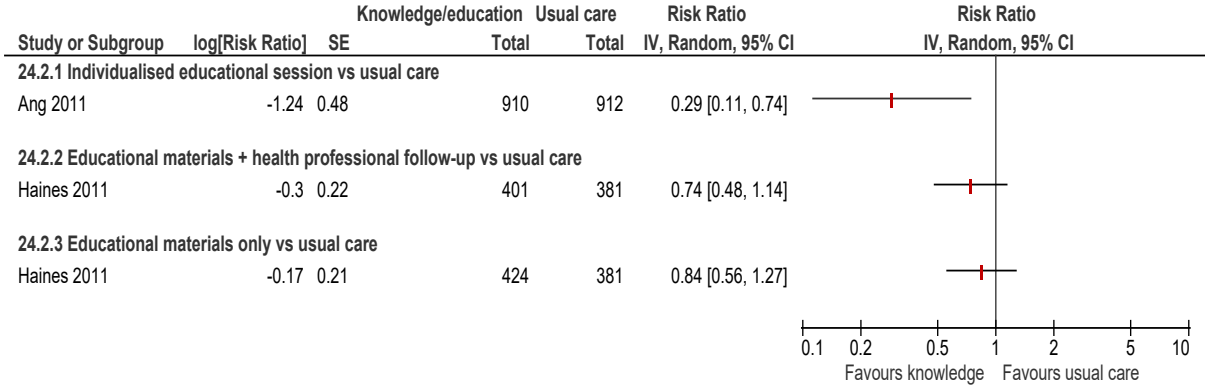


Figure 30: Educational interventions versus educational interventions: number of fallers

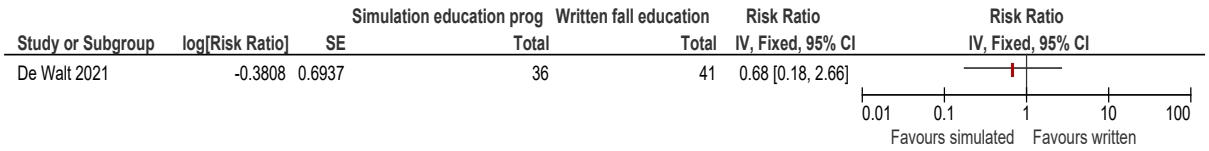
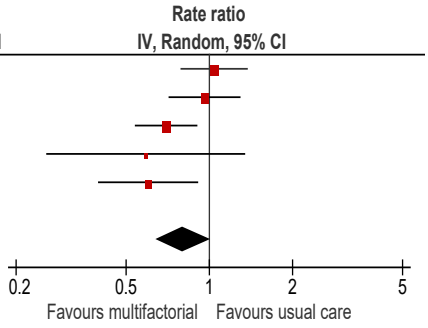


Figure 31: Multifactorial interventions versus usual care: rate of falls

Study or Subgroup	log[Rate ratio]	SE	Multifactorial Total	Usual care Total	Weight	Rate ratio IV, Random, 95% CI
Barker 2016 (1)	0.04	0.14	17698	17566	25.4%	1.04 [0.79, 1.37]
Cumming 2008 (2)	-0.04	0.15	2047	1952	24.1%	0.96 [0.72, 1.29]
Haines 2004 (3)	-0.36	0.13	310	316	26.8%	0.70 [0.54, 0.90]
Healey 2004 (4)	-0.53	0.42	749	905	6.3%	0.59 [0.26, 1.34]
Hill 2015 (5)	-0.51	0.21	1402	1719	17.3%	0.60 [0.40, 0.91]
Total (95% CI)			**22206**	**22458**	**100.0%**	**0.80 [0.64, 1.01]**

Heterogeneity: Tau² = 0.03; Chi² = 8.38, df = 4 (P = 0.08); I² = 52%
Test for overall effect: Z = 1.90 (P = 0.06)



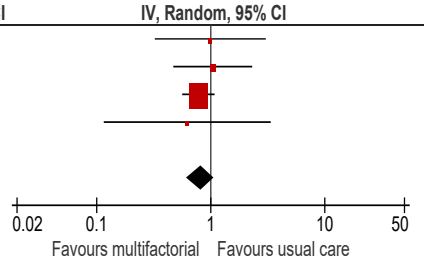
Footnotes

(1) Acute care: risk assessment and up to 6 interventions for high risk patients, plus staff education vs usual care
(2) Acute and subacute care: risk assessment, staff and patient education, drug review, environmental modifications, exercise vs usual care
(3) Subacute: risk assessment and targeted interventions (exercise, educational sessions from OT, hip protectors) vs usual care
(4) Acute and subacute care: risk factor screening and targeted care plan in at-risk patients vs usual care
(5) Subacute care: Multimedia falls education with follow-up for patients plus staff education and feedback.

Figure 32: Multifactorial interventions versus usual care: number of fallers

Study or Subgroup	log[Risk Ratio]	SE	Multifactorial Total	Usual care Total	Weight	Risk Ratio IV, Random, 95% CI
Barker 2016 (1)	-0.01	0.565	17698	17566	6.3%	0.99 [0.33, 3.00]
Cumming 2008 (2)	0.04	0.4	2047	1952	12.5%	1.04 [0.48, 2.28]
Haines 2004 (3)	-0.25	0.16	310	316	78.4%	0.78 [0.57, 1.07]
Kojaie-Bidgoli 2021	-0.4749	0.8532	82	102	2.8%	0.62 [0.12, 3.31]
Total (95% CI)			**20137**	**19936**	**100.0%**	**0.81 [0.62, 1.08]**

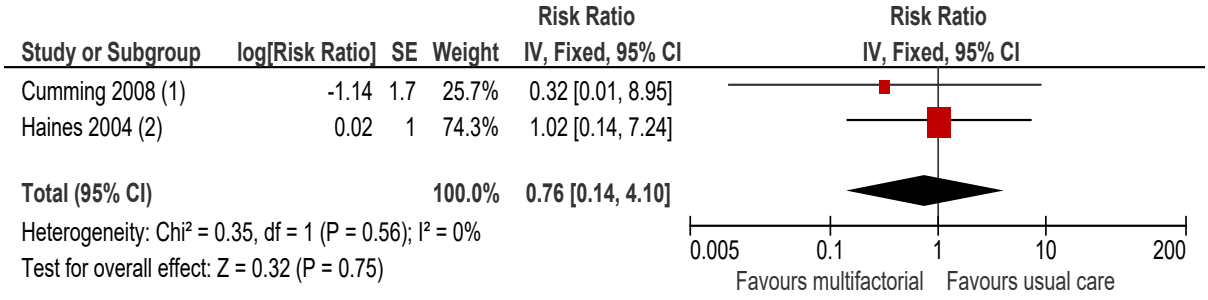
Heterogeneity: Tau² = 0.00; Chi² = 0.67, df = 3 (P = 0.88); I² = 0%
Test for overall effect: Z = 1.45 (P = 0.15)



Footnotes

(1) Acute care: risk assessment and up to 6 interventions for high risk patients, plus staff education vs usual care
(2) Acute and subacute care: risk assessment, staff and patient education, drug review, environmental modifications, exercise vs usual care
(3) Subacute: risk assessment and targeted interventions (exercise, educational sessions from OT, hip protectors) vs usual care

Figure 33: Multifactorial interventions versus usual care: number of people sustaining a fracture

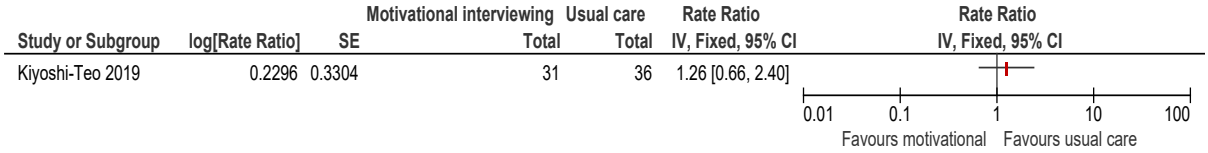


Footnotes

(1) Acute and subacute care: risk assessment, staff and patient education, drug review, environmental modifications, exercise vs...

(2) Subacute: risk assessment and targeted interventions (exercise, educational sessions from OT, hip protectors) vs usual care

Figure 34: Psychological interventions (motivational interviewing) versus usual care: rate of falls



Appendix F GRADE tables

Table 21: Clinical evidence profile: Exercise versus usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Exercise	usual care	Relative (95% CI)	Absolute (95% CI)		
Number of fallers - Simple supervised exercise vs usual care												
1	randomised trials	serious[a]	not serious	not serious	serious[cc]	none	0/125 (0.0%)	0/106 (0.0%)	RD 0.00 (-0.02 to 0.02)	0 fewer per 1000 (from 20 fewer to 20 more)	⊕⊕◯◯ Low	-
Number of fallers - Individual exercise vs usual care												
1	randomised trials	not serious	not serious	not serious	not serious	none	4/146 (2.7%)	0/139 (0.0%)	RD 0.03 (-0.00 to 0.06)	30 fewer per 1000 (from 0 fewer to 60 more)	⊕⊕⊕⊕ High	-
Quality of life (EuroQol-5D) - Individualised exercise vs usual care												
1	randomised trials	not serious	not serious	not serious	serious[b]	none	185	185	-	MD **13.2 higher** (8.2 higher to 18.2 higher)	⊕⊕⊕◯ Moderate	-

a. Downgraded by 1 increment as the evidence was at high risk of bias.

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 because there were zero events in both arms and the sample size was under 350.

Table 22: Clinical evidence profile: Exercise versus exercise

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Number of fallers - Resistance + balance vs resistance												
1	randomised trials	not serious	not serious	not serious	very serious[b]	none	4/30 (13.3%)	7/30 (23.3%)	**RR 0.57** (0.19 to 1.75)	-	⊕⊕◯◯ Low	-
Number of fallers - Tailored strength and balance exercise vs stretching and exercise												
1	randomised trials	serious[a]	not serious	not serious	very serious[b]	none	3/95 (3.2%)	3/95 (3.2%)	**RR 1.00** (0.21 to 4.83)	-	⊕◯◯◯ Very low	-
Quality of life (EQ-5D)												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	Serious[a]	not serious	not serious	very serious[b]	none	86	89	-	MD **5.3 higher** (0.59 lower to 11.19 higher)	⨁◯◯◯ Very low	-

Adverse events

1	randomised trials	not serious	not serious	not serious	very serious[c]	none	0/30 (0%)	0/30 (0%)	**RD 0.00** (-0.06 to 0.06)	**0 fewer per 1,000** (from 60 fewer to 60 more)	⨁⨁◯◯ Low	-

Deaths in hospital

1	randomised trials	Serious[a]	not serious	not serious	very serious[b]	none	3/95 (3.2%)	3/95 (3.2%)	**RR 1.00** (0.21 to 4.83)	**0 fewer per 1,000** (from 25 fewer to 121 more)	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment as the evidence was at high risk of bias.

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 as sample size <70.

Table 23: Clinical evidence profile: Additional exercise versus usual physiotherapy

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Additional exercises	usual physiotherapy	Relative (95% CI)	Absolute (95% CI)		

Rate of falls

2	randomised trials	serious[a]	not serious	not serious	very serious[b]	none	n=110	n=105	**Rate ratio 0.59** (0.26 to 1.34)	-	⨁◯◯◯ Very low	-

Number of fallers

3	randomised trials	serious[c]	not serious	serious[d]	Serious[b]	none	n=62	n=57	**RR 0.46** (0.19 to 1.11)	-	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment as the evidence was at high risk of bias (including unclear risk of selection bias and method of ascertaining falls in one study).

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.

c. Downgraded by 1 increment as the evidence was at high risk of bias (including unclear risk of bias in two trials for selection bias and high risk of attrition bias for largest study).

d. Downgraded 1 increment due to possibly limited applicability as two trials conducted in UK rehabilitation settings.

Table 24: Clinical evidence profile: Medication review versus usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Medication review	usual care	Relative (95% CI)	Absolute (95% CI)		
Rate of falls												
2	randomised trials	serious[b]	not serious	not serious	serious[a]	none	n=110	n=103	Rate Ratio 0.66 (0.39 to 1.11)	-	⨁⨁◯◯ Low	-
Number of fallers												
2	randomised trials	serious[b]	not serious	not serious	very serious[a]	none	n=110	n=103	RR 0.84 (0.46 to 1.55)	-	⨁◯◯◯ Very low	-
Number of people sustaining a non-vertebral fracture												
1	randomised trials	serious[b]	not serious	not serious	very serious[a]	none	1/65 (1.5%)	4/65 (6.2%)	**RR 0.25** (0.03 to 2.18)	-	⨁◯◯◯ Very low	-

a. 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.

b. Downgraded by 1 increment for high risk of bias due to the effect of adhering to the intervention and the effect of assignment to intervention and potentially inappropriate methods for recording the number of falls.

Table 25: Clinical evidence profile: Medication review (PIM-check) versus medication review (STOPP/START)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Medication review (PIM-check)	medication review (STOPP/START)	Relative (95% CI)	Absolute (95% CI)		
Number of fallers												
1	randomised trials	serious[a]	not serious	serious	very serious[b]	none	3/62 (4.8%)	3/60 (5.0%)	**RR 1.03** (0.22 to 4.92)	-	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment for high risk of bias due to methodology utilized for the analysis and there being limited available information regarding the analysis performed.

b. Downgraded by 2 increments as the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes

Table 26: Clinical evidence profile: Vitamin D supplements versus no Vitamin D supplements

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Vitamin D supplements	no vitamin D supplements	Relative (95% CI)	Absolute (95% CI)		
Number of fallers – Vitamin D + calcium vs calcium												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Vitamin D supplements	no vitamin D supplements	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious [b]	not serious	not serious	serious[a]	none	n=100	n=103	**RR 0.82** (0.59 to 1.14)	-	⨁◯◯◯ Very low	-

Number of people sustaining a fracture - Vitamin D + calcium vs calcium

1	randomised trials	serious [b]	not serious	not serious	very serious[a]	none	n=100	n=103	**RR 0.34** (0.04 to 3.05)	-	⨁◯◯◯ Very low	-

Adverse events - Gastrointestinal complaints (nausea, vomiting, diarrhoea)

1	randomised trials	serious [b]	not serious	not serious	very serious[a]	none	4/100 (4.0%)	3/103 (2.9%)	**RR 1.37** (0.32 to 5.98)	**11 more per 1,000** (from 20 fewer to 145 more)	⨁◯◯◯ Very low	-

a. 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

b. Downgraded by 1 increment for high risk of bias due to a noted imbalance at baseline between participants.

Table 27: Clinical evidence profile: Nutritional support versus usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Nutritional support	usual care	Relative (95% CI)	Absolute (95% CI)		

Rate of falls

1	randomised trials	Not serious	not serious	not serious	Very serious[a]	none	n=994	n=999	**Rate ratio 0.96** (0.72 to 1.28)	-	⨁⨁◯◯ Low	-

Number of fallers

1	randomised trials	serious[b]	not serious	not serious	serious[a]	none	108/994 (10.9%)	112/999 (11.2%)	**RR 0.97** (0.76 to 1.24)	**3 fewer per 1,000** (from 27 fewer to 27 more)	⨁◯◯◯ Very low	-

Falls with fracture

1	randomised trials	serious[b]	not serious	not serious	very serious[a]	none	18/994 (1.8%)	14/999 (1.4%)	**RR 1.29** (0.65 to 2.58)	**4 more per 1,000** (from 5 fewer to 22 more)	⨁◯◯◯ Very low	-

Quality of life (EQ-5D-visual analogue scale)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Nutritional support	usual care	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[b]	not serious	not serious	not serious	none	n=994	n=999	-	MD **0.2 higher** (2.89 lower to 3.29 higher)	⨁⨁⨁◯ Moderate	-

Quality of life (EQ-5D-index)

1	randomised trials	serious[b]	not serious	not serious	not serious	none	n=994	n=999	-	MD **0** (0.02 lower to 0.02 higher)	⨁⨁⨁◯ Moderate	-

a. 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.

b. Downgraded by 1 increment for high risk of bias due to considerations regarding patient adherence.

Table 28: Clinical evidence profile: Environmental interventions versus usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Environmental interventions	usual care	Relative (95% CI)	Absolute (95% CI)		

Rate of falls - Carpet flooring vs vinyl flooring

1	randomised trials	serious[a]	not serious	not serious	very serious[b]	none	n=28	n=6	**Rate ratio 14.73** (1.88 to 115.35)	-	⨁◯◯◯ Very low	-

Rate of falls - Low-low beds vs usual care

1	randomised trials	serious[c]	not serious	not serious	very serious[b]	none	6113	4986	**Rate ratio 1.39** (0.22 to 8.78)	-	⨁◯◯◯ Very low	-

Rate of falls - Blue identification bracelet vs usual care (no bracelet)

1	randomised trials	very serious[d]	not serious	not serious	Very serious[b]	none	n=65	n=69	**Rate ratio 1.15** (0.72 to 1.84)	-	⨁◯◯◯ Very low	-

Rate of falls - Bed alarms vs usual care

2	randomised trials	serious[e]	not serious	serious[f]	Very serious[b]	none	11163	17486	**Rate ratio 0.60** (0.27 to 1.34)	-	⨁◯◯◯ Very low	-

Number of fallers - Carpet flooring vs vinyl flooring

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Environmental interventions	usual care	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious [a]	not serious	not serious	very serious[b]	none	n=28	n=26	**RR 8.33** (0.95 to 73.37)	-	⨁◯◯◯ Very low	-

Number of fallers - Blue identification bracelet vs usual care (no bracelet)

1	randomised trials	serious [d]	not serious	not serious	Very Serious[b]	none	n=65	n=69	**RR 1.34** (0.76 to 2.36)	-	⨁◯◯◯ Very low	-

Number of fallers - Bed alarms vs usual care

2	randomised trials	serious [g]	not serious	serious[h]	Very serious[b]	none	n=11163	n=17486	**RR 0.93** (0.38 to 2.24)	-	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment for risk of bias due to outcome assessors and participants not blinded.

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

c. Downgraded by 1 increment for high risk of bias due to patient characteristics at baseline were not reported and outcome assessors were not blind.

d. Downgraded by 1 increment for high risk of bias due to patient imbalances at baseline regarding walking ability and outcome assessments were not blinded.

e. Downgraded 1 increment for high risk of bias (including high risk of selection bias and unclear risk of bias for balance in baseline characteristics in the larger trial, a cluster RCT, Shorr 2012; unclear or high risk of bias for all domains for trial with greatest weighting; risk of performance and detection bias due to lack of blinding although this is not feasible).

f. Downgraded 1 increment for indirectness (the larger trial, Shorr 2012, is of education and support using bed alarms, rather than directly implementing bed alarms).

g. Downgraded 1 increment for risk of bias (including high risk of selection bias and unclear risk of bias for balance of baseline characteristics in the larger trial, Shorr 2012).

h. Downgraded 1 increment for indirectness (the larger trial, Shorr 2012, is of education and support on using bed alarms, directly implementing bed alarms) harm).

Table 29: Clinical evidence profile: Social environment versus control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Social environment	control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	very serious[b]	not serious	not serious	very serious[a]	none	612	510	**Rate ratio 1.82** (0.23 to 14.55)	-	⨁◯◯◯ Very low	-

Rate of falls - Organisational service model change (fall prevention guideline implementation)

Rate of falls - Organisation service model change (falls prevention, incontinence and ulcer guideline implementation)

1	randomised trials	very serious[c]	not serious	not serious	very serious[a]	none	1081	1120	**Rate ratio 0.67** (0.17 to 2.59)	-	⨁◯◯◯ Very low	-

Rate of falls - Organisational service model change (fall prevention toolkit software)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Social environment	control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	very serious[d]	not serious	not serious	very serious[a]	none	2755	2509	**Rate ratio 0.55** (0.02 to 16.29)	-	⨁◯◯◯ Very low	-

Rate of falls - Acute care service for elderly patients vs usual care

1	randomised trials	very serious[b]	not serious	not serious	very serious[a]	none	122	95	**Rate ratio 0.72** (0.10 to 5.10)	-	⨁◯◯◯ Very low	-

Rate of falls - post-operative orthogeriatric service after hip fracture

1	randomised trials	serious[e]	not serious	not serious	not serious	none	102	97	**Rate ratio 0.38** (0.19 to 0.74)	-	⨁⨁⨁◯ Moderate	-

Rate of falls - Digitally enabled rehabilitation in addition to usual care vs usual care

1	randomised trials	serious[f]	not serious	not serious	very serious[a]	none	145	144	**Rate ratio 1.19** (0.78 to 1.82)	-	⨁◯◯◯ Very low	-

Number of fallers - Fall prevention tool kit software vs usual care

1	randomised trials	Serious[d]	not serious	not serious	very serious[a]	none	-/2755	-/2509	**RR 0.91** (0.06 to 14.21)	-	⨁◯◯◯ Very low	-

Number of fallers - Behaviour advisory service vs usual care

1	randomised trials	serious[e]	not serious	not serious	very serious[a]	none	36	35	**RR 2.44** (0.85 to 7.02)	-	⨁◯◯◯ Very low	-

Number of fallers - post-operative orthogeriatric service after hip fracture

1	randomised trials	serious[e]	not serious	not serious	serious[a]	none	102	97	**RR 0.41** (0.20 to 0.83)	-	⨁⨁◯◯ Low	-

Number of fallers - Digitally enabled rehabilitation in addition to usual care vs usual care

1	randomised trials	serious[f]	not serious	not serious	Very serious[a]	none	53/145 (36.6%)	53/144 (36.8%)	**RR 0.99** (0.73 to 1.34)	-	⨁◯◯◯ Very low	-

Number of people sustaining a fracture - Post-operative orthogeriatric service after hip fracture

1	randomised trials	serious[e]	not serious	not serious	Very serious[a]	none	0/102 (0.0%)	4/97 (4.1%)	**RR 0.11** (0.01 to 1.52)	-	⨁◯◯◯ Very low	-

Quality of life (EuroQol-5D VAS)

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Social environment	control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[f]	not serious	serious	not serious	none	129	129	-	MD **1.3 higher** (3.47 lower to 6.07 higher)	⨁⨁⨁◯ Moderate	-

a 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.

b. Downgraded by 2 for risk of bias due to the allocation was not concealed, outcome assessment was not blinded, participants were not blinded, and the method utilized to ascertain falls.

c. Downgraded by 2 for risk of bias due to the participants and personnel were not blinded, the outcome assessment was not blinded, outcome data was incomplete, the method utilized to ascertain falls, and the reported baseline imbalance.

d. Downgraded by 1 for risk of bias due allocation concealment, blinding of participants and personnel, and outcome assessment was not blinded.

e. Downgraded by 1 for risk of bias due to the participants not being blinded.

f. Downgraded by 1 for risk of bias due to deviation from the intervention.

Table 30: Clinical evidence profile: Knowledge/education interventions versus usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Knowledge/education interventions	usual care	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - Educational materials + health professional follow-up vs usual care												
1	randomised trials	serious[a]	not serious	not serious	very serious[b]	none	401	381	**Rate ratio 0.83** (0.54 to 1.27)	-	⨁◯◯◯ Very low	-
Rate of falls - Educational materials only vs usual care												
1	randomised trials	serious[a]	not serious	not serious	very serious[b]	none	424	381	**Rate ratio 0.91** (0.62 to 1.35)	-	⨁◯◯◯ Very low	-
Number of fallers - Individualised educational session vs usual care												
1	randomised trials	serious[c]	not serious	not serious	not serious	none	910	912	**RR 0.29** (0.11 to 0.74)	-	⨁⨁⨁◯ Moderate	-
Number of fallers - Educational materials + health professional follow-up vs usual care												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	401	381	**RR 0.74** (0.48 to 1.14)	-	⨁⨁◯◯ Low	-
Number of fallers - educational materials only vs usual care												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Knowledge/education interventions	usual care	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious [a]	not serious	not serious	very serious[b]	none	424	381	**RR 0.84** (0.56 to 1.27)	-	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment for risk of bias due to the participants and outcome assessors were not blinded.

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.

c. Downgraded by 1 increment for risk of bias due to selective reporting of the outcomes and due to the participants and outcome assessors not being blinded.

Table 31: Clinical evidence profile: Education intervention versus education intervention

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Education interventions	education interventions	Relative (95% CI)	Absolute (95% CI)		
Number of fallers												
1	randomised trials	serious [a]	not serious	not serious	very serious[b]	none	36	41	RR 0.68 (0.18 to 2.66)	-	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment for risk of bias due to the protocol not being specified and the method of analysis did not appear to be appropriate

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.

Table 32: Clinical evidence profile: Multifactorial intervention vs. usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Multifactorial interventions	usual care	Relative (95% CI)	Absolute (95% CI)		
Rate of falls												
5	randomised trials	serious [a]	serious[b]	not serious	serious[c]	none	22206	22458	**Rate ratio 0.80** (0.64 to 1.01)	-	⨁◯◯◯ Very low	-
Number of fallers												
4	randomised trials	serious [d]	not serious	not serious	serious[c]	none	20137	19936	**RR 0.81** (0.62 to 1.08)	-	⨁⨁◯◯ Low	-
Number of people sustaining a fracture												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Multifactorial interventions	usual care	Relative (95% CI)	Absolute (95% CI)		
2	randomised trials	serious [e]	not serious	not serious	very serious[c]	none	2357	2258	**RR 0.76** (0.14 to 4.10)	-	⨁◯◯◯ Very low	-

a. Downgraded by 1 increment for risk of bias due to issues with allocation concealment, blinding, and no definition of fall provided.

b. Downgraded by 1 increment for inconsistency due to the I^2 value of 52% suggesting substantial variation.

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.

d. The quality of the evidence was downgraded by 1 increment for risk of bias due to issues with allocation concealment, blinding, and participant adherence.

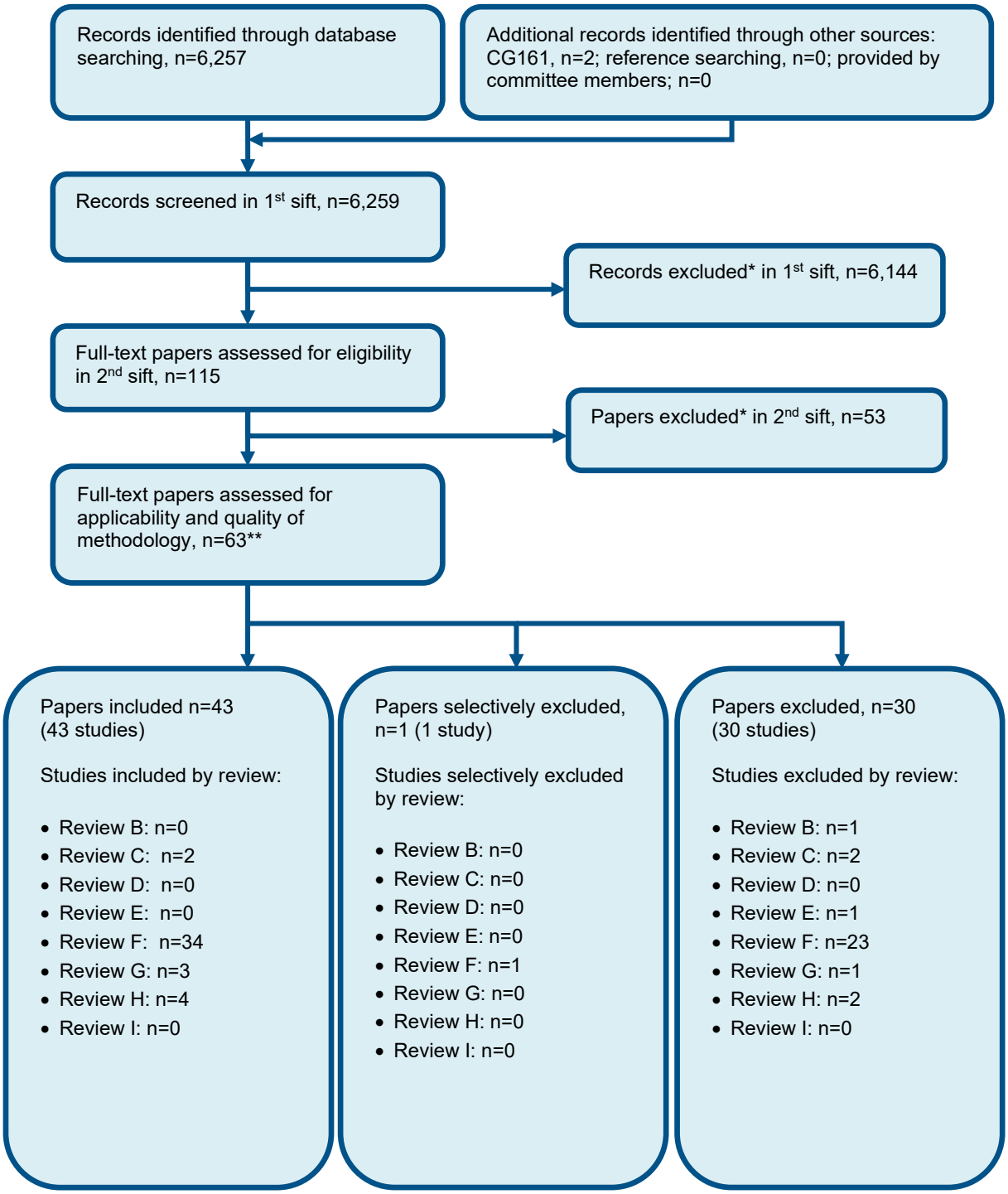
e. The quality of the evidence was downgraded by 1 increment for risk of bias due to issues with allocation concealment and blinding

Table 33: Clinical evidence profile: psychological interventions (motivational interviewing) versus usual care

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hospitals: Psychological interventions	usual care	Relative (95% CI)	Absolute (95% CI)		
Rate of falls												
1	randomised trials	serious [b]	not serious	not serious	Very serious[a]	none	13/31	12/36	**Rate ratio 1.26** (0.66 to 2.40)	-	⨁⨁◯◯ Low	-

a. 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.
b. Downgraded by 1 increment for risk of bias due to selection of the reported result and missing outcome data.

Appendix G Economic evidence study selection



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

Appendix H Economic evidence tables

Study	CG161			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA **Study design:** Patient level simulation **Approach to analysis:** Five discrete states: Acute hospital, non-acute hospital, home, full time care and dead (absorbing state). A fall could occur in all states except dead. Severity of injury influenced time to next event and change in state. Transition between all health states possible, apart from full-time care to non-acute hospital and full-time care to home. No cycle duration, rather time measured continuously in days. **Perspective:** UK NHS	**Population:** People admitted to hospital over 65 years of age **Cohort settings:** Start age: various Male: various **Intervention 1:** Usual care **Intervention 2:** Multifactorial falls prevention. "Two or more subdomains[(b)] of the intervention can be given to participants, but the interventions are linked to each individual's risk profile, and, unlike multiple interventions, not all participants receive the same combination of subdomains"	**Total costs (mean per patient):** Acute: Intervention 1: £32,440 Intervention 2: £32,202 Incremental (2−1): -£238 (95% CI: NR; p=NR) Non-Acute: Intervention 1: £36,853 Intervention 2: £36,725 Incremental (2−1): -£128 (95% CI: NR; p=NR) **Currency & cost year:** 2011 UK pounds **Cost components incorporated:** Staff cost, Postage, exercise booklet, ankle weights, day centre, nursing home, special aids or equipment, family support Intervention cost per admitted patient:	**QALYs (mean per patient):** Acute: Intervention 1: 5.446 Intervention 2: 5.448 Incremental (2−1): 0.002 (95% CI: NR; p=NR) Non-Acute: Intervention 1: 5.419 Intervention 2: 5.422 Incremental (2−1): 0.003 (95% CI: NR; p=NR)	**ICER:** Multifactorial interventions dominated usual care (less costly and more effective). Probability Intervention 2 cost effective (£20K/30K threshold): NR/NR (due to serious computational burden) **Analysis of uncertainty:** The only parameter that impacted cost effectiveness (changing the result to make usual care the preferred option) was the intervention effect (the relative risk for falls with intervention compared with control). Threshold analysis found that as long as some falls were prevented (RR<1), the intervention was likely to be cost effective. Two-way sensitivity analysis showed that if the intervention reduces the incidence of a fall by 15% or more than it is cost effective even if the intervention costs £100

Time horizon: Lifetime **Treatment effect duration:**[(a)] NR **Discounting:** Costs: 3.5%; Outcomes: 3.5%		- acute setting: £7.83 - non-acute setting £21.81		
Data sources				
Health outcomes: Meta analysis and systematic review of the data from CG161 used to inform the falls rate ratio for inpatients and applied to baseline fall rates taken from analysis of the UK National Patient Safety Agency (NPSA) data by Healey 2008. The relationship between falls and post fall events was also explored with the base case assuming that post fall events were partially appliable to the fall but not fully. Various published sources used for home and care state falls rates and severity including Health Survey for England 2005. The probability of hospital admission was from the Health Survey for England 2000, likelihood of entering a care home was from NHS Information Centre for Health and Social Care 2011 amongst other published sources. Mortality was from Life tables from the Office for National (2008-2010), adjustments using hazard rations made to account for increased risk of death in care home state (McCann 2009) and after experiencing a serious fall (Goldacre 2002). **Quality-of-life weights:** EQ-5D, UK tariff **Cost sources:** Resource use sources include Hospital Episode Statistics 2012, committee expert opinion and other published UK sources such as Vass 2013 for length of acute hospital stay and Watson 2009 for home and care setting falls. Intervention costs estimated using unpublished resource use from Healy 2009. Unit cost sources include NHS reference costs 2011, PSSRU 2011 and NPSA (cost of inpatient fall).				
Comments				
Source of funding: During the development of Nice Guideline CG161. **Limitations:** There was a lack of utility evidence or decrement for patients in hospital with a fall. Costs of interventions are generic, rather than specific to interventions provided to individuals. No analysis of different multifactorial interventions conducted. The falls risk of a patient does not change while in hospital, there is no adaptation benefit. Costs and outcomes are from 2008 to 2012. Probabilistic analysis not feasible due to model approach selected and subsequent computational burden. Very complex model and potential for coding and calculation errors. **Other:** This cost utility study was done alongside the 2013 update of the NICE Guideline for Falls in older people: assessing risk and prevention CG161.				
Overall applicability:[(c)] Directly applicable		**Overall quality:**[(d)] Potentially serious limitations		

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; 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; NPSA = National Patient Safety Agency; NR= not reported; 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) Subdomains include eyesight test, medication review, bed height alteration and bedrail, blood pressure check, physiotherapy, urine test, footwear assessment, moving the patient closer to the nurses and call bell education.

(c) Directly applicable/partially applicable/not applicable

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

Study	Sahota, 2014[36]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Within trial analysis (REFINE RCT) **Approach to analysis:** Within trial analysis – QALYs estimated using linear interpolation and are under the curve analysis adjusting for baseline utility. **Perspective:** UK NHS **Follow-up:** Variable, until discharge (median length of stay: 9 days for non-fallers and 20 days for fallers) **Treatment effect duration:**[(a)] n/a **Discounting:** Costs: n/a; Outcomes: n/a	**Population:** Hospital admitted (acute, general medical elderly care wards) adults with mean age 85 years (Queen's hospital Nottingham England). **Cohort settings:** Start age: 85 years Male: 45% **Intervention 1:** Standard care **Intervention 2:** Bed and bedside chair sensors using radio pagers.	**Total costs (mean per patient):** Intervention 1: £6,400 Intervention 2: £7,199 Incremental (2−1): £799 (95% CI:NR; p=NR) **Currency & cost year:** 2010/2011 UK pounds **Cost components incorporated:** Cost of the intervention, cost of injurious falls and hospitalisation (length of stay).	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.0001 (95% CI:-0.0006 to 0.0004; p=0.67) Note other clinical outcomes reported: Bedside falls: adjusted IRR: 0.90 (95% CI: 0.66–1.22; P = 0.50). Falls resulting in minor injury: adjusted IRR, 1.60; (95% CI: 0.83–3.08; P = 0.15)	**ICER (Intervention 2 versus Intervention 1):** £7,990,000 per QALY gained (da) **Analysis of uncertainty:** None undertaken.
Data sources				
Health outcomes: Within trial analysis with QoL and mortality data taken from REFINE RCT (same paper). This RCT was not included in the clinical review as excluded from Cameron 2018 Cochrane due to reporting injurious and bedside falls rather than all falls. **Quality-of-life weights**: EQ-5D, tariff not reported but assume UK tariff given UK setting. **Cost sources:** Falls and subsequent action taken (i.e. resource use) collected daily in forms by ward team. Unit cost sources include NHS reference costs.				
Comments				

Source of funding: NIHR. **Limitations:** Based on a single trial which was excluded from the clinical review due to not reporting correct outcome. Short follow up (until discharge), may not fully capture downstream impact of intervention or consequences of falls. 2010/11 costs may not represent current NHS context. No sensitivity analyses undertaken. **Other:**

Overall applicability:(b) Directly applicable **Overall quality:**(c) 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; IRR=incidence rate ratio; NR= not reported; RCT= randomised controlled trial.

(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

Study	Baris 2023			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CEA (health outcome: falls prevented) **Study design:** Decision analytic model **Approach to analysis:** Within trial analysis using a decision tree **Perspective:** Turkish health care **Time horizon:** 12 months **Discounting:** Costs: N/A; Outcomes: N/A	**Population:** People in a palliative clinic in a research hospital **Cohort settings:** Mean age: NR Male: NR **Intervention 1:** Usual care, involving an assessment of the patient's risk, signalling who is at high risk of falling, using bed rails, verbal information to patient and their families, and organising the environment.	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): £0.11 (SE=NR; p=NR) **Currency & cost year:** 2023 USD **Cost components incorporated:** Regression analysis of cost of fall.	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.000395 (SE:NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** ICER of £278 Probability falls prevention program cost effective (£20/£30K threshold): NR/NR **Analysis of uncertainty:** In the best-case scenario the ICER was £640, in the worst case scenario the falls prevention program was still dominant.

	Intervention 2: Falls prevention program. Signalling the falls risk of every patient, hanging information posters about patients falls interventions in rooms and bathrooms, providing education about falls and prevention to nurses, and wall calendar reminders			
Data sources				
Health outcomes: Primary outcome was number of falls prevented **Quality-of-life weights:** N/A. **Cost sources:** Cost of a fall was calculated using the regression model based on the matched case-control approach. Cost of the intervention was split into material costs and labour costs and obtained from the trial.				
Comments				
Source of funding: Within the scope of the Faculty Member Training Program carried out by the Republic of Turkey Council of Higher Education. **Limitations:** time horizon was only 1 year and based on a single RCT so may not be representative of the full body of evidence. Values in the paper appear to be incorrect (Corrected values are reported here) **Other:**				
Overall applicability: Partly[(a)] **Overall quality: Potentially serious**[(b)]				

Abbreviations: CCA= cost–consequences analysis; CEA= cost-effectiveness analysis; 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; N/A=Not applicable NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years
(a) =Directly applicable / Partially applicable / Not applicable
(b) Minor limitations / Potentially serious limitations / Very serious limitations

Appendix I Health economic model

Whilst this review question was prioritised for de novo economic modelling, it was for people in the community not hospitals.

Appendix J Excluded studies

Clinical studies

Table 34: Studies excluded from the clinical review

Study	Code [Reason]
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)	- Systematic review used as source of primary studies; not relevant setting
Ailabouni, Nagham; Mangin, Dee; Nishtala, Prasad S (2019) DEFEAT-polypharmacy: deprescribing anticholinergic and sedative medicines feasibility trial in residential aged care facilities. International journal of clinical pharmacy 41(1): 167-178	- Study design not relevant to this review protocol; not relevant setting
Appel, L., Appel, E., Kisonas, E. et al. (2022) VRCT: Randomized Controlled Trial Evaluating the Impact of Virtual Reality Therapy on BPSD and QoL of Acute Care In-Patients With Dementia. Alzheimer's and Dementia 18(s8): e062209	- Data not reported in an extractable format or a format that can be analysed
Bernocchi, Palmira, Giordano, Alessandro, Pintavalle, Giuseppe et al. (2019) Feasibility and Clinical Efficacy of a Multidisciplinary Home-Telehealth Program to Prevent Falls in Older Adults: A Randomized Controlled Trial. Journal of the American Medical Directors Association 20(3): 340-346	- Population not relevant to this review protocol; not relevant setting
Birimoglu Okuyan, Canan and Deveci, Ebru (2021) The effectiveness of Tai Chi Chuan on fear of movement, prevention of falls, physical activity, and cognitive status in older adults with mild cognitive impairment: A randomized controlled trial. Perspectives in psychiatric care 57(3): 1273-1281	- Data not reported in an extractable format or a format that can be analysed
Burleigh, E; Potter, J; McColl, J (2006) Does vitamin D stop hospital inpatients falling? A randomised controlled trial. Internal medicine journal 36: a165	- Duplicate reference
Colon-Emeric, CS, McConnell, E, Pinheiro, S et al. (2013) CONNECT for fall prevention: a randomized controlled pilot study. Journal of the American Geriatrics Society 61: 1	- Conference abstract
de Souto Barreto, Philipe, Maltais, Mathieu, Rosendahl, Erik et al. (2021) Exercise Effects on Falls, Fractures, Hospitalizations, and Mortality in Older Adults With Dementia: An Individual-Level Patient Data Meta-analysis. The journals of gerontology. Series A, Biological sciences and medical sciences 76(9): e203-e212	- Systematic review used as source of primary studies- Systematic review on exercise which is covered by Cochrane review.
de Souto Barreto, Philipe, Rolland, Yves, Vellas, Bruno et al. (2019) Association of Long-term Exercise Training With Risk of Falls, Fractures, Hospitalizations, and Mortality in Older Adults: A Systematic Review and Meta-analysis. JAMA internal medicine 179(3): 394-405	- Systematic review on exercise which is covered by Cochrane review. - Systematic review used as source of primary studies
Di Gennaro, Gianfranco, Chamitava, Liliya, Pertile, Paolo et al. (2024) A stepped-wedge randomised controlled trial to assess efficacy and cost-effectiveness of a care-bundle to prevent falls in older hospitalised patients. Age and ageing 53(1)	- Intervention not relevant to this review protocol
E, Jian-Yu, Li, Tianjing, McInally, Lianne et al. (2020) Environmental and behavioural interventions for reducing physical activity limitation	- Population not relevant to this review protocol

Study	Code [Reason]
and preventing falls in older people with visual impairment. The Cochrane database of systematic reviews 9: cd009233	
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	- Trial does not contain any relevant outcomes to this review protocol
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	- Trial does not contain any relevant interventions to this review protocol; not relevant setting
Gazineo, Domenica, Godino, Lea, Decaro, Roberta et al. (2021) Assisted Walking Program on Walking Ability in In-Hospital Geriatric Patients: A Randomized Trial. Journal of the American Geriatrics Society 69(3): 637-643	- Falls reported as an adverse event
Gulka, Heidi J, Patel, Vaidehi, Arora, Twinkle et al. (2020) Efficacy and Generalizability of Falls Prevention Interventions in Nursing Homes: A Systematic Review and Meta-analysis. Journal of the American Medical Directors Association 21(8): 1024-1035e4	- Population not relevant to this review protocol.
Hartley, Peter, Keating, Jennifer L, Jeffs, Kimberley J et al. (2022) Exercise for acutely hospitalised older medical patients. The Cochrane database of systematic reviews 11: cd005955	- Systematic review on exercise which is covered by Cochrane review. - Systematic review used as source of primary studies
Hastings, Susan N, Stechuchak, Karen M, Choate, Ashley et al. (2023) Effects of Implementation of a Supervised Walking Program in Veterans Affairs Hospitals : A Stepped-Wedge, Cluster Randomized Trial. Annals of internal medicine 176(6): 743-750	- Falls reported as an adverse event
Keller, M.S., Qureshi, N., Mays, A.M. et al. (2024) Cumulative Update of a Systematic Overview Evaluating Interventions Addressing Polypharmacy. JAMA Network Open 7(1): e2350963	- Systematic review used as source of primary studies
Klaiber, Ulla, Stephan-Paulsen, Lisa M, Bruckner, Thomas et al. (2018) Impact of preoperative patient education on the prevention of postoperative complications after major visceral surgery: the cluster randomized controlled PEDUCAT trial. Trials 19(1): 288	- Population not relevant to this review protocol
Kong, Lingyu, Zhang, Xinwen, Zhu, Xinrui et al. (2023) Effects of Otago Exercise Program on postural control ability in elders living in the nursing home: A systematic review and meta-analysis. Medicine 102(11): e33300	- Incorrect setting for the review protocol
Lewis, Sharon R, McGarrigle, Lisa, Pritchard, Michael W et al. (2024) Population-based interventions for preventing falls and fall-related injuries in older people. The Cochrane database of systematic reviews 1: cd013789	- Incorrect setting for the review protocol
Lo, B. (2021) A multidisciplinary ED-based fall prevention intervention reduced subsequent ED visits in older adults. Annals of internal medicine	- Incorrect setting for the review protocol
Martinez-Velilla, N., Valenzuela, P.L., Saez de Asteasu, M.L. et al. (2020) Effects of a tailored exercise intervention in acutely hospitalized diabetic oldest old adults: an ancillary analysis. The Journal of clinical endocrinology and metabolism	- Duplicate reference
Martinez-Velilla, Nicolas, Valenzuela, Pedro L, Saez de Asteasu, Mikel L et al. (2021) Effects of a Tailored Exercise Intervention in Acutely Hospitalized Oldest Old Diabetic Adults: An Ancillary	- Secondary analysis of Martinez-Velilla (2019), including subgroups that

Study	Code [Reason]
Analysis. The Journal of clinical endocrinology and metabolism 106(2): e899-e906	were not relevant to this review
Marumoto, Kohei, Yokoyama, Kazumasa, Inoue, Tomomi et al. (2019) Inpatient Enhanced Multidisciplinary Care Effects on the Quality of Life for Parkinson Disease: A Quasi-Randomized Controlled Trial. Journal of geriatric psychiatry and neurology 32(4): 186-194	- Quasi-randomised trial
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	- Setting not relevant to this review protocol
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	- Trial does not contain any relevant outcomes to this review protocol
Patel, J S, Norman, D, Brennan, M et al. (2013) First Report of Elm Canker Caused by Pestalotiopsis mangiferae in the United States. Plant disease 97(3): 426	- Study does not contain an intervention relevant to this review protocol
Pollock, Y.Y., Smith, M.R., Saad, F. et al. (2022) Clinical characteristics associated with falls in patients with non-metastatic castration-resistant prostate cancer treated with apalutamide. Prostate Cancer and Prostatic Diseases	- Population not relevant to this review protocol
Prithiani, Sham Lal, Kumar, Ratan, Mirani, Shahid H et al. (2021) Effect of Monthly 100,000 IU Vitamin D Supplementation on Falls and Non-Vertebral Fractures. Cureus 13(1): e12445	- Population not relevant to this review protocol
Rantz, Marilyn, Phillips, Lorraine J, Galambos, Colleen et al. (2017) Randomized Trial of Intelligent Sensor System for Early Illness Alerts in Senior Housing. Journal of the American Medical Directors Association 18(10): 860-870	- Data not reported in an extractable format or a format that can be analysed
Reeve, Emily, Jordan, Vanessa, Thompson, Wade et al. (2020) Withdrawal of antihypertensive drugs in older people. The Cochrane database of systematic reviews 6: cd012572	- Population not relevant to this review protocol
Rossi-Izquierdo, Marcos, Gayoso-Diz, Pilar, Santos-Perez, Sofia et al. (2017) Short-term effectiveness of vestibular rehabilitation in elderly patients with postural instability: a randomized clinical trial. European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery 274(6): 2395-2403	- 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.
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	- Comparator in study does not match that specified in this review protocol; population not relevant to this review protocol
Taylor-Rowan, M., Alharthi, A.A., Noel-Storr, A.H. et al. (2022) Anticholinergic deprescribing interventions for reducing risk of cognitive decline or dementia in older adults with and without prior	- Systematic review which includes study designs not relevant to this review protocol

Study	Code [Reason]
cognitive impairment. Cochrane Database of Systematic Reviews 2022(12): cd015405	
Tricco, Andrea C, Thomas, Sonia M, Veroniki, Areti Angeliki et al. (2017) Comparisons of Interventions for Preventing Falls in Older Adults: A Systematic Review and Meta-analysis. JAMA 318(17): 1687-1699	- Systematic review used as source of primary studies
Uusi-Rasi, Kirsti, Patil, Radhika, Karinkanta, Saija et al. (2017) 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 72(9): 1239-1245	- Population not relevant to this review protocol
van Ooijen, M.W., Roerdink, M., Trekop, M. et al. (2016) The efficacy of treadmill training with and without projected visual context for improving walking ability and reducing fall incidence and fear of falling in older adults with fall-related hip fracture: a randomized controlled trial. BMC geriatrics 16(1): 215	- Wrong setting. Exclusion details from Cameron, 2018 (Cochrane review): Intervention delivered in hospital, author confirmed falls recorded post discharge and the majority of participants were in the community
Wang, Fang and Tian, Bailing (2022) The effectiveness of physical exercise type and length to prevent falls in nursing homes: A systematic review and meta-analysis. Journal of clinical nursing 31(12): 32-42	- population not relevant to this review protocol.
Wen, G.J.; Singh, D.K.A.; Shahar, S. (2020) Effectiveness of falls prevention education on its prevention behavior among older adults: A systematic review. Indian Journal of Public Health Research and Development 11(1): 1119-1124	- Systematic review on exercise which is covered by Cochrane review. - Systematic review used as source of primary studies

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.

Table 35: Studies excluded from the health economic review

Reference	Reason for exclusion
Haines 2013 13 AM., Hill, K.D. et al. Cost effectiveness of patient education for the prevention of falls in hospital: economic evaluation from a randomized controlled trial. BMC Med 11, 135 (2013). https://doi.org/10.1186/1741-7015-11-135	Multimedia patient education materials combined with trained health professional follow-up in addition to usual care compared to usual care. Population adults over 60 years admitted into acute and sub-acute wards in Australian hospitals. Excluded due to a combination of applicability and methodological limitations. No QoL and therefore no QALYs. Short time horizon (inpatient stay, duration not reported) may not fully capture intervention effect. Based on single study and may not reflect the full body of evidence. Based on Australian 2008-unit costs and 1991 US cost of falls included which are unlikely to reflect current NHS context. Potential conflict of interest (lead author is director of

Reference	Reason for exclusion
	company that has been used to disseminate education of health professionals in the education program described in this manuscript).

Appendix K Research Recommendation

Does enhanced supervision lead to a reduction in the incidence of falls?

K.1.1 Why this is important

Falls in hospitals continue to be a major patient safety issue. The review undertaken for the update of these guidelines, found no benefit for identification bracelets that indicate if a person has previously fallen, but 'tagging' is commonly used in hospitals now, to enable staff to closely observe people identified at increased risk of falls, and provide more support with eating, getting out of bed, going to the bathroom, and mobilising. The committee acknowledged staff observations and knowledge of a patient's history/risk of falls are important in preventing further falls in hospital. The committee discussed the need for further research of enhanced supervision interventions such as bay tagging, identification bracelets/ socks / blankets, intentional rounding and increased staffing levels.

K.1.2 Rationale for the recommendation for research

Importance to 'patients' or the population	New evidence could provide effective ways to prevent falls and injuries in hospitals, improving patients' experience and improving quality of life whilst reducing falls related morbidity and mortality.
Relevance to NICE guidance	This question would potentially generate new knowledge and evidence that could change guidance in terms of if use Enhanced supervision interventions.
Relevance to the NHS	Potential impacts on the NHS include reduction of falls and injurious falls in hospitals, improving patient safety, improved patient and staff experience and provide evidence to support changes in practice, adding to new knowledge how to prevent falls in hospitals.
National priorities	High relevance to the NICE guideline for Falls in Older people
Current evidence base	The evidence base is extremely limited, therefore further research in this area is required.
Equality considerations	In addition to those aged 65 years and over this research recommendation highlights the need for understanding > 50 years of age who have a condition or conditions that may put them at a higher risk of falling

K.1.3 Modified PICO table

Population	People in hospital who are: • Aged 65 years and over

	• Aged 50 to 64 years who have a condition or conditions that may put them at a higher risk of falling
Intervention	Any intervention designed to reduce falls in older people in hospital using enhanced supervision. Possible descriptors include: Enhanced supervision of patients using bay tagging, intentional rounding, identification bracelets, coloured socks /blankets/bracelets, increased staffing levels and 1:1 care
Comparator	usual care
Outcome	All outcomes are considered equally important for decision making and therefore have all been rated as critical: • Rate of falls • Number of participants sustaining fall-related fractures • Quality of life • Length of stay
Study design	Cluster randomised controlled trials (RCTs), stepped wedge trials, natural experimental study design with interrupted time series analysis
Timeframe	Medium term – in time for the next update
Additional information	

References

Ali, U. M, Judge. A, Foster. C, Brooke. A, James. K, Marriott, T. and Lamb, S. E. (2018) *Do portable nursing stations within bays of hospital wards reduce the rate of inpatient falls?* An interrupted time-series analysis: Age & Ageing 47(6), pp. 818-824 https://libkey.io/10.1093/ageing/afy097

N E Mayo, L Gloutney, A R Levy (1994) *A randomized trial of identification bracelets to prevent falls among patients in a rehabilitation hospital* Arch Phys Med Rehabilitation. 1994 Dec;75(12):1302-8

Do interventions addressing the ward environment reduce the risk of falls in hospital settings?

K.1.4 Why this is important

Inpatient falls are a leading cause of hospital-related harm and finding ways to the reduce the incidence of falls is imperative. Research to date in hospital settings has found limited, low-quality evidence for multifactorial interventions to prevent inpatient falls, and the strongest effect of such interventions appears to be in sub-acute / rehabilitation settings. More research is required to determine the most effective methods to reduce falls risk, particularly in acute settings.

K.1.5 Rationale for the recommendation for research

Importance to 'patients' or the population	Inpatient falls are the lead cause of harm associated with hospital admission. Patients who experience inpatient falls are more likely to experience poor outcomes, including an increased risk of mortality in those who sustain serious injuries such as hip fracture. Falls also contribute to longer length of stay, lead to reduced confidence and restriction of physical activity and can be distressing for the patient, their families and hospital staff.
Relevance to NICE guidance	The NICE guidelines provide specific recommendation for the prevention of falls in hospital settings and require robust evidence from clinical trials to support recommending the most effective interventions.
Relevance to the NHS	Inpatient falls contribute to the use of NHS resources due to longer length of admission and the associated treatment and rehabilitation required after an inpatient fall. Services spend significant time and resource addressing the consequences of falls including resources spent on investigations and litigation. Inpatient falls are distressing for frontline hospital staff and fear of inpatient falls likely drives behaviours that also cause harm. For example, restriction of physical activity which would lead to deconditioning.
National priorities	As a leading cause of hospital-related harm, finding effective methods to reduce inpatient fall risk is a high priority.
Current evidence base	The evidence to support any intervention to prevent falls in inpatient settings is limited. These guidelines were unable to recommend any environmental interventions based on small numbers of low-quality studies or where there was lack of evidence of effect.

	The Cochrane review of 2018 found no strong evidence to support certain types of flooring, low beds, or bed alarms. An update of this review conducted for these guidelines did not add any further to this evidence base.
Equality considerations	None known

K.1.6 Modified PICO table

Population	People in hospital who are: • Aged 65 years and over • Aged 50 to 64 years who have a condition or conditions that may put them at a higher risk of falling
Intervention	Interventions to address risk factors in the ward environment including: - Ward layout, flooring, lighting, signage - Bed provision (low beds, rails) - Movement sensors/ bed alarms - Call bells
Comparator	Usual care
Outcome	All outcomes are considered equally important for decision making and therefore have all been rated as critical: • Rate of falls • Number of participants sustaining fall-related fractures • Quality of life • Length of stay
Study design	Cluster randomised controlled trials (RCTs), stepped wedge trials, natural experimental study design with interrupted time series analysis
Timeframe	Medium term – in time for the next update
Additional information	N/A