Appendix E 2013 Review protocols and evidence tables

Review protocols

	Details	
Review question 1	What assessment tool or process should be used to identify modifiable and non-modifiable risk factors for falling while in hospital? Does this method vary by underlying pathology?	GDG wanted to change 'assessment' to 'screening' and change the focus from the patients underlying pathology to the setting in which patients are admitted to. The GDG felt focusing on the setting was more appropriate than focusing on the patient's underlying pathology, since NHS care has shifted away from segregating patients based on their pathology.
Objectives	To establish • How patients should be assessed for risk factors, and which assessment tools, if any, should be used • Whether methods of assessment should differ for subgroups with underlying pathology • Who should conduct the assessment • When and how often should patients be assessed In order to enable implementation of appropriate primary or secondary prevention interventions/strategies	Change assessment to screening
Language	English	
Study design	RCT	
Status	Published papers (full papers only)	
Population	Inpatient Older adult	
Intervention	Clinical signs and symptoms Assessment tools	
Comparator	Standard care No assessment	
Outcomes	• Rate of falls (Rates, number of fallers). • Severity of falls and complications consequent of the fall. • Mortality. • Patient satisfaction and experience. • Quality of life (e.g. fear, confidence and	•

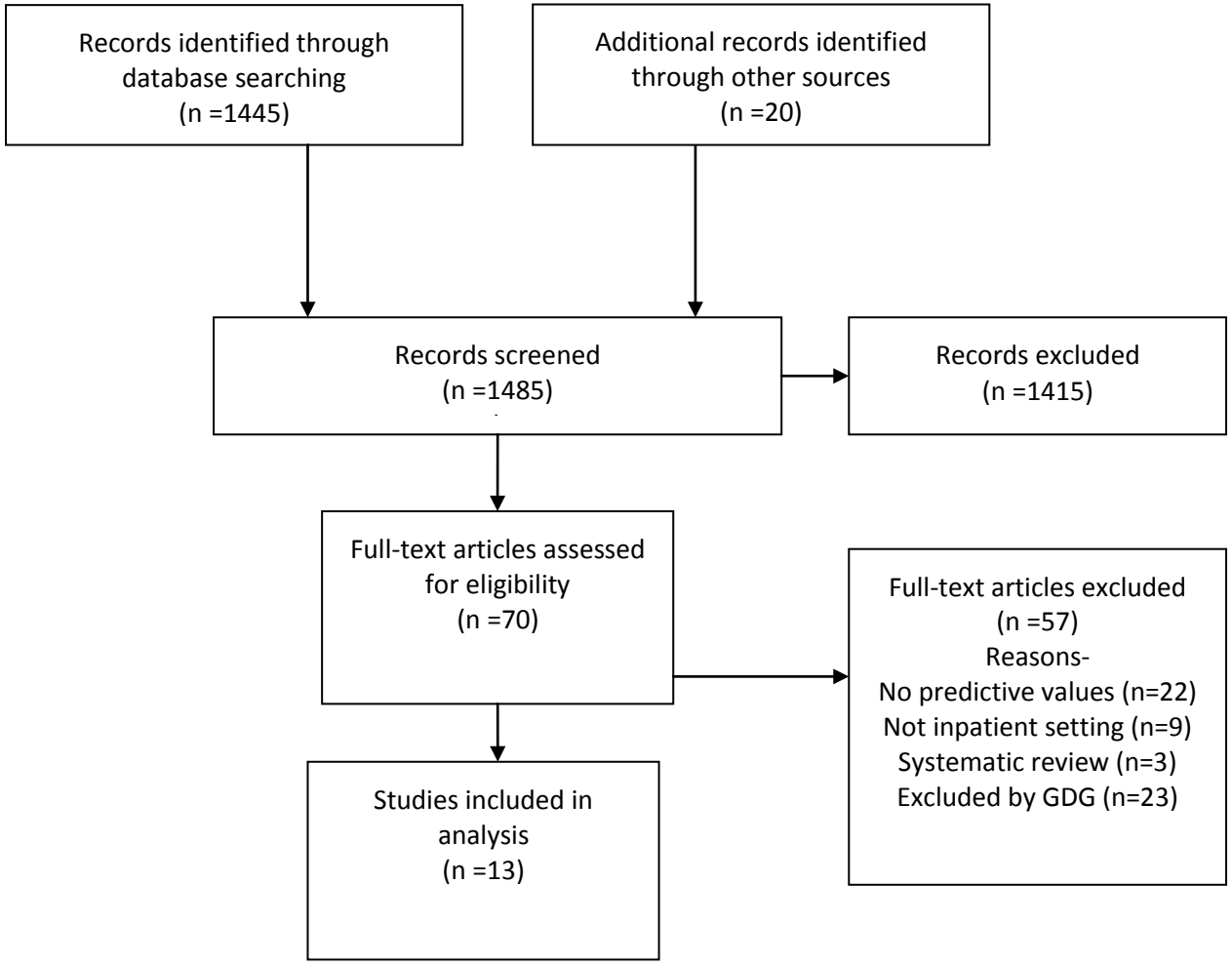
	functioning). • Activities of daily living • Adherence to falls prevention strategies (patient, healthcare professionals and other staff). • Resource use and costs (e.g. length of stay).	
Other criteria for inclusion/exclusion of studies	**Include:** • English language, primary research in full text • Cross sectional, Cohort, Case-control, RCT designs • Tools/processes that assess risk factors for inpatient falls **Exclude:** • Fracture risk assessment tools • Tools/processes for use in a community setting	
Review strategies	• The appropriate NICE methodology checklist will be used as a guide to appraise the quality of individual studies • Data on all included studies will be extracted into evidence tables • Where statistically possible, a meta-analytical approach will be used to give an overall summary effect • Where possible all key outcomes from evidence will be presented in GRADE profiles or modified profiles and further summarized in evidence statements • Sub-group analysis will be undertaken for underlying pathologies where appropriate	•

	Details
Review question 2	What interventions reduce older patients' risk and/or the severity of a fall in hospital, compared with usual care? Which interventions are the most effective? Does the intervention vary by underlying pathology?
Objectives	To identify the best interventions/strategies for reducing the risk and/or severity of a fall
Language	English
Study design	RCT, Cohort, Systematic reviews, case control, before/after studies
Status	Published papers (full papers only)
Population	Inpatient Older adult
Intervention	Any intervention to reduce the risk or severity of an inpatient fall such as: • Hip protectors • Podiatric interventions • Bed rails • Hand rails

	• Ergonomic interventions • Bed/floor alarms • Low beds • Monitoring/surveillance systems • Flooring • Identifying wrist bands/door plates/bed signs
Comparator	Standard care, other interventions
Outcomes	• Rate of falls (Rates, number of fallers). • Severity of falls and complications consequent of the fall. • Mortality. • Patient satisfaction and experience. • Quality of life (e.g. fear, confidence and functioning). • Activities of daily living • Adherence to falls prevention strategies (patient, healthcare professionals and other staff). • Resource use and costs (e.g. length of stay).
Other criteria for inclusion/ exclusion of studies	**Include** • English language, primary research in full text • RCT or cohort design, systematic reviews • Interventions delivered in the inpatient setting • All lengths of stay **Exclude** • Interventions not delivered in the inpatient setting • Non comparative studies
Review strategies	• The NICE methodology checklist for RCTs will be used as a guide to appraise the quality of individual studies • Data on all included studies will be extracted into evidence tables • Where statistically possible, a meta-analytical approach will be used to give an overall summary effect • All key outcomes from evidence will be presented in GRADE profiles or modified profiles and further summarized in evidence statements.

	Details
Review question 3	What are the education and information needs of patients and their carers after a hospital-based falls risk assessment, or a fall in hospital?
Objectives	To determine what information should be provided to patients and their carers about falls prevention prior to discharge: • After a hospital based falls risk assessment • After a sustaining a fall in hospital In order to promote primary and secondary prevention.
Language	English
Study design	All studies
Status	Published papers (full papers only)
Population	Older adult Inpatient
Intervention	Information provided to patients and their carers.
Comparator	NA
Outcomes	• Rate of falls (Rates, number of fallers). • Severity of falls and complications consequent of the fall. • Mortality. • Patient satisfaction and experience. • Quality of life (e.g. fear, confidence and functioning). • Activities of daily living • Adherence to falls prevention strategies (patient, healthcare professionals and other staff). • Resource use and costs (e.g. length of stay).
Other criteria for inclusion/exclusion of studies	**Include:** • Patient experiences during inpatient management of falls risk. • Identified patient needs/information during inpatient management of falls risk. **Exclude:** • Studies not focused on patient experience or needs • Any patient education intervention related to a hospital based fall or fall risk assessment (as this will be part of Q2)
Review strategies	• Appropriate NICE methodology checklists (depending on the study design) will be used as a guide to appraise the quality of individual studies • Data on all included studies will be extracted into evidence tables • All key outcomes from evidence will be presented and further summarized in evidence statements

Evidence tables



Inpatient assessment: Evidence tables

Reference	Chu (1999)	
Study type	Retrospective case control	
Number of patients	N=102	
Prevalence	50%	
Patient characteristics	Medical inpatients who did or did not fall during their inpatient stay. Hong Kong. Mean age of fallers= 77.8 years Mean age of non fallers= 77.5 years	
Type of test	Clinical risk factors, Clinical risk factors and functional performance Assessed within 48hrs of a fall by physician and physiotherapist	
Reference standard	Falls	
Cut off value	Clinical risk factors Lower limb weakness (<MRC grade 4) Psychoactive drug use	Clinical and Functional performance Lower limb weakness (<MRC grade 4) Tandem walk 2 m (>2 errors)
Sensitivity and Specificity	Sensitivity= 49% (CI= 35-63) Specificity= 90% (CI= 79-97)	Sensitivity= 84% (CI= 71-93) Specificity= 76% (CI= 65-88)
Positive and negative predictive values	PPV= 83% (CI= 65-94) NPV= 64% (CI= 52-75)	PPV= 78% (CI= 65-88) NPV= 83% (CI= 69-92)
Other validity measures	Not reported	
Source of funding	Queen Mary Hospital Charitable trust Training and Research Assistance Scheme.	
Study quality & additional comments		

Reference	Eagle (1999)
Study type	Prospective
Number of patients	98
Prevalence	30%
Patient characteristics	Patients admitted to a rehabilitation ward and a geriatric medical ward
Type of test	Functional reach, Morse Fall Scale, Clinical Judgement (nurses were asked to state yes or no in response to the question 'is your patient at risk of falls in the near future?') Assessed 3-5 days into the inpatient stay by nurse.
Reference standard	Falls documented on incident forms, defined as when patients were found on the floor, or assisted to the floor when a fall could not be prevented
Cut off value	Clinical judgement Yes responses
Sensitivity and Specificity	Sensitivity= 76% (CI= 56-90) Specificity= 49% (CI= 37-62)
Positive and negative predictive values	PPV= 39% (CI= 26-52) NPV= 83% (CI= 68-93)
Other validity measures	Not reported
Source of funding	Not stated
Study quality & additional comments	Scores for clinical judgement did not reach the threshold set by the GDG (sensitivity and specificity >70%) but has been retained for completeness, as clinical judgement did meet the threshold in another study (Chu, 1999). Scores for Functional Reach and Morse Fall Scale did not reach the threshold in this study or any of the included studies.

Reference	Haines (2006)
Study type	Prospective
Number of patients	N= 122 (phase 1) N= 316 (Phase 2)
Prevalence	22% 16 falls per 1000 patient days
Patient characteristics	Recruited from a randomised controlled trial, and conducted at a rehabilitation and aged care hospital, Australia Mean age= 80 years
Type of test	STRATIFY, Peter James Centre Falls Riak Assessment Tool (PJC-FRAT: assessors used their clinical judgement to identify if the participant had a risk factor resulting in a decision to deploy 4 interventions intervention. Participants were not provided with the recommended interventions during the study period) Performed on admission and repeated as required. STRATIFY repeated on a weekly basis.
Reference standard	Falls
Cut off value	PJC-FRAT Recommendation of an alert card
Sensitivity and Specificity	Phase 1 Sens= 73% (CI= 61-83) Spec= 75% (CI= 69-80) Phase 2 Sens= 58% (CI= 45-68) Spec= 66% (CI= 60-71)
Positive and negative predictive values	Phase 1 PPV= 46% (CI=37-56) NPV= 91% (CI=86-94) Phase 2 PPV= 33% (CI=25-42) NPV= 84% (CI= 78-89)
Other validity measures	Event rate data also reported

Source of funding	Department of Human Services, Aged Care Division, Victoria Branch, Australia.
Study quality & additional comments	STRATIFY scores did not reach the threshold set by the GDG (sensitivity and specificity >70%) Only PJC-FRAT alert card scores met the threshold and are included in the analysis

Reference	Haines (2009)
Study type	Prospective
Number of patients	1123
Prevalence	18% 206 participants fell during the study period
Patient characteristics	Recruited from 17 inpatient geriatric and rehabilitation units in Australia Mean age= 75 years
Type of test	Physiotherapist clinical judgement- Physiotherapists performed a routine assessment and were then asked if they thought the patient would experience one or more falls during their inpatient stay. Response was yes or no Performed during initial assessment
Reference standard	Fall documented on incident reports
Cut off value	Yes responses
Sensitivity and Specificity	Sensitivity= 61% (CI= 54-67) Specificity= 82% (CI= 80-85) Data also provided individually for each hospital site, and as event rates
Positive and negative predictive values	PPV= 44% (CI= 0.38-0.50) NPV= 90% (CI= 0.88-0.92) Data also provided individually for each hospital site, and as event rates
Other validity measures	Not reported
Source of funding	Not stated
Study quality & additional comments	Scores for clinical judgement did not reach the threshold set by the GDG (sensitivity and specificity >70%) but has been retained for completeness, as clinical judgement did meet the threshold in another study (Chu, 1999).

Reference	Heinze (2008)	
Study type	Prospective cohort	
Number of patients	560	
Prevalence	11% 7.6 per 1,000 patient days	
Patient characteristics	Recruited from a geriatric hospital in Germany Age m=82, SD= 7.3, range= 56-99	
Type of test	Care Dependency Scale (CDS), Hendrich Fall Risk Model (HFRM) Perforemd within 24hrs of admission by staff nurses	
Reference standard	Number of falls (or patient discovered sitting or lying on floor) recorded on an incident sheet	
Cut off value	≥ 3	≥ 11
Sensitivity and Specificity	Sensitivity= 97% (61/63, CI= 89-100) Specificity= 10% (48/497, CI= 7-13)	Sensitivity= 75% (47/63, CI= 62-85) Specificity= 47% (237/497, CI= 43-52)
Positive and negative predictive values	PPV= 12% (CI=0.09-0.15) NPV= 96% (CI= 0.86-1.00)	PPV= 15% (CI= 0.11-0.20) NPV= 94% (CI= 0.90-0.96)
Other validity measures	Internal consistency: Kruder Richardson 20= 0.30	
Source of funding	None stated	
Study quality & additional comments	CDS scores did not reach the threshold set by the GDG (sensitivity and specificity >70%). HFRM did not reach the threshold set by the GDG (sensitivity and specificity >70%) but has been retained for completeness, as HFRM did meet the threshold in another study (Hendrich, 1995).	

Reference	Hendrich (1995)
Study type	Retrospective
Number of patients	102 fallers 236 non-fallers (controls)
Prevalence	30%
Patient characteristics	Falls recorded in case notes forms in a 1 month period and controls were randomly selected from the pool of non-fallers for the same month from a teaching hospital, USA Mean age not stated
Type of test	Hendrich Fall Risk Model Patient chart review on admission and 24hrs prior to the fall. Performed by registered nurses.
Reference standard	Falls as recorded in case notes
Cut off value	3
Sensitivity and Specificity	Sensitivity= 77% (79/102, CI=68-85) Specificity= 72% (169/236, CI=65-77)
Positive and negative predictive values	PPV= 54% (CI=46-62) NPV= 88% (CI=83-92)
Other validity measures	Not reported
Source of funding	Not stated
Study quality & additional comments	

Reference	Maeda (2009)
Study type	Prospective
Number of patients	N= 72
Prevalence	38%
Patient characteristics	Hemiplegic stroke patients consecutively admitted to a rehabilitation centre hospital Mean age= 67.6 years Mean length of stay= 83 days
Type of test	Berg Balance Scale
Reference standard	Falls as documented in the patients' medical record
Cut off value	29
Sensitivity and Specificity	Sensitivity= 80% (CI= 65 to 98) Specificity= 78% (CI= 65 to 91)
Positive and negative predictive values	PPV= 69% (CI= 51 to 86) NPV= 88% (CI= 76 to 99)
Other validity measures	None
Source of funding	None stated
Study quality & additional comments	

Reference	Marschollek (2009)	
Study type	Prospective	
Number of patients	110	
Prevalence	24%	
Patient characteristics	Inpatients treated in the Department of Geriatric Medicine, Germany Aged between 45 and 90 years. Mean age= 80 years.	
Type of test	Model 1: Clinical assessment (Timed get up and go (TUG), STRATIFY, Barthel Index) Model 2: Clinical assessment (as above) with additional sensory measurement data (triaxial accelerometer), Unclear when performed or by whom. Clinical assessment was compulsory at the hospital.	
Reference standard	Falls	
Cut off value	Unclear	
Sensitivity and Specificity	Model 1 Sensitivity= 38% (CI= 20-59) Specificity= 97% (CI= 92-100)	Model 2 Sensitivity= 58% (CI= 37-77) Specificity= 100% (CI= 96-100)
Positive and negative predictive values	Model 1 PPV= 83% (CI= 0.52-0.98) NPV= 84% (CI= 0.75-0.90)	Model 2 PPV= 100% (CI= 0.78-1.00) NPV= 88% (CI= 0.80-0.94)
Other validity measures	Not reported	
Source of funding	Not stated	
Study quality & additional comments	Originally 119 participants were included, but 9 had to be excluded due to failure in the sensory measurement technology. Scores for clinical assessment did not reach the threshold set by the GDG (sensitivity and specificity >70%) but has been retained for completeness, as clinical judgement did meet the threshold in another study (Chu, 1999).	

Reference	Myers (2003)
Study type	Prospective cohort
Number of patients	226
Prevalence	15%
Patient characteristics	Recruited from two aged care and rehabilitation wards within an acute care tertiary teaching hospital in Australia
Type of test	Berryman (modified), Schmid, Clinical observation Performed at least 24hrs after admission. Nurses provided clinical judgement. Research assistant completed fall tools
Reference standard	Number of falls documented on hospital incident forms
Cut off value	Clinical Observation
Sensitivity and Specificity	Sensitivity= 88% (CI= 73-97) Specificity= 26% (CI= 20-33)
Positive and negative predictive values	PPV= 17% (CI= 0.12-0.24) NPV= 93% (CI= 0.82-0.98)
Other validity measures	Not reported
Source of funding	Not stated
Study quality & additional comments	Berryman and Schmid scores did not reach the threshold set by the GDG (sensitivity and specificity >70%). Clinical observation did not reach the threshold set by the GDG (sensitivity and specificity >70%) but has been retained for completeness, as clinical judgement did meet the threshold in another study (Chu, 1999).

Reference	Nanda (2011)
Study type	Retrospective development of new tool
Number of patients	136 fallers 89 non fallers
Prevalence	60%
Patient characteristics	Geriatric-psychiatric inpatients who had or had not fallen during their inpatient stay. USA Fallers mean age= 80.4, range 60-98 Non-fallers mean age= 80.1, range 62-97
Type of test	Falls Risk Assessment in Geriatric-psychiatric Inpatients to Lower Events (FRAGILE) Review of medical records by researchers
Reference standard	Falls documented in patient records
Cut off value	Probablility of falling ≥0.5
Sensitivity and Specificity	Sensitivity= 92% (125/136, CI= 0.86-0.96) Specificity= 83% (74/89, CI= 0.74-0.90)
Positive and negative predictive values	PPV= 89% (125/140, CI= 0.83-0.94) NPV= 87% (74/85, CI= 0.78-0.93)
Other validity measures	Not reported
Source of funding	Not stated
Study quality & additional comments	

Reference	Rapport (1993)	
Study type	Prospective	
Number of patients	32	
Prevalence	47%	
Patient characteristics	Males who were non ambulatory and had sustained a right hemisphere stroke Mean age= 62.31 years, range= 47-74	
Type of test	Falls Assessment Questionnaire with additional measure of behavioural impulsivity Test conducted by nurses, unclear when test was performed	
Reference standard	Falls as documented on hospital incident forms	
Cut off value	>0.49	>.55
Sensitivity and Specificity	Sensitivity= 100% (CI= 78-100) Specificity= 59% (CI= 33-82)	Sensitivity= 80% (CI= 52-92) Specificity= 82% (CI= 57-96)
Positive and negative predictive values	PPV= 68% (CI= 45-86) NPV= 100% (CI= 69-100)	PPV= 80% (CI= 52-96) NPV= 82% (CI= 57-96)
Other validity measures	None reported	
Source of funding	Rehabilitation R&D merit review grant	
Study quality & additional comments		

Reference	Vassallo (2008)
Study type	Prospective observational study
Number of patients	200
Prevalence	26%
Patient characteristics	Recruited from one rehabilitation ward of a rehabilitation hospital admitting elderly patients in the UK Age m= 80.9
Type of test	STRATIFY, Downton Falls risk tool, Clinical Observation of wandering Performed within 48hrs of admission by clinician
Reference standard	Falls
Cut off value	Clinical Observation of wandering High risk= observation of any one or more behaviours (defined by the paper) within 48hrs of admission.
Sensitivity and Specificity	Sensitivity= 43% (22/51, CI= 29-58) Specificity= 91% (135/149, CI= 85-95)
Positive and negative predictive values	PPV= 61% (22/36, CI= 0.43-0.77) NPV= 82% (135/164, CI= 0.76-0.88)
Other validity measures	Not reported
Source of funding	Not stated
Study quality & additional comments	Clinical observation did not reach the threshold set by the GDG (sensitivity and specificity >70%) but has been retained for completeness, as clinical judgement did meet the threshold in another study (Chu, 1999).

Reference	Walsh (2010)	
Study type	Prospective	
Number of patients	Phase 1 (Predictive accuracy): N= 130 Phase 2 (intra-rater reliability): N= 25 Phase 3 (inter-rater reliability): N= 35	
Prevalence	5% 10.7 falls per 1000 patient bed days	
Patient characteristics	Consecutive admissions from acute medical and surgical wards, Australia Phase 1: Mean age= 75, range= 29-97 Phase 2: Mean age= 76, range= 42-90 Phase 3: Mean age= 75, range= 29-94	
Type of test	STRATIFY, Western Health Falls Risk Assessment (WHeFRA) Performed by nurses on all current inpatients.	
Reference standard	Falls	
Cut off value	10	13
Sensitivity and Specificity	Sensitivity= 86% (CI= 42-100) Specificity= 77% (CI= 69-84)	Sensitivity= 86% (CI= 42-100) Specificity= 92% (CI= 86-96)
Positive and negative predictive values	PPV= 18% (CI= 7-35) NPV= 99% (CI= 94-100)	PPV= 38% (CI= 15-65) NPV= 99% (CI= 95-100)
Other validity measures	<u>Intra-rater reliability (N=25)</u> ICC= 0.94 (CI= 0.86-0.97) Kappa values also provided <u>Inter-rater reliability (N=35)</u> ICC= 0.78 (CI= 0.61-0.88) Kappa values also provided Event rates also provided	

Source of funding	Victorian Department of Human Services Quality Improvement Fund
Study quality & additional comments	STRATIFY scores did not reach the threshold set by the GDG (sensitivity and specificity >70%).

Inpatient assessment: GRADE tables

Acute Setting

Studies	N	Index	Limitations	Indirectness	Inconsistency	Imprecision	Other	Pre-test Prob.	TP	FP	FN	TN	Sens (95% CI)	Spec (95% CI)	PPV (95% CI)	NPV (95% CI)	Quality
Hendrich Fall Risk Model																	
Score >3																	
1 Hendrich (1995)	338	HFRM ≥3	VS[1,2]	S[3]	NS	S[4]	NS	30	79	67	23	169	77 (68-85)	72 (65-77)	54 (46-62)	88 (83-92)	V LOW
Western Health Falls Risk Assessment																	
Score >10																	
1 Walsh (2010)	130	WHeFRA score >10	S[2,5]	S3	NS	S[4]	NS	5	6	28	1	95	86 (42-100)	77 (69-84)	18 (7-35)	99 (94-100)	V LOW
Score > 13																	
1 Walsh (2010)	130	WHeFRA score >13	S[2,5]	S[3]	NS	S[4]	NS	5	6	10	1	113	86 (42-100)	92 (86-96)	38 (15-65)	99 (95-100)	V LOW

TP= True Positive (the number of patients identified as being at risk of falling who fell)
FP= False Positive (the number of patients identified as being at risk of falling who didn't fall)
FN= False Negative (the number of patients identified as not being at risk of falling who fell)
TN= True Negative (the number of patients identified as not being at risk of falling who didn't fall)
S= Serious, downgraded one place
VS= Very serious, downgraded two places
NS= Nothing serious, not downgraded

1= Retrospective review,
2= Researches were not blinded to patients fall status
3= Includes patients under the age of 50
4= Wide confidence intervals
5= Staff may have intervened to prevent falls during the study period

Non-Acute Setting

Studies	N	Index	Limitations	Indirectness	Inconsistency	Imprecision	Other	Pre-test Prob.	TP	FP	FN	TN	Sens (95% CI)	Spec (95% CI)	PPV (95% CI)	NPV (95% CI)	Quality
Berg Balance Scale																	
Score = 29																	
1 Maeda (2009)	72	Berg Balance Scale score 29	S[1,2]	NS	NS	S[3]	NS	38	22	10	5	35	82 (65-98)	78 (65-91)	69 (51-86)	88 (76-99)	LOW
Falls Assessment Questionnaire																	
Score >0.49																	
1 Rapport (1993)	32	Risk >0.49	S[1,2]	NS	NS	S[3]	NS	47	15	7	0	10	100 (78-100)	59 (33-82)	68 (45-86)	100 (69-100)	LOW
Score >0.55																	
1 Rapport (1993)	32	FAQ plus behavioural impulsivity measure. Risk >0.55	S[1,2]	NS	NS	S[3]	NS	47	12	3	3	14	80 (52-92)	82 (57-96)	80 (52-96)	82 (57-96)	LOW
Clinical Observation/Assessment																	
Observation of wondering behaviour																	
1 Vassallo (2008)	200	Observation of wandering behaviours	S[1,2]	S5	NS	NS	NS	26	22	14	29	135	43 (29-58)	91 (85-95)	61 (43-77)	82 (76-88)	LOW
1 Eagle	98	Clinical judgement	S[2]	S[3]	NA	S[4]	NA	30	22	35	7	34	76 (56-90)	49 (37-62)	39 (26-52)	83 (68-93)	V LOW

Peter James Centre Falls Risk Assessment Tool (PJC-FRAT)																	
Recommendation of an Alert Card																	
1 Haines (2006)	122	Alert card	S[2]	S[4]	NS	NS	NS	22	52	61	19	184	73 (61-83)	75 (69-80)	46 (37-56)	91 (86-94)	LOW
	316	Alert card						22	41	83	30	162	58 (45-68)	66 (60-71)	33 (25-42)	84 (78-89)	

TP= True Positive (the number of patients identified as being at risk of falling who fell)
FP= False Positive (the number of patients identified as being at risk of falling who didn't fall)
FN= False Negative (the number of patients identified as not being at risk of falling who fell)
TN= True Negative (the number of patients identified as not being at risk of falling who didn't fall)
S= Serious, downgraded one place
VS= Very serious, downgraded two places
NS= Nothing serious, not downgraded

1= Lack of researcher blinding
2= Staff may have intervened to prevent falls during study period
3= Wide confidence intervals
4= Includes patients under the age of 50
5= Retrospective review

Mixed/Unclear setting

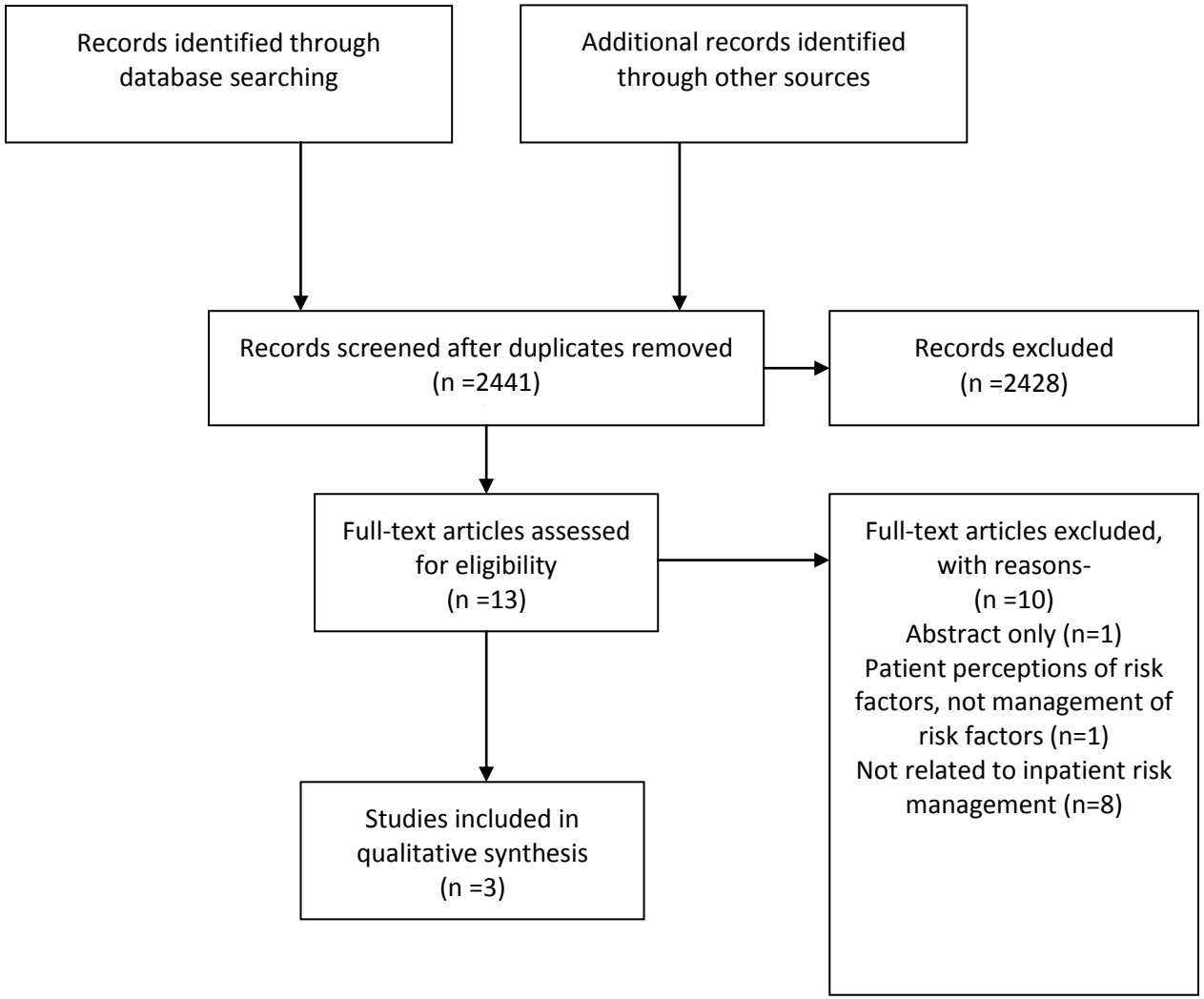
Studies	N	Index	Limitations	Indirectness	Inconsistency	Imprecision	Other	Pre-test Prob.	TP	FP	FN	TN	Sens (95% CI)	Spec (95% CI)	PPV (95% CI)	NPV (95% CI)	Quality
Falls Risk Assessment in Geriatric-Psychiatric Inpatients to Lower Events (FRAGILE)																	
Scores >0.05																	
1 Nanda (2011)	225	FRAGILE >.05	VS[1,2]	NS	NS	NS	NS	60	125	15	11	74	92 (86-96)	83 (74-90)	89 (83-94)	87 (78-93)	LOW
Clinical Assessment/observation																	
Clinical Judgement																	
1 Myers (2003)	226	Clinical judgement	S[2,3]	NS	NS	S[4]	NS	15	30	142	4	50	88 (73-97)	26 (20-33)	17 (12-24)	93 (82-98)	LOW
1 Haines (2009)	1123	Clinical judgement	S[2,3]	NS	NS	S[4]	NS	18	125	161	81	756	61 (54-67)	82 (80-85)	44 (38-50)	90 (88-92)	LOW
Clinical assessment using TUG, STRATIFY and Barthel index																	
1 Marsholleck (2009)	110	Clinical assessment using TUG, STRATIFY and Barthel index	S[2,3]	NS	NS	S[4]	Missing data	24	10	2	16	82	38 (20-59)	97 (92-100)	83 (52-98)	84 (75-90)	LOW
Clinical assessment and sensory measurement data																	
1 Marscholleck (2009)	110	Clinical assessment and sensory measurement data	S[2,3]	NS	NS	S[4]	Missing data	24	15	0	11	84	58 (37-77)	100 (96-100)	100 (78-100)	88 (80-94)	LOW
Clinical risk factors																	

1 Chu (1999)	102	Clinical risk factors	VS[1,2]	NS	NS	S[4]	NS	50	25	5	26	46	49 (35-63)	90 (79-97)	83 (65-94)	64 (52-75)	V LOW
Clinical risk factors and functional performance																	
1 Chu (1999)	102	Clinical and functional performance	VS[1,2]	NS	NS	S[4]	NS	50	43	12	8	39	84 (71-93)	76 (65-88)	78 (65-88)	83 (69-92)	V LOW
Hendrich Falls Risk Model																	
Score >3																	
1 Heinze (2008)	560	HFRM >3	S[2,3]	NS	NS	S[4]	Missing data	11	61	449	2	48	97 (89-100)	10 (7-13)	12 (9-15)	96 (86-100)	LOW
Score >11																	
1 Heinze (2008)	560	HFRM >11	S[2,3]	NS	NS	S[4]	Missing data	11	47	263	16	234	75 (62-85)	47 (43-52)	15 (11-20)	94 (90-96)	LOW

TP= True Positive (the number of patients identified as being at risk of falling who fell)
FP= False Positive (the number of patients identified as being at risk of falling who didn't fall)
FN= False Negative (the number of patients identified as not being at risk of falling who fell)
TN= True Negative (the number of patients identified as not being at risk of falling who didn't fall)
S= Serious, downgraded one place
VS= Very serious, downgraded two places
NS= Nothing serious, not downgraded

1= Retrospective review
2= Lack of researcher blinding
3= Staff may have intervened to prevent falls during the study period
4= Wide confidence intervals

Inpatient intervention: Evidence tables



Reference	Allen (1986)
Study Type	Randomised controlled trial
Quality	Appropriate randomisation and no significant differences between groups on any of the baseline variables. Appropriate analysis performed
Participants	N=185 patients aged 75 and older admitted to all inpatient units other than intensive care (USA)
Intervention	N= 92 Geriatric consultation team: Within 48 hrs of admission a multidimensional screening evaluation was performed by the geriatric consultation team (attending physician in geriatric medicine, geriatric clinical nurse specialist, social worker). Data obtained were presented and discussed by the geriatric team within 48hrs and recommendations for each patient were formulated and recorded on a recommendation form. Form was placed in the patients' medical charts, and patients were followed up by the geriatric team throughout their stay where additional recommendations could be made.
Comparison	N= 93 Routine care: As above, the geriatric consultation team made recommendations for each patient but the recommendations were not placed in the patients' medical charts, and the geriatric team did not follow patients up.
Length of follow up	Unclear, presume until discharge/death.
Outcomes and effect sizes	Intervention / Control / Mean Difference Implementation of recommendations: 70.4% (313/446) / 27.1% (102/377) / 2.59 (2.17, 3.19)
Source of funding	Mallinckrodt Foundation Grant; Geriatric research, education and clinical centre (VA medical centre); Health services research and development programme (VA medical centre)
Additional comments	Compliance was measured on 13 categories (Drug therapy, Long-term Care Resources, Sensory Impairment, Rehabilitation, Instability and Falls, Confusion, Depression, Incontinence, Nutrition, Speech, Immobility, General Medical, Other) but are presented overall here for ease. Compliance rates could be skewed by some individuals having many more recommendations than others so the authors computed and reported mean implementation for each patient. The GDG classified this setting as acute

Reference	Barry (2001)
Study Type	Before/after
Quality	Low: partial assessment of differences between groups, unclear how falls were defined and recorded. Descriptive data analysis only.
Patients	All inpatients admitted to hospital providing long term services for older people (Ireland) Pre intervention: mean age= 83.5 yrs (range 65-95) Year 1: mean age= 82.yrs (range 65-98) Year 2: mean age= 84 yrs (range 71-95)
Intervention	Staff lecture on falls prevention Implementation of environmental audit (hand rails, grab rails, arm rests, discontinuation of floor polishing policy, suitable chairs replaced low chairs, commodes without wheels, removal of obstructive furniture, men's trousers fitted with braces, rubber tiling on outdoor areas) Patient's intrinsic risk factors were corrected where possible (remedial vision problems, mobility assistance, replacement of unsuitable footwear, medication review to avoid polypharmacy, fall risk assessments-with those high at risk provided with hip protectors)
Comparison	Pre intervention data (June 1997- May 1998)
Length of follow up	Variable inpatient stay, monitored until two years post intervention
Outcomes and effect sizes	Intervention (year 2) / Control (pre intervention baseline) / Relative Risk Proportion of inpatients who fell: 26/149 / 39/156 / 0.70 (CI= 0.45-1.09) Proportion of inpatients who fell and injured: 4/149 / 27/156 / 0.16 (CI= 0.05-0.43) Proportion of inpatients who fell and fractured: 0/149 / 8/156 / 0.06 (CI= 0.01-1.06)
Source of funding	Not stated
Additional comments	GDG categorised this study setting as Non-Acute

Reference	Bischoff (2003)
Study Type	Double blind randomised controlled trial
Quality	High: patients, nurses and all investigators blinded. Appropriate assessment of baseline differences. Appropriate statistical analysis controlling for confounding factors.
Patients	N= 122 women age range 63-99 years in long stay geriatric care (Switzerland) Mean age= 85.3 years Exclusion criteria: primary hyperparathyroidism, hypocalcaemia, hypercalciuria, renal insufficiency, fracture/stroke with the last 3 months
Intervention	1200 mg calcium + 800 IU Cholecalciferol
Comparison	1200 mg calcium
Length of follow up	12 weeks
Outcomes and effect sizes	Intervention / Control / Relative Risk Number of people who fell: 14/62 / 18/60 / 0.75 (0.41 to 1.37) Tablets were swallowed in presence of the nurse administering to ensure compliance. It is possible to calculate a Ratio of Risk Ratio using data from baseline and follow up time periods, but this has not been done due to a violation of the assumption of independence (baseline and follow up samples were the same).
Source of funding	Supported by Strathman AG; Germany; International Foundation for the promotion of nutrition research and nutrition education; Swiss orthopaedic society; Swiss foundation for Nutrition Research
Additional comments	Patients were in the institution for an average of 345 days (control group) and 337 days (intervention group) prior to commencing treatment. The GDG classified this setting as non acute

Reference	Brandis (1999)
Study Type	Before/after
Quality	Very low: no assessment of differences/confounding factors between groups. Descriptive data analysis only.
Patients	N= unclear , 550 bed acute general hospital inpatients (Australia) Mean age = unclear, Range= unclear
Intervention	FallSTOP prevention programme specifically targeted at those aged 65 and older (Admission assessment, High risk patients wear green armband permanently and green coloured bed sign at the bed head, Hip protectors for all who had previously fallen, Falls management plan decision tree added to ward manuals, ward posters, clinical and support staff education via written memorandum, hospital newsletter, presentations at meetings)
Comparison	Audit data obtained from April 1995- March 1996
Length of follow up	Variable inpatient stay, monitored for 2 years post intervention
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Rate of falls per 1000 OBDs: 1.74 (258/159989) / 1.16 (270/155023) / 0.93 (CI= 0.78-1.10) Rate of injury per 1000 OBD: (143/159989) / (189/155023) / 0.73 (CI= 0.59-0.91) Rate of fracture per 1000 OBD: (3/159989) / (8/144023) / 0.36 (CI= 0.09-1.37)
Source of funding	None stated
Additional comments	GDG categorised this study setting as Acute

Reference	Burleigh (2007)
Study Type	Randomised controlled trial (patients)
Quality	High: appropriate method of randomisation and allocation concealment, appropriate analysis of potential confounding factors, appropriate statistical analysis of falls data
Patients	N= 203 newly transferred or admitted patients on a general assessment and rehabilitation ward in an acute geriatric unit aged 65 years and older, range= unclear (Scotland) *Exclusion criteria: known hypercalcaemia, urolithiasis, renal disease therapy, patients who were terminal or bed bound with a reduced GCS, those already prescribed calcium and vitamin D products, those deemed nil by mouth on admission.*
Intervention	800 iu cholecalciferol plus 1,200 mg calcium carbonate once daily
Comparison	1,200 mg calcium carbonate once daily
Length of follow up	Variable inpatient stay- Until discharge or death.
Outcomes and effect sizes	Intervention (N=100) / Control (n=103) / Relative Risk Proportion of inpatients who fell: 36/100 / 45/103 / 0.82 (CI= 0.59-1.16) Proportion of inpatients with fractures: 1/100 / 3/103 / 0.42 (CI= 0.05-3.84) *Compliance to medication: 89/100 (89%) / 90/103 (87%) / 1.05 (CI= 0.95-1.17)*
Source of funding	Strakan pharmaceuticals supplied drugs free of charge, but did not have a role in the design, conduct, analysis or interpretation of the study
Additional comments	The GDG classified this setting as mixed/unclear

Reference	Capan (2007)
Study Type	Before/after
Quality	Very Low: lack of analysis of group differences/confounding factors. Unclear if differences occurred in care provided over time. Descriptive data analysis only. Unclear sample size
Patients	Acute care hospital (USA)
Intervention	Risk assessment tool to identify those at risk. Patient is reassessed every 24hrs or on positive assessment for orthostatic hypotension. High risk patients received 5 interventions (Orange wrist band, 'Falling Star' magnet placed on the outside of the door, written guide for preventing falls to be reviewed with the patient and their family, hip protectors offered to women over 65 and men over 75, assessment for orthostatic hypertension)
Comparison	audit data
Length of follow up	Variable inpatient stay. Monitored for 2 years (2004-2006)
Outcomes and effect sizes	Intervention Control Incidence Rate Ratio Rate of falls per 1000 OBD 3.20 (NA) 4.50 (NA) NA Authors report that 'No injury' has decreased by 50%, 'Minor injury' decreased by 52%, 'severe injury' decreased by 82%
Source of funding	Not stated
Additional comments	The GDG classified this setting as acute

Reference	Cumming (2008)
Study Type	Cluster randomised controlled trial (wards)
Quality	High: appropriate randomisation of matched wards to reduce confounding factors, appropriate assessment of baseline differences between groups, appropriate statistical analysis.
Patients	N= 3999 from 24 elderly care wards in 12 hospitals (Australia) Mean age= 79 (range= unclear)
Intervention	Delivered by a nurse and a physiotherapist Nurse assessed all patients using a fall risk assessment tool. On the basis of the assessment patients were offered interventions (education of patient and family, walking aids, eyewear, modifications to the bedside environment, increased supervision, liaised with other staff about possible changes to drugs, management of confusion, management of foot problems) Physiotherapist saw patients referred by the nurse and supervised them doing exercises (individually or in groups) designed to enhance balance and functional abilities (in addition to any other physiotherapy the patient was receiving) Alarms were used for ambulant patients who were unsafe to walk (delirium/cognitive impairments)
Comparison	Control wards matched on 4 characteristics (type of ward- acute/elderly care or rehabilitation, fall rates, lengths of stay, patients ages) had no interventions.
Length of follow up	Variable inpatient stay. Each ward was studied for 3 months, pairs of wards participated consecutively over 36 months.
Outcomes and effect sizes	Incidence Rate Ratio Rate of falls per 1000 OBD (Acute) 1.06 (CI= 0.63, 1.77) adjusted for cluster design Rate of falls per 1000 OBD (Non-acute) 0.92 (CI= 0.64, 1.32) adjusted for cluster design
Source of funding	Grant from National health and medical research council Australia.
Additional comments	The GDG were able to categorise separate subgroups into acute and non acute settings

Reference	Donald (2000)
Study Type	Randomised control trial (patients)
Quality	Moderate: appropriate randomisation and stratification to ensure any confounding factors are equal across groups, appropriate statistical analysis performed, unclear if investigators were blinded, small sample size
Patients	N=54 patients from an elderly care rehabilitation ward in a community hospital (UK) Patients were stratified into low, medium or high risk groups using an assessment tool
Intervention	N= 28 Carpet floor N= 30 Exercise (conventional physiotherapy plus specific strengthening exercises twice daily)
Comparison	N= 26 Vinyl floor N= 24 Conventional physiotherapy (twice daily function based therapy)
Length of follow up	Variable inpatient stay, monitored for 9 months
Outcomes and effect sizes	Carpet / Vinyl / Relative Risk Proportion of inpatients who fell: 7/28 / 1/26 / 6.50 (CI= 0.86-49.30) Additional Physio / Routine Physio / Relative Risk Proportion of inpatients who fell: 2/30 / 6/24 / 0.27 (CI=0.06-1.20)
Source of funding	Grant from the research and development support unit, Gloucestershire Health authority.
Additional comments	Authors report: Carpet vs vinyl Relative risk of faller = 8.3 (0.95 to 73.0) Additional vs routine physio Relative risk of faller = 0.21 (0.04 to 1.20) These are odds ratios not relative risks. The GDG classified this setting as non acute

Reference	Donoghue (2005)
Study Type	Before/After
Quality	Very low: no assessment of group differences or confounding factors, unclear sample size, basic descriptive data only.
Patients	N= unclear Aged care ward (Australia) A nurse risk assessed all patients. Those considered to be at high risk were placed in a 4 bedded room opposite the nurses' station and received the intervention. Additional room was acquired for the extension.
Intervention	6 month pilot: Companion observers (volunteers who were rostered for 2 hr shifts to observe patient behaviour and interact with them. Volunteers were permitted to provide reassurance and provide practical assistance such as finding glasses, but were not permitted to assist patients mobilise. Volunteers called nurses if patient attempted to get out of bed) 18 month extension: As above, but observers were rostered in pairs whenever feasible, with one sitting in the room and another canvassing the ward alert for wandering/wobbling patients.
Comparison	Audit data from the previous 9 months (January 2001-July 2002)
Length of follow up	Variable inpatient stay, monitored from August 2002- March 2004
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Rate of falls per 1000 OBD[1] 0.57 (2/3455) 2.52 (10/3972) 0.23 (CI= 0.57-0.93) Rate of falls per 1000 OBD[2] 8.4 (29/3455) 16.4 (65/3972) 0.51 (CI= 0.33-0.79) No falls occurred in the rooms where companion observers were present. Fall rate increased when companion observers were not present over the Christmas period 1= rooms where observers were present, 2= entire ward during intervention period
Source of funding	None stated
Additional comments	The GDG classified this setting as acute

Reference	Dykes (2010)
Study Type	Cluster randomised controlled trial (units)
Quality	Moderate: units with similar fall rates were matched and then randomised, unclear how this was done. Appropriate analysis of baseline differences between the groups, appropriate statistical analysis performed.
Patients	Medical units matched to units with similar fall rates and patient days (USA) Age= Unclear, mean age of those under 65 was 47.9 years, and mean age of those over 65 was 78.8 years Phase 1: Identified barriers and facilitators to fall risk communication and intervention Phase 2: Developed tool kit using risk factors from the Morse falls scale (MFS) Phase 3: Developed software system Phase 4: Implemented and tested the system on wards that were randomised to the intervention or control
Intervention	N= 2509 Falls software system
Comparison	N= 2755 Usual care related to falls prevention
Length of follow up	January 2009 – June 2009
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Rate of falls per 1000 OBD- 65+: 2.76 / 5.05 / 0.55 (CI= 0.34-0.87) adjusted for cluster design Injuries: 7/2755 / 9/2509 / 0.71 (CI= 0.26-1.90) unadjusted Authors also present data that is adjusted for sex and race. Authors also present data on all age groups (unclear what the lowest age was).
Source of funding	Robert Wood Johnson Foundation
Additional comments	GDG categorised this study setting as Acute

Reference	Fonda (2006)
Study Type	Before/after
Quality	Moderate: some assessment of baseline differences between groups, lack of randomisation, appropriate statistical analysis.
Patients	All patients admitted to Aged Care Services between Jan 2001 and Dec 2003 (Australia)
Intervention	All patients were risk assessed using the FRASS (falls risk assessment scoring system) Various interventions were piloted in different groups of patients. Successful strategies were then rolled out to other wards (i.e. toileting protocols, fitted bed sheets, non slip bed/chair mats, extending bedside call bells, low beds, bed alarms, bed poles, family involvement, volunteer programme, orange wrist band, glow in the dark commode seats and toilet signs, night sensor light, staff education, environmental hazard reviews, early feeding of dependent patients)
Comparison	Audit data prior to the intervention
Length of follow up	Variable inpatient stay, monitored for 2 years
Outcomes and effect sizes	Intervention (Year 2) / Pre intervention baseline / Incidence Rate Ratio Rate of falls per 1000 OBD: 10.10 (413/41013) / 12.50 (465/37133) / 0.80 (CI= 0.70-0.91) Rate of serious Injuries per 1000 OBD: 0.17 (7/41013) / 0.73 (27/37133) / 0.23 (CI= 0.10-0.53) Staff compliance with assessment: 70% / 42% *Serious injuries defined as Fracture, Head injury, Injuries causing permanent disability, Death*
Source of funding	Victoria department of human services
Additional comments	GDG categorised this study setting as mixed/unclear

Reference	Giles (2006)
Study Type	Before/After
Quality	Low: no assessment of baseline differences or confounding factors, appropriate statistical analysis, unclear sample size
Patients	Geriatric wards from two hospitals (Australia)
Intervention	Risk assessment as per hospital protocol- STRATIFY used at one site, clinical judgement used at second site. Patients at highest risk were accommodated on a 'safety bay' and volunteer companions observed them. Volunteers worked four hour shifts Monday to Friday 9am-5pm on both sites. One site had volunteers working for 4 hrs on Saturdays. At one site volunteers worked alone, at the second site they worked in pairs Intervention formally implemented in Feb 2003
Comparison	Baseline audit (Feb-May 2002) compared to implementation audit (Feb-May 2003)
Length of follow up	Variable inpatient stay, monitored for one year
Outcomes and effect sizes	Intervention Baseline Incidence Rate Ratio Rate of falls per 1000 OBDs 15.5 (82/5300) 14.5 (70/4828) 1.07 (CI= 0.77-1.47) No falls occurred when volunteers were present 24% of falls occurred in the safety bays when the volunteers were absent.
Source of funding	Grant from the Australian Commonwealth Department of Health and Ageing
Additional comments	The GDG classified this setting as acute

Reference	Haines (2004)
Study Type	Randomised control trial (patients)
Quality	High: adequate randomisation of participants to study groups, not possible to blind staff delivering intervention but investigators examined differences in reporting of falls from staff in the study vs rest of hospital to examine the level of bias that may be present in the intervention group- results suggested that groups were similar. Appropriate statistical analysis, appropriate assessment of baseline differences between groups.
Patients	N= 626 consecutive admissions to rehabilitation and care of the elderly wards (Australia) (mean age= 80, range= 38-99)
Intervention	N= 310 Usual care plus targeted multiple intervention programme (falls risk alert card with information brochure, 3x per week exercise programme(45mins), 2x per week education programme (30 mins), hip protectors) Hospital staff used their clinical judgement and PJC-FRAT assessment tool to determine the need for each intervention
Comparison	N= 316 Usual care
Length of follow up	Variable inpatient stay
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Rate of falls per 1000 OBD: 11.22 (105/9356) / 16.13 (149/9239) / 0.70 (CI=0.54-0.89) Proportion of falls with any injury: 23/9356 / 32/9239 / 0.71 (CI= 0.42-1.21) Proportion of falls resulting in fracture: 2/9356 / 2/9239 / 0.99 (0.14-7.01) Fall rate similar in both groups until day 45 when the fall rate increased in the control and dropped in the intervention (Log rank p=0.004, Peto extension p=0.045)
Source of funding	Not stated
Additional comments	GDG categorised this study setting as Non- Acute

Reference	Haines (2006)
Study Type	Subgroup analysis of randomised control trial
Quality	High: appropriate statistical corrections used to account for this planned subgroup analysis of a previous high quality RCT (Haines 2004)
Patients	N= 226 patients at high risk of falls who had been recommended an educational programme by an occupational therapist. Patients were admissions to rehabilitation and care of the elderly wards (Australia)
Intervention	N= 115 One-to-one education sessions with an occupational therapist. Duration of sessions at the discretion of the occupational therapist (usually between 15 and 35 mins). Intention was for material to be covered in 4 sessions, but participants could receive more sessions if required
Comparison	N= 111 Usual care
Length of follow up	Variable inpatient stay,
Outcomes and effect sizes	Intervention Control Incidence Rate Ratio Rate of falls per 1000 bed days[1] 8.2 (26/3190) 16.0 (48/3007) 0.51 (CI= 0.32-0.82) Rate of falls per 1000 bed days[2] 3.9 (4/1026) 13.8 (9/652) 0.28 (CI= 0.09-0.86) Cognitive Function subgroup Falls per 1000 bed days[3] 5.6 (11/1964) 10.9 (24/2201) 0.51 (CI= 0.26 – 1.03) Falls per 1000 bed days[4] 12.3 (15/1219) 29.8 (24/805) 0.41 (CI= 0.22 – 0.78) 1= Any participant recommended education, 2= Participants only recommended education 3= Any participant recommended education with MMSE>23, 4= any participant recommended education with MMSE<23
Source of funding	Victoria Department of Human Services, Aged Care Division
Additional comments	This is a subgroup analysis of the previous Haines (2004) RCT (n=626) which was investigating targeted multiple falls prevention programme. The GDG classified this setting as non acute

Reference	Haines (2007)
Study Type	Subgroup analysis of randomised control trial
Quality	High: appropriate statistical corrections used to account for this planned subgroup analysis of a previous high quality RCT (Haines 2004)
Patients	N= 173 patients at high risk of falls who had been recommended an exercise programme by a physiotherapist. Patients were admissions to rehabilitation and care of the elderly wards (Australia)
Intervention	45 min exercise sessions 3 times per week combining tai chi with functional movements Max 4 patients to 1 physiotherapist
Comparison	Usual care
Length of follow up	Discharge or death
Outcomes and effect sizes	Intervention Control Incidence Rate Ratio Rate of falls per 1000 bed days 10.0 (26/2596) 21.2 (47/2215) 0.47 (CI= 0.29-0.76) Bonferoni corrected Alpha was used to take into consideration the planned subgroup analysis
Source of funding	Victorian Department of Human Services
Additional comments	This is a subgroup analysis of the previous Haines (2004) RCT (n=626) which was investigating targeted multiple falls prevention programme. Results in abstract appear to be direct copy of 2006 paper and do not reflect the results of the 2007 paper. The GDG classified this setting as non actue

Reference	Haines (2010)
Study Type	Cluster randomised control trial (wards)
Quality	High: appropriate randomisation of wards after being matched on falls rates, appropriate statistical analysis performed, included data from 6 months prior to investigate confounding factors as researcher were aware of similar study where intervention and control groups were found to be different before study commencement.
Patients	From 18 hospitals who had not had access to low-low beds (Australia)
Intervention	9 wards received Huntleigh Healthcare low-low beds, lowest height= 28.5cm, highest height= 64cm Each ward allocated 1 low-low bed for every 12 regular beds
Comparison	9 wards usual care
Length of follow up	6 months post intervention
Outcomes and effect sizes	Falls / Follow Up / Baseline / Incidence Rate Ratio Intervention / 186/35441 / 257/36176 / 0.74 Control / 114/30228 / 154/29960 / 0.73 Ratio of Incidence Rate Ratio / 1.01 (0.74 to 1.37) Injuries / Follow Up / Baseline / Incidence Rate Ratio Intervention / 85/35441 / 84/36176 / 1.03 Control / 51/30228 / 63/29960 / 0.80 Ratio of Incidence Rate Ratio / 1.29 (0.80 to 2.07) Serious Injury / Follow Up / Baseline / Incidence Rate Ratio Intervention / 7/35441 / 7/36176 / 1.02 Control / 3/30228 / 6/29960 / 0.49 Ratio of Incidence Rate Ratio / 2.06 (0.36 to 11.70)
Source of funding	Falls injury Prevention Collaborative, Patient Safety Centre.
Additional comments	All staff received training material for classifying falls accurately according to WHO, and received beds in Oct 2007. Sites reported difficulties using bed stock and bed moving equipment due to incompatibilities between manufacturers. One site withdrew from the study due to inability to move beds to Trendelenburg position. The GDG classified this setting as mixed/unclear

Reference	Haines (2011)
Study Type	Randomised control trial (participants)
Quality	High: recruiters, data collectors and analyst blinded. Appropriate randomisation of each participant. Analysis of baseline differences and confounding factors. Appropriate statistical analysis
Patients	Older adults (>60 years) admitted to acute and geriatric rehab/assessment units
Intervention	N= 401 Model 1: Written and video based materials and 1-to-1 follow up N= 424 Model 2: Written and video based materials without follow up
Comparison	N=381 Usual care
Length of follow up	Discharge or death

Outcomes and effect sizes

All patients	Falls	IRR	Falls with Injury	IRR	Falls with Fracture	IRR
Model 1 / Control	70/9174 vs 81/8737	0.82 (0.60, 1.13)	32/9174 vs 25/8737	1.22 (0.72, 2.06)	1/9174 vs 2/8737	0.48 (0.04, 5.25)
Model 2 / Control	96/11149 vs 81/8737	0.92 (0.96, 1.25)	40/11149 vs 25/8737	0.39 (0.27, 0.57)	2/11149 vs 2/8737	0.78 (0.11, 5.56)
Model 1 / Model 2	70/9174 vs 96/11149	0.89 (0.65, 1.12)	32/9174 vs 40/11149	0.97 (0.61, 1.55)	1/9174 vs 2/11149	0.60 (0.06, 6.70)
Cognitively Impaired						
Model 1 / Control	45/2941 vs 35/3465	1.51 (0.97, 2.36)	22/2941 vs 10/3465	2.59 (1.28, 5.47)	1/2941 vs 0/3465	3.53 (0.14, 86.76)
Model 2 / Control	35/3695 vs 35/3465	0.94 (0.59, 1.50)	15/3695 vs 10/3465	1.04 (0.63, 3.13)	1/3695 vs 0/3465	2.81 (0.11, 69.06)
Model 1 / Model 2	45/2941 vs 35/3465	1.62 (1.04, 2.51)	22/2941 vs 15/3695	1.84 (0.96, 3.55)	1/2941 vs 1/3695	1.26 (0.07, 20.08)
Cognitively Intact						
Model 1 / Control	25/6234 vs 46/5275	0.45 (0.28, 0.75)	10/6234 vs 15/5275	0.56 (0.25, 1.26)	0/6234 vs 2/5275	0.17 (0.01, 3.53)
Model 2 / Control	61/7457 vs 46/5275	0.94 (0.64, 1.38)	25/7457 vs 16/5275	1.17 (0.62, 2.24)	1/7457 vs 2/5275	0.35 (0.03, 3.90)
Model 1 / Model 2	25/6234 vs 61/7457	0.49 (0.30, 0.78)	10/6234 vs 25/7457	0.48 (0.23, 1.00)	0/6234 vs 1/7457	0.40 (0.02, 9.79)

Source of funding	National health and medical research council Australia
Additional comments	

Reference	Healey (2004)
Study Type	Cluster randomised controlled trial (wards)
Quality	High: Appropriate randomisation of wards which were matched on number of beds, skill mix, nursing staff establishments and patients with similar dependency levels. Appropriate statistical analysis.
Patients	Care of the elderly wards mainly aged 75 years and older
Intervention	Risk factor screen and related interventions in the form of a care plan conducted for all patients who had a history of falls, had fallen or had a near miss
Comparison	Usual care
Length of follow up	Study lasted 12 months, with the intervention applied to wards in the latter 6 months
Outcomes and effect sizes	Falls: Follow Up / Baseline / Incidence Rate Ratio Intervention wards: 180/15951 / 240/16746 / 0.79 (0.65-0.95) Control wards: 319/16577 / 300/17413 / 1.12 (0.96-1.30) Ratio of Incidence Rate Ratio 0.71 (0.55-0.90) Adjusted Ratio of Incidence Rate Ratio 0.70 (0.18- 2.77)* Injuries: Follow Up / Baseline / Incidence Rate Ratio Intervention wards: 49/15951 / 45/16746 / 1.14 (0.76-1.71) Control wards: 62 /16577 / 77 /17413 / 0.85 (0.61-1.18) Ratio of Incidence Rate Ratio 1.35 (0.80-2.28) Adjusted Ratio of Incidence Rate Ratio 1.34 (0.06-23.92)* *Reviewer adjusted the results to take account of unit error present in cluster randomisation using Intracluster Correlation Coefficient of 0.014 from the Cummings (2008) paper, and calculations outlined by Cochrane.
Source of funding	No research funding was received
Additional comments	GDG categorised this study setting as mixed/unclear

Reference	Huda and Wise (1998)
Study Type	Before/After
Quality	Very Low: no analysis of baseline differences or potential confounding factors. Descriptive analysis only.
Patients	All admitted patients to a medical centre (USA)
Intervention	Phase 1: Falls risk assessment using a standard tool- High risk patients had a formal fall risk care plan, fall risk wall hanging in patients room, orange arm band on patient, fall risk insert into the patient record, inform other carers staff and family of the fall risk care plan. Phase 2: interventions to increase staff awareness and compliance- audit results presented at monthly meetings, newsletters, obtaining staff input, educational programme Phase 3: Fall risk inserts to be placed in all patients record, fall risk check box added to nursing inter-shift report cards to remind them to reassess patients, inservice held with nursing assistants
Comparison	Pre intervention fall rate (Winter 1995) Phase 1 audit data (summer 1995), Phase 2 audit data (Autumn 1995), Phase 3 audit data (Summer 1996)
Length of follow up	
Outcomes and effect sizes	

	Phase 1	Phase 2	Phase 3
Falls per 1000 bed days	5.4 (NA)	5.2 (NA)	3.7 (NA)
Staff compliance			
Wall stickers	45%	68%	78%
Arm bands	5%	28%	59%
Fall inserts	20%	28%	92%
Plan of care	15%	46%	78%
Admission assessment	54%	75%	83%
Daily reassessment	26%	22%	60%

Source of funding	Not stated
Additional comments	The GDG classified this setting as acute

Reference	Jeske (2006)
Study Type	Before/after
Quality	Very low: no analysis of baseline differences or confounding factors. Descriptive analysis only
Patients	N= unclear Acute care telemetry unit (USA)
Intervention	Educational poster for patients/relatives
Comparison	Audit data
Length of follow up	9 months
Outcomes and effect sizes	*Baseline* *Post intervention* *Falls per 1000 bed days* *4.4 (NR)* *4.7 (NR)*
Source of funding	Not stated
Additional comments	Data provided monthly for 12 months The GDG classified this setting as acute

Reference	Kato (2008)
Study Type	Non random controlled trail (Wards)
Quality	Moderate: assessment of differences between groups, non random assignment to intervention or control condition. Appropriate statistical analysis
Patients	N= 51 elderly patients recruited from a long term care facility (Japan) Mean age= 83 (intervention) 85 (control)
Intervention	N= 31 multifactorial falls prevention programme aimed to increase the caregiving skills and motivation of staff members
Comparison	N= 20 usual falls prevention care
Length of follow up	6 months
Outcomes and effect sizes	

Falls	Follow Up	Baseline	
Intervention	27/5568	37/5104	0.69 (0.41, 1.10)
Control	12/3541	12/3178	0.90 (0.40, 2.00)
	Ratio of Incidence Rate Ratio		0.75 (0.29, 1.19)
Injurious Falls	Follow Up	Baseline	
Intervention	3/5568	13/5104	0.21 (0.06, 0.74)
Control	4/3541	4/3178	0.89 (0.22, 3.59)
	Ratio of Incidence Rate Ratio		0.24 (0.04, 1.53)

Source of funding	Grant-in-Aid for Scientific Research from the Japan Society for the promotion of sciences
Additional comments	Patients were in the institution for one year or longer. GDG categorised this study setting as Non-Acute

Reference	Kilpack (1991)
Study Type	Before/after
Quality	Very low: No analysis of baseline differences or confounding factors. Descriptive analysis only.
Patients	Patients on unit with higher than the hospital average fall rate who had previously fallen in the hospital (USA) N= unclear, Age= unclear
Intervention	Wards with higher than average fall rate When a patient who had fallen was identified, a nurse completed an assessment and selected interventions to be included in their care plan (evidence based *such as coloured tagging, raised side rails, call light within reach, secure patients in wheelchairs etc*., Nurse proposed *such as restraint when in bed, commode at bedside, ambulate with assistance, condom catheter*). Nurse wrote patient fell in patient's kardex in red ink. Staff education programme implemented
Comparison	Fall rate in rest of hospital
Length of follow up	1 year
Outcomes and effect sizes	Intervention Pre intervention Falls per 1000 bed days 4.4 (NA) 4.7 (NA)
Source of funding	Not stated (page missing)
Additional comments	The GDG classified this setting as acute

Reference	Koh (2009)
Study Type	Before/after
Quality	Very low: primary purpose was to examine nurse barriers with falls being a secondary outcome. No analysis of baseline differences or confounding factors between patient groups. Descriptive analysis only.
Patients	Medical records reviewed for medical, surgical and geriatric patients from two acute care hospitals with matched perceived barriers to falls prevention (Singapore)
Intervention	Hospital 1: n= 612 Routine dissemination of falls prevention guidelines (launched in 2006), plus tailored, multifaceted implementation strategy for the fall prevention programme, based on five barriers to implementation cited by the nurses (implemented June 2005-September 2006)
Comparison	Hospital 2: n=510 Routine dissemination strategies used to implement falls prevention guidelines (launched February 2006)
Length of follow up	6 month (nurses attitudes) 15 months (falls outcomes)
Outcomes and effect sizes	Falls: Follow Up / Baseline / Incidence Rate Ratio Intervention wards: 1.1 (193/175454) / 1.4 (391/279286) / 0.79 (0.66-0.93) Control wards: 0.6 (67/111667) / 0.6 (148/246667) / 1.00 (0.75-1.33) Ratio of Incidence Rate Ratio 0.79 (0.57-1.10) Injuries: Follow Up / Baseline / Incidence Rate Ratio Intervention wards: 77/175454 / 127/279286 / 0.97 (0.73-1.28) Control wards: 17/111667 / 25/246667 / 1.50 (0.81-2.78) Ratio of Incidence Rate Ratio 0.64 (0.33-1.27) Compliance across both hospitals. Baseline / Post implementation Documentation In nursing record: 97.3% / 99.3% Fall risk assessment: 50.2% / 99.3%
Source of funding	Grant from Ministry of Health (Singapore) Nursing Research Committee, and Ministry of Health Quality Improvement Fund.
Additional comments	GDG categorised this study setting as Acute

Reference	Krauss (2008)
Study Type	Non random cluster controlled trial (wards)
Quality	Low: intervention and control wards matched on the severity of their patient's conditions and fall rates. However no analysis of baseline differences or potential confounding factors for the actual patients studied. Some statistical analysis performed.
Patients	4 general medicine floors of a tertiary care hospital (USA) Mean age= 65 years
Intervention	N= 57 2 floors: Fall prevention self study module for nurses, technicians and secretaries. Nursing staff also used the following interventions: green armband for at risk patients, green sign above patients bed or on the door, specification of mobility needs on patients whiteboard, communication to other staff on shift change, fall prevention teaching with patient and family, toileting schedule (every 2hrs during the day, every 4 hrs during the night), medication review, consultation with physiotherapy/occupational therapy. Once these were in place staff could also choose from other fall prevention strategies (bed alarms, low beds, floor mat, placement of patient close to nurses station, request family members to sit with the patient) April –December 2005. In-services given in April and May 05
Comparison	N= 78 2 floors: no self study modules or in-services. Usual falls prevention
Length of follow up	
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Falls per 1000 OBD: 5.09 (57/11198) / 6.85 (78/11387) / 0.74 (0.53,1.05) Staff knowledge test scores Follow Up / Baseline / Mean Difference Mean Score: 90.7 (6.9) / 71.7 (7.3) / 19 (16.7, 21.73)
Source of funding	Not stated
Additional comments	Raw data not available for all fall rates. GDG categorised this study setting as Acute

Reference	Lane (1999)
Study Type	Before/after
Quality	Very Low: no analysis of baseline differences or potential confounding factors. Descriptive analysis only.
Patients	N=292 patients from medical-surgical/critical care at a large community hospital (USA) Group 1 N= 101 who fell in 1988 Group 2 N= 98 who fell in 1995 Group 3 N= 93 did not fall in 1995
Intervention	Identification of at risk patients Interventions to promote patient safety used for all at risk patients
Comparison	Audit data
Length of follow up	1 year
Outcomes and effect sizes	Group 2 / Group 1 / Incidence Rate Ratio Rate of falls per 1000 OBD: 3.89 (373/95867) / 2.27 (412/181876) / 1.72 (1.49 to 1.98)
Source of funding	Not stated
Additional comments	The intervention was developed in 1989 and not found to be effective, but was rolled out to the hospital in 1990. In 1992 the intervention was evaluated- and the programme was not supported. The programme continued and the data here is from the 5 year evaluation. GDG categorised this study setting as mixed/unclear

Reference	Lieu (1997)
Study Type	Before/after
Quality	Low: no analysis of baseline differences or potential confounding factors. Some statistical analysis.
Patients	Geriatric inpatients (Singapore) Phase 1 n= 770 (mean age= 73 years) Phase 2 n= 831 Phase 3 n= 505
Intervention	Phase 1 (1993/94): Staff lectures to educate ward staff on preventing falls Phase 2 (1994/95): Institution of nursing protocol for each admission, reviewed every 3 days. Phase 3 (1995/96): Implementation of nursing protocol
Comparison	Audit data
Length of follow up	1 year
Outcomes and effect sizes	Intervention Control Phase 3 Phase 1 Incidence Rate Ratio Rate of falls per 1000 bed days 2.94 (30/10204) 6.85 (70/10218) 0.43 (CI=0.28-0.66)
Source of funding	Not stated
Additional comments	GDG categorised this study setting as Acute

Reference	Mayo (1994)
Study Type	Randomised controlled trial (participants)
Quality	Moderate: participants randomly assigned to intervention or control group but unclear what method was used, unclear if blinding of investigators took place (inappropriate to blind patients/care givers), appropriate comparison of control and intervention groups, appropriate statistical analysis
Patients	N= 134 patients at risk of falls who were admitted to a specialist physical rehabilitation hospital (Canada)
Intervention	N= 65: Blue identification bracelet for high risk patients, in addition to usual hospital bracelet. Patients told to use their blue bracelet to remind themselves to be careful when moving around (examples of unsafe activities provided)
Comparison	N=69: Usual hospital bracelet. Patients told to remember to be careful (examples of unsafe behaviours provided)
Length of follow up	Discharge or death
Outcomes and effect sizes	Intervention / Control / Relative Risk Proportion of inpatients who fell: 27/65 / 21/69 / 1.36 (CI=0.86-2.16)
Source of funding	Not stated
Additional comments	Cost data provided Study originally identified and obtained consent for 360 at risk patients, but removed 226 from the analysis as these cases had a lower rate of falling (they had secondary rather than primary risk factors). Only patients with primary risk factors were retained in the analysis. The GDG classified this setting as acute

Reference	Mitchell (1996)
Study Type	Before/after
Quality	Low: some analysis of baseline differences, appropriate statistical analysis.
Patients	Patients admitted to a medical ward (Australia) Pre intervention: N= 39 (mean age= 76, Range= 38-92) Post intervention: N= 19 (mean age= 72, Range= 50-81)
Intervention	Falls assessment tool, Alert system (orange dot in visible areas- arm band, notes, bed head, incident forms), preventive actions, staff education.
Comparison	Audit
Length of follow up	6 months
Outcomes and effect sizes	Intervention / Control (baseline) / Incidence Rate Ratio Rate of falls per 1000 bed days: 4.42 / 7.75 / 0.57 (CI= 0.34 to 0.96)
Source of funding	Not stated
Additional comments	GDG categorised this study setting as Acute

Reference	Rainville (1984)
Study Type	Before/after
Quality	Very Low: no analysis of baseline differences or potential confounding factors. Descriptive analysis only.
Patients	All inpatients admitted to a short term care facility on a unit with the highest rate of falls (USA)
Intervention	Care plan for high risk patients including an assessment, patient/family education, environment, staff awareness Assessment occurred on day of admission and day 8 and 15 of the patient stay, and more frequently if the patient's condition changed Implemented Jan-April 1984
Comparison	Audit data from July-Oct 1983
Length of follow up	3 months
Outcomes and effect sizes	Intervention / Control (baseline) / Incidence Rate Ratio Falls per 1000 bed days: 7.74 (27/3488) / 7.76 (26/3351) / 1.00 (CI=0.59-1.70)
Source of funding	Not stated
Additional comments	GDG categorised this study setting as Acute

Reference	Schwendimann (2006a)
Study Type	Before/after
Quality	Low: Some analysis of differences between groups. Appropriate statistical analysis
Patients	n= 34,972 inpatients admitted between 1999 and 2003 (Switzerland) (Mean age= 67 years)
Intervention	In 2000 an Interdisciplinary fall prevention programme was introduced
Comparison	Audit
Length of follow up	3 years
Outcomes and effect sizes	Intervention 2003 / Control 1999 / Effect Size Rate of falls per 1000 OBD: 8.9 (NA) / 9.1 (NA) / NA Proportion of falls resulting in injury: 548/805 / 495/763 / Relative Risk= 1.05 (CI=0.98-1.13) Proportion of falls resulting in major injury: 31/805 / 19/763 / Relative Risk= 1.55 (CI=0.88-2.71) *Major injury= Fractures, intra cranial bleed, luxation, multiple haemotoma*
Source of funding	Not stated
Additional comments	Data also provided for 2000, 2001 and 2002. GDG categorised this study setting as Acute Contacted author to provide additional falls data. Author responded but data could not be obtained.

Reference	Schwendimann (2006b)
Study Type	Non randomised controlled trail (wards)
Quality	Low: non random allocation, analysis of baseline differences and possible confounding factors, appropriate statistical analysis.
Patients	N=409 consecutive admissions to two nursing units in the Department of Internal Medicine (Switerland) (mean age= 71 years)
Intervention	N= 198 Fall risk assessment and protocol of nursing interventions, Staff education
Comparison	N= 211 Usual care + staff education
Length of follow up	4 months
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Rate of falls per 1000 OBD: 11.5 (31/2696) / 15.7 (51/3248) / 0.73 (CI= 0.47-1.14) Rate of injurious falls per 1000 OBD: 3.70 (10/2696) / 3.69 (12/3248) / 1.00 (CI= 0.44-2.27) Rate of severe injury falls per 1000 OBD: N/A (0/2696) / 0.92 (3/3248) / 0.17 (CI=0.01 to 3.33) *No definition of 'severe injury'*
Source of funding	Not stated
Additional comments	GDG categorised this study setting as Acute

Reference	Stenvall (2007)
Study Type	Randomised controlled trial (patients)
Quality	High: appropriate randomisation and investigator blinding, analysis of baseline differences and confounding factors, appropriate statistical analysis
Patients	Patients aged >70 years admitted with femoral neck fracture (Sweden)
Intervention	Postoperative care in a geriatric ward with special intervention programme
Comparison	Conventional postoperative care in an orthopaedic ward
Length of follow up	Unclear, presume discharge or death
Outcomes and effect sizes	Intervention / Control / Incidence Rate Ratio Rate of falls per 1000 OBD: 6.29 (18/2860) / 16.28 (60/3685) / 0.39 (CI= 0.23-0.67) *Proportion of falls among people with dementia: 1/18 / 34/60 / 0.10 (CI=0.02-0.57)*
Source of funding	States a sponsor provided financial support- unclear who.
Additional comments	GDG categorised this study setting as mixed/unclear

Reference	Von Renteln-Kruse
Study Type	Before/After
Quality	Moderate: analysis of baseline differences and possible confounding factors, appropriate statistical analysis
Patients	N= 4272 patients admitted to a geriatric clinic (Germany) Mean age=80
Intervention	N= 2981: From Dec 2004 all consecutively admitted patients received falls risk assessment within 48 hrs. At risk patients had a visible 'risk alert' sign placed above their bed. Mobility devices provided if necessary, and individual preventive measures also used when indicated. Patients were reassessed after a fall. Frequent observations and plans for toileting/commode use. Patient and family education and information booklet
Comparison	N= 4272: Preintervention audit (Jan 03 –Nov 04)
Length of follow up	15 months (Dec 04-March 06)
Outcomes and effect sizes	

	Post Intervention	Pre Intervention	Incidence Rate Ratio
Falls per 1000 OBD	8.2 (468/57115)	10.0 (893/89222)	0.82 (0.73 to 0.92)
Injurious falls per 1000 OBD	2.26 (129/57115)	2.69 (240/89222)	0.84 (0.68 to 1.04)
Falls with fracture per 1000 OBD	0.16 (9/57115)	0.11 (10/89222)	1.41 (0.57 to 3.46)

Source of funding	No sponsor role
Additional comments	GDG categorised this study setting as Acute

Reference	Vassallo (2004)
Study Type	Non random cluster controlled trial (wards)
Quality	Moderate: analysis of baseline differences and possible confounding factors, appropriate statistical analysis
Patients	825 consecutive patients admitted to a three elderly care wards in a community rehabilitation hospital (UK) Mean age= 86 years
Intervention	N= 550: Proactive MDT approach to falls prevention (physician , nurse, OT, PT, social worker). Patients were assessed by all members of the MDT, and a weekly reassessment and medical examination. Care plan for at risk patients, red wrist band, patient safety advice, other interventions as appropriate. Weekly discussion of patients.
Comparison	N= 275: Usual care: Less frequent and comprehensive assessments and fall prevention plans, no weekly falls assessment, no treatment plan
Length of follow up	Variable inpatient stay
Outcomes and effect sizes	Intervention Control Incidence Rate Ratio Falls per 1000 OBD 12.30 (72/5855) 11.49 (170/14791) 1.07 (CI=0.81-1.41)
Source of funding	None stated
Additional comments	The GDG classified this setting as non acute

Reference	Wald (2011) STAFF STRUCTURE
Study Type	Quasi-RCT
Quality	Low: randomisation used but not adequate to control for block bias error, unclear if blinding took place. Appropriate statistical analysis
Participants	N=122 Medical inpatients aged 70 and older (USA)
Intervention	Hospital ACE (Acute care of the Elderly service): a hybrid of a general medical service and an inpatient geriatrics unit staffed with a core group of hospitalist attendings who have attended an intensive course in inpatient geriatrics as a minimum. The unit team consisted of one attending hospitalist (who had additional training in geriatric medicine who rotated around attending responsibilities on the service), one resident, one intern, and medical students. A brief geriatric assessment was conducted on admission. Interdisciplinary rounds were attended by Hospital ACE physicians, nurses, case managers, social workers, physical or occupational therapists, pharmacists and volunteers and focussed on organising and managing geriatric syndromes and early discharge planning. A standard educational curriculum for medical residents addressed hazards of hospitalisation.
Comparison	Usual care: Hospitalist, a general internist or an internal medicine subspecialist attending physician, with one medical resident and medical students admitting every 4th day. The general medical team attended daily discharge planning rounds with a discharge planner and social worker focussed soley on discharge planning. Content of teaching rounds was left to the discretion of the attending physician.
Length of follow up	Duration of inpatient stay
Outcomes and effect sizes	Intervention / Control / Effect size Fall rate: 4.8 / 6.4 / NA* *Authors report no significant differences between fall rates on intervention and control wards.
Source of funding	Grant from University of Colorado Hospital Quality Improvement; Authors funded by awards from Hartford/Jahnigem Centre of Excellence, National Institutes on Aging, John A Hartford Foundation, the Atlantic Philanthropies and the Starr Foundation.
Additional comments	The GDG classified this setting as acute

Reference	Williams (2007)
Study Type	Before/after
Quality	Moderate: some assessment of baseline differences and possible confounding factors, appropriate statistical analysis
Patients	N= 1357 from 3 wards and a geriatric evaluation management unit of a tertiary teaching hospital (Australia) (1041 patients were 65 and over)
Intervention	N= 1357 Implementation of a falls prevention programme started in 2003-2004 Risk screening tool, with specific interventions directed at each level of risk on a falls care plan Staff education to improve compliance with risk assessment
Comparison	Audit data from same months in 2002/3
Length of follow up	6 months
Outcomes and effect sizes	Intervention 2003/4 — Control 2002/3 — Effect Size Falls per 1000 OBD — 8 (NA) — 9.5 (NA) — NA
Source of funding	Not stated
Additional comments	The GDG classified this setting as mixed/unclear

Inpatient interventions: GRADE tables

1. Acute Setting

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Geriatric Consultation team compared to routine care										
Implementation of recommendations by staff (Mean difference)										
1 Allen (1986)	Randomised trials	NS	NS	S[1]	NS	Mean LOS= 17 days	313/446 (70.4%)	102/377 (27.1%)	MD= 2.59 (2.17 to 3.19)	MOD
Hospital Acute Care of the Elderly Service compared to Usual Care										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Wald (2011)	Randomised trials	S[2]	NS	NS	VS[3]	Mean LOS= 3 days	(4.8)	(6.4)	-	LOW
Companion observers in the rooms of high risk patients compared to no observers on the ward										
Falls in the intervention rooms and no intervention wards (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
2 Donoghue (2005); Giles (2006)	Non randomised trials	VS[4]	S[5]	NS	S[6]	-	111/8755 (12.68)	135/8770 (15.39)	IRR= 0.75 (0.37 to 1.54)	V LOW
Falls in the intervention rooms only (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Donoghue (2005)	Non randomised trials	VS [4]	NS	NS	S[6]	-	2/3455 (0.57)	10/3972 (2.52)	IRR= 0.22 (0.06 to 0.93)	V LOW
Educational Poster for patients/relatives, compared to no educational poster										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Jeske (2006)	Non randomised trials	VS[4]	NS	S[7]	VS[3]	-	(4.7)	(4.4)	-	V LOW
Multifactorial interventions, compared to no multifactorial interventions										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
2	Randomised	NS	NS	NS	NS	-	-	-	IRR= 0.76 (0.40 to 1.44)	HIGH

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Cumming (2008), Dykes (2010),	trials									
1 Koh (2009)	Controlled pre/post	S[4]	NS	S[7]	NS				RIRR= 0.79 (0.57 to 1.09)	V LOW
8 Brandis (1999), Krauss (2008), Lieu (1997), Mitchell (1996), Rainville (1984), Schwendimann (2006b); Von Renteln-Kruse (2007)	Non randomised trials	S[4]	NS	S[7]	NS	-	-	-	IRR= 0.77 (0.66 to 0.89)	V LOW
Falls (Relative Risk- Number of inpatients who fell as a proportion of number of inpatients)										
1 Capan (2007)	Non randomised trials	S[4]	NS	S[7]	S[3]	-	3.20	4.50	-	V LOW
1 Kilpack (1991)	Non randomised trials	S[4]	NS	S[7]	S[3]	-	4.4	4.7	-	V LOW
1 Schwendimann (2006a)	Non randomised trials	S[4]	NS	S[7]	S[3]	Mean LOS= 11.9 days	8.9	9.1	-	V LOW
Any Injury (Incidence Rate Ratio- Number of falls resulting in any injury as a proportion of occupied bed days)										
1 Koh (2009),	Controlled pre/post	S[4]	NS	S[7]	NS	-	-	-	RIRR= 0.64 (0.33 to1.27)	V LOW
3 Brandis (1999), Schwendimann (2006b), Von Renteln-Kruse (2007)	Non randomised trials	S[4]	NS	S[7]	NS	-	-	-	IRR= 0.78 (0.68 to 0.90)	V LOW

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Any Injury (Relative Risk- Number of inpatients who fell and sustained any injury as a proportion of number of inpatients)										
1 Dykes (2010),	Randomised trials	S[8]	NS	NS	NS	Mean LOS= 3.2 days	7/2755	9/2509	RR= 0.71 (0.26 to 1.90)	MOD
1 Schwendimann (2006a)	Non randomised trials	S[4]	NS	S[7]	S[3]	Mean LOS= 11.9 days	548/805	495/763	RR= 1.05 (0.98 to 1.13)	V LOW
Severe Injury (Incidence Rate Ratio- Number of falls resulting in severe injury as a proportion of occupied bed days)										
3 Brandis (1999), Schwendimann (2006b), Von Renteln-Kruse (2007)	Non Randomised trials	VS[4,8]	S[5]	NS	S[6]	-	-	-	IRR= 0.64 (0.19 to 2.12)	V LOW
Severe Injury (Relative Risk- Number of inpatients who fell and sustained severe injury as a proportion of number of inpatients)										
1 Schwendimann (2006a)	Non randomised trials	NS	NS	S[7]	S[6]	Mean LOS= 11.9 days	31/805	19/763	RR= 1.55 (0.88 to 2.71)	V LOW
Staff knowledge (Mean difference- Post intervention compared to pre intervention)										
1 Krauss (2008)	Non randomised trials	S[4]	NS	S[7]	NS	-	90.7	71.3	MD=19 (16.70 to 21.73)	V LOW

LOS= length of stay
NS= Nothing serious (not downgraded)
S= Serious (downgraded one place)
VS= Very serious (downgraded two places)
RR= Relative Risk
IRR= Incidence Rate Ratio
RRR= Ratio of Relative Risk
RIRR= Ratio of Incidence Rate Ratio
MD= Mean Difference

1= Don't know the impact of the intervention on fall rates

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
2= Inadequate randomisation (allocation by last digit of medical number) 3= Confidence intervals not reported or calculable 4= Failure to measure prognostic factors/control confounding 5= Inconsistent point estimates 6= Wide confidence intervals 7= Includes participants under the age of 50 years 8= No correction for unit analysis error that is present in cluster randomisation										

2. Non-Acute setting

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Vitamin D plus calcium compared to calcium alone										
Falls (Relative Risk- Number of inpatients who fell as a proportion of number of inpatients)										
1 Bischoff (2003)	Randomised trials	NS	NS	S[1]	S[2]	Mean LOS= 341 days	-	-	RR= 0.75 (0.41-1.37)	LOW
Flooring- Carpet flooring compared to Vinyl flooring										
Falls (Relative Risk- Number of inpatients who fell as a proportion of number of inpatients)										
1 Donald (2000)	Randomised trials	VS[3]	S[4]	NS	S[2]	Mean LOS= 30 days	7/28 (25.0%)	1/26 (3.8%)	RR= 6.50 (0.86 to 49.30)	V LOW
Physiotherapy- Enhanced (2x daily standard physiotherapy plus specific strengthening exercises) compared to Standard physiotherapy alone										
Falls (Relative Risk- Number of inpatients who fell as a proportion of number of inpatients)										
1 Donald (2000)	Randomised trials	VS[3]	S[4]	NS	S[2]	Mean LOS= 30 days	2/30 (6.7%)	6/24 (25.0%)	RR= 0.27 (0.06 to 1.20)	V LOW
Education for patients (including 1:1 sessions) delivered in combination with another intervention, compared to no education										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2006)	Randomised trials	NS	NS	NS	NS	Mean LOS= 21 days	26/3190 (8.2)	48/3007 (16.0)	IRR= 0.51 (0.32 to 0.82)[10]	HIGH
							4/1026 (3.9)	9/652 (13.8)	IRR= 0.28 (0.09 to 0.86)[11]	
							11/1964 (5.6)	24/2201 (10.9)	IRR= 0.51 (0.26 to 1.03)[12]	
							15/1219 (12.3)	24/805 (8.9)	IRR= 0.41 (0.22 to 0.78)[13]	
Exercise (45 min 3x per week) compared to no exercise										

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2007)	Randomised trials	NS	NS	NS	NS	-	26/2596 (10.0)	47/2215 (21.2)	IRR= 0.47 (0.29 to 0.76)	HIGH
Bracelets worn by high risk patients, compared to no bracelet										
Falls (Relative Risk- Number of inpatients who fell as a proportion of number of inpatients)										
1 Mayo (1994)	Randomised trials	VS[6]	NS	S[7]	S[2]	-	27/65 (41.5%)	21/69 (30.4%)	RR= 1.36 (0.86 to 2.16)	V LOW
Proactive MDT approach (Weekly assessment by all MDT members) compared to standard MDT approach										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Vassallo (2004)	Non randomised trials	S[5]	NS	NS	S[2]	Mean LOS= 28 days	72/5855 (12.3)	170/14791 (11.5)	IRR= 1.07 (0.81 to 1.41)	V LOW
1.2.2 Multifactorial interventions compared to no multifactorial intervention										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
2 Cumming (2008), Haines (2004),	Randomised trials	NS	NS	S[7]	NS	-	-	-	IRR= 0.78 (0.60 to 1.01)	MOD
1 Kato (2008)	Controlled pre/post	S[5]	NS	NS	NS	-	-	-	RIRR= 0.75 (0.29 to 1.94)	V LOW
Falls (Relative Risk- *Number of inpatients who fell as a proportion of number of inpatients*)										
1 Barry (2001)	Non randomised trials	S[9]	NS	NS	NS	-	26/149	39/156	RR= 0.70 (0.45 to 1.09)	LOW
Any Injury (Incidence Rate Ratio- Number of falls resulting in any injury as a proportion of occupied bed days)										
1 Haines (2004)	Randomised trials	NS	NS	S[7]	NS	-	-	-	IRR= 0.71 (0.42 to 1.20)	MOD
1 Kato (2008)	Controlled pre/post	S[5]	NS	NS	NS				RIRR= 0.24 (0.04 to 1.44)	V LOW
Any Injury (Relative Risk- *Number of inpatients who fell and sustained any injury as a proportion of number of inpatients*)										
1	Non	S[9]	NS	NS	NS	-	4/149	27/156	RR= 0.16 (0.05 to 0.43)	LOW

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Barry (2001)	randomised trials									
Severe Injury (Incidence Rate Ratio- Number of falls resulting in severe injury as a proportion of occupied bed days)										
1 Haines (2004)	Randomised trials	NS	NS	S[7]	S[2]	-	2/9356	2/9239	IRR= 0.99 (0.14 to 7.01)	LOW
Severe Injury (Relative Risk- *Number of inpatients who fell and sustained severe injury as a proportion of number of inpatients*)										
1 (Barry, 2001)	Non randomised trials	S[9]	NS	NS	NS	-	0/149	8/156	RR= 0.06 (0.01 to 1.06)	LOW

LOS= length of stay
NS= Nothing serious (not downgraded)
S= Serious (downgraded one place)
VS= Very serious (downgraded two places)
RR= Relative Risk
IRR= Incidence Rate Ratio
RRR= Ratio of Relative Risk

1= Males were not included in the study
2= Wide confidence intervals
3= Inadequate randomisation (GDG opinion, technique used was sealed envelope)
4= Groups had different lengths of stay
5= Inadequate allocation to groups, possible selection bias
6= Incomplete outcome data (63% of data excluded from the analysis)
7= Included participants under the age of 50 years
8= Inadequate allocation (participants assigned to intervention and control groups sequentially)
9= Inadequate measurement of prognostic factors/control of confounding factors
10= Any participant recommended Education
11= Participants only recommended Education
12= Any participant recommended education with Mini Mental State Exam >23
13= Any participant recommended education with MMSE <23 (cognitively impaired)

3. Mixed/unclear setting

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Education for patients (Model 1- including 1:1 sessions) compared to no education										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	70/9174 (7.36)	81/8737 (9.27)	IRR= 0.82 (0.60 to 1.13)[6]	LOW
							45/2941	35/3465	IRR= 1.51 (0.97 to 2.36)[7]	
							25/6234	46/5275	IRR=0.45 (0.28 to 0.75)[8]	
Any injury (Incidence Rate Ratio- number of falls with any injury as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	32/9174	25/8737	IRR= 1.22 (0.72 to 2.06)[6]	LOW
							22/2941	10/3465	IRR= 2.59 (1.28 to 5.47)[7]	
							10/6234	15/5275	IRR=0.56 (0.25 to 1.26)[8]	
Severe injury (Incidence Rate Ratio- number of falls with severe injury as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	1/9174	2/8737	IRR= 0.48 (0.04 to 5.25)[6]	LOW
							1/2941	0/3465	IRR= 3.53 (0.14 to 86.76)[7]	
							0/6234	2/5275	IRR=0.17 (0.01 to 3.53)[8]	
Education for patients (Model 2- written materials only) compared to no education										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	96/11149 (8.6)	81/8737 (9.3)	IRR= 0.92 (0.69 to 1.25)[6]	LOW
							35/3695 (9.47)	35/3465 (10.10)	IRR= 0.94 (0.59, 1.50)[7]	
							61/7457	46/5275	IRR=0.94 (0.64 to 1.38)[8]	
Any injury (Incidence Rate Ratio- number of falls with any injury as a proportion of occupied bed days)										
1	Randomised	S[1]	NS	NS	S[2]	Mean	40/11149	25/8737	IRR= 0.39 (0.27, 0.57)[6]	LOW

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Haines (2011)	trials					LOS= 21 days	15/3695	10/3465	IRR= 1.04 (0.63, 3.13)[7]	
							25/7457	16/5275	IRR=1.17 (0.62 to 2.24)[8]	
Severe injury (Incidence Rate Ratio- Number of falls with severe injury as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	2/11149	2/8737	IRR= 0.78 (0.11, 5.56)[6]	LOW
							1/3695	0/3465	IRR= 2.81 (0.11, 69.06)[7]	
							1/7457	2/5275	IRR=0.17 (0.01 to 3.53)[8]	
Education (Model 1- including 1:1 session) compared to education (Model 2- written materials only)										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	70/9174 (7.36)	96/11149 (8.6)	IRR= 0.89 (0.65 to 1.12)[6]	LOW
							45/2941	35/3465	IRR= 1.62 (1.04 to 2.51)[7]	
							25/6234	61/7457	IRR=0.49 (0.30 to 0.78)[8]	
Any injury (Incidence Rate Ratio- Number of falls with any injury as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	32/9174	40/11149	IRR= 0.97 (0.61 to 1.55)[6]	LOW
							22/2941	15/3695	IRR= 1.84 (0.96 to 3.55)[7]	
							10/6234	25/7457	IRR=0.48 (0.23 to 1.00)[8]	
Severe injury (Incidence Rate Ratio- Number of falls with severe injury as a proportion of occupied bed days)										
1 Haines (2011)	Randomised trials	S[1]	NS	NS	S[2]	Mean LOS= 21 days	1/9174	2/11149	IRR= 0.60 (0.06 to 6.70)[6]	LOW
							1/2941	1/3695	IRR= 1.26 (0.07 to 20.08)[7]	
							0/6234	1/7457	IRR=0.40 (0.02 to 9.79)[8]	
Low-Low beds (1 for every 12 standard beds) compared to usual care										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2010)	Randomised trials	S[1]	NS	S[3]	NS	-	186/35441 (5.25)	114/30228 (3.77)	RIRR= 1.01 (0.74 to 1.37)	LOW
Any injury (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
1 Haines (2010)	Randomised trials	S[1]	NS	S[3]	S[2]	-	85/35411 (2.4)	51/30228 (1.69)	RIRR= 1.29 (0.80 to 2.07)	LOW

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		
Severe injury (Incidence Rate Ratio- Number of falls with severe injury as a proportion of occupied bed days)										
1 Haines (2010)	Randomised trials	S[1]	NS	S[3]	S[2]	-	3/35441 (0.08)	7/30228 (0.23)	RIRR= 2.06 (0.36 to 11.70)	LOW
Vitamin D plus calcium compared to calcium alone (Number of inpatients who fell as a proportion of number of inpatients)										
Falls (Relative Risk- Number of inpatients who fell as a proportion of number of inpatients)										
1 Burleigh (2007)	Randomised trials	NS	NS	NS	S[2]	Mean LOS= 43 days	36/100	45/103	RR= 0.82 (0.59 to1.16)	MOD
Severe injury (Relative Risk- Number of inpatients who fell and sustained severe injury as a proportion of number of inpatients)										
1 Burleigh (2007)	Randomised trials	NS	NS	NS	S[2]	Mean LOS= 43 days	1/100 (1.0%)	3/103 (2.91%)	RR= 0.42 (0.05 to 3.84)	MOD
Adherence amongst all participants to drugs (Mean Difference)										
1 Burleigh (2007)	Randomised trials	NS	NS	NS	S[2]	Mean LOS= 43 days	89/100 (89%)	87/103 (87%)	MD= 1.05 (0.95 to 1.17)	MOD
Multifactorial Interventions										
Falls (Incidence Rate Ratio- Number of falls as a proportion of occupied bed days)										
2 Healey (2004) Stenvall (2007)	Randomised trials	NS	NS	NS	NS	-	-	-	IRR= 0.42 (0.26 to 0.69)	HIGH
2 Fonda (2006), Lane (1997),	Non randomised trials	S[4]	NS	S[3]	NS	-	-	-	IRR= 1.17 (0.55 to 2.48)	V LOW
Any Injury (Incidence Rate Ratio- Number of falls resulting in any injury as a proportion of occupied bed days)										
1 Healey (2004)	Randomised trials	S	NS	NS	S[2]	Mean LOS= 20 days	(1.14)	(0.85)	IRR= 1.34 (0.06 to 23.92)	MOD
Severe Injury (Incidence Rate Ratio- Number of falls resulting in severe injury as a proportion of occupied bed days)										
1 Fonda (2006)	Non Randomised trials	S[1]	NS	NS	NS	Mean LOS= 20 days	7/41013 (0.17)	27/37133 (0.73)	IRR= 0.23 (0.10 to 0.53)	V LOW

Quality assessment							Count (Rate or %)		Effect (95% CI)	Quality
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Intervention	Comparison		

LOS= length of stay
NS= Nothing serious (not downgraded)
S= Serious (downgraded one place)
VS= Very serious (downgraded two places)
RR= Relative Risk
IRR= Incidence Rate Ratio
RIRR= Ratio of Incidence Rate Ratio
MD= Mean Difference

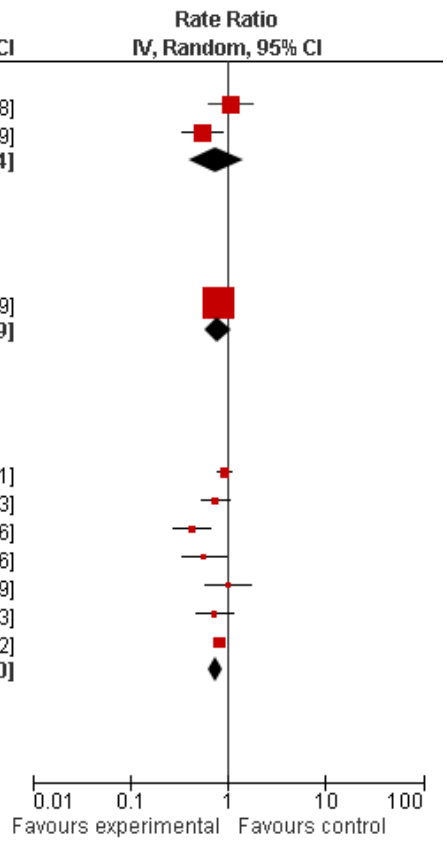
1= No correction for unit analysis error that is present in cluster randomisation
2= Wide confidence intervals
3= Includes participants under the age of 50 years
4= Failure to measure prognostic factors/control confounding
5= Inconsistent point estimates
6= Analysis of all participants
7= Analysis of participants only with cognitive impairment
8= Analysis of cognitively intact participants only

Inpatient intervention: Forest plots (multifactorial interventions)

Acute Setting

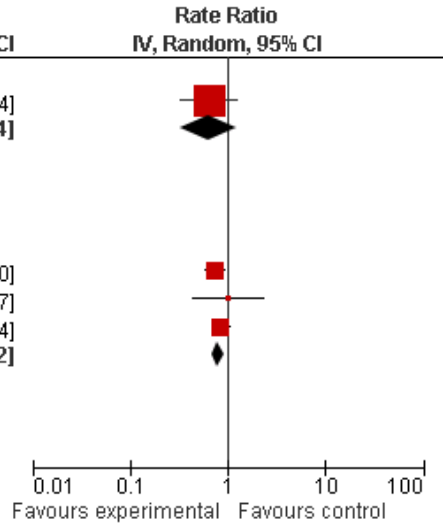
Falls – incidence rate ratio

Study or Subgroup	log[Rate Ratio]	SE	Weight	Rate Ratio IV, Random, 95% CI
1.1.1 Randomised trials				
Cumming (acute)	0.0583	0.2655	48.8%	1.06 [0.63, 1.78]
Dykes 2010	-0.5978	0.2454	51.2%	0.55 [0.34, 0.89]
Subtotal (95% CI)			**100.0%**	**0.76 [0.40, 1.44]**
Heterogeneity: Tau² = 0.15; Chi² = 3.29, df = 1 (P = 0.07); I² = 70%				
Test for overall effect: Z = 0.85 (P = 0.40)				
1.1.2 Controlled Pre/Post				
Koh 2009	-0.2357	0.1665	100.0%	0.79 [0.57, 1.09]
Subtotal (95% CI)			**100.0%**	**0.79 [0.57, 1.09]**
Heterogeneity: Not applicable				
Test for overall effect: Z = 1.42 (P = 0.16)				
1.1.3 Other non random				
Brandis 1999	-0.0726	0.0897	23.1%	0.93 [0.78, 1.11]
Krauss 2008	-0.3011	0.1703	14.0%	0.74 [0.53, 1.03]
Lieu 1997	-0.844	0.2189	10.3%	0.43 [0.28, 0.66]
Mitchell 1996	-0.5621	0.2636	7.9%	0.57 [0.34, 0.96]
Rainville 1984	0	0.2692	7.7%	1.00 [0.59, 1.69]
Schwendimann 2006b	-0.3147	0.2247	10.0%	0.73 [0.47, 1.13]
Von Renteln-Kruse 2007	-0.1985	0.0593	27.0%	0.82 [0.73, 0.92]
Subtotal (95% CI)			**100.0%**	**0.76 [0.64, 0.90]**
Heterogeneity: Tau² = 0.02; Chi² = 13.67, df = 6 (P = 0.03); I² = 56%				
Test for overall effect: Z = 3.20 (P = 0.001)				



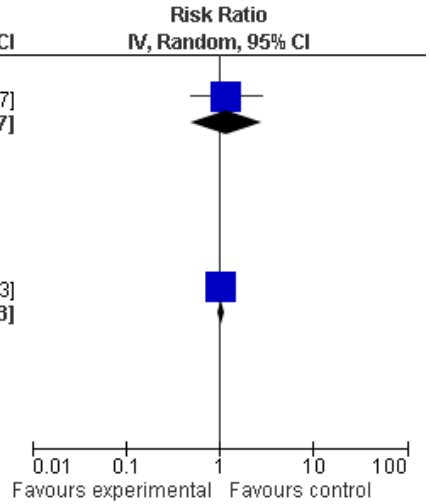
Falls resulting in any injury- incidence rate ratio

Study or Subgroup	log[Rate Ratio]	SE	Weight	Rate Ratio IV, Random, 95% CI
1.2.1 Controlled pre/post				
Koh 2009	-0.4463	0.338	100.0%	0.64 [0.33, 1.24]
Subtotal (95% CI)			**100.0%**	**0.64 [0.33, 1.24]**
Heterogeneity: Not applicable				
Test for overall effect: Z = 1.32 (P = 0.19)				
1.2.2 Other non random				
Brandis 1999	-0.3147	0.1086	48.0%	0.73 [0.59, 0.90]
Schwendimann 2006b	0	0.4189	3.2%	1.00 [0.44, 2.27]
Von Renteln-Kruse 2007	-0.1744	0.1078	48.7%	0.84 [0.68, 1.04]
Subtotal (95% CI)			**100.0%**	**0.79 [0.68, 0.92]**
Heterogeneity: Tau² = 0.00; Chi² = 1.17, df = 2 (P = 0.56); I² = 0%				
Test for overall effect: Z = 3.14 (P = 0.002)				



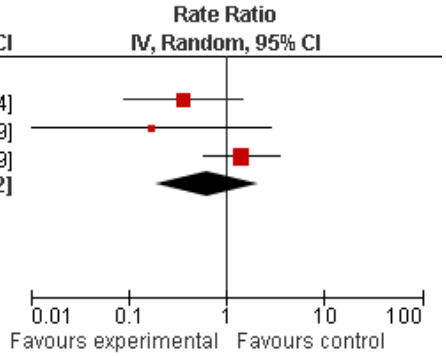
Falls resulting in any injury- relative risk

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio IV, Random, 95% CI
1.3.1 Randomised Trials						
Dykes 2010	7	35	9	53	100.0%	1.18 [0.48, 2.87]
Subtotal (95% CI)		**35**		**53**	**100.0%**	**1.18 [0.48, 2.87]**
Total events	7		9			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.36 (P = 0.72)						
1.3.2 Other non random						
Schwendimann 2006a	548	805	495	763	100.0%	1.05 [0.98, 1.13]
Subtotal (95% CI)		**805**		**763**	**100.0%**	**1.05 [0.98, 1.13]**
Total events	548		495			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.34 (P = 0.18)						



Falls resulting in severe injury- incidence rate ratio

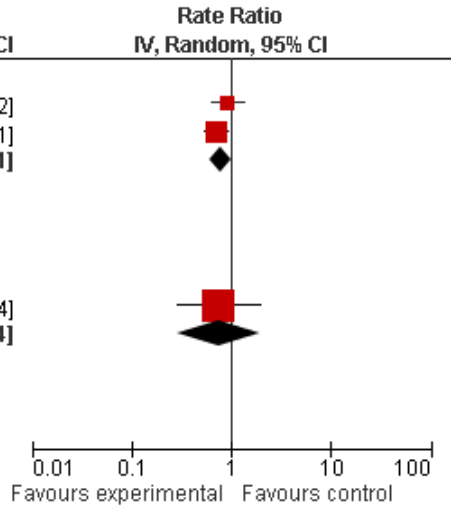
Study or Subgroup	log[Rate Ratio]	SE	Weight	Rate Ratio IV, Random, 95% CI
1.4.1 Other non random				
Brandis 1999	-1.0217	0.7073	36.0%	0.36 [0.09, 1.44]
Schwendimann 2006b	-1.772	1.4455	14.3%	0.17 [0.01, 2.89]
Von Renteln-Kruse 2007	0.3436	0.4621	49.7%	1.41 [0.57, 3.49]
Subtotal (95% CI)			**100.0%**	**0.64 [0.19, 2.12]**
Heterogeneity: Tau² = 0.55; Chi² = 3.91, df = 2 (P = 0.14); I² = 49%				
Test for overall effect: Z = 0.73 (P = 0.46)				



Non-Acute setting

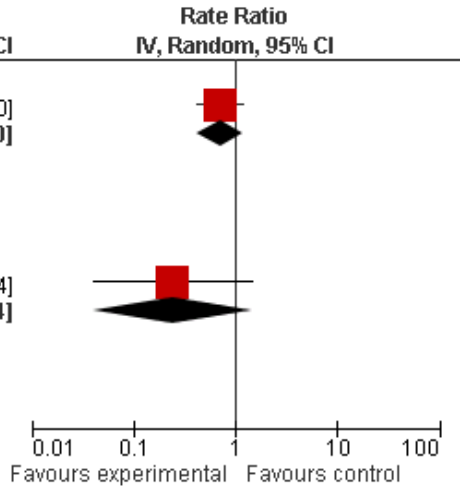
Falls- incidence rate ratio

Study or Subgroup	log[Rate Ratio]	SE	Weight	Rate Ratio IV, Random, 95% CI
2.1.1 Randomised trials				
Cumming (non acute)	-0.0834	0.1852	38.8%	0.92 [0.64, 1.32]
Haines 2004	-0.3567	0.1324	61.2%	0.70 [0.54, 0.91]
Subtotal (95% CI)			**100.0%**	**0.78 [0.60, 1.01]**
Heterogeneity: Tau² = 0.01; Chi² = 1.44, df = 1 (P = 0.23); I² = 31%				
Test for overall effect: Z = 1.88 (P = 0.06)				
2.1.2 Controlled pre/post				
Kato 2008	-0.2877	0.4848	100.0%	0.75 [0.29, 1.94]
Subtotal (95% CI)			**100.0%**	**0.75 [0.29, 1.94]**
Heterogeneity: Not applicable				
Test for overall effect: Z = 0.59 (P = 0.55)				



Falls resulting in any injury- incidence rate ratio

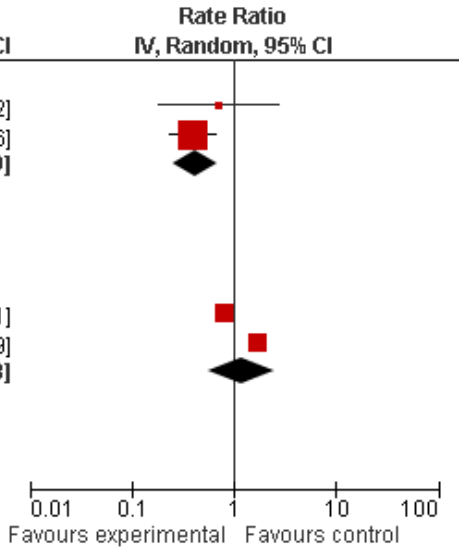
Study or Subgroup	log[Rate Ratio]	SE	Weight	Rate Ratio IV, Random, 95% CI
2.2.1 Randomised trials				
Haines 2004	-0.3425	0.2679	100.0%	0.71 [0.42, 1.20]
Subtotal (95% CI)			**100.0%**	**0.71 [0.42, 1.20]**
Heterogeneity: Not applicable				
Test for overall effect: Z = 1.28 (P = 0.20)				
2.2.2 Controlled pre/post				
Kato 2008	-1.4271	0.9142	100.0%	0.24 [0.04, 1.44]
Subtotal (95% CI)			**100.0%**	**0.24 [0.04, 1.44]**
Heterogeneity: Not applicable				
Test for overall effect: Z = 1.56 (P = 0.12)				



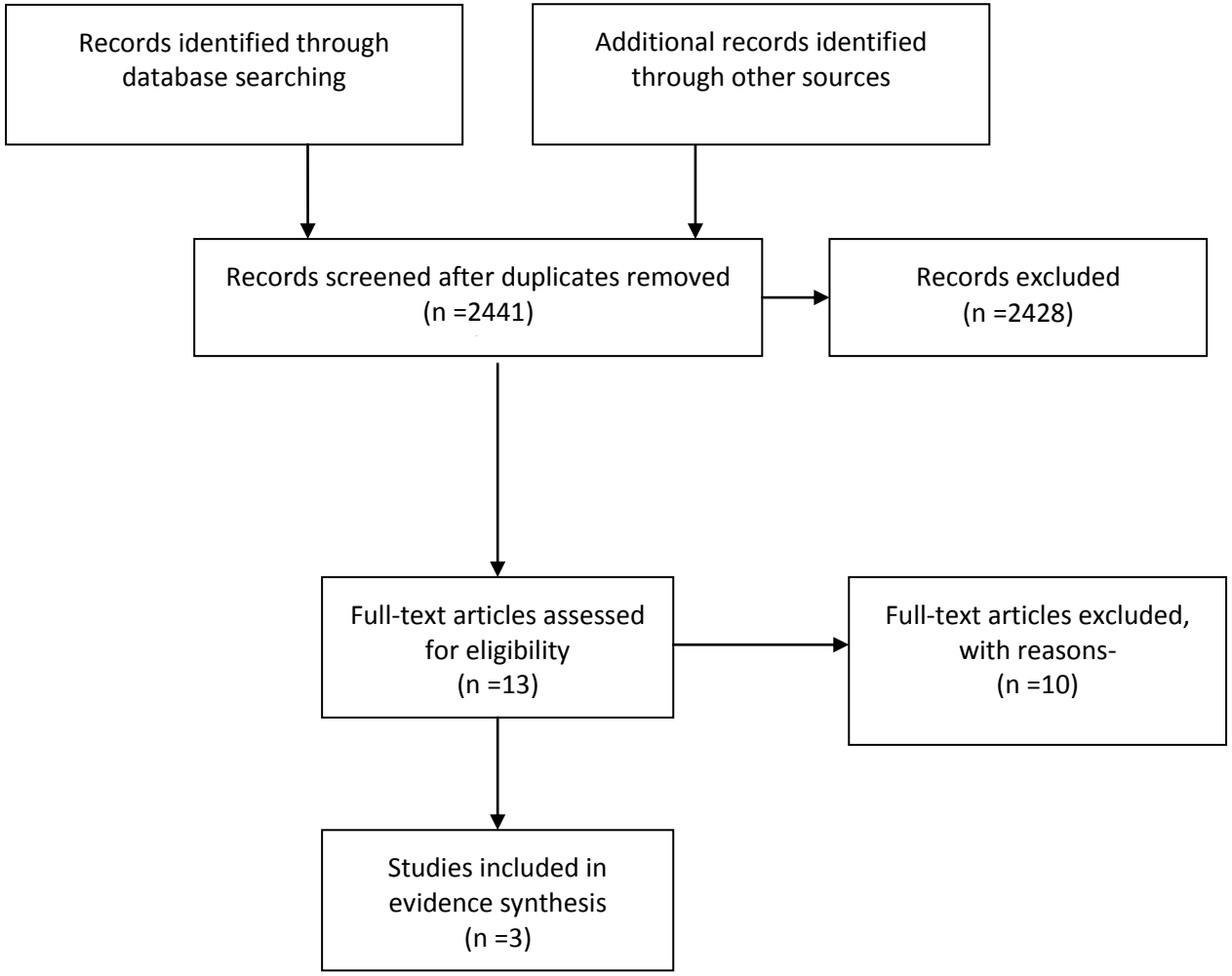
Mixed/Unclear setting

Falls- incidence rate ratio

Study or Subgroup	log[Rate Ratio]	SE	Weight	Rate Ratio IV, Random, 95% CI
3.2.1 Randomised trials				
Healey 2004	-0.3567	0.6929	13.1%	0.70 [0.18, 2.72]
Stenvall 2007	-0.9416	0.2694	86.9%	0.39 [0.23, 0.66]
Subtotal (95% CI)			**100.0%**	**0.42 [0.26, 0.69]**
Heterogeneity: Tau² = 0.00; Chi² = 0.62, df = 1 (P = 0.43); I² = 0%				
Test for overall effect: Z = 3.44 (P = 0.0006)				
3.2.2 Other non controlled/non randomised trials				
Fonda 2006	-0.2231	0.0681	50.1%	0.80 [0.70, 0.91]
Lane 1997	0.5423	0.0732	49.9%	1.72 [1.49, 1.99]
Subtotal (95% CI)			**100.0%**	**1.17 [0.55, 2.48]**
Heterogeneity: Tau² = 0.29; Chi² = 58.61, df = 1 (P < 0.00001); I² = 98%				
Test for overall effect: Z = 0.42 (P = 0.68)				



Inpatient information: Evidence tables



Study ID	**Carroll (2010)**
Aim	To explore the patient's perspective regarding their inpatient falls experience
Theoretical approach	Qualitative descriptive study
Data collection	Tape recorded interviews using a semi structured interview schedule Aprox 15 to 45 mins in duration.
Method & process of analysis	Patients were interviewed and the interviews were transcribed verbatim Two person analysis was performed to ensure consensus for the analysis Text was open coded to capture meanings. Codes were compared with each other and selective coding was performed to identify core categories. Reliability and validity was assured through a process of keeping field and reflective notes, debriefing amongst researchers, and engagement with the raw data and codes
Population & sample collection	9 participants who had fallen in hospital in the previous 48hrs, who were cognitively intact and able to share and communicate their experience in English. Age: Mean= 61.2 years, Range= 24 - 78 years LOS: Mean= 14 days, Range= 1 to 47 days Country: USA
Key themes	**Reasons for falling**: urgent need to reach bathroom was identified as a common reason for falling, with participants stating that the urgency and sleeping medication clouded their memory about their physical limitations (no quotes provided) **Unaware of risk:** most participants mentioned that they were not aware of their risk of falling (no quotes provided) **Inconsistent messages regarding their risk:** Participants who were aware of their risk received inconsistent messages about their risk from different nurses (no quotes provided) **Not wanting to bother staff:** Participants noted the request from their nurses to call them before they get out of bed/chair/go to the bathroom but expressed the emotional obstacle of not calling for assistance because they did not want to bother a nurse: 'I am supposed to call for help…but I don't want to bother them' 'I feel like I call the nurse enough. You know I don't want to be a bother'. They also cited physical obstacles of waiting for a nurse to respond to their call, and not being able to reach their call device.
Source of funding	Funded by the Interdisciplinary Nursing Quality Initiative
Evidence gap & limitations	Limitations: underpinning theories/assumptions not discussed, no rational provided, data lack depth and richness (few quotes provided)
Comment	Authors recommend that nurses need to provide a clear messages, to be heard by and acted upon by patients and their families, that nurses are there for patients and to provide a safe environment, including prompt response to patient needs. Patients and their families should be included in communication about falls risk assessments and care plans.

Study ID	**Gallinagh (2001)**
Aim	To explore the perceptions of 9 relatives whose family had side rails used during their care in an older person ward
Theoretical approach	Qualitative approach using a simplified version of a family interview guide (Strumpf and Evans, 1988, simplified by Hardin et al 1993)
Data collection	Interviews were carried out in private in a room adjacent to the ward. Interviews were audiotaped. Interviews were conducted by a gerontological specialist nurse Duration of no more than 15 minutes
Method & process of analysis	Content analysis using the approach suggested by Cavanagh (1997) enabled researchers to quantify the experiences and perceptions of relatives in a systematic way. Main trends from this process were categorised and coded. Reliability of the method was attained through agreement being reached in the classification trends and in the coding process. Participants were provided with a verbal overview of their own perceptions to ensure clarity and understanding.
Population & sample collection	A purposive sample of 9 relatives (sibling, partner, spouse, child) representing 9 inpatients on an older person/rehabilitation unit of an acute care hospital. 6 patients had side rails up during the time of the interviews Age: Mean= 77 years, Range= Unclear LOS: Mean= 3 months, Range= Unclear Country= Ireland
Key themes	**Acceptance of side rail use:** Participants agreed with staff rationale for side rail use, but reasonings given by staff were not based on actual incidents of patient safety, but on the anticipated preventive function of side rails *'I was told it was in case she rolled out of bed*.' Other participants who had not had side rail use explained to them offered their own reasoning '*They are there for safety reasons aren't they*?' **Ritualised care:** Participants associated side rail use with the care of older people '*old people always have them on their beds'*, '*you naturally expect it with older patients'* **Entrapment**: participants mentioned the inhibitor effect of rails *'he can't do things he would like, but it's for his own good you know*', '*sometimes she felt like she was being hemmed in. I knew it because of her expression'* **Injury:** side rails were associated with injury risk '*I don't like the spaces in between them, the way limbs can get caught'*, '*she's constantly putting her legs through them and getting entangled, especially when agitated'*
Source of funding	Financially supported by the Marther McMenamin Memorial Scholarship.
Evidence gap & limitations	Inadequate reporting/consideration of the role of the researcher, methods are not as reliable as they could be, unclear if one or more than one researcher was involved in reliability checks
Comment	Authors recommend that staff need to enter into discussions with patients and families about impeding an individual's freedom, the repercussions of this, and alternative strategies for the patient

Reference	**Haines (2011)**
Study Type	Cross sectional survey
Quality	High: assessment of potential prognostic and confounding factors, appropriate statistical analysis, description of missing data
Patients	N= 125 inpatients from the geriatric assessment and rehabilitation unit, mean age= 79 years Australia
Intervention	Six fall prevention approaches were incorporated into willingness to pay scenarios. The descriptions of the interventions was provided to the participants along with any description of visual and tactile cues to facilitate participant conceptualisation of the intervention. 6 fall prevention approaches were Falls consultation, Exercise, Face to face education, Booklet and video education, Hip protectors, Targeted multifactorial programme
Comparison	None
Length of follow up	None
Outcomes and effect sizes	

Intervention	Intangible costs	Intangible benefits	Mean patient willingness to pay
Targeted multifactorial intervention	Discomfort, anxiety, reduced leisure time, discomfort, extra time to dress	Health benefits	$268
Falls Consultation	None	None	$215
Exercise	Discomfort, reduced leisure time	Health benefits	$174
Face to face education	Anxiety, reduced leisure time	Social interaction	$164
Hip protectors	Discomfort, extra time to dress	None	$74
Booklet and video education	Reduced leisure time	None	$68

Addition of visual cues significantly reduced participant misunderstanding

Source of funding	None stated
Additional comments	