Featured Falls Research – March

Home based, tailored intervention to reduce rate of falls after stroke (FAST): randomised trial

Clemson L, Scrivener K, Lannin N, Ada L, Day S, Lin I, Isbel S, Cusick A, Gardner B, Preston E, Heller G, Dean CM; FAST Study Group. BMJ. 2026 Mar 24;392:e085519.

DOI: 10.1136/bmj-2025-085519 **PMID:** 41876122

Abstract

Objective: To investigate the effectiveness of a multidisciplinary, home based, tailored intervention to reduce falls after stroke.

Design: Two armed, randomised trial.

Setting: Three states in Australia.

Participants: People within 5 years of stroke, aged >50 years, discharged from formal rehabilitation to the community, and able to walk 10 m across flat ground with or without an aid. Those with moderate-to-severe receptive aphasia or walking speed >1.4 m/s without falls in the previous year were excluded.

Intervention: Over 6 months, the experimental group received a habit forming functional exercise, home fall hazard reduction, and goal directed community mobility coaching; the control group received usual care. Physiotherapist and occupational therapist dyadic teams worked collaboratively to deliver the intervention.

Main outcome measures: The primary outcome was rate of falls over 12 months. Secondary outcomes were proportion of participants having a fall, community participation, self-efficacy, balance, mobility, physical activity, activities of daily living, depression, and health related quality of life.

Results: Between August 2019 and December 2023, 370 people with stroke were enrolled. At 12 months, a significant between group difference was seen in the rate of falls in favour of the experimental group, representing a 33% reduction in falls (incidence rate ratio 0.67, 95% confidence interval (CI) 0.48 to 0.94; P=0.02). No significant between group difference was seen in the number of participants having a fall (absolute risk reduction 0.03, 95% CI -0.07 to 0.13; P=0.52). The main between group differences in favour of the experimental group were in community participation (Late Life Function and Disability Instrument disability limitation: mean difference 3% (95% CI 1% to 6%); P=0.02), self-efficacy (mean difference 0.6 (0.2 to 1.0); P=0.004), mobility (fast walking speed: mean difference 0.13 (0.06 to 0.19) m/s (P<0.001); preferred walking speed: 0.06 (0.02 to 0.10) m/s (P=0.02)), and balance (Step Test: mean difference 0.06 (0.01 to 0.12) steps/s; P=0.03).

Conclusion: A tailored intervention prevented falls in community dwelling, ambulatory people with stroke. The decrease in the rate of falls was underpinned by clinically worthwhile improvements in self-efficacy, mobility, community participation, and balance.

Comparing the impact of active floor-rise training with video demonstration on fear of falling and independent floor-rise ability in older adults living in the community: a pilot cluster randomised controlled trial

Seeley SC, Skelton DA, Tan CW, Stansfield B, Dall PM. Age Ageing. 2026 Mar 16;55(3):afag064.

DOI: 10.1093/ageing/afag064 **PMID:** 41894198

Abstract

Background: Many older adults cannot rise from the floor independently after a fall, increasing risks of long-lies and reliance on emergency services.

Objective: Investigate whether floor-rise training (FRT) reduces fear of falling (FoF) and improves floor-rise ability in older adults.

Design: Multi-centre, cluster-randomised controlled before-after pilot trial.

Setting: Five community-based Otago exercise classes run by a third-sector organisation.

Participants: Sixty-one community-dwelling older adults (aged ≥65 years) attending weekly Otago classes were randomised (FRT n = 27, control n = 34). Forty-nine completed to follow-up and were analysed (FRT n = 22, control n = 27). No adverse events occurred.

Methods: Classes were cluster-randomised (3:2 allocation). Intervention: 5 weekly 20-minute FRT sessions utilising backward-chaining. Controls viewed a FRT demonstration video followed by discussion (20-minutes total), without physical practise. Primary outcome: Falls Efficacy Scale-International (FES-I). Secondary outcomes: timed floor-rise and independent floor-rise ability (from supine, side-sitting, half-kneeling), Perceived Ability to Manage Risk of a Falls or Actual Falls (PAMF), FoF and activity avoidance, measured via visual analogue scales (1-item-question).

Results: Primary outcome (FES-I), FoF and activity avoidance showed no significant differences. However, FRT participants significantly reduced floor-rise times compared to controls: supine (13.1 s to 7.1 s, P = .001), side-sitting (8.0 s to 4.6 s, P = .046), and half-kneeling (3.9 s to 1.5 s, P < .001). Post-intervention, 100% of FRT participants could rise from supine versus 63% of controls (P = .007). PAMF scores increased significantly in the FRT group (13.6 to 16.3, P = .033).

Conclusion: Although FoF did not change, a brief FRT intervention significantly improved floor-rise ability and PAMF. Integrating FRT into fall prevention programmes may reduce long-lie consequences.

Keywords: exercise therapy; fear of falling; floor-rise training; older adults.

Falls Research – March

Availability of Falls Prevention Programmes for Diverse Communities in Greater Sydney: A Gap Analysis

Abdi F, Harris-Roxas B, Ivers R. Health Promot J Austr. 2026 Apr;37(2):e70172.

DOI: 10.1002/hpja.70172 **PMID:** 41839218 **PMCID:** PMC12991855

Abstract

Introduction: Falls are a major health risk for older Australians, causing most injury-related hospitalisations and deaths in this age group. Despite growth in Australia's older culturally and linguistically diverse (CALD) population, limited data exist on the availability and suitability of falls prevention programmes for this group. This study examines the availability and suitability of such programmes for CALD populations in local government areas (LGAs) in Greater Sydney, NSW.

Methods: An audit of publicly available demographic data and falls prevention programme offerings from 20 LGAs was conducted, based on language diversity and Socio-Economic Indexes for Areas (SEIFA)-Index of Relative Socio-Economic Disadvantage (IRSD) score. Seven LGAs with the highest and lowest SEIFA-IRSD scores, plus seven LGAs with the most and least linguistic diversity were included. Data are presented using column charts to identify trends.

Results: Fewer programmes were found in areas of greater disadvantage and higher linguistic diversity. Least disadvantaged areas offered more programmes, whilst the most disadvantaged and linguistically diverse areas offered fewer. Only one programme was offered in a language other than English, in a least disadvantaged LGA (Ku-Ring-Gai). These trends suggest that programme availability does not align with community needs.

Conclusions: Disparities exist in falls prevention programme availability across LGAs, with fewer programmes in areas of higher disadvantage and linguistic diversity, highlighting access inequities for older CALD populations. SO WHAT?: Older CALD populations in high-need LGAs have reduced access to falls prevention programmes, signalling a need for targeted, culturally and linguistically appropriate health promotion initiatives.

Keywords: aged care; culturally and linguistically diverse (CALD); falls prevention; health equity; health service access; public health disparities.

A Systematic Review of Multivariate Models for Predicting Fall-Related Injuries in Older Adults

Cai Y, Zhu W, Zhang X, Wang C, Liu S, Jiang Y. J Nurs Manag. 2026;2026(1):e1740588.

DOI: 10.1155/jonm/1740588 **PMID:** 41877399

Abstract

Aim: To evaluate the quality, risk of bias, and clinical applicability of prediction models for fall-related injuries in older adults.

Background: Numerous prediction models for fall-related injuries in older adults have been developed, but their quality and applicability in clinical practice and future research remain uncertain.

Methods: We systematically searched Medline (via OVID), Embase (via OVID), Cochrane Library, CINAHL (via EBSCO), Web of Science, and Scopus from inception to May 23, 2024, for English-language publications. All observational and experimental studies reporting the development or validation of any multivariable prediction model for fall-related injuries in older adults were included. The risk of bias and applicability was assessed using the PROBAST, and the reporting quality was measured based on the TRIPOD + AI checklist. Data were synthesized using a narrative synthesis approach.

Results: Thirty-one models from 15 studies were included. Twelve studies focused on the development and/or internal validation of a model, two studies dealt with development and external validation using a nonrandom split-sample, and one study externally validated existing models. The reported model discriminative statistics exhibited a broad range, from 0.54 to 0.89, in internal or external validation contexts. The risk of applicability was low for all studies, while the overall risk of bias was high in all studies (100.0%). High bias risk was notably prevalent in the analysis domain (100% of studies) and observed in the predictors (33.3%), participants (26.7%), and outcome (6.7%) domains. Median adherence to TRIPOD + AI reporting items was 56.4%.

Conclusion: The discriminative ability in the prediction models of fall-related injuries in older adults varied widely, with all models exhibiting a high risk of bias according to the PROBAST. Upcoming research should focus on developing high-quality and reproducible models that undergo proper external validation, followed by studies on implementation.

Implications for nursing management: Existing fall-related injuries prediction models exhibit high bias and inconsistent accuracy, limiting clinical utility. Nursing leaders should advocate for future models that undergo thorough internal and external validation, ensure sufficient events per variable, properly handle missing data, and adopt transparent reporting practices. This will underpin data-driven clinical decisions and enable targeted fall prevention strategies in vulnerable older adults.

Keywords: fall-related injuries; older adults; prediction model; risk assessment; systematic review.

Effectiveness of fall prevention interventions for community-dwelling adults aged 60 years and above in low- and middle-income countries: a systematic review and meta-analysis

Chellapillai FMD, Dissanayaka TD, Weerasekara I, Tiedemann A, Hill KD, Sivarasa S, Rikas AMM, Samarasekara DLGHM, Safinaz ZMFZ, Kariyawasam A. BMC Geriatr. 2026 Mar 18.

DOI: 10.1186/s12877-026-07319-8 **PMID:** 41851652

Abstract

Background: Falls are a major cause of disability and mortality in older age. There is clear evidence of effective fall prevention interventions that have informed global guidelines, however much of the evidence comes from high-income countries. The objective of this study was to identify and assess the effectiveness of fall prevention interventions for community-dwelling older people living in low- and middle-income countries (LMICs).

Methods: Studies published up to March 2025, in Medline, Embase, the Cochrane Library, Scopus, CINAHL and references of previous reviews were searched. A study was included if an intervention was used to prevent falls or to improve fall-related outcomes among community-dwelling older adults in LMICs. Titles, abstracts, full texts and study quality were screened by two independent reviewers and conflicts were resolved by a third reviewer. Data were extracted by two independent reviewers and studies which had sufficient data were included for meta-analysis.

Results: Among the retrieved 2013 studies, 30 relevant studies with 9817 participants (65% female) from 12 LMICs were included. The participants' ages ranged from 60 to 94 years. Nine studies were eligible for meta-analysis and only two to four studies were able to be pooled for each outcome. According to the meta-analysis, exercise significantly improved balance (standardised mean difference (SMD) = 1.18, [0.30,2.06], p = 0.008), while it had no effect on falls (SMD=-0.4, [-1.08,0.29], p = 0.18) and fall-related outcomes such as mobility (SMD=-0.50, [-1.13,0.12], p = 0.11), and fear of falling (SMD=-0.04, [-0.69,0.61], p = 0.90). According to the narrative synthesis interventions such as exercise, dance, and education programs may reduce falls and fall-related outcomes.

Conclusion: Exercise, a senior dance program, Thai traditional dance, and education programs were among the interventions identified in the included studies. Exercises could improve balance in community-dwelling older adults living in the LMICs. However, the effectiveness of these interventions in reducing falls or other fall-related outcomes is uncertain due to the limited number of studies with small samples available from LMICs.

Trial registration: CRD42022335448, 07th June, 2022.

Keywords: Accidental falls; Community-dwelling; Low- and middle-income countries; Older adults.

Twelve-month cost analysis of a geriatrician-led falls prevention clinic in Canada

Davis JC, Wiley E, Khan KM, Dian L, Madden K, Tai D, Hsu CL, Seo YS, Golbidi M, Liu-Ambrose T.
Maturitas. 2026 Apr;207:108862.

DOI: 10.1016/j.maturitas.2026.108862 **PMID:** 41722333

Abstract

Introduction: A geriatrician-led falls prevention clinic service (that includes the option of a physiotherapist) to prescribe and deliver exercise is an evidence-based model of care. The economic data are unknown. Therefore, for a 12-month period, we examined: 1) clinic demand, 2) clinic costs and 3) health resource use.

Methods: Clinic demand was quantified from a Falls Prevention Clinic Registry cohort for new and repeat visits and waitlist frequencies over 12 months. Costs of the Vancouver-based falls prevention clinic included operating and medical services plan costs. The number of falls experienced was self-reported. Health resource utilization from a healthcare system perspective was ascertained. Cost savings from falls averted over 12 months were estimated from literature and our randomized clinical trial data subset (n = 344) of falls prevention clinic users. We calculated the return on investment and benefit-cost ratio to reflect the incremental benefit of a structured home-based exercise program within the falls prevention clinic pathway.

Results: In 2024, annual demand for the falls prevention clinic totalled 543 visits (240 (44.2%) new baseline visits, 303 (55.8%) follow-up visits) with an average monthly waitlist of 30 individuals. Annual operating costs were ~$317 thousand. Clinic demand costs were ~$88 thousand (~$51 thousand for new and ~$37 thousand for follow-up visits). The cost of falls averted ranged from $1.5 million to $8.5 million based on a range of costs per fall of $4.2 thousand to $20 thousand. The return on investment ranged from ~500% to 2.7 thousand %, while the benefit-cost ratio ranged from 6:1 to 28:1.

Discussion: The high return on investment yielded from the falls prevention clinic plus physiotherapist-delivered home-based exercise provides an economically attractive model of evidence-based care for falls prevention.

Trial registration: NCT01029171; NCT00323596 for the subsample.

Keywords: Cost-analysis; Evidence-based medicine; Falls; Falls prevention clinic; Home-based exercise; Older adults.

Fall risk assessment using the World Guidelines for Falls Prevention Algorithm: Evidence from the ELSI-Brazil study

de Avelar NCP, Danielewicz AL, Moreira BS, de Souza Andrade AC, Torres JL, de Amorim JSC, Montero-Odasso M, Lima-Costa MF, Perracini MR. Evidence from the ELSI-Brazil study. Eur Geriatr Med. 2026 Apr 1.

DOI: 10.1007/s41999-026-01446-6 **PMID:** 41917319

Abstract

Background: The World Guidelines for Falls Prevention and Management (WGF) propose a global algorithm to stratify fall risk in older adults using fall history (FH) or key questions (KQ). However, evidence on the applicability of this screening tool in low- and middle-income countries, and on whether these approaches produce different population estimates, remains limited. Implementing this tool may enhance the identification of older adults at higher risk of falls.

Objective: This study estimated national and regional fall risk prevalence in Brazil using both methods and examined geographic differences.

Methods: We conducted a cross-sectional study using data from older participants (≥ 60 years) of the third wave of the Brazilian Longitudinal Study of Aging (ELSI-Brazil, 2023-2024), a nationally representative study. According to the WGF algorithm, participants were classified as high, intermediate, or low fall risk based on FH or two KQ (concern about falling and postural instability) combined with gait speed ≤ 0.8 m/s and severity markers. KQ included concern about falling, assessed using the short version of the Falls Efficacy Scale-International, and postural instability evaluated using the tandem stance test (impaired balance if < 10 s). Poisson regression with robust variance adjusted for sociodemographic factors was used to examine regional differences in fall risk prevalence.

Results: A total of 7515 older adults participated in this study (67.8 ± 0.2 years; 57.1% female). Using FH alone, 82.2% of older adults were classified as low risk, 7.8% as intermediate, and 10.0% as high risk. Using KQ, the prevalence was 50.4%, 34.6%, and 15.0%, respectively. With the KQ approach, older adults in the Northeast and Southeast had a lower probability of being low risk and a higher probability of being intermediate risk compared with those in the South. No regional differences were observed for high-risk classification or when FH alone was used.

Conclusion: Operationalizing the WGF algorithm with KQ substantially increases intermediate fall risk identification compared to FH alone. Based on national population estimates, approximately 3.5 million older Brazilian adults may be at high risk of falls. Within-country regional disparities reinforce the need for tailored strategies to address contextual differences in fall prevention.

Keywords: Accidental falls; Community-dwelling; Older adults; Prevalence.

Influence of Adherence and Satisfaction with an Intervention Based on Case Management on Physical Functional Outcomes in Older Adults with a History of Falls: A Randomized Clinical Trial

de Melo ML, Pelicioni PHS, Dias ALO, de Sá MS, Maciel LT, Gramani-Say K, Ansai JH. Sage Open Aging. 2026 Mar 4;12:30495334261430961.

DOI: 10.1177/30495334261430961 **PMID:** 41799368

Abstract

The aim of this study was to determine whether adherence, satisfaction, and overall satisfaction in a remote case management-based intervention influence changes in functional physical performance in older adults with a history of recurrent falls. A clinical trial was conducted with 28 older adults randomized to the intervention group (IG), who received an online case management program focused on fall prevention and reducing modifiable risk factors for 16 weeks. The control group (CG) consisted of 26 participants who received general health guidance. Performance was assessed using the *Short Physical Performance Battery* (SPPB), *Timed Up and Go* (TUG), and *Timed Up and Go Dual Task* (TUGDT) tests at three time points (baseline, after 16 weeks, and after 1 year). After 16 weeks, adherence was evaluated based on participation frequency in the intervention, and satisfaction with remote interventions was assessed using a questionnaire based on the *Short Assessment of Patient Satisfaction* (SAPS). Adherence significantly influenced changes in postural balance ($p = 0.044$, $R^2 = 0.09$) and in muscle strength gain in lower limbs (sit-to-stand, seconds) ($p = 0.034$, $R^2 = 0.11$). Overall satisfaction positively influenced changes in verbal fluency ($p = 0.048$, $R^2 = 0.11$). Good adherence and satisfaction contributed to improvements in muscle strength, mobility and postural balance in older adults.

Keywords: accidental falls; aged; case management; treatment adherence and compliance.

Age-related differences in balance, gait, and dual-task costs: A cross-sectional study

Goulets D, O'Neil J, Sheehy L. Clin Biomech (Bristol). 2026 Mar 6;136:106810.

DOI: 10.1016/j.clinbiomech.2026.106810 **PMID:** 41849837

Abstract

Background: Dual-tasking is essential for daily activities, demanding the coordination of cognitive and physical functions which often decline with age. These declines can adversely affect gait and balance, increasing fall risks in older adults. However, there is little research on how aging is associated with gait under dual-task conditions and on the relationship between balance and dual-task gait. This study aimed to investigate age-related differences in spatiotemporal gait parameters during dual-tasking, and the related dual-task costs, and to explore the relationship between balance and gait performance in younger and older adults.

Methods: A cross-sectional study was conducted with 15 younger adults (mean age 21) and 15 older adults (mean age 76). Participants completed a balance assessment using a force plate. Gait and dual-task performance were evaluated using the Timed Up and Go (TUG) test on a pressure-sensing walkway, under single-task, dual-task (manual), and dual-task (cognitive) conditions. Statistical analyses included descriptive statistics, linear mixed models, and Pearson's correlations.

Findings: Older adults exhibited increased TUG times and velocity, and shorter stride length than younger adults across both TUG dual-task conditions. Dual-tasking increased TUG times and decreased velocity and cadence for both age groups. However, dual-task costs were not significantly associated with age group, and weak to moderate (non-significant) correlations were found between static balance and dynamic spatiotemporal gait parameters.

Interpretation: Older age is associated with gait and balance disturbances, including under dual-task conditions. This underscores the need for targeted interventions to enhance dual-task performance and potentially reduce fall risks among older adults.

Keywords: Aging; Balance; Dual-task costs; Dual-tasking; Falls; Gait.

Grip strength but not stair climb power is associated with injurious falls in middle-aged and older women: The Study of Women's Health Across the Nation (SWAN)

Heilmann NZ, Ruppert KM, Roberts JE, Karvonen-Gutierrez CA, Pettee Gabriel K, Ylitalo KR, Nindl BC, Cauley JA, Strotmeyer ES. Arch Osteoporos. 2026 Mar 4;21(1):48.

DOI: 10.1007/s11657-026-01655-3 **PMID:** 41779076

Abstract

We examined both muscle strength and power in relation to non-injurious and injurious falls in older women. Higher grip strength, but not stair climb power, was associated with lower odds of both fall outcomes. Findings highlight muscle strength as a potential target for fall prevention strategies in older women.

Background: Falls are the leading cause of injury and injury death in older women, with an increase in fall prevalence during midlife. While muscle strength and power may be modifiable risk factors for falls, associations of both muscle strength and power with injurious falls have not been investigated together in a study of community-dwelling middle-aged and older women.

Methods: In the Study of Women's Health Across the Nation (SWAN), muscle function and falls were measured in 2015-2017 and 2021-2023 (6.6 ± 0.3 years follow-up). Muscle function tests included grip strength (kg/weight(kg)) and stair climb power (W/weight(kg)). Self-reported falls in the past year were categorized as no falls, non-injurious falls, or injurious falls (fractured bone, hit/injured head, sprain/strain, bruises, bleeding, other). Generalized estimating equations were used to model associations between time-varying muscle function measures and fall outcomes adjusted for demographics, body size, lifestyle factors, and multimorbidities.

Results: Among 1710 women (age 65.0 ± 2.7 years), 28% reported injurious falls and 16% reported non-injurious falls during the study period. Average declines were -1.37%/year for stair climb power and -0.90%/year for grip strength. In final models, a 1 standard deviation (0.10 kg/kg) higher grip strength was associated with 18% lower odds of non-injurious falls (OR = 0.82, 95% CI 0.69-0.98) and 19% lower odds of injurious falls (OR = 0.81, 95% CI 0.70-0.94). Stair climb power was not associated with either fall outcome.

Conclusions: Muscle strength may be a potential target for musculoskeletal interventions to reduce fall and fall injury risk in older women.

Keywords: Community-dwelling; Grip strength; Injurious falls; Stair climb power; Women.

Research of Fall Detection and Fall Prevention Technologies: A Review

Hrubý D, Hrubá E, Černý M. Sensors (Basel). 2026 Feb 12;26(4):1192.

DOI: 10.3390/s26041192 **PMID:** 41755133

Abstract

Falls represent a significant global public health issue, particularly among adults over the age of 60. This comprehensive review aims to provide an in-depth examination of current fall detection and prevention technologies. The study categorizes fall detection methods into pre-fall prediction and post-fall detection, using both wearable and unobtrusive sensors. Wearable technologies, such as accelerometers, gyroscopes, and electromyography (EMG) sensors, are explored for their efficacy in real-time fall prediction and detection. Unobtrusive methods, including camera-based systems, LiDAR, radar, ultrasonic sensors, and depth sensors, are evaluated for their ability to monitor falls without intruding on users' daily activities. The integration of these technologies into healthcare settings is also discussed, with an emphasis on the importance of immediate response to fall events. By analyzing the operational principles, technological advancements, and practical applications of these systems, promising directions for future research and innovation in fall detection and prevention are identified. The findings highlight the need for multifaceted approaches combining various sensor technologies to enhance fall detection accuracy and response times, ultimately improving patient safety and quality of life.

Keywords: fall detection; unobtrusive fall detectors; wearable fall detectors.

Effects of arch support insoles on the standing balance of community-dwelling older adults with mild cognitive impairment

Hsieh RL, Song CY, Peng HY, Tien CW. Medicine (Baltimore). 2026 Feb 20;105(8):e47771.

DOI: 10.1097/MD.0000000000047771 **PMID:** 41731815

Abstract

People with mild cognitive impairment (MCI) exhibit subtle but measurable cognitive deficits and a decline in balance. This study explored the effects of arch support insoles on standing balance in community-dwelling older adults with MCI. This was a quasi-experimental study with a single-group pre- and post-test design. Fifteen older adults with MCI were enrolled in the study. Postural stability, fall risk, and limits of stability tests, as well as the modified Clinical Test of Sensory Interaction on Balance, were conducted using the Biodex balance system SD before and after an 8-week intervention with arch support insoles. After the intervention, the fall risk index (1.27 ± 0.50 vs 0.87 ± 0.33, P = .006) decreased significantly. Some medium-to-large effect sizes were noted in the postural stability index and foam surface with eyes open testing condition of the modified Clinical Test of Sensory Interaction on Balance. The use of arch support insoles may enhance standing balance in older adults with MCI; it may contribute to fall prevention in this population. Further well-designed controlled trials are warranted to strengthen causal inferences.

Keywords: balance; cognition; insole; older adult.

Effectiveness of exercise based on wearable electronic devices on lower limb strength and balance in older adults: a systematic review and meta-analysis

Li Y, Li Q, Chen X. Front Public Health. 2026 Feb 25;14:1778082.

DOI: 10.3389/fpubh.2026.1778082 **PMID:** 41822921

Abstract

Objective: This systematic review and meta-analysis aimed to evaluate the effectiveness of wearable electronic device-based exercise interventions on lower limb strength and balance in older adults.

Methods: A systematic search was conducted following PRISMA guidelines to evaluate the impact of exercise based on wearable electronic devices on health behaviors (such as muscle strength, balance, endurance, mental health, and cognitive function) in older adults. This meta-analysis included 13 two-arm, between-group studies and 4 single-arm, within-group studies, involving a total of 611 participants. The inclusion of single-arm studies in the meta-analysis was based on the limited availability of two-arm studies and to maximize the available evidence for understanding the broader effects of the intervention.

Results: The results show that in the meta-analysis of two-arm controlled studies, exercise based on wearable electronic devices significantly improved lower limb strength (SMD = -0.60; 95% CI [-1.15, -0.05]; $p < 0.001$; $I^2 = 81\%$) and balance (SMD = -0.43; 95% CI [-0.81, -0.06]; $I^2 = 17\%$) in older adults. However, the high heterogeneity for lower limb strength ($I^2 = 81\%$) should be interpreted cautiously, as it suggests substantial variability across studies. Subgroup analysis found that interventions with a frequency of once per week, a session duration of 10-45 min, and a total intervention duration of 8-12 weeks showed the best improvement in lower limb strength. Additionally, in the meta-analysis of single-arm studies, exercise based on wearable electronic devices significantly improved lower limb strength (SMD = 0.51; 95% CI [0.05, 0.97]; $I^2 = 23.5\%$). However, no significant effects were found on endurance, upper limb strength, mental health, cognitive function, and waist-to-hip ratio.

Conclusion: The significant improvements in lower limb strength and balance, as key factors in older adults' health, may have a positive impact on physical activity function, but falls were not directly meta-analyzed in this study. The findings support the potential of wearable electronic device-based exercise to improve specific aspects of health in older adults, but further studies are needed to confirm its broader impact on fall prevention and other health outcomes.

Systematic review registration: PROSPERO, CRD420251273186.

Keywords: exercise; health; older adults; physical activity; wearable electronic devices.

Implementation of a multifactorial fall intervention model to guide hospital nurses: A quasi-experimental before-and-after study

Liao C, Guo L, Li P, Liu Y. Sci Rep. 2026 Mar 13;16(1):9560.

DOI: 10.1038/s41598-025-08096-x **PMID:** 41826360

Abstract

Falls are serious public health problems associated with irreversible health consequences and substantial economic burden, which are currently difficult to prevent and manage. Nurses have always been the main force in the prevention and control of falls. To develop and evaluate a comprehensive fall intervention model for hospital nurses to manage falls. This was a quasi-experimental study to evaluate the effect of a newly designed hospital fall intervention model on fall management by nurses. The control group consisted of 153,601 hospitalized patients who received standard fall care from 2015 to 2016, while the Multifactorial Fall Intervention Model (MFIM) group included 171,776 inpatients managed with the new intervention model from 2017 to 2018. Patients' information and data were extracted from the medical records of our hospital. We recorded a total of 396 falls in the MFIM group with a remarkably declined fall rate (MFIM group: 0.22% vs. control group: 0.31%, p = 0.000) and fall rate per 1000 patient-days (0.22‰ vs. 0.29‰, p = 0.000) as compared with a total of 491 falls in the control group. The adjusted incidence rate ratio of falls was 0.721. Furthermore, the occurrence and the severity of fall injuries in the MFIM group were significantly lower than that in the control group. The MFIM model demonstrated a favorable effect in reducing the occurrence of falls and fall-related injuries among hospitalized patients. These findings suggest that the implementation of MFIM can significantly enhance patient safety and should be considered for broader adoption in hospital settings to mitigate fall risks.

Keywords: Fall; Fall injuries; Fall prevention; Model; Nursing guidance.

Evaluation of a Frustrated Total Internal Reflection (FTIR) based balance sensor for objective fall risk assessment in older adults: a study protocol

Liu H, Cai L, Ma X, Chen J, Lam CLK, Yuen JKY, Chan CP, Sze HH, Wang HL, Xi N, Lou VW. BMC Geriatr. 2026 Mar 2.

DOI: 10.1186/s12877-026-07253-9 **PMID:** 41772485

Abstract

Background: Clinical fall risk assessments, such as the Fall Risk Assessment Scale for the Elderly (FRASE), often rely on subjective clinician observation. This protocol described the evaluation of "iBalance", an AI-enabled device utilizing Frustrated Total Internal Reflection (FTIR) to objectively measure dynamic balance and predict fall risk. This study aims to validate the screening accuracy of the iBalance device and explore its feasibility for clinical integration.

Methods: 412 adults aged 60 years and above and 10 clinical professionals will be recruited from outpatient clinics for this mixed-method study. Older adults' fall risk will be assessed by the iBalance and clinical assessments (e.g., FRASE scale) separately, and their fall incidents will be recorded during a three-month follow-up. The iBalance captures high-resolution plantar pressure at 30 Hz. The system processes data via: (1) a machine learning model trained on extracted 3D Center of Pressure (CoP) and Center of Gravity (CoG) features; (2) a Convolutional Neural Network (CNN) for direct video data analysis; and (3) a statistical method optimized for maximum Area Under the Curve (AUC). To ensure participant safety, all the assessments will be conducted with side handrails and staff guarding to prevent falls. Individual interviews with clinical professionals will be conducted to gather insights on improving the device's practicality and the application of clinical workflows. The primary outcome is sensitivity, specificity, and AUC of iBalance compared to the clinical assessments. Logistic regression will adjust for key confounders (age, gender, and BMI) for both fall risk factor identification and 3-month prospective fall prediction. Qualitative interviews will undergo thematic analysis.

Conclusion: This protocol outlines a comprehensive evaluation for validating an AI-driven fall risk assessment tool. By addressing both technical screening accuracy and practical clinical utility, the study seeks to establish a standardized, objective framework for early fall intervention in geriatric care.

Ethics and trial registration: This study has been approved by the IRB of The University of Hong Kong/Hong Kong Hospital Authority Hong Kong West Cluster (IRB reference number: UW 24–540). This protocol has been registered on the US ClinicalTrial.gov website (NCT06767163, registration date: January 16, 2025).

Effectiveness of Multifactorial and Exercise Programs in Preventing Falls Among Older Adults: A Systematic Review and Component Network Meta-Analysis

Luo Y, Miao Y, Zhao Y, Li J, Guo R, Wu Y. Worldviews Evid Based Nurs. 2026 Apr;23(2):e70136.

DOI: 10.1111/wvn.70136 **PMID:** 41923402

Abstract

Background: To compare the effectiveness of multifactorial and exercise programs in preventing falls among older adults, with a specific focus on evaluating the individual and combined contributions of their key intervention components.

Methods: This study was a systematic review and component network meta-analysis. PubMed, Embase, and Web of Science were searched from inception to February 2025 for randomized controlled trials, focusing on four primary outcomes: fallers, recurrent fallers, injurious fallers, and fractured fallers. Risk of bias was evaluated using the Cochrane tool, and additive component network meta-analysis compared intervention group and component efficacy.

Results: 69 randomized controlled studies were included. In multifactorial interventions, traditional health education could increase fall risk (iRR: 1.10, 95% CI [1.03; 1.67]) and recurrent fall risk (iRR: 1.25, 95% CI [1.06; 1.48]). Medication management can increase recurrent fall risk (iRR: 1.35, 95% CI [1.09; 1.67]) and fracture risk (iRR: 2.11, 95% CI [1.48; 3.00]). Exercise (iRR: 1.24, 95% CI [1.01; 1.53]) increased fracture risk, and environment modification (iRR: 0.56, 95% CI [0.61; 0.79]) reduced it. The additive effect of risk assessment and advice, exercise, and environment modification reduced fall risk. In exercise programs, gait and balance (iRR: 0.58, 95% CI [0.36; 0.93]) can reduce recurrent fall risk. An intervention containing two components (gait and balance + strength and resistance) reduced the risk of falls and fall-related injuries.

Linking evidence to action: Environment modification reduced fracture risk, emphasizing the value of creating safe living spaces. The combination of risk assessment, advice, exercise, and environment modification reduced fall risk, suggesting a holistic approach may be effective in preventing falls. Traditional methods of health education and medication management are in urgent need of updating to synergize with other exercise components and enhance the effectiveness of fall prevention. Prospective clinical trials are needed to optimize combinations of exercise components, particularly integrating gait and balance training with strength and resistance exercises.

Trial registration: The review was registered online in the International Prospective Register of Systematic Reviews (PROSPERO) under registration number (CRD42025643530).

Keywords: component analysis; fall prevention; network meta-analysis; older adults; systematic review.

Exercise training and balance function in middle-aged and older adults with diabetic peripheral neuropathy: a GRADE-based systematic review and meta-analysis

Ma R, Xu S, Kang J, Liu X, Liu M. Front Public Health. 2026 Feb 23;14:1756867.

DOI: 10.3389/fpubh.2026.1756867 **PMID:** 41810304

Abstract

Objective: To systematically evaluate, using the GRADE framework, the effects of exercise training on static and dynamic balance function in middle-aged and older adults with DPN.

Methods: We systematically searched the Cochrane Library, EMBASE, PubMed, Web of Science, CNKI, and Scopus from inception to March 21, 2025, for randomized controlled trials (RCTs) investigating exercise interventions targeting balance in adults with DPN. Eligible studies enrolled middle-aged and older adults with DPN and reported at least one validated balance-related outcome. Risk of bias was assessed, and the certainty of evidence was rated using the GRADE approach. Meta-analyses were performed using R software and expressed as mean differences (MDs) with 95% confidence intervals (CIs).

Results: Sixteen RCTs involving 759 middle-aged and older adults with DPN were included. Low to very low certainty evidence indicated that exercise training significantly improved Berg Balance Scale scores [*MD* = 2.14, 95% CI (1.57-2.73)], Functional Reach Test distance [*MD* = 3.23, 95% CI (1.82-4.64)], and Timed Up and Go test performance [*MD* = -1.65, 95% CI (-1.98-1.32)]. Exercise also increased One-Leg Stand Test duration with eyes open [*MD* = 2.93, 95% CI (2.10-3.76)] and eyes closed [*MD* = 1.37, 95% CI (0.55-2.19)]. After exclusion of a study contributing substantial heterogeneity, the Five-Times Sit-to-Stand Test showed significant improvement [*MD* = -3.07, 95% CI (-4.87-1.28)]. No significant effect was observed for the Six-min Walk Test [*MD* = 27.36, 95% CI (-18.43-73.14)].

Conclusion: Exercise training may confer beneficial effects on both static and dynamic balance function in middle-aged and older adults with DPN, although the certainty of evidence is generally low to very low. No significant effect was found on six-min walking capacity. Larger, pragmatic trials are needed to confirm effects and to guide implementation in community and outpatient services, including monitoring of fall-related and longer-term functional outcomes.

Systematic review registration: https://www.crd.york.ac.uk/PROSPERO/view/CRD420261305039.

Keywords: balance; diabetic peripheral neuropathy; disability burden; exercise; functional performance; healthy aging; meta-analysis; mobility independence.

The Synergy of Cognitive Impairment and Physical Frailty on Fall Risk in Older Adults: A Memory Clinic-Based Study

Maeshima S, Osawa A, Itoh N, Akatsu H, Arai H. Geriatr Gerontol Int. 2026 Mar;26(3):e70451.

DOI: 10.1111/ggi.70451 **PMID:** 41834533

Abstract

Fall risk was highest in older adults with coexisting cognitive impairment and frailty. Frailty alone had minimal impact in cognitively normal individuals, demonstrating a synergistic interaction between cognitive and physical vulnerability.

Gait instability in community-dwelling older fallers: How visual search behaviors reveal hidden fall risk

Mak TCT, Wong TWL, Chan DCL, Wong DWC, Ng SSM. J Safety Res. 2026 Feb;96:223-228.

DOI: 10.1016/j.jsr.2026.01.001 **PMID:** 41786419

Abstract

Introduction: Falls during walking contribute significantly to injuries in older adults, with gait instability being a key risk factor. While visual search behaviors are essential for safe navigation, their relationship to instability remains unclear. This study compared visual search behaviors during walking between community-dwelling older adults with and without a fall history and examined their association with gait instability.

Methods: Seventy-four older adults (mean age: 70.7 ± 3.9 years; 37 fallers, 37 non-fallers) walked at a self-selected pace along an 8-m level-ground walkway for five trials. Gait stability was assessed by variability of spatial and temporal gait parameters, where greater variability reflects reduced stability. Visual search behaviors were assessed by the percentage of total fixations and the percentage of total fixation duration directed towards the ground (floor area of the walkway), the destination (end-point of the walkway), and random areas (non-task-relevant areas).

Results: No significant differences in visual search behaviors were observed between groups. In fallers, greater variability of stride time was associated with greater percentages of the number of fixations on the ground ($\rho = 0.348$, $p = 0.043$), while greater variability of step width was associated with fewer percentages of the number of fixations ($\rho = -0.464$, $p = 0.006$) and fixation duration on the destination ($\rho = -0.452$, $p = 0.007$). These associations were not apparent in non-fallers.

Conclusions: Despite similar visual search behaviors between older fallers and non-fallers, fallers exhibited unique associations between reduced visual scanning towards the destination and lateral instability (i.e., increased variability of step width) during walking-an effective predictor of falls. This suggests maladaptive visuomotor behaviors and compromised gait stability may be interrelated, collectively increasing fall injury risk in older fallers.

Practical applications: The observed associations suggest that visuomotor training could be explored in fall prevention programs to improve gait safety in older fallers. Future studies should investigate causality and evaluate efficacy in hazard-rich environments.

Keywords: Fall history; Fall prevention; Gait variability; Older adults; Visuomotor behaviors.

From stiffness to automaticity: visuomotor training alters postural control strategies in older adults

Malik J, Główka N. Geroscience. 2026 Mar 19.

DOI: 10.1007/s11357-026-02204-z **PMID:** 41854954

Abstract

Aging is often associated with a maladaptive "stiffness" strategy of postural control, which limits adaptability and increases fall risk. Complex visuomotor training (e.g., juggling) may counteract this decline, but the relationship between biomechanical reorganization and cognitive cost reduction remains unclear. We hypothesized that juggling would induce a shift from stiffness to "active monitoring" and reduce the dual-task cost. This exploratory secondary analysis of a randomized crossover trial consists of twenty-five older adults (70 ± 4 years). Participants underwent 4 weeks of juggling training versus a passive control period. Postural sway was assessed using a force platform to analyze kinematic metrics reflecting sway activity (path density) and spatial precision (radial standard deviation). Cognitive cost was assessed via dual-task cost during a counting task. Linear mixed models were used for analysis. Juggling training significantly increased path density ($p = 0.014$) and improved central precision (reduced radial standard deviation, $p = 0.040$). This pattern indicates a transition to an "active monitoring" strategy, effectively "unfreezing" rigid postural control. However, this biomechanical reorganization was not accompanied by a statistically significant reduction in dual-task cost ($p = 0.08$). Visuomotor training effectively "unfreezes" rigid postural strategies in older adults, promoting active, exploratory control. However, these findings should be interpreted as hypothesis-generating. The lack of significant cognitive cost reduction suggests a temporal dissociation: biomechanical flexibility is restored before full automatization occurs, warranting verification in larger, longitudinal studies. The study was retrospectively registered (30.10.2023) at ClinicalTrials.gov (NCT06108713).

Keywords: Aging; Attentional resources; Balance; Bernstein's theory; Dual-task; Juggling.

Supported implementation of tailored hospital fall prevention interventions: a protocol for the PROTECT stepped wedge type I hybrid effectiveness-implementation trial

McLennan C, Hassett L, Tilden W, Naganathan V, Haynes A, Jennings M, Ni Chroinin D, Richards B, Hallahan A, Biswas RK, Kwok W, McVeigh T, Heppleston E, Jackson D, Nayak V, Delaney S, Howard K, Pinheiro M, Macpherson A, Rayner J, Hill AM, Haines T, Sherrington C. BMJ Open. 2026 Mar 19;16(3):e111744.

DOI: 10.1136/bmjopen-2025-111744 **PMID:** 41856599

Abstract

Introduction: Patient falls in hospitals lead to patient harm, staff distress and economic burden on health systems. There are few strategies with robust evidence demonstrating benefit for the prevention of falls, especially in acute hospital settings. Education and multicomponent fall prevention approaches are promising. Rigorous systematic measurement of implementation has been lacking in most hospital fall prevention trials. This paper describes the protocol for a trial that will evaluate the impact of supported implementation of tailored multicomponent fall prevention interventions on patient falls in hospital.

Methods and analysis: A stepped-wedge hybrid type I effectiveness implementation cluster randomised trial will be conducted. Twelve inpatient wards across four metropolitan hospitals will be enrolled in the trial, clustered into groups of four and randomised to commence the intervention at one of three time periods. Patients and ward staff will be recruited to complete pre-implementation surveys, which, combined with analysis of routinely collected local falls data and staff brainstorming, will inform tailored multicomponent fall prevention interventions for each ward. Wards will receive quality improvement training, clinical facilitation and staff education for at least 4 months to support implementation of their fall prevention interventions. The primary outcome-rate of falls-will be measured using routinely collected hospital falls data from the incident management system and medical records. Pre-implementation and post-implementation patient and staff surveys, qualitative interviews and bedside audits will measure secondary effectiveness and implementation outcomes. Healthcare utilisation from hospital data will inform the cost-effectiveness analysis.

Ethics and dissemination: The Sydney Local Health District Human Research Ethics Committee (RPAH Zone) approved this trial (protocol number X24-0087 and 2024/ETH00583). The trial is registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12624000896572). Data collection commenced in October 2024, due for completion in May 2026. Results will be published in reputable international journals and presented at relevant conferences.

Trial registration number: Australian and New Zealand Clinical Trials Registry (ACTRN12624000896572).

Keywords: Clinical Trial; GERIATRIC MEDICINE; Health Services; Hospitals.

Accuracy of wearable devices in predicting falls in older adults: a systematic review and meta-analysis

Mou C, Yan X, Miao X, Zhu L. Front Public Health. 2026 Mar 11;14:1778750.

DOI: 10.3389/fpubh.2026.1778750 **PMID:** 41889634

Abstract

Background: Wearable devices enable the continuous collection of kinematic information, such as gait and postural control, in real-life environments, offering potential for the early identification and stratified management of fall risk in older adults. However, quantitative integrated evidence regarding their overall accuracy in predicting future falls is lacking. This systematic review and meta-analysis aims to evaluate the accuracy of wearable devices in predicting falls among older adults and to explore the potential influence of key study characteristics on predictive performance.

Methods: A systematic search was conducted in PubMed, Embase, Web of Science, and the Cochrane Library from database inception to October 9, 2025. Using a bivariate random-effects model, we pooled sensitivity and specificity, calculated likelihood ratios, and fitted a summary receiver operating characteristic (SROC) curve to determine the area under the curve (AUC). Subgroup analysis and meta-regression explored potential sources of heterogeneity. The risk of bias was assessed with the PROBAST tool.

Results: A total of 20 studies were included. The pooled sensitivity was 0.55 (95% CI: 0.42-0.67), specificity was 0.89 (95% CI: 0.84-0.93), positive likelihood ratio was 5.2, negative likelihood ratio was 0.50, and diagnostic odds ratio was 10.39. The area under the summary receiver operating characteristic (SROC) curve was 0.85 (95% CI: 0.81-0.88). Subgroup and regression analyses indicated that studies employing machine learning modeling demonstrated superior overall discriminative ability (AUC = 0.90). Predictive performance may be influenced by factors such as population age structure, sample size, and sensor placement location.

Conclusion: Wearable devices exhibit good discriminative ability for predicting future falls in older adults, characterized overall by high specificity and moderate sensitivity. They are more suitable as tools for early screening and risk stratification in community and institutional settings, thereby supporting decision-making regarding intervention priorities.

Systematic review registration: https://www.crd.york.ac.uk/PROSPERO/view/CRD420251274570.

Keywords: fall prediction; meta-analysis; older adults; postural control; wearable devices.

Feasibility of aquatic reactive balance training (AquaReBal) for older adults: protocol for a single-arm pre-post study

Ogonowska-Slodownik A, Marinho-Buzelli A, Danells C, Musselman KE, Bonnyman A, Alavinia M, Mansfield A. Gerontology. 2026 Mar 4:1-19.

DOI: 10.1159/000550917 **PMID:** 41779675

Abstract

Introduction: Falls are a serious problem for older adults, and as the number of older adults increases rapidly, the burden of falls is expected to continue rising. Reactive balance training is an important component of balance- and fall-prevention exercise programmes in older people at elevated fall risk. Despite its effectiveness for improving reactive balance control and preventing falls, land-based RBT programs can be associated with increased risk of adverse events including joint pain, fear and anxiety that results in participants withdrawing from the program. A water environment could minimize the barriers associated with land-based RBT. The aim of this research is to determine the feasibility and preliminary effectiveness of aquatic reactive balance training (AquaReBal).

Methods: Older adults (n=12-15) will be recruited and will complete twelve sessions of AquaReBal over six weeks. Feasibility outcomes (fidelity, acceptability, adherence, safety) will be assessed throughout the study. Interviews with participants will be conducted post-training to understand participants' experiences with the intervention. Secondary outcomes related to falls - physical activity, psychological consequences, generic health-related quality of life, and reactive balance control - will be assessed pre- and post-training; however, given the small sample size, these measures will be treated as exploratory and are not powered to detect change with precision. Falls in daily life will be recorded throughout the study until six months post-training.

Conclusion: Findings from this study will inform the feasibility and design of AquaReBal, contributing to the development of aquatic interventions for fall prevention in older adults.

Age-related changes in static and dynamic postural balance performance

Rizzato A, Bozzato M, Paoli A, Faggian S, Marcolin G. Front Aging Neurosci. 2026 Mar 4;18:1759879.

DOI: 10.3389/fnagi.2026.1759879 **PMID:** 41858794

Abstract

Background: Age-related changes in the neuromuscular and sensory systems compromise the control of balance and stability. Static balance assessments may overlook deficits that appear when coping with unexpected perturbations. This cross-sectional study aimed to compare static and dynamic balance performance in younger and older adults to assess age-related differences in postural control between the two age groups.

Methods: Sixty-nine younger adults (24.3 ± 0.4 years) and sixty-one older adults (72.1 ± 0.6 years) performed balance assessments under static and dynamic conditions on a force platform. Center of pressure (CoP) was calculated during quiet standing for static balance and during an unexpected perturbation of the base of support for dynamic balance. In the perturbation-based task, the following CoP-related parameters were analyzed within a 2.5-s window from perturbation onset: displacement (Area95D), Mean VelocityD, anterior-posterior first peak (FP), post-perturbation variability (PPV), and maximal oscillations (ΔCoPMax). Sample Entropy (SampEn X and Y) was computed to infer the automaticity of postural control.

Results: In the static test, balance performance did not differ between younger and older adults, although older adults exhibited reduced efficiency ($p < 0.05$). Dynamic balance showed age-related differences, with older adults highlighting larger Area95D ($p < 0.001$), higher Mean VelocityD ($p < 0.001$), and greater FP ($p < 0.05$). SampEn X did not differ between groups, whereas SampEn Y was lower in older adults ($p < 0.001$).

Conclusion: Age-related changes in balance control are task dependent. Older adults preserved static balance performance but demonstrated impaired reactive balance responses in dynamic tasks. Furthermore, static and dynamic balance rely on distinct control mechanisms, highlighting the need for separate assessments.

Keywords: aging; balance; center of pressure; fall risk; perturbations; postural control; sample entropy.

Zumba Gold dance compared to conventional balance exercises as a proposed approach to improving balance and reducing the risk of falls in older adults

Sadura-Sieklucka T, Sokołowska B, Sikora JA, Kądalska E, Sokołowska E, Targowski T. Reumatologia. 2026 Feb 27;64(1):36-45.

DOI: 10.5114/reum/213410 **PMID:** 41909073

Abstract

Introduction: The aging population is growing worldwide, and according to a 2015 World Health Organization report, the number of seniors over the age of 65 will be as high as 1.6 billion in 2050, representing 16.7% of the world's population. Moreover, the number of falls among people aged ≥ 65 is expected to increase by 47% by 2050, since coordination and balance, both static and dynamic, have a huge impact on the incidence of falls in seniors. This study was designed to determine whether there are differences in the effectiveness of Zumba Gold (ZG) dance training and conventional balance exercises (BE) in the context of static and dynamic balance and whether ZG may reduce the risk of falls in older adults.

Material and methods: The study involved 38 subjects aged 61 to 83, 19 in both groups, who participated in ten 45-minute classes three times a week. Pre- and post-training balance tests were conducted to evaluate the effectiveness of the exercise sessions.

Results: The results showed significant improvements in a battery of clinical tests, after training sessions, such as the Timed Up and Go test ($p \leq 0.01$), Tandem Stance Test ($p \leq 0.03$), Tandem Walk Test ($p \leq 0.02$), Tandem Pivot Test ($p \leq 0.02$), Four Square Step Test ($p \leq 0.001$), and Functional Reach Test ($p \leq 0.004$). Zumba Gold, like BE, positively affects static and dynamic balance and is an effective physical activity in preventing falls.

Conclusions: The findings suggest that just 10 ZG or BE sessions are sufficient to observe beneficial improvements in functional fitness and balance, which may result in a reduction in fall risk. Moreover, ZG training, like other exercise classes with dynamic music, can also be called active leisure.

Keywords: conventional balance training; dance training; risk of falling; static and dynamic balance tests.

Brief Instrumented Mobility Testing Improves Fall Risk Stratification in Older Emergency Department Patients

Suffoletto B, Ashenburg N, Losak M, Kim D. Acad Emerg Med. 2026 Mar;33(3):e70259.

DOI: 10.1111/acem.70259 **PMID:** 41803038

Abstract

Background: Emergency department (ED) fall-risk screening often relies on measures that incompletely capture body movement signals relevant to future falls.

Objective: Test whether inertial measurement unit (IMU) features from a brief, modified, instrumented Timed Up and Go (miTUG) provide incremental prognostic value for 6-month falls after ED discharge beyond a clinical screening tool.

Methods: We conducted a prospective cohort study of community-dwelling adults ≥ 60 years discharged from an urban academic ED (September 2023-May 2024). Before discharge, participants completed a miTUG; four IMU features (sit-to-stand dominant frequency and duration; turn-to-sit spectral power and dominant frequency) were added to nine clinical predictors. The primary outcome was any fall within 180 days (6 months). Model performance was assessed using discrimination (AUC/C-index) and operating characteristics at ED-relevant thresholds. Secondary analyses examined models predicting time to first fall. Exploratory analyses examined patient subgroups that may benefit from additional testing.

Results: Among 360 participants, 94 (26.1%) fell within 180 days. The combined clinical+IMU model demonstrated modestly improved discrimination compared with the clinical-only model (AUC 0.72 vs. 0.67; Wilcoxon p = 0.19). At a prespecified 30% fall risk threshold, addition of IMU features improved sensitivity (0.57 vs. 0.45), specificity (0.80 vs. 0.76) and positive predictive value (0.50 vs. 0.39). In time-to-event analyses, the combined clinical+IMU model showed higher concordance (C-index 0.73 vs. 0.69) and better fit (likelihood-ratio p = 0.0006). Incremental gains were largest among adults ≥ 70 years, those with a recent prior fall, and those classified as lower risk by the clinical screen.

Conclusions: In older adults discharged from the ED, IMU features from a brief, mobility assessment added modest improvements in fall risk stratification beyond a clinical screen. These findings are hypothesis-generating and support the need for external validation and implementation studies before clinical adoption.

Keywords: aged; emergency department; falls; predictive modeling; risk assessment.

Unequal Ground: A Review of Socioeconomic Disparities in Falls

Tidd M, Flayter RR. J Emerg Nurs. 2026 Mar;52(2):278-285.

DOI: 10.1016/j.jen.2025.11.009 **PMID:** 41796547

Abstract

Falls among older adults are a leading cause of injury and hospitalization, with socioeconomic status emerging as a significant but often underrecognized risk factor. This review examined 9 studies and 1 narrative review across multiple countries, revealing that lower socioeconomic status is associated with an increase in fall risk through potential pathways, such as limited access to safety modifications, poor nutrition, reduced health literacy, and social isolation. However, some studies presented context-dependent findings, suggesting that cultural and environmental factors may moderate socioeconomic status-fall associations. Emergency nurses are uniquely positioned to intervene early, given that the emergency department often serves as the first point of contact after a fall. By incorporating a social determinants of health screening, initiating referrals, and providing targeted education, emergency nurses can help prevent repeat falls and improve recovery outcomes. Integrating social determinants of health assessments into emergency care is needed for advancing equitable, patient-centered strategies that address both clinical and socioeconomic contributors to fall risk.

Keywords: Fall prevention; Fall risk; Falls; Older adults; Social determinants of health; Socioeconomic status.

Fall risk screening in older persons using a wearable sensor in free-living conditions - A pilot and feasibility study

Törnblom M, Karlsson S, Rönkkö K, Nivestam A, Olsson Möller U. Gait Posture. 2026 Mar 15;127:110161.

DOI: 10.1016/j.gaitpost.2026.110161 **PMID:** 41850192

Abstract

Introduction: Wearable sensors measuring bodily movements used in free-living conditions may help predict falls in older persons. Assessing their use in this context is essential to identify potential challenges related to fall risk screening. Therefore, this study aimed to assess the feasibility of conducting a prospective study comparing self-rated and wearable sensor-based measures for the assessment and prediction of falls in older persons in free-living conditions.

Materials and methods: A prospective pilot and feasibility study was conducted in six municipalities in Sweden. Data was collected using a systematic questionnaire, a fall journal, a wearable sensor, and a research log. Data from 32 older persons (median age 81 years, 63% women) who completed a six-month fall journal were included in the statistical analysis.

Results: The proportion of persons interested in participating in the study varied, ranging from 5% to 73%. Several problems were identified regarding data collection and technical equipment. In total, 51% of the participants obtained a complete set of data on the first try using the wearable sensor. Maximal angular velocity was higher for fallers than non-fallers ($p = 0.054$).

Conclusions: The study was considered feasible; however, the issues that arose need to be addressed, emphasising the need for pilot and feasibility studies before undertaking a large-scale study using these technologies in new settings. This study underscores the importance of person-centred data collection processes. Further studies should confirm whether maximal angular velocity could be a predictor of future falls.

Keywords: Aged; Balance; Community-dwelling; Fall risk assessment; Person-centredness; Physical activity; Technology.

Association Between Cholinesterase Inhibitor-Overactive Bladder Antimuscarinic Prescribing Cascade and Risk of Delirium and Falls Among Individuals Living With Dementia

Tucker SB, Love BL, Okeke CM, Zwick ED, Teng C, Wei J, Karaye IM, Alsahali S, Rajagopalan K, Yunusa I.
J Am Geriatr Soc. 2026 Mar 15.

DOI: 10.1111/jgs.70386 **PMID:** 41833520

Abstract

Background: Prescribing cascades occur when cholinesterase inhibitor (ChEI)-induced urinary incontinence is misinterpreted as a new condition, leading to overactive bladder (OAB) antimuscarinic initiation. We evaluated whether the ChEI-OAB antimuscarinic prescribing cascade was associated with delirium or falls compared with mirabegron in older adults living with dementia.

Methods: We conducted a retrospective cohort study using the Anlitiks All-Payor Claims database (2015-2020). Participants were adults aged ≥ 65 years with dementia newly prescribed a ChEI with no prior ChEI or OAB therapy (180 days). A 60-day window identified OAB treatment initiation after ChEI therapy. Exposures were OAB antimuscarinics or mirabegron. Outcomes were incident delirium and falls identified using diagnosis codes. Propensity score-based weighting balanced baseline characteristics.

Results: Among 2693 patients (mean age 80 years; 66.3% female), 201 (7.5%) initiated antimuscarinics and 2492 (92.5%) started mirabegron. Over 1 year, 8 (4.0%) antimuscarinic users developed delirium versus 95 (3.8%) mirabegron users (adjusted HR 1.35; 95% CI, 0.64-2.86). Falls occurred in 3 (1.5%) antimuscarinic users and 63 (2.5%) mirabegron users (adjusted HR 0.66; 95% CI, 0.20-2.15).

Conclusions: In older adults living with dementia, the estimated association between initiation of OAB antimuscarinics following ChEIs and the risks of delirium or falls, compared with mirabegron, was statistically compatible with benefit, harm, or no clinically meaningful difference. These findings highlight the need to evaluate whether OAB antimuscarinics are prescribed in response to true clinical need or as part of a prescribing cascade. Given the limited number of outcome events and resulting wide 95% CIs, future studies are needed to more precisely estimate the risk.

Keywords: cholinesterase inhibitors; delirium and falls; dementia; overactive bladder antimuscarinics; prescribing cascades.

Design considerations for technology-assisted fall-resisting skills training trials in older adults: A pilot and feasibility study

van der Hulst EG, Meijer K, Meyns P, McCrum C. PLoS One. 2026 Mar 24;21(3):e0345798.

DOI: 10.1371/journal.pone.0345798 **PMID:** 41875211

Abstract

Training fall-resisting skills can prevent falls in older adults. These fall-resisting skills include proactive gait adaptability, gait robustness, and reactive gait recovery, which allow people to effectively avoid, resist, and recover from balance threats, respectively. This pilot study guided the design of an RCT of fall-resisting skills training by investigating key design factors, such as the design of a placebo-control group, obstacle difficulty settings, exploring evaluation methods for gait robustness, testing the effect of task unpredictability on anxiety, and the general feasibility. Eleven healthy older adults performed non-task-specific "placebo" balance tasks and assessment and training tasks for each fall-resisting skill. Placebo tasks included static weight-shifting exercises and dual-task walking. For the fall-resisting skill tasks, participants walked on a treadmill under different conditions. For proactive gait adaptability, participants avoided projected obstacles varying in size, approach speed, and available response time. Gait robustness was assessed using perturbations of increasing magnitude, where the margin of stability following each perturbation was compared with participants' perceived balance loss and researchers' observations. For reactive gait recovery, perturbations with increasing unpredictability were applied, after which participants reported their anxiety scores. Weight-shifting tasks were perceived as balance training by most participants, indicating their potential as placebo tasks. Obstacle avoidance difficulty increased most with fast approach speed and large obstacle sizes. A margin of stability-based threshold did not consistently align with perceived balance loss or observer judgement. Anxiety did not increase with more unpredictable perturbation tasks when introduced gradually. Fall-resisting skill tasks generally were feasible for older adults.

Fall risk, fall awareness, and social support among 825 community-dwelling older adults with functional limitations: a cross-sectional study

Xiao L, Hu R, Zou X, Wu H. Front Public Health. 2026 Feb 25;14:1763697.

DOI: 10.3389/fpubh.2026.1763697 **PMID:** 41822936

Abstract

Purpose: This study aimed to examine the level of fall risk and its associations with fall awareness and social support among community-dwelling older adults with functional limitations.

Methods: A cross-sectional study was conducted from January to October 2025. Using cluster sampling, 825 older adults with functional limitations were recruited from four communities in Chengdu, China. Fall risk was assessed using the Modified Falls Risk for Older People in the Community Assessment (MFROP-com), fall awareness was measured with the Self-awareness of Falls in Elderly Scale (SAFE), and social support was evaluated via the Social Support Rating Scale (SSRS). Data were analyzed using Pearson correlation and multiple linear regression.

Results: Participants exhibited a high fall risk (mean score 26.51 ± 10.95). The regression model explained a significant proportion of variance in fall risk (Adjusted $R^2 = 0.536$, $p < 0.001$). Higher fall awareness (B = -0.463, $\beta = -0.565$, $p < 0.001$) and greater social support (B = -0.422, $\beta = -0.190$, $p < 0.001$) were independent predictors of lower fall risk. Advanced age, unmarried, living alone, and having sleep disorders were associated with increased risk ($p < 0.05$).

Conclusion: Fall awareness and social support were identified as key modifiable factors associated with reduced fall risk among community-dwelling older adults with functional limitations. Fall prevention programs should focus on enhancing risk perception and strengthening social support networks for this population.

Keywords: community-dwelling older adults with functional limitations; cross-sectional study; fall risk; self- awareness; social support.

Personalizing fall fear prevention in knee osteoarthritis: an interpretable prediction framework via IGKSO synchronous optimization and SHAP-based risk stratification

Yin M, Fang W, Cheng Y, Feng Y. Front Public Health. 2026 Feb 26;14:1749921.

DOI: 10.3389/fpubh.2026.1749921 **PMID:** 41835436 **PMCID:** PMC12979443

Abstract

Objective: To construct a concern about falling (CAF) prediction model for patients with knee osteoarthritis (KOA) based on synchronous optimization.

Methods: A total of 541 patients with KOA admitted to two hospital from September 2021 to September 2023 were selected. CAF was evaluated using the Falls Efficacy Scale-International (FES-I). Patients were divided into a CAF group (n = 360, FES-I ≥ 28 points) and a no CAF group (n = 181, FES-I < 28 points). 80% of the data (433 cases) were used as the training set, and the remaining 20% (108 cases) were used as the test set. An improved swarm intelligence algorithm was used for feature selection and hyperparameter optimization. The selected variables were further analyzed by Shapley Additive exPlanation (SHAP) interpretable method.

Results: In the training set, the maximum F1 score of the improved synchronous optimization machine learning model was 0.8842, and the area under the curve reached 0.9451. In the test set, the maximum F1 score of the improved synchronous optimization machine learning model was 0.8589, and the area under the curve reached 0.9315. Eight variables were selected based on the improved synchronous optimization machine learning model, including Timed Up-and-Go (TUG) time, Western Ontario and McMaster Universities Osteoarthritis (WOMAC) pain score, Hospital Anxiety and Depression Scale (HADS) anxiety score, knee extensor moment, age, sex, Kellgren-Lawrence (KL) grade, and Body mass index (BMI). Critically, SHAP analysis demonstrated triadic interactive effects among key risk indicators, revealing that older adult female patients with concurrent TUG time >14 s, HADS-anxiety scores >10, and high WOMAC pain scores constituted the peak-risk cohort amplified through bio-psycho-social interactions.

Conclusion: This study validated a multimodal predictor model for CAF in knee osteoarthritis (KOA) patients through a machine learning framework, revealing synergistic mechanisms among biomechanical, psychological, and social dynamics, with specific risk stratification for high-risk populations such as older adult females to guide clinical practice.

Keywords: artificial intelligence; concern about falling; forecasting; knee osteoarthritis; machine learning.

Hip Abductor Strength Predicts Injurious Falls and Mediates the Balance Confidence-Falls Relationship: A Competing Risk Model

Yosef T, Pasco JA, Tembo MC, Holloway-Kew KL. J Cachexia Sarcopenia Muscle. 2026 Apr;17(2):e70280.

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Abstract

Background: Falls are a major public health issue, largely driven by age-related declines in hip and lower limb muscle strength. Hip muscle strength plays a critical role in postural stability and falls prevention. Lower balance confidence increases fall risk by restricting activity participation, which may contribute to muscle weakness over time. This study examined the association between hip abductor and flexor strength and the incidence of injurious falls in older adults and investigated whether hip abductor and flexor strength mediate the relationship between balance confidence and incident injurious falls.

Methods: Participants (n = 952; aged ≥ 65 years) were drawn from the Geelong Osteoporosis Study (GOS). The outcome was the time to first emergency department presentation for an incident injurious fall. Hip abductor and flexor strength were assessed using a handheld dynamometer to measure hip abduction and flexion force, with strength values adjusted for leg lean mass measured by dual-energy X-ray absorptiometry. Balance confidence was assessed using the 14-item Modified Falls Efficacy Scale (MFES). Associations between hip muscle strength and incident injurious falls were evaluated using a competing risk regression model, which accounted for death as a competing event. The results are expressed as adjusted sub-distribution hazard ratios (aSHR) and 95% confidence intervals. Mediation analysis was conducted to assess whether hip abductor and flexor strength mediated the relationship between balance confidence and the incidence of injurious falls.

Results: Among the 952 participants, 38% were women (mean age 76.1 ± 7.3 years), and 62% were men (mean age 76.9 ± 7.0 years). The median follow-up time was 11.5 years (IQR 5.9-19.0). During follow-up, 219 participants (23.0%) experienced at least one injurious fall, corresponding to an incidence rate of 19.3 per 1000 person-years (95% CI: 16.9-22.0). Greater hip abductor strength was associated with a lower risk of incident injurious falls (aSHR = 0.835, 95% CI: 0.724-0.963; p = 0.013), with each 1-N/kg increase in hip abductor strength reducing the sub-distribution hazard by 16.5%. Hip flexor strength was not significantly associated with incident injurious falls. Hip abductor strength accounted for 23.7% of the association between balance confidence and incident injurious falls.

Conclusions: Greater hip abductor strength is protective against incident injurious falls in older adults and partially mediates the relationship between balance confidence and injurious falls. Fall prevention strategies should integrate hip abductor strengthening with interventions targeting cognitive and psychological factors, such as improving balance confidence.

Keywords: aged; balance confidence; hip abductor strength; injurious falls; sarcopenia; specific force.

Falls in Acute Care Patients-Exploring the Predictive Value of the Morse Fall Scale: A Retrospective Analysis

Zhang Y, Ramamoorthy V, Saxena A, Armaignac DL, Chang Martinez C, Angel A, Hurtado L, Girado H.
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Abstract

Background: Falls among hospitalized patients are a substantial cause of adverse health outcomes, making prevention efforts an important priority. The Morse Fall Scale (MFS) is a popular tool to assess fall risk, although its predictive usefulness is limited in certain health care settings.

Purpose: We aimed to explore the predictive value of the MFS, as well as additional factors associated with falls in acute care settings.

Methods: This retrospective analysis included data from 4,887 adult patients 18 years of age and older stored in the repository of an acute care inpatient hospital. Data were analyzed using multivariate regression models and area under the receiver operating characteristic curves to determine the validity of the MFS as a predictor of falls.

Results: Of the 4,887 patients admitted to the acute care hospital setting, 343 (7%) experienced a fall. The median age of the cohort was 70.9 years. After propensity score matching, MFS scores did not differ significantly between those who experienced falls and those who did not. Several variables, such as All Patient Refined Diagnosis Related Group severity, environmental factors, unsteady gait, low bowel continence level, lack of alertness, skin moisture status as either dry or moist, benzodiazepine administration, diabetes, previous drug use, discharge status documented in the electronic health record, sepsis, atrial fibrillation, and hospitalization duration, were significantly associated with a greater risk of falls.

Conclusions: The MFS did not adequately predict falls. Several additional factors were associated with a greater risk of falls. Nurses and other clinicians should incorporate these insights into fall prevention protocols. These findings warrant inclusion in fall risk assessment guidelines, protocols, and fall prevention training programs.

Keywords: Morse Fall Scale; acute care patients; falls; logistic regression; receiver operating characteristic curve.

Beyond patient education: fall prevention knowledge, health literacy, and implementation gaps in Chinese hospitals-a patient-caregiver study

Zhao Q, Zhou L, Guo J, Yang Y, Hou S. Front Public Health. 2026 Feb 25;14:1786050.

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Abstract

Background: Falls among hospitalized older adults represent a critical patient safety concern, yet comprehensive assessments of fall prevention knowledge, attitudes, behaviors (KAB), education quality, and health literacy in Chinese hospital settings remain scarce. This study examined these domains and their relationships with fall outcomes.

Methods: This cross-sectional study enrolled patient-caregiver dyads at a tertiary hospital in China between February 2023 and October 2025. Participants completed validated assessments measuring fall prevention knowledge (18-item scale), attitudes (9-item scale), behaviors (14-item scale), education quality metrics (cascade framework with teach-back assessment), health literacy (composite score), and communication barriers. Fall/near-fall events during hospitalization were ascertained through structured interviews. Progressive multivariable logistic regression models examined associations between KAB domains, education quality, health literacy, and fall outcomes.

Results: Among 3,223 participants, 950 (29.5%) reported experiencing at least one fall or near-fall event. Fall prevention knowledge was modest (mean accuracy 58-59%), with critical gaps in recognizing the risks of prior falls (29.6%) and the value of environmental modifications (29.3%). Although attitudes were positive and comparable between groups, caregivers reported significantly higher behavioral engagement than patients (48.80 vs. 45.10; $p < 0.001$); however, adherence to healthcare provider recommendations was notably low across both groups (mean 2.12 ± 1.14/5). The education cascade revealed substantial system attrition: while 69.8% of respondents were informed of fall risks, only 46.6% demonstrated verified comprehension via teach-back. Health literacy was frequently inadequate (41.5% scored ≤2/5), and KAB domains showed negligible intercorrelations ($r \leq 0.02$). In adjusted multivariable models, KAB scores did not predict fall outcomes. Instead, higher health literacy (aOR = 1.11, 95% CI 1.03-1.19; $p = 0.006$) and greater comfort asking staff questions (aOR = 1.17, 95% CI 1.07-1.27; $p < 0.001$) were independently associated with increased probability of reporting events, despite low overall model discrimination (AUC = 0.577).

Conclusion: Hospital fall prevention requires system-level interventions beyond patient education, including standardized comprehension verification, literacy-sensitive communication, and integration of clinical risk assessment with environmental safety protocols to address multifactorial determinants inadequately captured by KAB-centered frameworks.

Keywords: falls prevention; health literacy; hospitalized older adults; knowledge attitudes behaviors; patient education; patient safety; teach-back method.

Implementation of Small Group Physiotherapy for People at Risk of Falls with Compromised Bone Mineral Density

Ziebart C, Francis A. Clin Interv Aging. 2026 Jan 29;21:560594.

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Abstract

Design: Interventional Implementation Study.

Setting: Outpatient private practice physiotherapy clinic.

Participants: Adults with osteoporosis or at risk of developing osteoporosis.

Intervention: Using the knowledge-to-action framework to implement a group physiotherapy program, participants were enrolled in a 6 week, twice weekly, 60-minute exercise intervention that targeted whole body strength and balance. Participants provided written feedback on the program.

Results: The mean age of the participants was 72 (SD: 6.03, min 60 years, max 84 years). There were 2 males, and 41 females that participated in the study. The program was successfully integrated into an outpatient physiotherapy clinic. All participants enjoyed the exercises, the social aspect, and having a booklet to support their exercise. Participants suggested that the program could be improved by having a class capacity of 9 participants per class due to space, having pictures in the booklet. Preliminary physical outcome measures showed promise, the 30-second sit-to-stand improved by a mean of 3.1 repetitions ($p<0.001$).

Conclusion: There was positive patient and clinician feedback on the implementation of the program within the clinic. Future iterations of the program will need to consider sustainability and accessibility of the program within the osteoporosis population.

Keywords: exercise; implementation; osteoporosis; resistance training.