Falls Research Highlights – October and November Edition

Efficacy of the Otago-Exercise-Programme to reduce falls in community-dwelling adults aged 65-80 when delivered as group or individual training: Non-inferiority-clinical-trial

Albornos-Muñoz L, Blanco-Blanco J, Cidoncha-Moreno MÁ, Abad-Corpa E, Rivera-Álvarez A, López-Pisa RM, Caperos JM; Otago Project Working Group Consortium; Moreno-Casbas MT. BMC Nurs. 2024 Oct 1;23(1):705.

DOI: 10.1186/s12912-024-02310-3 **PMID:** 39354514 **PMCID:** PMC11443953

Abstract

Background: The Otago Exercise Programme is an effective intervention for falls prevention. However, there is limited evidence in relation to studies that compare efficacy for falls prevention when delivered Otago Exercise Programme in a group or individual format in a primary care context.

Objective: To compare the Otago Exercise Programme delivered as a group vs. individual format for community dwelling older adults, over a one year period. The hypothesis was that neither format would be inferior to the other.

Methods: DESIGN: A four-year multicentre, randomized, non-inferiority clinical trial, with two arms-Otago Exercise Programme group training and individual Otago exercise training.

Setting(s): 21 primary healthcare centers.

Participants: A sample size of 728 participants was established. Participants were aged between 65 and 80 years; living in the community; able to walk independently; and agreed to take part in the study and provided signed informed consent.

Intervention: The Otago Exercise Programme was delivered mainly by nurses in primary care, with five face to face sessions, and a reinforcement 6 months later. Participants were encouraged to exercise at home between face to face sessions.

Data collection: at baseline and after 6 and 12 months from October 2017 to 2020.

Primary outcome: people who reported at least one fall.

Secondary outcomes: number of falls, cause of falls, consequences and assistance, adherence and satisfaction. Group allocation was blinded to the researchers involved in analysis. Reporting: Consolidated Standards of Reporting Trials recommendations for the Statement for Randomized Trials of Nonpharmacologic Treatments.

Results: Eight hundred twenty-seven participants were randomized (226 were allocated in group training and 272 in individual training). The analysis of the proportion of people who reported at least one fall and number of falls showed no differences between individual and group training. Assessment of the equivalence between the interventions at 12 months showed that the confidence interval for the difference of people who reported at least one fall was found to be within the equivalence limit of 10% considered. However, in those participants with a

NSW Fall Prevention & Healthy Ageing Network

previous history of falls, group format showed potentially greater benefit. The participants in individual training presented higher scores on the Exercise Adherence Rating Scale test. No differences were found in satisfaction between the groups.

Conclusions: The group Otago Exercise Programme is equivalent to individually delivered Otago Exercise Programme in terms of prevention of falls over a 12-month follow up. Adherence was higher in individual training.

Implications: Healthcare professionals could offer either Otago Exercise Programme format dependent on patient preference and be confident that that standardized intervention provides patient benefit.

Trial registration: ClinicalTrials.gov (NCT03320668). Data registration 31/10/2017.

Keywords: Accidental Falls; Clinical Trial; Exercise Therapy; Otago Exercise Programme; Primary Care.

FallFitness exercise program provided using the train-the-trainer approach for community-dwelling older adults: a randomized controlled trial

Arkkukangas M, Bååthe KS, Hamilton J, Hassan A, Tonkonogi M. BMC Geriatr. 2024 Nov 30;24(1):983.

DOI: 10.1186/s12877-024-05575-0 **PMID:** 39616365

Abstract

Background: Falls and fall-related injuries remain a global challenge and threat to the health of older adults. Specific strength and balance exercises are effective in preventing falls among community-dwelling older adults. Nevertheless, provision of evidence-based fall prevention interventions to a broad population represents a healthcare challenge, indicating that new models for promoting exercise among community-dwelling older adults need to be addressed. Here, we aimed to evaluate the effects of a peer-led group-based exercise intervention provided using the train-the-trainer approach and targeting physical performance, activity level, handgrip strength, quality of life, fall-related self-efficacy, fear of falling, and falling techniques compared with a control group at 8-week follow-up.

Methods: This randomized controlled trial (RCT) included trainers and participants who were recruited from four collaborating regional organizations for retired persons. The intervention was planned to be provided in five municipalities in Sweden, depending on the location of the registered trainers. Eligible participants included adults aged ≥ 60 years who could walk independently and understand written and oral information in Swedish. The FallFitness multicomponent exercise program delivered weekly strength, balance, and falling techniques over eight weeks. It was evaluated using the train-the-trainer approach. Fourteen older adults were eligible for trainer education, and 101 participants were randomly allocated for the FallFitness exercise (n = 50) or a control group (n = 51).

Results: After 8 weeks of peer-led training, the short multicomponent exercise program significantly improved the physical activity levels ($p = 0.036$) and backward and sideways falling techniques ($p < 0.001$) compared to those in the control group. Fear of falling significantly decreased in the exercise group ($p = 0.009$). Other outcomes in this study showed to be non-significant.

Conclusions: The multicomponent exercise program provided in eight sessions using the train-the-trainer approach may be effective in promoting physical activity and the learning of motor skills and safe landing strategies. Furthermore, the FallFitness exercise program may reduce the fear of falling and may be both time- and cost-effective.

Trial registration: ClinicalTrials.gov, NCT06265480 (20240208).

Keywords: Falling techniques; Falls; Older adults; Public health.

Falls prevention interventions for community-dwelling older adults: systematic review and meta-analysis of benefits, harms, and patient values and preferences

Pillay J, Gaudet LA, Saba S, Vandermeer B, Ashiq AR, Wingert A, Hartling L. Syst Rev. 2024 Nov 26;13(1):289.

DOI: 10.1186/s13643-024-02681-3 **PMID:** 39593159 **PMCID:** PMC11590344

Abstract

Background: About 20-30% of older adults (≥ 65 years old) experience one or more falls each year, and falls are associated with substantial burden to the health care system, individuals, and families from resulting injuries, fractures, and reduced functioning and quality of life. Many interventions for preventing falls have been studied, and their effectiveness, factors relevant to their implementation, and patient preferences may determine which interventions to use in primary care. The aim of this set of reviews was to inform recommendations by the Canadian Task Force on Preventive Health Care (task force) on fall prevention interventions. We undertook three systematic reviews to address questions about the following: (i) the benefits and harms of interventions, (ii) how patients weigh the potential outcomes (outcome valuation), and (iii) patient preferences for different types of interventions, and their attributes, shown to offer benefit (intervention preferences).

Methods: We searched four databases for benefits and harms (MEDLINE, Embase, AgeLine, CENTRAL, to August 25, 2023) and three for outcome valuation and intervention preferences (MEDLINE, PsycINFO, CINAHL, to June 9, 2023). For benefits and harms, we relied heavily on a previous review for studies published until 2016. We also searched trial registries, references of included studies, and recent reviews. Two reviewers independently screened studies. The population of interest was community-dwelling adults ≥ 65 years old. We did not limit eligibility by participant fall history. The task force rated several outcomes, decided on their eligibility, and provided input on the effect thresholds to apply for each outcome (fallers, falls, injurious fallers, fractures, hip fractures, functional status, health-related quality of life, long-term care admissions, adverse effects, serious adverse effects). For benefits and harms, we included a broad range of non-pharmacological interventions relevant to primary care. Although usual care was the main comparator of interest, we included studies comparing interventions head-to-head and conducted a network meta-analysis (NMAs) for each outcome, enabling analysis of interventions lacking direct comparisons to usual care. For benefits and harms, we included randomized controlled trials with a minimum 3-month follow-up and reporting on one of our fall outcomes (fallers, falls, injurious fallers); for the other questions, we preferred quantitative data but considered qualitative findings to fill gaps in evidence. No date limits were applied for benefits and harms, whereas for outcome valuation and intervention preferences we included studies published in 2000 or later. All data were extracted by one trained reviewer and verified for accuracy and completeness. For benefits and harms, we relied on the previous review team's risk-of-bias assessments for benefit outcomes, but otherwise, two reviewers independently assessed the risk of bias (within and across study). For the other questions, one reviewer verified another's assessments. Consensus was used, with adjudication by a lead author when necessary. A coding framework, modified from the ProFANE taxonomy, classified interventions and their attributes (e.g., supervision, delivery format, duration/intensity).

For benefit outcomes, we employed random-effects NMA using a frequentist approach and a consistency model. Transitivity and coherence were assessed using meta-regressions and global and local coherence tests, as well as through graphical display and descriptive data on the composition of the nodes with respect to major pre-planned effect modifiers. We assessed heterogeneity using prediction intervals. For intervention-related adverse effects, we pooled proportions except for vitamin D for which we considered data in the control groups and undertook random-effects pairwise meta-analysis using a relative risk (any adverse effects) or risk difference (serious adverse effects). For outcome valuation, we pooled disutilities (representing the impact of a negative event, e.g. fall, on one's usual quality of life, with 0 = no impact and 1 = death and ~ 0.05 indicating important disutility) from the EQ-5D utility measurement using the inverse variance method and a random-effects model and explored heterogeneity. When studies only reported other data, we compared the findings with our main analysis. For intervention preferences, we used a coding schema identifying whether there were strong, clear, no, or variable preferences within, and then across, studies. We assessed the certainty of evidence for each outcome using CINeMA for benefit outcomes and GRADE for all other outcomes.

Results: A total of 290 studies were included across the reviews, with two studies included in multiple questions. For benefits and harms, we included 219 trials reporting on 167,864 participants and created 59 interventions (nodes). Transitivity and coherence were assessed as adequate. Across eight NMAs, the number of contributing trials ranged between 19 and 173, and the number of interventions ranged from 19 to 57. Approximately, half of the interventions in each network had at least low certainty for benefit. The fallers outcome had the highest number of interventions with moderate certainty for benefit (18/57). For the non-fall outcomes (fractures, hip fracture, long-term care [LTC] admission, functional status, health-related quality of life), many interventions had very low certainty evidence, often from lack of data. We prioritized findings from 21 interventions where there was moderate certainty for at least some benefit. Fourteen of these had a focus on exercise, the majority being supervised (for > 2 sessions) and of long duration (> 3 months), and with balance/resistance and group Tai Chi interventions generally having the most outcomes with at least low certainty for benefit. None of the interventions having moderate certainty evidence focused on walking. Whole-body vibration or home-hazard assessment (HHA) plus exercise provided to everyone showed moderate certainty for some benefit. No multifactorial intervention alone showed moderate certainty for any benefit. Six interventions only had very-low certainty evidence for the benefit outcomes. Two interventions had moderate certainty of harmful effects for at least one benefit outcome, though the populations across studies were at high risk for falls. Vitamin D and most single-component exercise interventions are probably associated with minimal adverse effects. Some uncertainty exists about possible adverse effects from other interventions. For outcome valuation, we included 44 studies of which 34 reported EQ-5D disutilities. Admission to long-term care had the highest disutility (1.0), but the evidence was rated as low certainty. Both fall-related hip (moderate certainty) and non-hip (low certainty) fracture may result in substantial disutility (0.53 and 0.57) in the first 3 months after injury. Disutility for both hip and non-hip fractures is probably lower 12 months after injury (0.16 and 0.19, with high and moderate certainty, respectively) compared to within the first 3 months. No study measured the disutility of an injurious fall. Fractures are probably more important than either falls (0.09 over 12 months) or functional status (0.12). Functional status may be somewhat more important than falls. For intervention preferences, 29 studies (9 qualitative) reported on 17 comparisons among single-component interventions

showing benefit. Exercise interventions focusing on balance and/or resistance training appear to be clearly preferred over Tai Chi and other forms of exercise (e.g., yoga, aerobic). For exercise programs in general, there is probably variability among people in whether they prefer group or individual delivery, though there was high certainty that individual was preferred over group delivery of balance/resistance programs. Balance/resistance exercise may be preferred over education, though the evidence was low certainty. There was low certainty for a slight preference for education over cognitive-behavioral therapy, and group education may be preferred over individual education.

Conclusions: To prevent falls among community-dwelling older adults, evidence is most certain for benefit, at least over 1-2 years, from supervised, long-duration balance/resistance and group Tai Chi interventions, whole-body vibration, high-intensity/dose education or cognitive-behavioral therapy, and interventions of comprehensive multifactorial assessment with targeted treatment plus HHA, HHA plus exercise, or education provided to everyone. Adding other interventions to exercise does not appear to substantially increase benefits. Overall, effects appear most applicable to those with elevated fall risk. Choice among effective interventions that are available may best depend on individual patient preferences, though when implementing new balance/resistance programs delivering individual over group sessions when feasible may be most acceptable. Data on more patient-important outcomes including fall-related fractures and adverse effects would be beneficial, as would studies focusing on equity-deserving populations and on programs delivered virtually.

Systematic review registration: Not registered.

Keywords: Fall prevention; Guideline; Interventions; Network meta-analysis; Patient preferences; Systematic review.

Falls Research – October and November Edition

Severity of Fall-Related Injuries and Older Persons' Hospital Admission in Kuwait: A Cross-Sectional Study

Alsaleh H, AlObaidi S, Alsaber A. J Frailty Aging. 2024;13(4):565-571.

DOI: 10.14283/jfa.2024.76 **PMID:** 39574283

Abstract

Background: Falls among the older population have attracted global attention, with a specific emphasis on the regional contexts of falls. This study reports the incidence and characteristics of falls in the State of Kuwait, where there is currently no national fall prevention strategy.

Methodology: A prospective, cross-sectional study reported on 420 individuals aged 55 years and above admitted to Alrazi Orthopaedic Hospital in Kuwait City due to falls between March 2022 and February 2023. ICD-10 codes were used to classify the fall causes. The National Database of Nursing Quality Indicators injury severity classification was used to classify the fall-related injuries. Structured interviews were used to identify 10 main fall risk factors. Annual fall-rate was calculated and fall-related injuries were reported in frequencies and percentages. Chi-square tests and multinomial logistic regression models were used to examine the cross-sectional associations between fall severity and risk factors to determine the factors that could predict more severe fall-related injuries.

Results: Fall-related injuries comprised 24.1% of the total hospital admissions, with 4% mortality rate. Around 31.6% of the falls led to temporary impairment injuries, 23.5% resulted in long-term impairment injuries, and 44.8% created potentially fatal injuries. The results of this study show that being between 55 and 74 years of age, having no history of falls, suffering from at least one illness, with no polypharmacy effect, and possessing fair vision are significantly associated with the severity of fall injuries. Being male (odds ratio [OR] = 3.38), being over 65 years of age (OR = 3.46), having a history of falls (OR = 2.49), and limitations in visual acuity predict more severe fall injuries among older individuals.

Conclusion: The severity of fall injuries is significantly associated with more capable older people. Government officials should immediately design and implement culture-specific fall-prevention strategies tailored to the targeted population.

Keywords: Falls; older people; severity of injuries.

Feasibility of a Multicomponent Digital Fall Prevention Exercise Intervention for At-Risk Older Adults

Bajdek N, Latham NK, Dishaw M, Farrell S, Shang YV, Pencina KM, Valderrábano R, McAlevey M, Dixon R, Williams A, Hachen N, Reid KF. J Frailty Aging. 2024;13(4):349-358.

DOI: 10.14283/jfa.2024.35 **PMID:** 39574283

Abstract

Background: Falls are a leading cause of disability, institutionalization and mortality for older adults. More effective strategies to prevent falls are essential and may help at-risk older adults continue to live independently. While exercise programs with in-person supervision reduce fall risk, there are numerous barriers associated with older adults' participation in such programs. Digitally delivered exercise interventions utilizing wearable technology may be an alternative fall prevention strategy for many vulnerable older adults.

Objectives: To evaluate the feasibility of a scalable, multicomponent, remotely delivered, digital fall prevention exercise intervention for community-dwelling older adults with elevated fall risk.

Design: This single arm intervention trial enrolled older adults who reported ≥ 2 falls, or ≥ 1 injurious fall in the past year, or fear of falling.

Study setting and participants: Community-dwelling adults aged ≥ 65 years were recruited from the greater Boston region, MA, USA.

Intervention: The 12-week multicomponent intervention was delivered via tablet and wearable sensors and consisted of a program of progressive moderate-intensity strength, power and balance training, adaptive aerobic walking exercise, regular coaching calls and digital motivational messaging.

Measurements: Intervention adherence and measures of intervention feasibility, acceptability, and appropriateness were evaluated. Intervention effects on measures of fall risk, physical and cognitive performance, and other measures of well-being were also examined.

Results: Twenty-three participants enrolled in the study and 20 completed the intervention (mean age: 76.3±5.5 yrs; BMI: 26.9±4.6 kg/m2; short physical performance battery score: 8.8±2.2; 70% female). Overall adherence rates were 84.4±14.6% with no serious adverse events. Significant reductions in fear of falling and improvements in cognition and technology readiness were elicited ($p \leq 0.04$).

Conclusion: This study has demonstrated the feasibility of a multicomponent digital fall prevention exercise intervention for at-risk older adults. Additional studies are warranted to establish the efficacy of this highly scalable fall prevention strategy.

Keywords: Falls; digital; exercise; multicomponent intervention.

Cost-effectiveness analysis of the digital fall preventive intervention Safe Step among community-dwelling older people aged 70 and older

Bajraktari S, Sandlund M, Pettersson B, Rosendahl E, Zingmark M. Eur J Ageing. 2024 Oct 26;21(1):32.PeerJ. 2024 Nov 13:12:e18512.

DOI: 10.1007/s10433-024-00828-8 **PMID:** 39455479 **PMCID:** PMC11511800

Abstract

Falls are the most common cause of injury in older people, with consequences for the individual and society. With an increasing population of older people, falls and related costs are expected to increase. It is crucial to identify scalable and cost-effective interventions and subsequently reduce fall-related costs. The aim was to evaluate the cost-effectiveness of the Safe Step digital fall preventive exercise intervention over a period of 12 years and, in addition, to evaluate the impact of increased recruitment cost and decreased intervention effect. The intervention was evaluated in an observational study in a municipality context targeting community-dwelling older people of age 70 + . A Markov model with five states was used to model the cost-effectiveness of the Safe Step intervention and evaluate quality-adjusted life years (QALYs) and fall-related costs from a societal perspective. By using data from a meta-analysis as basis for the estimated intervention effect, the Safe Step intervention was compared with a no-intervention alternative. The results showed that the Safe Step intervention dominated no intervention. In the sensitivity analysis with the most conservative estimate of intervention effect, the ICER was €7 616 per QALY gained. Hence, Safe Step showed to be a cost-saving fall preventive intervention in older people at risk of falling and potentially cost-effective even with a low estimated intervention effect. Future studies on efficacy of fall preventive digital interventions will contribute in precising effect estimates and enhance the validity of these cost-effectiveness results.

Keywords: Accidental falls; Balance and strength exercise; Cost-effectiveness; Digital health; Reach; mHealth.

Fall risk screening in older adults using the "CARE" frailty scale: The NuAge cohort results

Beauchet O, Matskiv J, Gaudreau P, Allali G, Vaillant-Ciszewicz AJ, Guerin O, Gros A. Maturitas. 2024 Oct 24:191:108134.

DOI: 10.1016/j.maturitas.2024.108134 **PMID:** 39500127

Abstract

Background: "CARE" is an electronic health (e-health) application (app) which assesses frailty with its frailty module and risk of falls with its mobility module. This study examines and compares the risk of incident falls (i.e., ≥1, ≥2 and severe falls) among older people in Quebec classified as "frail" and those classified as being at a high risk of falls by the CARE app.

Methods: A subset of men and women (n = 1151; 74.2 ± 4.2 years; 52.8 % female) who participated in the Quebec Longitudinal Study on Nutrition and Successful Aging (NuAge) were selected for this study. Pre-frail and frail states using the CARE frailty scale as well as high risk of falls estimated by CARE mobility module were determined at baseline. Pre-frail and frail states were merged in a single "frail state" group. Incident falls (i.e., ≥1, ≥2 and severe falls) were annually recorded over a 3-year follow-up.

Results: Both CARE frail state (Odd ratio (OR) ≥1.89 with P ≥ 0.040) and high risk of falls estimated by the CARE mobility module (OR) ≥3.32 with P ≥ 0.023) were significantly associated with incident falls (i.e., at least one fall) and recurrent falls (i.e., at least two falls). A greater association with these fall outcomes was observed with the high risk of falls than with the frail state. No significant association between the high risk of falls and severe falls was found (OR = 1.71 with P = 0.227), whereas that was the case with frail state (OR = 3.08 with P = 0.003).

Conclusions: Frail state determined by the CARE frailty module and high risk of falls determined by the CARE mobility module were both significantly associated with fall outcomes, a greater association being shown with the CARE high risk of falls and with CARE frail state for severe falls. These results suggest that the CARE app may be useful for screening older people for the risk of falls.

Keywords: Aging; Cohort study; Fall; Older adults; Screening tool; e-Health.

Gender differences in the incidence, characteristics and hospital admission outcomes of fall-related injuries in older adults in Victoria, Australia, over 5 years from 2018/19 to 2022/23

Berecki-Gisolf J, Rezaei-Darzi E, Natora AH. Front Public Health. 2024 Nov 14;12:1426726.

DOI: 10.3389/fpubh.2024.1426726 **PMID:** 39610389 **PMCID:** PMC11602514

Abstract

Background: Falls are the leading cause of injury morbidity and mortality in older adults. This study aimed to: (1) Explore gender differences in falls injury incidence and outcomes in Victoria, Australia; and (2) Test if these differences are explained by patient demographics and clinical complexity.

Method: Fall-related injury admissions records from 1-JULY-2018 to 30-JUNE-2023 were extracted from the Victorian Admitted Episodes Dataset. Admissions for injury (S00-T98) caused by a fall (W00-W19), in males and females aged 60+ years, were selected using ICD-10-AM codes. Incidence was calculated as annual falls admissions per 100,000 population. Gender differences in terms of demographics, falls details, injury types, complexity and admission outcomes were tested using logistic regression models.

Results: There were 187,878 fall-related injury admissions: 67,635 (36.0%) by males and 120,243 (64.0%) by females. The incidence rate ratio peaked at 1.52 (female: male) at 70-79 years. Compared to males, female fall injuries were more likely due to same-level falls and to occur at home. Female sex was associated with fractures and male sex was associated with head injuries. Although female sex was associated with surgery and longer hospital stay, death-in-hospital was associated with male sex, with and without adjustment for patient demographics, fall details, injury type and clinical complexity.

Conclusion: This contemporary gender-stratified study provides important evidence relevant to falls prevention and management. The findings suggest that same-level falls prevention is of particular relevance to females while in males, improved hospital outcomes and fall-related injury survivability, and any underlying frailty, should be prioritized.

Keywords: fall-related injury; gender; hospital outcomes; injury epidemiology; injury prevention; sex.

Loneliness and the prevalence of injuries, falls and fractures in older people

Ciochon A, Kozela M, Pajak A. European Journal of Public Health, 34(3), November 2024, ckae144.1953

DOI: 10.1093/eurpub/ckae144.1953

Abstract

The feeling of being alone (loneliness) experienced by older people contributes to deterioration of health, reduced physical and mental fitness, or inability to continue life roles. Loneliness may lead to behaviors that increase the risk of accidents, falls, and fractures, which are particularly dangerous in old age. The aim of this study was to assess the relationship between loneliness and the prevalence of injuries, falls, and fractures in older people. The studied group consisted of 464 people (48% men), aged 62-86 years (mean: 71.6, SD: 6.3), who participated in the Polish part of the HAPIEE Study (Health Alcohol and Psychosocial Factors in Eastern Europe); random subsample examined in 2019-2020. Trained nurses interviewed respondents in their homes. The 3-item UCLA scale (range 3-9, cut-off point≥6) was used to assess loneliness. Data on injuries or accidents in previous 10 years, falls in previous 12 months, history of wrist, hip fracture or undergoing joint surgery/alloplastic was recorded. Multivariable logistic regression analysis was used. There were 460 participants included in the analysis. In 34 participants (7.3%) UCLA score was ≥6. In the previous 10 years, 95 respondents (20.5%) reported an injury or accident, 77 (16.6%) fell in previous 12 months. There were 6 (1.3%) respondents with history of hip fracture, 48 (10.3%) with history of wrist fracture, and 35 (7.5%) with history of joint surgery/alloplastic. No statistically significant relationship between loneliness and the prevalence of injuries, falls and fractures in older residents was found neither in the crude models nor after adjustment for covariates (age, sex, BMI, marital status, having offspring). Loneliness did not predict injuries, falls, and fractures in older urban residents. It seems that perception of being alone is weaker determinant of health as a measure not fully reflecting objective social isolation, which may actually have a greater impact on falls and injuries.

Cost-effectiveness of falls prevention strategies for older adults: protocol for a living systematic review

Davis JC, Husdal K, Rice J, Loomba S, Falck RS, Dimri V, Pinheiro M, Cameron I, Sherrington C, Madden KM, Liu-Ambrose T. BMJ Open. 2024 Nov 5;14(11):e088536.

DOI: 10.1136/bmjopen-2024-088536 **PMID:** 39500610 **PMCID:** PMC11552585

Abstract

Introduction: One-third of adults aged 65+ fall annually. Injuries from falls can be devastating for individuals and account for 1.5% of annual healthcare spending. With the growing ageing population, falls place increased strain on scarce health resources. Prevention strategies that target individuals at high risk for falls demonstrate the best value for money; however, limited efficiency (ie, cost-effectiveness) information for fall prevention interventions hinders the implementation of effective falls prevention programmes. Living systematic reviews provide a timely up-to-date evidence-based resource to inform clinical guidelines and health policy decisions. This protocol details the methodology for a living systematic review of the efficiency (ie, cost-effectiveness) of fall prevention interventions for older adults in three settings: community-dwelling, aged care and hospitals.

Methods and analysis: This protocol used the reporting guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocol. Peer-reviewed economic evaluations of controlled clinical trials or health state models will be included. Reports will be obtained through monthly systematic searches of CENTRAL (Ovid), CINAHL (EBSCO), Embase (Ovid), MEDLINE (Ovid), SCOPUS (Elsevier) and Web of Science (Clarivate) alongside snowballing and handsearching EconLit and the Tufts Cost Effectivness Analysis Registry. Screening, data extraction, quality assessment and risk of bias will be assessed by multiple reviewers. The primary outcomes will be the incremental cost-effectiveness (ie, incremental cost per fall prevented), incremental cost-utility (ie, incremental cost per quality-adjusted life year gained) or cost-benefit ratio. Additional outcomes will include falls and cost-related measures. All economic outcomes will be reported in a common year and currency. Results will be reported as a narrative synthesis; meta-analysis will be considered based on data quality, suitability and availability.

Ethics and dissemination: Ethical approval is not required as primary human data will not be collected. Results will be disseminated through peer-reviewed publications and a dedicated website.

Prospero registration number: CRD42024532485.

Keywords: Aged; Ageing; HEALTH ECONOMICS; Health Care Costs.

Standing balance test for fall prediction in older adults: a 6-month longitudinal study

de Abreu DCC, Bandeira ACL, Magnani PE, de Oliveira Grigoletto DA, de Faria Junior JR, Teixeira VRS, Fuentes VM, de Matos Brunelli Braghin R. BMC Geriatr. 2024 Nov 15;24(1):947.

DOI: 10.1186/s12877-024-05380-9 **PMID:** 39548372 **PMCID:** PMC11566129

Abstract

Background: A core component of older adult health care assessment includes identifying fall risk, which also includes identifying those with subtle balance deficits.

Objective: To compare body displacement of the Center of Pressure (CoP) and time held during the balance test. Also, to examine whether balance tests at baseline can predict falls after 6 months.

Methods: A longitudinal study with 153 community-dwelling older adults, between 60-89 years old. Anteroposterior (AP) and mediolateral (ML) amplitude and velocity CoP displacements were assessed in four upright positions using a force platform: double-leg, semi-tandem, tandem, and single-leg stances, with a maximum duration of 30 s each. Adjusted repeated measures ANOVA were used to compare the differences among the balance positions. Comparisons between males and females were also conducted. Logistic regression adjusted for confounders was performed to verify whether upright balance tests can predict future falls.

Results: As the base of support narrows, body sway increases. A decrease in stance time was observed across the balance stages, i.e., double-leg/semi-tandem versus tandem versus single-leg stances. The mean duration held in the single-leg stance was 14.8 s and for tandem was 22.2 s. Similar stance durations were observed for double-leg and semi-tandem stances. Males were able to maintain balance positions longer than females even with greater CoP displacement. ML amplitude of CoP displacement and the time held during tandem and single-leg positions were able to predict falls after 6 months ($p < 0.05$).

Conclusion: In clinical practice in which only stance time is recorded, it is possible to interchangeably use the double-leg or semi-tandem stance. To identify early signs of imbalance, we suggest setting a time limit for the balance test equal to or greater than 23 s, as 10 s appear to be insufficient to detect subtle balance deficits. The time maintenance on tandem and single-leg positions was able to predict future falls.

Keywords: Aging; Body sway; Center of pressure; Force platform; Sex difference.

Association of fall risk-increasing drugs with falls in generally healthy older adults: a 3-year prospective observational study of the DO-HEALTH trial

de Godoi Rezende Costa Molino C, Forster CK, Wieczorek M, Orav EJ, Kressig RW, Vellas B, Egli A, Freystaetter G, Bischoff-Ferrari HA; DO-HEALTH Research Group. BMC Geriatr. 2024 Nov 29;24(1):980.

DOI: 10.1186/s12877-024-05557-2 **PMID:** 39614147 **PMCID:** PMC11606022

Abstract

Background: The association between fall risk-increasing drugs (FRIDs, medications known to be associated with falls) and the number of falls among generally healthy and active community-dwelling older adults is understudied. Prior studies have focused on individual medication classes or have predominantly relied on retrospective assessments of falls. The aim of this study was to investigate the association between FRID use at baseline and the prospective incidence rates of total, injurious and recurrent falls in community-dwelling older adults.

Methods: This is a 3-year observational analysis of DO-HEALTH, a randomized controlled trial, among community-dwelling adults aged ≥ 70 years without major diseases at baseline. The main exposures were use of at least one FRID and multiple FRIDs (≥ 2 FRIDs) at baseline. The number of total falls (including high- and low-trauma falls, as well as injurious falls) over 3 years of follow-up was defined as the primary outcome, and the number of injurious and the number of recurrent total falls (≥ 2 falls), as the two separate secondary outcomes. To examine these associations, separate negative binomial regression models controlled for the fixed effects of treatment allocation in the DO-HEALTH trial, study site, fall in the last year, age, sex, BMI, and walking aid were used. Additionally, an offset of the logarithm of each participant's time in the study was included in the models.

Results: A total of 2157 participants were included, with a baseline median age of 74.0 years, 61.7% of whom were women, and 41.9% having experienced a prior fall in the year preceding enrolment. At baseline, 908 (42.1%) participants used at least one FRID, and 351 (16.3%) reported multiple FRIDs use. Prospectively, over 3 years of follow-up, 3333 falls were reported by 1311 (60.8%) out of the 2157 participants. Baseline use of at least one FRID was significantly associated with increased incidence rates of total falls (incidence rate ratio (IRR) [95% Confidence Interval (CI)] = 1.13 [1.01-1.27]), injurious falls (IRR = 1.15 [1.02-1.29]), and recurrent falls (IRR = 1.12 [1.01-1.23]) over 3 years. These associations were most pronounced among users of multiple FRIDs, with increased incidence rates of total falls (IRR = 1.22 [1.05-1.42]), injurious falls (IRR = 1.33 [1.14-1.54]) and recurrent falls (IRR = 1.14 [1.02-1.29]).

Conclusion: Our results suggest that FRID use is associated with increased prospective incidence rates of total, injurious, and recurrent falls even among generally healthy older adults.

Trial registration: DO-HEALTH is registered as NCT01745263 on clinicaltrials.gov, with a registration date of 2012-12-06.

Keywords: Adverse events; Community-dwelling older adults; DO-HEALTH; Fall risk-increasing drugs; Falls; Longitudinal study; Medications; Prospective study.

Use of the walking and turning test to accurately discriminate between independently ambulatory community-dwelling older Thai adults with and without a history of falls: a retrospective diagnostic study

Duangsanjun W, Poncumhak P. BMJ Open. 2024 Nov 11;14(11):e089944.

DOI: 10.1136/bmjopen-2024-089944 **PMID:** 39532380 **PMCID:** PMC11555103

Abstract

Objectives: This study developed and investigated the possibility of using the walking and turning test (WTT) to indicate fall risk in community-dwelling older adults.

Design: Retrospective diagnostic study.

Setting: The study was carried out in a community setting.

Participants: The study focused on community-dwelling older Thai adults.

Primary and secondary outcome measures: The participants were assessed based on demographics, fear of falls using a 'yes/no' question and the Short Falls Efficacy Scale International, as well as fall data in the previous 6 months. The participants then performed the WTT, timed up and go test, five times sit-to-stand test and handgrip strength test (HG) in random order.

Results: There were a total of 86 participants with an average age of 69.95±6.10 years (range from 60 to 88 years), most of whom were female (67.44%). 40 participants (46.51%) reported that they had fallen at least once in the previous 6 months. A comparison of various physical ability tests revealed significant differences between faller and non-faller participants ($p<0.001$). The outcomes of the WTT showed significant correlations with fall variables, balance and muscle strength (0.394 to 0.853, $p<0.001$). Based on sensitivity, specificity and area under the curve, the cut-off score of 6.40 s showed the highest level of ability to indicate falls among community-dwelling older adults, with a sensitivity of 92.50% and a specificity of 78.26%.

Conclusions: The study suggests the clinical usefulness of the WTT in determining falls in older individuals. WTT is a physical ability measurement that indicates balance ability and muscle strength. The test is practical, requires little space and equipment and can be used in large populations.

Keywords: Aging; Gait; REHABILITATION MEDICINE.

Optimal cutoff score of the circular tandem walk test for determining the risk of falls in older community-dwelling individuals with type 2 diabetes

Duangsanjun W, Poncumhak P, Namwong W. Sci Rep. 2024 Nov 7;14(1):27151.

DOI: 10.1038/s41598-024-78934-x **PMID:** 39511407 **PMCID:** PMC11544173

Abstract

Patients with chronic diabetes may have a physical performance decline, which significantly increases the risk of falling. The study aimed to assess the validity of the Circular Tandem Walk Test (CTWT) in determining fall risk among older community-dwelling Thais with type 2 diabetes mellitus (T2DM). This is a cross-sectional diagnostic study of 71 older participants with T2DM from various communities. The participants were divided into "faller" (who had experienced one or more fall events) and "non-faller" groups based on 6-month fall history data. They were then interviewed about their fear of falling (FOF) using a single question and the Falls Efficacy Scale International (FES-I), followed by the CTWT. Thirty-five participants reported having fallen in the past six months. Significant differences were in the fallers and non-fallers CTWT, FOF, and FES-I scores ($p < 0.001$). CTWT results were significantly correlated with FOF (rpb = 0.605, $p < 0.001$), FES-I (rho = 0.837, $p < 0.001$), and number of falls (rho = 0.736, $p < 0.001$). The study suggested that the cutoff score for CTWT is 15.2 s, with a sensitivity = 80.00, specificity = 86.11, and AUC = 0.915. This study demonstrated the validity of the CTWT for determining the risk of falls in older community-dwelling individuals with T2DM. Implementing this tool in a community setting would be helpful in the initial screening and referral of data by concerned healthcare professionals. However, further studies may be needed to explore the reliability of CTWT and ensure the appropriate clinical use of CTWT by healthcare professionals.

Keywords: Balance ability; Diabetes; Falls; Screening tool; Tandem walk.

The Associations Between Depression, Regular Exercises, and Falls Among the Community Dwelling Older People.

Fang L, Fang CL, Fang SH. Florence Nightingale J Nurs. 2024 Jun 28;32(2):184-189.

DOI: 10.5152/FNJN.2024.23296 **PMID:** 39552178 **PMCID:** PMC11332437

Abstract

The aim of this study was to explore the relationship between regular exercise, depression, and fall among the community older people to find out the predictors of fall. This study applied cross-sectional and correlational study design. The study recruited 285 community older people by using the questionnaires which included social-demographic data, regular exercise, depression, and whether fall history questionnaires were used in this study. The mean score of the depression scale for older people was 3.47 (SD 2.92). People who took anti-hypertensive or anti-diabetes drugs have higher risks of falls than those who did not (B = 1.659; p < .001; Exp (B) = 5.256). Community-dwelling older people with regular exercise have a lower risk of falls than those without (B = -1.485; p < .001; Exp(B) = 0.227). Rehabilitation programs designed to improve both the older people's physical function and mental health played very important roles in preventing falls. It is necessary to undergo depression screening programs for the community older people in order to detect older people depression in advance and prevent the incidence of falls.

Feasibility of Fall-Risk Detection in Older Adults: Real-World Use of Sensor Data With Machine Learning

Farmer M, Powell KR. J Gerontol Nurs. 2024 Oct;50(10):7-10.

DOI: 10.3928/00989134-20240912-03 **PMID:** 39361636

Abstract

Purpose: To use machine learning techniques with sensor data to predict fall risk in older adults aging in place.

Method: We tested the feasibility of using anomaly detection on a dataset comprising 315 days of continuous unobtrusive sensor data obtained from a single participant to predict fall risk within a 10-day window. Predictions were validated with performance metrics, including accuracy, F1 score, and receiver operating characteristic-area under curve (ROC-AUC), using actual falls documented in the electronic health record.

Results: The model resulted with accuracy = 0.96 (95% confidence interval [CI] [0.94, 0.99]), F1 = 0.78 (95% CI [0.73, 0.83]), and ROC-AUC = 0.89 (95% CI [0.85, 0.93]).

Conclusion: The application of anomaly detection on sensor data may provide a timely and valid indication of fall risk in older adults within a 10-day window. Further research and validation are warranted to confirm these findings and expand the scope of application in the domain of older adult care and health care support. [Journal of Gerontological Nursing, 50(10), 7-10.].

Impacts of Square Stepping Exercise on Physical-Cognitive Function, Biomarkers, Body Composition and Mental Health in Healthy Senior Aged 60 and Above: A Systematic Review

Franco-García, J.M.; Carlos-Vivas, J.; Castillo-Paredes, A.; Mayordomo-Pinilla, N.; Rojo-Ramos, J.; Pérez-Gómez, J. Healthcare. 2024; 12(23):2325.

DOI: 10.3390/healthcare12232325

Abstract

Background: The aim of this systematic review is to analyze the effects of Square Stepping Exercise (SSE) on physical and cognitive function in older people, including its effects on biomarkers, body composition and mental health, focusing only on research that assessed the efficacy of SSE-based interventions.

Methods: PubMed, Web of Science, Scopus and Cochrane databases were searched from June 2006 to June 2024 according to the PRISMA guidelines. The main search terms used were related to "older people" and "square-stepping exercise". Controlled trials that included at least one intervention group focused on SSE were included. Participants had to be healthy, without physical or cognitive impairment, and the studies published in English or Spanish. The methodological quality of the selected research was assessed using the Physiotherapy Evidence Database (PEDro).

Results: Twelve studies were selected from a total of 444 original records, with a total sample size of 577 participants. The health parameters of the participants were homogeneous, with ages ranging from 60 to 80 years. Significant gains were reported in certain physical function assessments, including balance, lower body strength and power, gait speed and flexibility. There were also significant findings in cognitive function, particularly in general cognitive status, focused attention, response time, basic task performance, and executive function. In addition, SSE can improve metrics such as body composition, brain-derived neurotrophic factor (BDNF), and mental health characteristics.

Conclusions: SSE has the potential to significantly improve physical function, cognitive performance and body composition, as well as provide mental health benefits and have variable effects on biomarkers and cardiovascular health.

Keywords: body composition; executive function; fear of falling; muscle strength; physical fitness

Association between weight and body composition changes with falls risk in the Malaysian Elders Longitudinal Research (MELoR) study

Hashim NNA, Mat S, Myint PK, Kioh SH, Delibegovic M, Chin AV, Kamaruzzaman SB, Hairi NN, Khoo SPK, Tan MP. BMJ Open. 2024 Nov 7;14(11):e087358.

DOI: 10.1136/bmjopen-2024-087358 **PMID:** 39510770 **PMCID:** PMC11552593

Abstract

Objective: Both changes in body composition and increased fall risk occur with increasing age. While weight management may be considered a component of falls prevention, the long-term consequences of changes in weight, however, remain uncertain. This prospective study aimed to evaluate the relationship between weight and body composition changes over 5 years with fall occurrence.

Design: Prospective cohort study.

Setting: Community-dwelling older adults interviewed at baseline (2013-2016) and follow-up (2020-2022) as a part of the Malaysian Elders Longitudinal Research study were included.

Participants: Participants who attended face-to-face follow-up visits.

Primary and secondary outcome measures: Fall occurrence over 12 months preceding the follow-up visit was determined. Anthropometric, bioimpedance analysis and physical performance measurements were obtained at both time points. Participants were categorised into three groups according to changes in weight and body composition using≥5% increase or decrease in weight to determine loss or gain.

Results: Of the 225 participants, aged 71.8±6.8 years, 128 (56.9%) were women. Weight gain was associated with increased fall risk at follow-up compared with stable weight (adjusted rate ratio, aRR (95% confidence interval, CI)=2.86 (1.02-8.02)) following adjustments for age and body mass index (BMI), but this relationship was attenuated by low baseline percentage lean body mass (%LBM) in women. The association was strenghtened after adjusting for age, BMI, and low muscle strength (aRR (95% CI)=2.89 (1.01-8.28)). Weight change did not influence falls risk in men. No difference was observed with changes in percentage body fat and %LBM over time with fall occurrence for both genders.

Conclusion: Lower baseline lean body mass influenced the relationship between weight gain and falls longitudinally. Interventions addressing low lean body mass should be considered in the prevention of weight-gain-related falls in older women.

Keywords: Aging; Risk Factors; Weight Gain.

The prevalence of falls and associated factors in older adults of the Torres Strait

Henry R, Sagigi B, Miller G, Russell SG, Thompson F, Quigley R, Strivens E. Australas J Ageing. 2024 Oct 27.

DOI: 10.1111/ajag.13383 **PMID:** 39462242

Abstract

Objective: To assess the prevalence of falls and examine associations between falls and potential risk factors in older adults of the Torres Strait Region of Australia.

Methods: Two hundred and fifty people aged ≥45 years residing in the Torres Strait, who identified as Torres Strait Islander, Aboriginal or both, were asked whether they had sustained any falls in the past year. Associations between self-reported falls and predictor variables were examined using logistic regression.

Results: 21% of participants reported at least one fall; 9% reported ≥2 falls. Participants who reported any falls in the past year were more than twice as likely to have urinary incontinence and poor mobility ($p < .01$) compared to participants who did not report any falls.

Conclusions: Around one in five respondents reported one or more falls in the past year, demonstrating that falls are a significant issue for older adults of the Torres Strait. Fall prevention strategies that are effective in other populations are likely to be beneficial to the region but need to be informed by local consultation and implemented in partnership with the people of the Torres Strait.

Keywords: Australian Aboriginal and Torres Strait Islander Peoples; accidental falls; accidental injuries; healthy ageing.

Implementation and Impact of a Lifting Cushion for Care Home Residents Who Have Fallen

Houghton R, Cowdell F, Fry D, Dyson J. Int J Older People Nurs. 2024 Nov;19(6):e12664.

DOI: 10.1111/opn.12664 **PMID:** 39498861

Abstract

Introduction: Falls are a global public health problem and the second leading cause of death from unintentional injury. Globally, approximately 30%-50% of people living in nursing or residential care homes fall each year. Falls have an impact on quality of life and morbidity. Prevention of falls is gold standard care. When falls do occur, implementation of safe strategies to help the person rise is required. Structured risk assessment and the use of a 'lifting' cushion are one such strategy.

Aims: To evaluate the impact of the lifting cushion on management of falls and assess barriers and facilitators to staff use of the lifting cushion in 18 care homes.

Methods: Two-phase study involving (i) capturing quantitative pre- and post-cushion implementation data along with comparison of means testing and (ii) theoretically underpinned qualitative semi-structured interviews to explore barriers and facilitators to cushion implementation with inductive and deductive data analysis.

Results: The cushion was used a total of 32 times out of 567 post-implementation recorded falls (6% of all falls). Barriers and facilitators to cushion use aligned to the Theoretical Domains Framework include knowledge, skills and confidence, emotion, beliefs about safety and decision processes, environmental context and resources and social influences.

Conclusion: The lifting cushion was poorly adopted. Identified barriers to adoption would not be addressed using routine train and cascade processes. We identified facilitators that could be enhanced to promote uptake. Theoretically underpinned implementation strategies, tailored to assess determinants, are known to be more effective; however, this approach has rarely been used in care homes. We have demonstrated a structured approach to implementation of cushion use; this may be transferable to other care home practices.

Implications for practice: Cae home leaders should be aware that giving information alone will not change practice. Implementation or improvement strategies will be more effective.

Keywords: Theoretical Domains Framework; care home; implementation; lifting cushion.

Fear of falling and its related factors in older adults following a fall in Kashan, Iran (2023-2024)

Izadi-Avanji FS, Safa A, Abedzadeh-Kalahroudi M, Shaterian N. BMC Geriatr. 2024 Nov 20;24(1):965.

DOI: 10.1186/s12877-024-05560-7 **PMID:** 39567872 **PMCID:** PMC11577670

Abstract

Background: Falling is a significant challenge in old age, often leading to isolation, self-imposed limitation, reduced movement, and muscle strength. This study aimed to explore the fear of falling and its related factors in older adults following a fall in Kashan, Iran.

Methods: This cross-sectional study followed 200 older adults who visited medical centers in Kashan from July 2023 to May 2024. Continuous sampling was carried out. Data collection involved a background information questionnaire, the shortened version of the falls efficacy scale-international in older adults, the independence scale of activities of daily living, and the short-form state-trait anxiety inventory. Data were gathered before, one month, and three months after the fall. Data analysis utilized SPSS-24, including t-test, ANOVA, Pearson's correlation coefficient, and repeated measures analysis of variance.

Results: Participants had a mean age of 71.34 ± 8.36 years (ranging from 65 to 96 years). There was a significant increase in fear of falling scores one month and three months after the fall ($P < 0.001$). Multiple linear regression revealed that factors such as illiteracy, old age, and previous falls were predictors of fear of falling before the fall ($P < 0.05$). One month after the fall, predictors included illiteracy, hip fracture, and high anxiety scores ($P < 0.05$). Three months after the fall, predictors encompassed illiteracy, hip fracture, high anxiety score, and internal fixator placement as a treatment intervention ($P < 0.05$), explaining 15% of the variance in fear of falling.

Conclusions: Identifying predictive factors for fear of falling can assist health policymakers in developing a holistic care plan to enhance the quality of life for older adults post-fall. It is essential to screen for fear of falling levels, particularly after trauma, offer educational counseling services, particularly in mental health, after discharge, and prepare training programs related to fall prevention.

Keywords: Accidental falls; Aged; Fear.

Risk factors for falls in older people with pre-frailty: A systematic review and meta-analysis

Jing H, Chen Y, Liang B, Tian Z, Song F, Chen M, Kong W, Duan Y. Geriatr Nurs. 2024 Nov 8:S0197-4572(24)00346-X.

DOI: 10.1016/j.gerinurse.2024.10.030 **PMID:** 39521661

Abstract

Background: Frailty is considered highly prevalent among the elderly, and falls are a severe adverse event that occurs at a significantly higher rate in frail elderly patients, leading to serious consequences. The pre-frailty stage represents a reversible transitional state between health and frailty, and targeted interventions for pre-frail older adults can effectively reduce the incidence of falls in this population. Existing studies have not definitely identified the risk factors for falls in pre-frail older adults. This paper explores the relevant risk factors for falls in pre-frail older adults.

Methods: PubMed, Embase, Web of Science, Cochrane Library, CBM, CNKI, Wan fang, and VIP databases were searched for studies published from inception to 2023, without language restrictions. Observational studies were included in this systematic review that analyzed risk factors for accidental falls in pre-frail older adults. The NOS scale was used to evaluate the quality of cohort studies and case-control studies, while the AHRQ scale was used to evaluate the quality of the cross-sectional study. We utilized odds ratios (OR) and their corresponding 95 % confidence intervals (CI) to describe the statistical indicators. OR and 95 % CI values were directly extracted and organized in Excel. In cases where OR and CI values were not directly available, we extracted β and p values, calculated Exp using functions, and subsequently derived OR and 95 % CI using formulas. Finally, data pertaining to each risk factor were incorporated into RevMan 5.4 software for statistical analysis and effect size synthesis. We performed tests for heterogeneity and evaluated publication bias.

Results: A total of 14,370 studies were initially identified, and 26 studies were included in the systematic review. Among these studies, 14 were of high quality, while the remaining 12 were of moderate quality. A total of 16 risk factors were identified as potential risk factors for falls in pre-frail older adults. Significant risk factors were peripheral neuropathy(OR = 3.18, 95 %CI:3.02-3.35), decreased gait speed(OR = 1.90, 95 %CI:1.60-2.27), decreased ability to perform activities of daily living(OR = 1.57, 95 % CI:1.42-1.75), grip strength decreases(OR = 1.53, 95 % CI:1.17-2.00), gender (female)(OR = 1.51, 95 % CI:1.39-1.64), pain(OR = 1.47, 95 %CI:1.41-1.54), history of falls(OR = 1.20, 95 %CI:1.13-1.28) and age(OR = 1.10, 95 %CI:1.07-1.14).

Conclusions: The occurrence of falls in pre-frail older adults is associated with multiple risk factors. These risk factors can provide clinical nursing staff with specific focal points for monitoring this population and devising targeted fall prevention measures, with the aim of reducing the incidence of falls in pre-frail older adults.

Registration: The systematic review was registered on the International Prospective Register of Systematic Review (CRD42023450670).

Keywords: Elderly patients; Fall; Meta-analysis; Pre-frailty; Risk factors.

Cross-sectional analysis of speed-up mechanism in normal gait among healthy older adults with and without falls - Results from the Baltimore Longitudinal Study of Aging

Ko SU, Jerome GJ, Simonsick EM, Ferrucci L. Gait Posture. 2024 Nov 13:115:82-85.

DOI: 10.1016/j.gaitpost.2024.11.004 **PMID:** 39566360

Abstract

Background: Falls in older adults increase the risk of mobility loss. Proper understanding of gait mechanisms related to falls may provide novel solutions for maintaining mobility in older adults.

Research question: Identify fall-related gait patterns through analyzing alterations in gait parameters to walk faster than usual pace in older adults.

Methods: A Total of 519 participants (mean age = 73.12 years; 51.05 % female), including non-fallers (n = 396) and fallers (n = 123), aged 60-96 years were assessed in the Baltimore Longitudinal Study of Aging. Participants completed gait assessments at both usual and fast paces. Range of motions (ROM) for the hip, knee, and ankle joint in the sagittal plane and hip abductor ROM during normal and fast pace gait were measured by 3D motion capture system (Vicon 612). For all gait variables, percentage-changes (PC; (((fast-walking_parameter - usual-walking_parameter) /usual-walking_parameter)*100)) was calculated. Associations of PC for gait speed and PC for other gait parameters were compared between fallers and non-fallers.

Results: Compared to non-fallers, fallers walked with shorter stride, elongated double support time and shorter knee ROM in the faster pace walk ($p = 0.044$, $p = 0.019$, and $p = 0.036$, respectively). PCs of all gait related variables were significantly associated with PC of gait speed in non-fallers (ps < 0.005), while in the fallers, only PC for stride length, cadence, and hip ROM were associated with PC for gait speed (ps < 0.001).

Significance: Among non-fallers related PC for gait speed was associated with PC across gait parameters suggesting the use of similar biomechanical approaches in usual and fast gait. Compared to non-fallers, fallers demonstrated different mechanisms of transition from usual to fast gait. Evaluating speed-up strategies could provide insight into subtle yet important gait modifications in apparently well-functioning older adults that would help identify individuals at high risk of falling.

Keywords: BLSA gait lab; Falls; Speed-up strategies.

Emerging Digital Technologies Used for Fall Detection in Older Adults in Aged Care: A Scoping Review

Konara Mudiyanselage SP, Yao CT, Maithreepala SD, Lee BO. J Am Med Dir Assoc. 2024 Nov 1;26(1):105330.

DOI: 10.1016/j.jamda.2024.105330 **PMID:** 39492106

Abstract

Objective: To explore a comprehensive overview of digital technologies used for fall detection in older adults, categorizing the types, functions, and usability of these systems.

Design: A scoping review was conducted to search across 5 databases [Embase, Medline (OVID), CINAHL, Coherence and IEEE Explore] from January 2013 to September 2023.

Setting and participants: Studies in older adults living in nursing homes, care homes, residential homes, respite care homes, and all skilled and ambulatory care facilities (without context restrictions).

Methods: This review followed the 6 methodological stages: (1) identification of research question; (2) identification of relevant studies; (3) study selection; (4) charting the data; (5) collating, summarizing, and reporting the results; and an optional stage, (6) consulting with stakeholders regarding findings to explore pivotal concepts in emerging technology usage in long-term care for falls detection among older people. Data were extracted and categorized based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.

Results: A total of 73 studies met the inclusion criteria. Four main categories of fall detection technologies were identified: motion and sensor technologies, imaging and visual systems, environmental sensors, and robotic and autonomous systems. Commonly used devices: wearable accelerometers, gyroscopes, infrared array sensors, and smart carpet pressure sensors. Data storage methods were wearable devices, cameras, and floor-mounted sensors. Communication technologies included Bluetooth, Wi-Fi, and GPS, and notification methods ranged from alarms and SMS to cloud communications. Various health care response teams, including caregivers, health care providers, and emergency services, were integral to the fall detection systems.

Conclusions and implications: Most studies primarily focus on fall detection; however, we recommend further clinical research to emphasize both fall detection and, more importantly, fall prevention (both primary and secondary). Investigating the effectiveness of fall prevention technologies in real-world settings will be crucial for enhancing the safety and quality of life of the aging population.

Keywords: Digital technology; aged care; fall detection systems; fall prevention; older people.

Malnutrition and Fall Risk in Older Adults: A Comprehensive Assessment Across Different Living Situations

Mziray M, Nowosad K, Śliwińska A, Chwesiuk M, Małgorzewicz S. Nutrients. 2024 Oct 30;16(21):3694.

DOI: 10.3390/nu16213694 **PMID:** 39519527 **PMCID:** PMC11547385

Abstract

Background: Malnutrition among older adults is associated with numerous adverse effects, including increased morbidity, mortality, prolonged hospital stays, and a heightened risk of falls. This study aims to investigate the prevalence of malnutrition in different groups of older adults using the F-MNA, anthropometry, and s-albumin and the association between nutritional status and fall risk.

Methods: A total of 228 participants aged 60 years and older were divided into three groups: (1) patients in an internal medicine ward, (2) individuals living in family homes, and (3) residents of care homes. Disease profiles, nutritional status (assessed using the F-MNA and SNAQ), body composition, fall risk, and biochemical markers were evaluated.

Results: The results indicated the highest prevalence of malnutrition among hospitalized individuals. Fall risk was associated with age, calf circumference, the F-MNA, the SNAQ, serum albumin levels, residence in a care home, comorbidities, and the number of medications taken daily. Regression analysis revealed that age, calf circumference, and residence in a care home were independent predictors of fall risk in older adults.

Conclusion: Older adults are at significant risk of malnutrition, with the risk notably increasing during hospitalization and long-term stays in care homes. Hospitalized individuals had the poorest nutritional status and were at significant risk of further weight loss, underscoring the importance of post-discharge care and rehabilitation.

Keywords: assessment of nutritional status; fall risk assessment; malnutrition; older people.

Inpatient referrals to a specialist falls and syncope service: prevalence of STOPPFall FRIDs and review of deprescribing patterns

O'Donnell D, Zainal T, Malomo K, Fitzpatrick N, Rice C, Byrne L, Briggs R, Cunningham C, Kenny RA, Lavan AH. Eur J Clin Pharmacol. 2024 Nov 23.

DOI: 10.1007/s00228-024-03776-5 **PMID:** 39578287

Abstract

Purpose: Falls are the commonest cause of accidental death in older people and the most frequent reason for their presentation to hospital. The Screening Tool of Older Persons Prescriptions in older adults with high falls risk (STOPPFall) facilitates deprescribing by providing a clear consensus on which medications are considered fall-risk-increasing drugs (FRIDs). This study aimed to determine the prevalence of STOPPFall FRIDs in inpatients referred to a falls and syncope service (FASS). Additionally, we aimed to analyse the impact of a dedicated FASS on deprescribing, both of FRIDs and of non-FRID medications.

Methods: We conducted a retrospective observational study of all FASS inpatient consultations over a 6-month period (March-August 2021). Patients ≥ 65 years old were included. Medications on admission and discharge (following FASS assessment) were reviewed, with FRIDs identified using the STOPPFall deprescribing tool. The prevalence of FRIDs was defined as the proportion of patients who had at least one regular FRID prescribed on admission.

Results: In total, 162 patients were included for review: 54.94% were (n = 89) female. The mean age of patients was 79.26 years (SD 7.45). STOPPFall FRIDs were prevalent, with 74.07% (120/162) on at least 1 regular FRID. Antidepressants (37.04%, n = 60) and diuretics (27.78%, n = 45) were the most frequently prescribed FRID classes. Of patients with a fracture, the mean number of FRIDs was 2.44 versus 1.56 in those without fracture (p = 0.01). At least one FRID was stopped in 35. 8% (n = 58) of patients. Following FASS review, 28.6% (n = 79) of all admission FRIDs were discontinued.

Conclusion: STOPPFall FRIDs are prevalent in patients referred for inpatient FASS consultations. Presentations with acute fracture are associated with higher number of FRIDs on admission. Review by a dedicated hospital falls service leads to a reduction in FRIDs and deprescribing of anti-hypertensive medications.

Keywords: Fall-risk-increasing drugs; Falls; Older adults.

Fall risk-increasing drugs and associated health outcomes among community-dwelling older patients: A cross-sectional study in Croatian cohort of the EuroAgeism H2020 project

Paar E, Lai E, Držaić M, Kummer I, Bužančić I, Hadžiabdić MO, Brkic J, Fialová D. Acta Pharm. 2024 Nov 19.

DOI: 10.2478/acph-2024-0034 **PMID:** 39560349

Abstract

Our study aimed to assess the prevalence of fall risk-increasing drugs (FRIDs) in a sample of community-residing older patients in Croatia and its association with negative health outcomes. An observational, cross-sectional study was conducted on older patients (65+) visiting community pharmacies in three regionally different study sites in Croatia. Data were collected using a questionnaire developed for that purpose and included components of comprehensive geriatric assessment. Prevalence of FRIDs was identified using the "Screening Tool of Older Persons Prescriptions in older adults with high fall risk" (STOPPFall). In the sample of 407 participants (median age 73 (IQR 69-70) years; 63.9 % females), 79.1 % used at least one FRID. The most common drug classes were diuretics, benzodiazepines, and opioids (in 51.1 %, 38.1 %, and 17.2 % participants, respectively). More FRIDs were prescribed to the oldest old patients (85+) and participants from poorer regions of Croatia (Slavonia) ($p < 0.05$). Exposition to FRIDs was identified as the significant risk factor associated with falls (OR = 1.24 (1.04-1.50); p = 0.020) and higher health-care utilization (OR = 1.29 (1.10-1.51); p = 0.001). Our study highlights the need for rationalization of FRID use. To reduce the unnecessary exposure to FRIDs in older adults, health-care professionals must consider high individualization of medication schemes regarding selection, dosing, and combinations of only necessary FRIDs.

Keywords: STOPPFall; deprescribing; fall; fall risk-increasing drugs (FRIDs); older adults.

Nomogram for Predicting the Risk Factors for Falls in Older People: A Secondary Data Analysis Based on the 2021 Community Health Survey

Park SK, Kim HJ, Lee YM, Kim HY. Inquiry. 2024 Jan-Dec:61:469580241273173.

DOI: 10.1177/00469580241273173 **PMID:** 39432440 **PMCID:** PMC11526277

Abstract

This study aimed to identify the risk factors for falls among older individuals living at home in a community and develop a nomogram to predict falls. This study included 74 492 people aged 65 years or older who participated in the 2021 Community Health Survey conducted in Korea. The data analysis methods used included the Rao-Scott χ2 test, a complex sample t-test, and complex binary logistic regression using SPSS 26.0. Using logistic regression analysis, a fall-risk prediction nomogram was created based on regression coefficients, and the reliability of the nomogram was calculated using a receiver operating characteristic (ROC) curve and values of the area under the curve (AUC). The fall incidence rate among older adults was 16.4%. Factors affecting the subject's fall experience included being more than 85 years old (OR = 1.40); living alone (OR = 1.13); receiving basic welfare (OR = 1.18); subjective health status (OR = 1.72); number of days spent walking (OR = 0.98); obesity (OR = 1.08); severe depression (OR = 2.84); sleep duration time (OR = 1.11); experiencing cognitive decline (OR = 1.34); and diabetes (OR = 1.12). In the nomogram, the depression score exhibited the greatest discriminatory power, followed by subjective health status, gender, experience of cognitive decline, age, basic livelihood security, adequacy of sleep, living alone, diabetes, and number of days of walking. The AUC value was 0.66. An intervention plan that comprehensively considers physical, psychological, and social factors is required to prevent falls in older adults. The nomogram developed in this study will help local health institutions assess all these risk factors for falling and create and implement systematic education and intervention programs to prevent falls and fall-related injuries among older individuals.

Keywords: accidental falls; aged; nomograms; risk factors; secondary analysis.

Assessment of the risk of falls among elderly persons in primary care settings

Savić S, Gavran L, Petrović V, Tešanović G, Batić-Mujanović O, Borjanović G. Med Glas (Zenica). 2024 Sep 1;21(2):398-403.

DOI: 10.17392/1743-21-02 **PMID:** 39526710

Abstract

Aim: To investigate the risk for falls in elderly patients treated in the Primary Health Care Centre Gradiška, Bosnia and Herzegovina.

Methods: This study included 500 patients aged 65 and older. They were chosen randomly by 10 family physicians. Data collection took place every Wednesday and Friday, between January 2022 and July 2022. The patients' gait and balance assessment were performed using the Tinetti Gait and Balance Tool to assess the risk of falls. A supplementary questionnaire was created to record data about the patients' age, sex, chronic diseases, and drugs they take.

Results: Among the included patients there were 266 females (53.2%) and 234 (46.8%) males, with the mean age of 75.25 years. The Tinetti test showed that the risk of falls was high for patients older than 75 years, 111 patients (69.8%), and 48 patients (30.2%) aged 65 to 74 (p=0.000). The risk of falling was higher for female, 93 (35%), than male patients, 66 (28.2%) (p=0.018). Considering chronic diseases, a high risk of falls was found in 32 (2.1%) patients with heart failure (p=0.029) and 19 (11.9%) patients with osteoporosis (p=0.000). Patients who used antihypertensive drugs had the highest risk for falls, 124 (78.0%) (p=0.757).

Conclusion: About two-thirds of the examinees over the age of 75 had a high risk of falls, which indicates that family doctors should be more involved in fall prevention of elderly patients and constantly educate older patients and their families about it.

Keywords: elderly patients; fall prevention; family physicians.

Gait abnormalities and longitudinal fall risk in older patients with end-stage kidney disease and sarcopenia

Sun CY, Hsu LC, Su CC, Li CY, Chao CT, Chang YT, Chang CM, Wang WF, Lien WC. BMC Geriatr. 2024 Nov 13;24(1):937.

DOI: 10.1186/s12877-024-05506-z **PMID:** 39538169 **PMCID:** PMC11559052

Abstract

Background: Sarcopenia, gait disturbance, and intradialytic hypotension are among the various factors that contribute to fall risk. This study aimed to investigate the relationship between risk of sarcopenia, hemodialysis (HD) session, and long-term fall risk in older end-stage kidney disease (ESKD) patients by analyzing their spatiotemporal gait characteristics.

Methods: We recruited 22 non-demented patients aged ≥ 65 years who were undergoing maintenance HD. Participants were divided into two groups based on their SARC-F score (< 4 and ≥ 4) to identify those with higher and lower risk of sarcopenia. Demographics, comorbidities, and renal parameters were compared between groups. Inertial measurement unit-based technology equipped with triaxial accelerometry and gyroscope was used to evaluate gait characteristics. The gait task was assessed both before and after dialysis using the Timed-Up and Go (TUG) test and a 10-meter walking test at a regular pace. Essential gait parameters were thoroughly analyzed, including gait speed, stride time, stride length, double-support phase, stability, and symmetry. We investigated the interaction between the dialysis procedure and gait components. Outcome of interest was any occurrence of injurious fall during follow-up period. Logistic regression models were employed to examine the relationship between baseline gait markers and long-term fall risk.

Results: The SARC-F ≥ 4 group showed various gait abnormalities, including longer TUG time, slower gait speed, longer stride time, shorter stride length, and longer double support time compared to counterpart (SARC-F < 4). After HD sessions, the SARC-F ≥ 4 group showed a 2.0-second decrease in TUG task time, an 8.0 cm/s increase in gait speed, an 11.6% lower stride time, and a 2.4% increase in gait symmetry with significant group-time interactions. Shorter stride length and longer double support time were associated with injurious falls during the two-year follow-up.

Conclusion: Our study demonstrated the utility of triaxial accelerometers in extracting gait characteristics in older HD patients. High-risk sarcopenia (SARC-F ≥ 4) was associated with various gait abnormalities, some of which partially improved after HD sessions. These gait abnormalities were predictive of future falls, highlighting their prognostic significance.

Keywords: Fall; Hemodialysis; Older; Sarcopenia; Triaxial accelerometry.

Investigating the biomechanics of falls in older adults in long-term care using a video camera: a scoping review

Traverso A, Bayram A, Rossettini G, Chiappinotto S, Galazzi A, Palese A. BMC Geriatr. 2024 Oct 4;24(1):810.

DOI: 10.1186/s12877-024-05395-2 **PMID:** 39367304 **PMCID:** PMC11451165

Abstract

Background: Falls are a worrying and growing phenomenon worldwide that especially affects the elderly. With the development of technology, one way of studying the real-life falls that occur in healthcare settings is by using video cameras.

Aims: To (a) map the patterns of the research on real-life falls among older adults in healthcare settings as assessed with digital video camera supports; and (b) highlight the advances, the evidence produced, and the gaps still present regarding the biomechanics of falls as assessed technologically.

Methods: A scoping review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews. CINAHL, PubMed and Google Scholar were searched. All studies regarding falls investigated with video cameras among older individuals in healthcare settings published from 1st January 1990 to 1st January 2022 were eligible. Findings were summarised according to the Patterns, Advances, Gaps, Evidence and Recommendations framework for Scoping Reviews.

Results: In total, 1943 studies were retrieved, and 16 met the inclusion criteria. Studies were mostly conducted in Canada. They described the real-life falls that occurred mainly in common and living areas of long-term facilities among older individuals, mainly females. Thirteen studies investigated falls through biomechanics, while three provided advances in the reliability of the measures as collected with video cameras. Studies reported that the biomechanics of a fall, reflecting the direction of the fall and protective responses, increase or decrease the likelihood of serious impact. In addition, the direction of the landing after a fall has been determined as having a significant impact on the severity and outcome of the fall.

Conclusion: The use of video cameras to investigate the biomechanics of falls is a well-established research area that offer interesting insight regarding (a) how to prevent falls and their injuries and (b) the direction of the research in the field of falls.

Keywords: Accidental falls; Biomechanics; Digital technology; Healthcare settings; Older adults; Scoping review; Video camera; Video recording.

Comorbidity patterns and the risk of injurious falls in older people with atrial fibrillation: Findings from a Swedish nation-wide population-based study

Trevisan C, Damiano C, Dai L, Calderón-Larrañaga A, Wastesson JW, Johnell K, Amrouch C, Onder G, Marengoni A, Proietti R, Lip GYH, Johnsen SP, Petrovic M, Vetrano DL; AFFIRMO Consortium. Eur J Intern Med. 2024 Nov 29:S0953-6205(24)00474-6.

DOI: 10.1016/j.ejim.2024.11.011 **PMID:** 39616017

Abstract

Background: Atrial fibrillation (AF) is associated with an increased fall risk, partly due to AF-related comorbidities. We investigated the impact of different comorbidity patterns on fall risk in older adults with AF.

Methods: Using the Swedish National Patient Register, we identified 203,042 adults (45 % females) with AF and at least one comorbidity, aged 65 years or older, on 01/01/2017. The primary study outcome was any fall requiring medical attention. Secondary outcomes were falls with fractures, falls with hip fractures, and falls with head trauma. Comorbidity patterns were identified through latent class analysis, and their association with 3-year fall risk was tested through Cox regressions.

Results: The sample mean age was 79.6 (SD: 7.9) years, and the mean number of chronic diseases was 6.6 (SD 3.2). We identified one unspecific (34.2 %) and six specific comorbidity patterns characterized by neuropsychiatric (6.6 %), eye (17.4 %), musculoskeletal (7.2 %), metabolic (15.8 %), cardiovascular (7.4 %), and complex (11.3 %) chronic conditions coexisting with AF. Older adults with AF and complex (HR=1.63, 95 %CI: 1.56-1.70), neuropsychiatric (HR=1.48, 95 %CI: 1.41-1.56), cardiovascular (HR=1.21, 95 %CI: 1.15-1.27), eye (HR=1.16, 95 %CI: 1.12-1.20), and musculoskeletal (HR=1.07, 95 %CI: 1.01-1.13) comorbidity had an increased fall risk compared to those with unspecific comorbidity. The highest risk of falls with fractures or head trauma was found in older adults displaying a complex or neuropsychiatric disease pattern, respectively. Higher estimates emerged in males and those aged <80 years.

Conclusions: Evaluating comorbidity patterns in older AF patients could help stratify the risk of falls in this population and support targeted preventive interventions.

Keywords: Atrial fibrillation; Falls; Fractures; Multimorbidity.

Association of fear of falling and low physical activity with fall risk among older Taiwanese community-dwellers

Tsai YJ, Sun WJ, Yang YC, Wei MY. BMC Public Health. 2024 Nov 6;24(1):3066.

DOI: 10.1186/s12889-024-20467-z **PMID:** 39508228 **PMCID:** PMC11539577

Abstract

Background and purpose: Fear of falling and low physical activity become prevalent in an aged society, but their association with fall risk warrants further investigation.

Methods: Our study involved 600 individuals aged 70.8-96.1 years who completed two rounds of community surveys. During the second survey, we analyzed the correlations between fall incidents and a range of factors, including age, sex, gait maneuverability, vision, comorbidity count, depressive symptoms, cognitive function, history of falls, fear of falling, and physical activity level. The chi-square test and univariate and multivariate logistic regression models were used, with further analyses either adjusted for or stratified by the full-factor combinations of fear of falling (with versus without) and low physical activity (low versus moderate-to-high).

Results: Falls exhibited a prevalence rate of 13.8%. A fall risk gradient by the full-factor combinations was observed. Multivariate logistic regression modeling identified independent risk predictors for falls, including the number of comorbidities, depressive symptoms, a history of falls, and fear of falling. Fear of falling and low physical activity presented a synergistic effect to increase the fall risk by two- and one-third times (adjusted odds ratio: 2.35, 95% confidence interval: 1.12-4.91). Depressive symptoms, cognitive impairment, and a history of falls remained as significant risk predictors for older adults with both factors, those with fear of falling only, and those with neither, respectively, when the models were further stratified.

Conclusion: Fear of falling and low physical activity presented likely synergism to increase the fall risk. Those older community-dwellers with both risk factors warrant fall prevention resources as a priority over those with either or neither.

Keywords: Aged; Falls; Fear of falling; Low physical activity.

Retrospective evaluation of the world falls guidelines-algorithm in older adults

van de Loo B, Heymans MW, Medlock S, Abu-Hanna A, van der Velde N, van Schoor NM. Age Ageing. 2024 Oct 1;53(10):afae229.

DOI: 10.1093/ageing/afae229 **PMID:** 39424356 **PMCID:** PMC11488976

Abstract

Background: The World Falls Guidelines (WFG) propose an algorithm that classifies patients as low-, intermediate-, and high-risk. We evaluated different operationalizations of the WFG algorithm and compared its predictive performance to other screening tools for falls, namely: the American Geriatrics Society and British Geriatrics Society (AGS/BGS) algorithm, the 3KQ on their own and fall history on its own.

Methods: We included data from 1509 adults aged ≥65 years from the population-based Longitudinal Aging Study Amsterdam. The outcome was ≥1 fall during 1-year follow-up, which was ascertained using fall calendars. The screening tools' items were retrospectively operationalized using baseline measures, using proxies where necessary.

Results: Sensitivity ranged between 30.9-48.0% and specificity ranged between 77.0-88.2%. Operationalizing the algorithm with the 3KQ instead of fall history yielded a higher sensitivity but lower specificity, whereas operationalization with the Clinical Frailty Scale (CFS) classification tree instead of Fried's frailty criteria did not affect predictive performance. Compared to the WFG algorithm, the AGS/BGS algorithm and fall history on its own yielded similar predictive performance, whereas the 3KQ on their own yielded a higher sensitivity but lower specificity.

Conclusion: The WFG algorithm can identify patients at risk of a fall, especially when the 3KQ are included in its operationalization. The CFS and Fried's frailty criteria may be used interchangeably in the algorithm's operationalization. The algorithm performed similarly compared to other screening tools, except for the 3KQ on their own, which have higher sensitivity but lower specificity and lack clinical recommendations per risk category.

Keywords: falls; older people; prediction; screening; stratification.

Application of wearable sensors in constructing a fall risk prediction model for community-dwelling older adults: A scoping review

Wang B, Liu Y, Lu A, Wang C. Arch Gerontol Geriatr. 2024 Nov 14:129:105689.

DOI: 10.1016/j.archger.2024.105689 **PMID:** 39566120

Abstract

Background: Falls are a particularly important public health problem among older people. Early identification of risk factors is crucial for reducing the risk of falls in older adults. Studies have confirmed the effectiveness of sensor-based fall risk prediction models for the older population. This article aims to sort out the current use of wearable sensors in building fall risk models for older adults in the community and explore the suitable use of sensors in model construction and the prospects and possible difficulties of model application.

Methods: This scoping review was conducted from 26 November 2023 to 9 March 2024. It was searched through Web of Science, PubMed, OVID, EBSCO and CNKI using the terms "wearable sensor" or "inertial sensor" or "inertial motion capture" or "wearable electronic devices" or "IMU" or "MEMS" or "accelerometer" or "gyroscope" or "magnetometer" or "smartphone" and "fall" and "predict" or "prediction" and "older adults" or "older men" or "older women" or "elderly" and "community" or "neighborhood" or "dwelling".

Results: Thirty-one articles were included, and the selection of sensor type, location, and other characteristics and indicators, as well as model types, was summarized.

Discussion and conclusions: Wearable sensors with a frequency of 100 Hz located in a combination of spine/ pelvis/ hip-shank-feet position is recommended. In addition, walking tests and TUG and its variants are appropriate in the community. However, more empirical research is needed to obtain the best model construction combination and apply it effectively to the community.

Keywords: Community-dwelling; Fall; Older adults; Wearable sensors.

Comparing the effectiveness of five traditional Chinese exercises in improving balance function in older adults: a systematic review and Bayesian network meta-analysis

Xie J, Guo J, Wang B. PeerJ. 2024 Nov 13:12:e18512.

DOI: 10.7717/peerj.18512 **PMID:** 39553713 **PMCID:** PMC11568816

Abstract

Background: Despite numerous studies affirming the potential of traditional Chinese exercises (TCEs) in enhancing balance in older adults, systematic integration is lacking. This study evaluated the effectiveness of five TCEs-Baduanjin, Liuzijue, Tai Chi, Wuqinxi, and Yijinjing-in improving balance among older adults using network meta-analysis.

Methods: This meta-analysis was registered in PROSPERO with the registration number CRD42023481450. Related articles indexed by Web of Science, Cochrane, PubMed, Embase, China National Knowledge Infrastructure (CNKI), Wanfang, and VIP databases before October 2023 were searched. Randomized controlled trials (RCTs) involving TCEs interventions to improve balance function conducted in older adults who aged ≥60 years were included. Two researchers used Review Manager to assess the quality of the studies, and analyzed the data using Stata and R.

Results: In total, 46 RCTs and 3,333 older adults were included. The aforementioned TCEs had positive effects on improving balance in older adults. Tai Chi revealed significant intervention effects in performing the Single-Leg Stand with eyes Closed (SLSC), 6-Min Walk Test (6MWT), and Short Form 36-Item Physical Component Summary (SF-36PCS). Liuzijue significantly improved performance in the Timed Up and Go Test (TUGT), 6MWT, SF-36PCS, and Berg Balance Scale (BBS). Baduanjin, Wuqinxi, and Yijinjing showed noteworthy intervention effects on the BBS. Tai Chi ranked highest in the SLSC, 6MWT, and SF-36PCS in the surface under the cumulative ranking, while Liuzijue and Yijinjing ranked highest in the TUGT and BBS, respectively.

Conclusion: Tai Chi, Liuzijue, and Yijinjing improved the static, dynamic, and overall balance outcomes, respectively. Older adults can make a reasonable choice among these TCEs based on their needs.

Keywords: Balance; Exercises; Fall; Older adults.

Falls and fall-related injuries: prevalence, characteristics, and treatment among participants of the Geelong Osteoporosis Study

Yosef T, Pasco JA, Tembo MC, Williams LJ, Holloway-Kew KL. Front Public Health. 2024 Oct 18:12:1454117.

DOI: 10.3389/fpubh.2024.1454117 **PMID:** 39494080 **PMCID:** PMC11527698

Abstract

Background: Falls are a significant public health challenge, especially among older adults. In Australia, falls and related injuries incur an annual cost of $2.3 billion. However, there is a scarcity of prevalence data on falls among population-based groups. This study aimed to report the characteristics, circumstances, and treatment for falls and fall-related injuries in a population-based sample of Australian men and women.

Methods: Participants from the Geelong Osteoporosis Study provided cross-sectional data: baseline for men (2001-2006) and 10-year follow-up for women (2004-2008). Falls over the previous 12 months were self-reported by 2,631 participants aged 20-97 years (1,533 men and 1,098 women). The study described the timing, location, cause, and treatment of falls. Fall prevalence was standardized to the 2006 Australian population. Data collection included self-reported prior fractures, medication, disease conditions, anthropometry, and biochemical tests. Binary logistic regression identified factors linked to fall-related injuries.

Results: Fall rates by age group: 20-29 (24.4%), 30-39 (21.5%), 40-49 (18.7%), 50-59 (24.9%), 60-69 (25.0%), 70-79 (34.6%), 80+ (40.5%). The age-standardized prevalence of falls was 25.0% (95% CI: 23.4-26.7%). In adults ≥65 years, the age-standardized prevalence of falls was 32.4% (95% CI: 29.3-35.5%). Fallers were typically older, less mobile, had higher BMI and cholesterol levels, and were more likely to have musculoskeletal conditions, cancer, and polypharmacy. Men had a higher fall risk, but fewer fall-related fractures compared to women. Most falls occurred outdoors (62.1%), were due to extrinsic cause (58.5%), and were on the same level (78.5%). Factors associated with fall-related injuries included being female, elevated falls and falls outside the home. Nearly half (45.7%) of those injured sought medical attention, primarily from general practitioners (25.7%) and emergency departments (12.6%).

Conclusion: Falls are common, occurring in approximately one quarter of adults in this study, with a greater prevalence among those ≥65 years. Women experienced fewer multiple falls than men. Many participants sought medical attention, primarily from general practitioners. This research identifies fall characteristics and circumstances, informing targeted prevention strategies to reduce occurrences and alleviate burdens on healthcare systems and individuals.

Keywords: Geelong Osteoporosis Study; fall-related injuries; falls; older adults; population based sample.

Views and experiences of older people taking part in a safe-falling training program: Lessons learned from the FAlling Safely Training (FAST) trial

Zanotto A, Zanotto T, Alexander NB, Sosnoff JJ. BMC Geriatr. 2024 Oct 11;24(1):818.

DOI: 10.1186/s12877-024-05382-7 **PMID:** 39394576 **PMCID:** PMC11468552

Abstract

Background: While falls are the leading cause of accidental injury among older people, the current fall prevention strategies have not resulted in a remarkable reduction in fall rates. An alternative novel approach, teaching older adults how to fall safely to prevent injury, has been recently implemented in the FAlling Safely Training (FAST) trial. The current study aimed to explore the views and perceptions of older people about their participation in the safe-falling training program.

Methods: Focus groups were conducted with eight community-dwelling older adults (age range: 66 to 76 years, five females) at risk of falling who completed the FAST program. Two focus groups involving four participants each were conducted. Recordings were transcribed verbatim and analyzed using thematic analysis.

Results: Three themes were identified following the analysis: (1) Before the training; with subthemes: Previous fall prevention strategies and Motivation to participate. Motivations to take part in the training included worries about falling, an awareness of an increased risk of falling, and a desire to decrease the chances of sustaining an injury. (2) Training itself; with subthemes: General impressions of the training and Learning the techniques. Older people highlighted that the training was well-designed and executed. (3) Going forward; with subthemes: Training increased confidence, Incorporating in a community setting, and Proposing improvements to the study. It was reported that the training enhanced participants' confidence about falling without injury. Incorporating the training into a community context was discussed, and suggestions for program enhancements were made. The individual nature of the training was valued, but participants also provided suggestions for how they would see the program taking place successfully in small groups.

Conclusions: The results indicated that the safe-falling training was acceptable to older adults. The perceived ability to fall without injury was reported to have increased. Individuals who experienced a fall after the training ended reported being able to use the techniques learned in their daily life. The findings have implications for the training to be refined and implemented in the community.

Trial registration: The article is linked to a randomized controlled trial registered at http://ClinicalTrials.gov (NCT05260034).

Keywords: Falls; Focus groups; Older people; Qualitative methods; Training.