

**Academic detailing as a health information technology implementation method: supporting the design and implementation of an emergency department-based clinical decision support tool to prevent future falls**

Barton HJ, Maru A, Leaf MA, Hekman DJ, Wiegmann DA, Shah MN, Patterson BW. JMIR Hum. Factors 2024; 11: e52592.

(Copyright © 2024, JMIR Publications)

DOI: 10.2196/52592

PMID: 38635318

**Abstract**

**BACKGROUND:** Clinical decision support (CDS) tools that incorporate machine learning-derived content have the potential to transform clinical care by augmenting clinicians' expertise. To realize this potential, such tools must be designed to fit the dynamic work systems of the clinicians who use them. We propose the use of academic detailing-personal visits to clinicians by an expert in a specific health IT tool-as a method for both ensuring the correct understanding of that tool and its evidence base and identifying factors influencing the tool's implementation.

**OBJECTIVE:** This study aimed to assess academic detailing as a method for simultaneously ensuring the correct understanding of an emergency department-based CDS tool to prevent future falls and identifying factors impacting clinicians' use of the tool through an analysis of the resultant qualitative data.

**METHODS:** Previously, our team designed a CDS tool to identify patients aged 65 years and older who are at the highest risk of future falls and prompt an interruptive alert to clinicians, suggesting the patient be referred to a mobility and falls clinic for an evidence-based preventative intervention. We conducted 10-minute academic detailing interviews (n=16) with resident emergency medicine physicians and advanced practice providers who had encountered our CDS tool in practice. We conducted an inductive, team-based content analysis to identify factors that influenced clinicians' use of the CDS tool.

**RESULTS:** The following categories of factors that impacted clinicians' use of the CDS were identified: (1) aspects of the CDS tool's design (2) clinicians' understanding (or misunderstanding) of the CDS or referral process, (3) the busy nature of the emergency department environment, (4) clinicians' perceptions of the patient and their associated fall risk, and (5) the opacity of the referral process. Additionally, clinician education was done to address any misconceptions about the CDS tool or referral process, for example, demonstrating how simple it is to place a referral via the CDS and clarifying which clinic the referral goes to.

**CONCLUSIONS:** Our study demonstrates the use of academic detailing for supporting the implementation of health information technologies, allowing us to identify factors that impacted clinicians' use of the CDS while

concurrently educating clinicians to ensure the correct understanding of the CDS tool and intervention. Thus, academic detailing can inform both real-time adjustments of a tool's implementation, for example, refinement of the language used to introduce the tool, and larger scale redesign of the CDS tool to better fit the dynamic work environment of clinicians.

**Language:** en

**Keywords:** \*Decision Support Systems, Clinical; academic detailing; Ambulatory Care Facilities; CDS; CDS tool; clinical care; clinical decision support; Data Accuracy; department-based; ED environment; educational outreach; Educational Status; EHR; elder; elderly; electronic health record; emergency department; emergency medicine; Emergency Service, Hospital; evidence-based; fall-risk prediction; geriatric; geriatrics; gerontology; health IT; high-risk patient; high-risk patients; human factors; Humans; implementation method; interview; machine learning; older adult; older adults; older people; older person; pharmaceutical; pharmaceutical sales; preventative intervention; SEIPS; Systems Engineering Initiative for Patient Safety; team-based analysis; United States; work systems

## **Characteristics of unsuccessful balance reactive responses to lateral loss of balance in older adults**

Batcir S, Berdichevsky Y, Bachner YG, Lubovsky O, Debi R, Melzer I. *Gerontology* 2024; ePub(ePub): ePub.

(Copyright © 2024, Karger Publishers)

**DOI:** 10.1159/000535968

**PMID:** 38657580

### **Abstract**

**INTRODUCTION:** An effective reactive step response to an unexpected balance loss is an important factor that determines if a fall will happen. We investigated reactive step strategies and kinematics of unsuccessful balance recovery responses that ended with falls in older adults.

**METHODS:** We compared the strategies and kinematics of reactive stepping after a lateral loss of balance, i.e., perturbations, between 49 older female adults who were able to successfully recover from perturbations (perturbation-related non-fallers, PNFs) and 10 female older adults who failed to recover (perturbation-related fallers, PFs). In addition, we compared the successful versus unsuccessful recovery responses of PFs matched to perturbation magnitude.

**RESULTS:** The kinematics of the first reactive step response were significantly different between PFs and PNFs, i.e., longer initiation time, step time, swing time, and time to peak swing-leg velocity, larger first-step length, and center of mass displacement. Incomplete crossover stepping and leg collision were significant causes of falls among PFs. Similar findings were found when we compared the successful versus unsuccessful recovery responses of PFs.

**CONCLUSIONS:** The crossover step, which requires a complex coordinated leg movement, resulted in difficulty in controlling and decelerating the moving center of mass following a lateral perturbation, affecting the kinematics of the stepping response, leading to a fall.

**Language:** en

## **The effectiveness of a fall detection device in older nursing home residents: a pilot study**

Can B, Tufan A, Karadağ, Durmuş N, Topçu M, Aysevinç B, Düzel S, Dağcıoğlu S, Afşar Fak N, Tazegul G, Fak AS. *Psychogeriatr.* 2024; ePub(ePub): ePub.

(Copyright © 2024, Japanese Psychogeriatrics Society, Publisher John Wiley and Sons)

**DOI:** 10.1111/psyg.13126

**PMID:** 38634167

### **Abstract**

**BACKGROUND:** Real-world research to evaluate the effect of device technology in preventing fall-related morbidity is limited. This pilot study aims to investigate the effectiveness of a non-wearable fall detection device in older nursing home residents.

**METHODS:** The study was conducted in a nursing home with single-resident rooms. Fall detection devices were randomly set up in half of the rooms. Demographic data, comorbidities, lists of medications, and functional, nutritional, and frailty status were recorded. The residents were followed up for 3 months. The primary outcome was falls and the secondary outcome was all-cause mortality.

**RESULTS:** A total of 26 participants were enrolled in the study. The study group consisted of 13 residents who had a fall detection device in their rooms. The remaining 13 residents on the same floor formed the control group. Participants had a mean age of  $82 \pm 10$  years and 89% of the residents were female. The most prevalent comorbidity was dementia. Two residents from the control group and one resident from the study group experienced a fall event during follow-up. The fall events in the control group were identified retrospectively by the nursing home staff, whereas the fall in the study group received a prompt response from the staff who were notified by the alarm. One resident was transferred to the hospital and died due to a non-fall related reason.

**CONCLUSION:** Device technology may provide an opportunity for timely intervention to prevent fall-related morbidity in institutionalized older adults.

**Language:** en

**Keywords:** fall detection device; falls; nursing home; older adults

## **Blood pressure management and falls in nursing home residents-a matter of balance**

Canales MT, Shorr RI. JAMA Intern. Med. 2024; ePub(ePub): ePub.

(Copyright © 2024, American Medical Association)

**DOI:** 10.1001/jamainternmed.2024.0506     **PMID:** 38648066

### **Abstract**

In this study, Dave et al harness national Veterans Health Administration (VHA) clinical data to examine the association between initiation of a new antihypertensive agent with the incidence of fall-related fractures in residents at VHA nursing homes, or community living centers. In this carefully designed study, residents who received a new antihypertensive agent had more than 2-fold greater risk of fractures compared with those who did not (adjusted hazard ratio [aHR], 2.42 [95% CI, 1.43-4.08]). This practice was also associated with 1.8-fold greater risk of serious falls (HR, 1.80 [95% CI, 1.52-2.13]) and 1.7-fold greater risk of syncope (HR, 1.69 [95% CI, 1.30-2.19]). Subgroup analysis revealed an even higher risk of fractures in nursing home residents with dementia (HR, 3.28 [95% CI, 1.76-6.10]), elevated systolic (HR, 3.12 [95% CI, 1.71-5.69]) or diastolic (HR, 4.41 [95% CI, 1.67-11.68]) blood pressure, and those who had not used antihypertensives (HR, 4.77 [95% CI, 1.49-15.32]). These findings create a compelling narrative that rapidly decreasing blood pressure in nursing home residents may cause orthostatic hypotension, leading to falls and fractures. They also extend the findings from a smaller study of participants in the Systolic Blood Pressure Intervention Trial (SPRINT).<sup>2</sup> In a secondary analysis of SPRING, participants randomized to intensive treatment of systolic hypertension (blood pressure <120 mm Hg) were more likely to experience hypotension, and possibly syncope, but not falls...

**Language:** en

# The effects of Tai Chi on standing balance control in older adults may be attributed to the improvement of sensory reweighting and complexity rather than reduced sway velocity or amplitude

Cui J, Hao Z, Tian H, Yang Y, Wang J, Lin X. *Front. Aging Neurosci.* 2024; 16: e1330063.

(Copyright © 2024, Frontiers Research Foundation)

DOI: 10.3389/fnagi.2024.1330063

PMID: 38650868

PMCID: PMC11033441

## Abstract

**INTRODUCTION:** Tai Chi has proved to be an effective therapy for balance performance and cognition. However, non-consistency exists in the results of the effect of Tai Chi training on standing balance control in older adults. This study aimed to use traditional and non-traditional methods to investigate the effect of Tai Chi on standing balance in older adults.

**METHODS:** Thirty-six Tai Chi practitioners (TC group) and thirty-six older adults with no Tai Chi practice (control group) were recruited in this study. A Nintendo Wii Balance Board was used to record the center of pressure (COP) during standing balance over 20 s in the condition of eyes closed with three repetitions. The wavelet analysis, multiscale entropy, recurrence quantification analysis, and traditional methods were used to evaluate the standing balance control in the anterior-posterior (AP) and mediolateral (ML) directions.

**RESULTS:** (1) Greater sway mean velocity in the AP direction and sway Path length were found in the TC group compared with the control group; (2) lower Very-low frequency band (0.10-0.39 Hz) and higher Moderate frequency band (1.56-6.25 Hz) in the AP and ML directions were found in the TC group compared with the control group; (3) greater complexity index (CI) and lower determinism (DET) in the AP and ML directions were observed in the TC group compared with control group; (4) greater path length linked with smaller Very-low frequency band in the AP and ML directions and higher Moderate frequency band in the AP direction in both groups; (5) greater path length linked with lower DET and higher CI in the AP direction only in the TC group.

**CONCLUSION:** Long-term Tai Chi practice improved sensory reweighting (more reliance on the proprioception system and less reliance on the vestibular system) and complexity of standing balance control in older adults. In addition, greater sway velocity may be as an exploratory role in standing balance control of TC older adults, which correlated with greater complexity, but no such significant relationship in the control group. Therefore, the effects of Tai Chi practice on standing balance control in older adults may be attributed to the improvement of sensory reweighting and complexity rather than reduced sway velocity or amplitude.

**Language:** en

**Keywords:** complexity; multiscale entropy; older adults; recurrence quantification analysis; sensory reweighting; standing balance; Tai Chi; wavelet analysis

## **Antihypertensive medication and fracture risk in older veterans health administration nursing home residents**

Dave CV, Li Y, Steinman MA, Lee SJ, Liu X, Jing B, Graham LA, Marcum ZA, Fung KZ, Odden MC. *JAMA Intern. Med.* 2024; ePub(ePub): ePub.

(Copyright © 2024, American Medical Association)

**DOI:** 10.1001/jamainternmed.2024.0507     **PMID:** 38648065

### **Abstract**

**IMPORTANCE:** Limited evidence exists on the association between initiation of antihypertensive medication and risk of fractures in older long-term nursing home residents.

**OBJECTIVE:** To assess the association between antihypertensive medication initiation and risk of fracture. **DESIGN, SETTING, AND PARTICIPANTS:** This was a retrospective cohort study using target trial emulation for data derived from 29 648 older long-term care nursing home residents in the Veterans Health Administration (VA) from January 1, 2006, to October 31, 2019. Data were analyzed from December 1, 2021, to November 11, 2023. **EXPOSURE:** Episodes of antihypertensive medication initiation were identified, and eligible initiation episodes were matched with comparable controls who did not initiate therapy. **MAIN OUTCOME AND MEASURES:** The primary outcome was nontraumatic fracture of the humerus, hip, pelvis, radius, or ulna within 30 days of antihypertensive medication initiation.

**RESULTS** were computed among subgroups of residents with dementia, across systolic and diastolic blood pressure thresholds of 140 and 80 mm Hg, respectively, and with use of prior antihypertensive therapies. Analyses were adjusted for more than 50 baseline covariates using 1:4 propensity score matching.

**RESULTS:** Data from 29 648 individuals were included in this study (mean [SD] age, 78.0 [8.4] years; 28 952 [97.7%] male). In the propensity score-matched cohort of 64 710 residents (mean [SD] age, 77.9 [8.5] years), the incidence rate of fractures per 100 person-years in residents initiating antihypertensive medication was 5.4 compared with 2.2 in the control arm. This finding corresponded to an adjusted hazard ratio (HR) of 2.42 (95% CI, 1.43-4.08) and an adjusted excess risk per 100 person-years of 3.12 (95% CI, 0.95-6.78).

Antihypertensive medication initiation was also associated with higher risk of severe falls requiring hospitalizations or emergency department visits (HR, 1.80 [95% CI, 1.53-2.13]) and syncope (HR, 1.69 [95% CI, 1.30-2.19]). The magnitude of fracture risk was numerically higher among subgroups of residents with dementia (HR, 3.28 [95% CI, 1.76-6.10]), systolic blood pressure of 140 mm Hg or higher (HR, 3.12 [95% CI, 1.71-5.69]), diastolic blood pressure of 80 mm Hg or higher (HR, 4.41 [95% CI, 1.67-11.68]), and no recent antihypertensive medication use (HR, 4.77 [95% CI, 1.49-15.32]).

**CONCLUSIONS AND RELEVANCE:** Findings indicated that initiation of antihypertensive medication was associated with elevated risks of fractures and falls. These risks were numerically higher among residents with dementia, higher baseline blood pressures values, and no recent antihypertensive medication use. Caution and

additional monitoring are advised when initiating antihypertensive medication in this vulnerable population.

**Language:** en

## **Effective fall prevention exercise in residential aged care: an intervention component analysis from an updated systematic review**

Dawson R, Suen J, Sherrington C, Kwok W, Pinheiro MB, Haynes A, McLennan C, Sutcliffe K, Kneale D, Dyer S. *Br. J. Sports Med.* 2024; ePub(ePub): ePub.

(Copyright © 2024, BMJ Publishing Group)

**DOI:** 10.1136/bjsports-2023-107505

**PMID:** 38658135

### **Abstract**

**OBJECTIVE:** The effect of fall prevention exercise programmes in residential aged care (RAC) is uncertain. This paper reports on an intervention component analysis (ICA) of randomised controlled trials (RCTs), from an update of a Cochrane review, to develop a theory of features of successful fall prevention exercise in RAC.

**METHODS:** Trial characteristics were extracted from RCTs testing exercise interventions in RAC identified from an update of a Cochrane review to December 2022 (n=32). Eligible trials included RCTs or cluster RCTs in RAC, focusing on participants aged 65 or older, assessing fall outcomes with stand-alone exercise interventions. ICA was conducted on trials with >30 participants per treatment arm compared with control (n=17). Two authors coded trialists' perceptions on intervention features that may have contributed to the observed effect on falls. Inductive thematic analysis was used to identify the key differences between the trials which might account for positive and negative outcomes.

**RESULTS:** 32 RCTs involving 3960 residents including people with cognitive (57%) and mobility (41%) impairments were included. ICA on the 17 eligible RCTs informed the development of a theory that (1) effective fall prevention exercise delivers the right exercise by specifically targeting balance and strength, tailored to the individual and delivered simply at a moderate intensity and (2) successful implementation needs to be sufficiently resourced to deliver structured and supervised exercise at an adequate dose.

**CONCLUSIONS:** This analysis suggests that delivering the right exercise, sufficiently resourced, is important for preventing falls in RAC. This clinical guidance requires confirmation in larger trials.

**Language:** en

**Keywords:** Accidental Falls; Aged; Exercise; Qualitative Research

## **The association of fear of falling and falls with sedentary behavior in people with multiple sclerosis**

Farber AE, Menascu S, Kalron A. J. Psychosom. Res. 2024; 181: e111675.

(Copyright © 2024, Elsevier Publishing)

**DOI:** 10.1016/j.jpsychores.2024.111675      **PMID:** 38652979

### **Abstract**

**OBJECTIVE:** Sedentary behavior, falls, and fear of falling (FoF) are specific concerns for people with MS (pwMS). Considering the relatively high incidence and potential linkage, it is surprising that this triple relationship has as yet not been extensively investigated in pwMS. Thus, the present study aimed to examine the correlates of sedentary behavior with FoF and falls in pwMS.

**METHODS:** Fifty pwMS, 30 women, were admitted to this cross-sectional study. Primary outcome measures included physical activity and sedentary behavior metrics measured by accelerometry, fall status, and FoF. Additional measures included mobility clinical tests, cognition, perceived fatigue, depression, and anxiety. The sample was divided into two subgroups according to the daily Metabolic Equivalent of Task (MET) rate scores; <1.5 was defined as sedentary,  $\geq 1.5$  were defined as non-sedentary. Multivariate analysis of variance and linear regression analyses assessed the relationships by using an alpha of 0.05.

**RESULTS:** Sixty-four percent of the sample were classified as sedentary. The sedentary subgroup reported more FoF than the non-sedentary subgroup (32.5 (S.D. = 11.3) vs. 29.9 (S.D. = 9.5); however, no differences were found in fall status between the subgroups. No differences were found for depression, anxiety, cognition, and perceived fatigue between the subgroups. Furthermore, according to the linear regression analysis, FoF explained 23.9% of the variance pertaining to the daily MET rate when controlling for age, gender, disease duration, and disability.

**CONCLUSIONS:** Clinicians are encouraged to incorporate the issue of FoF during standard management, which may represent an opportunity to improve care and reduce sedentary behavior in pwMS.

**Language:** en

**Keywords:** Falls; Fear of falling; Multiple sclerosis; Physical activity; Sedentary behavior

## **Beyond gait speed: exploring the added value of Inertial Measurement Unit-based measurements of gait in the estimation of the walking ability in daily life**

Felius RAW, Wouda NC, Geerars M, Bruijn SM, Van Dieën JH, Punt M. BMC Neurol. 2024; 24(1): e129.

(Copyright © 2024, Holtzbrinck Springer Nature Publishing Group - BMC)

**DOI:** 10.1186/s12883-024-03632-0

**PMID:** 38627674

### **Abstract**

**BACKGROUND:** Gait speed is often used to estimate the walking ability in daily life in people after stroke. While measuring gait with inertial measurement units (IMUs) during clinical assessment yields additional information, it remains unclear if this information can improve the estimation of the walking ability in daily life beyond gait speed.

**OBJECTIVE:** We evaluated the additive value of IMU-based gait features over a simple gait-speed measurement in the estimation of walking ability in people after stroke.

**METHODS:** Longitudinal data during clinical stroke rehabilitation were collected. The assessment consisted of two parts and was administered every three weeks. In the first part, participants walked for two minutes (2MWT) on a fourteen-meter path with three IMUs attached to low back and feet, from which multiple gait features, including gait speed, were calculated. The dimensionality of the corresponding gait features was reduced with a principal component analysis. In the second part, gait was measured for two consecutive days using one ankle-mounted IMU. Next, three measures of walking ability in daily life were calculated, including the number of steps per day, and the average and maximal gait speed. A gait-speed-only Linear Mixed Model was used to estimate the association between gait speed and each of the three measures of walking ability. Next, the principal components (PC), derived from the 2MWT, were added to the gait-speed-only model to evaluate if they were confounders or effect modifiers.

**RESULTS:** Eighty-one participants were measured during rehabilitation, resulting in 198 2MWTs and 135 corresponding walking-performance measurements. 106 Gait features were reduced to nine PCs with 85.1% explained variance. The linear mixed models demonstrated that gait speed was weakly associated with the average and maximum gait speed in daily life and moderately associated with the number of steps per day. The PCs did not considerably improve the outcomes in comparison to the gait speed only models.

**CONCLUSIONS:** Gait in people after stroke assessed in a clinical setting with IMUs differs from their walking ability in daily life. More research is needed to determine whether these discrepancies also occur in non-laboratory settings, and to identify additional non-gait factors that influence walking ability in daily life.

**Language:** en

**Keywords:** Accelerometer; Cerebrovascular accident; Daily life gait characteristics; Functional gait assessment; Gait quality; Inertial measurement units; Stroke recovery; Walking ability

## **Association between advanced glycation end-products and fall risk in older adults: the Yakumo Study**

Iida H, Takegami Y, Osawa Y, Funahashi H, Ozawa Y, Ido H, Asamoto T, Otaka K, Tanaka S, Nakashima H, Ishizuka S, Seki T, Hasegawa Y, Imagama S. *Geriatr. Gerontol. Int.* 2024; ePub(ePub): ePub.

(Copyright © 2024, Japan Geriatrics Society, Publisher John Wiley and Sons)

**DOI:** 10.1111/ggi.14871

**PMID:** 38644665

### **Abstract**

**AIM:** Advanced glycation end-products (AGEs) are irreversibly and heterogeneously formed compounds during the non-enzymatic modification of macromolecules, such as proteins. Aging and lifestyle habits, such as high-fat and high-protein diets, and smoking, promote AGEs accumulation. This study aimed to investigate the relationship between fall risk and AGEs in community-dwelling older adults.

**METHODS:** This cross-sectional study included patients from the 2022 Yakumo Study who were evaluated for fall risk index 5-items version, locomotive syndrome stage and AGEs. AGEs were evaluated using Skin autofluorescence (SAF) measured by the AGE reader (DiagnOptics Technologies BV, Groningen, the Netherlands). We divided the participants into two groups according to the presence or absence of fall risk (fall risk index 5-items version  $\geq 6$  or not), and investigated the factors associated with fall risk.

**RESULTS:** The fall risk group had a higher age and SAF, and a higher proportion of locomotive syndrome stage  $>2$  than the without fall risk group in patients aged  $\geq 65$  years ( $P < 0.01$ ). The multivariate logistic regression analysis after adjustment of age, sex and body mass index showed that locomotive syndrome stage  $\geq 2$  and SAF were independent associators of fall risk in older adults (odds ratio 3.26,  $P < 0.01$ , odds ratio 2.96,  $P < 0.05$ , respectively). The optimal cutoff value of the SAF for fall risk was 2.4 (area under the curve 0.631; 95% CI 0.53-0.733; sensitivity 0.415; specificity 0.814;  $P < 0.05$ ).

**CONCLUSION:** The accumulation of AGEs in skin tissues can be used to screen for fall risk comprehensively. *Geriatr Gerontol Int* 2024; ••: ••-••.

**Language:** en

**Keywords:** advanced glycation end-products; fall; fall risk; Yakumo Study

## **Emergency physician gender and head computed tomography orders for older adults who have fallen**

Kraft R, Mercuri M, Clayton N, Worster A, Mercier E, Emond M, Varner C, McLeod SL, Eagles D, Stiell I, Barbic D, Morris J, Jeanmonod R, Kagoma YK, Shoamanesh A, Engels PT, Sharma S, Papaioannou A, Parpia S, Buchanan I, Ali M, de Wit K. Acad. Emerg. Med. 2024; ePub(ePub): ePub.

(Copyright © 2024, Society for Academic Emergency Medicine, Publisher John Wiley and Sons)

**DOI:** 10.1111/acem.14928

**PMID:** 38644592

### **Abstract**

**OBJECTIVE:** Physicians vary in their computed tomography (CT) scan usage. It remains unclear how physician gender relates to clinical practice or patient outcomes. The aim of this study was to assess the association between physician gender and decision to order head CT scans for older emergency patients who had fallen.

**METHODS:** This was a secondary analysis of a prospective observational cohort study conducted in 11 hospital emergency departments (EDs) in Canada and the United States. The primary study enrolled patients who were 65 years and older who presented to the ED after a fall. The analysis evaluated treating physician gender adjusted for multiple clinical variables. Primary analysis used a hierarchical logistic regression model to evaluate the association between treating physician gender and the patient receiving a head CT scan. Secondary analysis reported the adjusted odds ratio (OR) for diagnosing intracranial bleeding by physician gender.

**RESULTS:** There were 3663 patients and 256 physicians included in the primary analysis. In the adjusted analysis, women physicians were no more likely to order a head CT than men (OR 1.26, 95% confidence interval 0.98-1.61). In the secondary analysis of 2294 patients who received a head CT, physician gender was not associated with finding a clinically important intracranial bleed.

**CONCLUSIONS:** There was no significant association between physician gender and ordering head CT scans for older emergency patients who had fallen. For patients where CT scans were ordered, there was no significant relationship between physician gender and the diagnosis of clinically important intracranial bleeding.

**Language:** en

## **Privacy-preserving cameras for fall detection: data acquisition for artificial intelligence**

Lachance SL, Hutchins JM. *Comput. Inform. Nurs.* 2024; ePub(ePub): ePub.

(Copyright © 2024, Lippincott Williams and Wilkins)

**DOI:** 10.1097/CIN.0000000000001136      **PMID:** 38657018

### **Abstract**

No abstract was provided. However, the first page of this article is available by following the DOI.

**Language:** en

## **The effect of adding real-time postural feedback in balance and mobility training in older adults: a systematic review and meta-analysis**

Liang SGS, Fan ESL, Lam PK, Kwok WT, Ma CZH, Lam FMH. Arch. Gerontol. Geriatr. 2024; 123: e105439.

(Copyright © 2024, Elsevier Publishing)

**DOI:** 10.1016/j.archger.2024.105439

**PMID:** 38643641

### **Abstract**

**OBJECTIVES:** This study aimed to systematically review the additional value of providing real-time postural feedback during balance and mobility training in older people.

**METHODS:** PubMed, Embase, CINAHL, and Web-of-Science were searched from inception to August 2023. Studies comparing the effectiveness of feedback-based versus non-feedback-based postural balance or mobility training on balance or mobility outcomes were selected. Similar outcomes were pooled in meta-analyses using a random-effect model. The quality of evidence for available outcomes was rated by Grading of Recommendations Assessment, Development and Evaluation (GRADE).

**RESULTS:** Eight studies were identified with 203 subjects. Two studies showed that providing postural feedback immediately improved stability in static balance and gait. For the post-training effect, however, no significant change was found in trunk movement during single-leg standing (i.e., pitch angle, MD=0.65, 95 %CI=-0.77 to 2.07, low-quality; roll angle, MD=0.96, 95 %CI=-0.87 to 2.80, moderate-quality), in the Mini-BESTest (MD=1.88, 95 %CI=-0.05 to 3.80, moderate-quality), and in balance confidence (MD=0.29, 95 %CI=-3.43 to 4.2, moderate-quality). A worsened functional reach distance was associated with providing feedback during balance training (MD=-3.26, 95 %CI=-6.31 to -0.21, high-quality). Meta-analyses on mobility outcomes were mostly insignificant, except for the trunk-roll angle of walking (MD=0.87, 95 %CI=0.05 to 1.70, low-quality) and trunk-pitch angle of walking with head-turning (MD=1.87, 95 %CI=0.95 to 2.79, moderate-quality).

**CONCLUSION:** Adding real-time postural feedback to balance and mobility training might immediately improve stability in balance and mobility in older people. However, mixed results were reported for its post-training effect.

**Language:** en

**Keywords:** Balance; Fall; Feedback; Mobility; Older adult; Real-time

## **Association between postoperative fall history and toe grip strength in patients after total knee arthroplasty: a prospective observational study**

Mawarikado Y, Inagaki Y, Fujii T, Kubo T, Kido A, Tanaka Y. J. Foot Ankle Res. 2024; 17(2): e12007.

(Copyright © 2024, Holtzbrinck Springer Nature Publishing Group - BMC)

**DOI:** 10.1002/jfa2.12007

**PMID:** 38632697

### **Abstract**

**BACKGROUND:** Factors associated with falls after total knee arthroplasty (TKA) have been rarely reported. The aim of this study was to identify factors that influence the incidence of falls after TKA, focusing on toe grip strength (TGS) in particular, which has been associated with falls in older adults.

**METHODS:** 217 patients who underwent TKA were included and followed up for 1 year. Main study outcome measures were the presence or absence of falls within 1 year after TKA. Multiple logistic regression analysis was used with postoperative falls as the dependent variable and preoperative falls and postoperative TGS on the affected sides as independent variables.

**RESULTS:** 170 (43 and 127 in the fall and non-fall groups) patients were included in the analysis. The presence of a preoperative falls history before TKA and a weak postoperative affected TGS indicated an increased susceptibility of the patient to fall postoperatively.

**CONCLUSIONS:** Results of the current study revealed the association between postoperative TGS and postoperative falls. We highlight the importance of preoperative fall monitoring and postoperative TGS evaluation to prevent falls after TKA.

**Language:** en

**Keywords:** \*Arthroplasty, Replacement, Knee/methods; \*Osteoarthritis, Knee; Accidental Falls/prevention & control; Aged; cohort study; falls; Hand Strength; Humans; toe grip strength; Toes/surgery; total knee arthroplasty

## **Immediate fall prevention: the missing key to a comprehensive solution for falling hazard in older adults**

Misaghian K, Lugo JE, Faubert J. *Front. Aging Neurosci.* 2024; 16: e1348712.

(Copyright © 2024, Frontiers Research Foundation)

**DOI:** 10.3389/fnagi.2024.1348712

**PMID:** 38638191

**PMCID:** PMC11024377

### **Abstract**

The world is witnessing an unprecedented demographic shift due to increased life expectancy and declining birth rates. By 2050, 20% of the global population will be over 60, presenting significant challenges like a shortage of caregivers, maintaining health and independence, and funding extended retirement. The technology that caters to the needs of older adults and their caregivers is the most promising candidate to tackle these issues. Although multiple companies and startups offer various aging solutions, preventive technology, which could prevent trauma, is not a big part of it. Trauma is the leading cause of morbidity, disability, and mortality in older adults, and statistics constitute traumatic fall accidents as its leading cause. Therefore, an immediate preventive technology that anticipates an accident on time and prevents it must be the first response to this hazard category to decrease the gap between life expectancy and the health/wellness expectancy of older adults. The article outlines the challenges of the upcoming aging crisis and introduces falls as one major challenge. After that, falls and their mechanisms are investigated, highlighting the cognitive functions and their relation to falls. Moreover, since understanding predictive cognitive mechanisms is critical to an effective prediction-interception design, they are discussed in more detail, signifying the role of cognitive decline in balance maintenance. Furthermore, the landscape of available solutions for falling and its shortcomings is inspected. Finally, immediate fall prevention, the missing part of a wholesome solution, and its barriers are introduced, and some promising methodologies are proposed.

**Language:** en

**Keywords:** aging; aging in place; fall prevention; falling; immediate prevention; longevity; trauma

## **Sarcopenic obesity defined by the ESPEN and EASO consensus statement in older women: risk of falls and bone mineral density implications**

Montalvão-Sousa TM, Ferreira PA, Colombelli NL, de Carvalho KMB, Blazevich AJ, Lima RM. Arch. Gerontol. Geriatr. 2024; 124: e105444.

(Copyright © 2024, Elsevier Publishing)

**DOI:** 10.1016/j.archger.2024.105444

**PMID:** 38643667

### **Abstract**

**PURPOSE:** To apply the ESPEN-EASO diagnostic criteria for Sarcopenic Obesity (SO) in older women and to assess its association with the risk of falls, fear of falls (FOF), and bone mineral density (BMD).

**METHODS:** After exclusion criteria, 232 women aged  $\geq 60$  years ( $68.2 \pm 6.1$ ) were enrolled in the study. Volunteers had handgrip strength (HGS; dynamometer) and body composition assessed by DXA before risk of falls was evaluated using the QuickScreen and FOF evaluated by the Falls Efficiency Scale. SO was defined according to the ESPEN-EASO algorithm, which includes reduced HGS and fat-free mass, and elevated fat mass.

**RESULTS:** The prevalence of SO was 6.5 %, which was associated with a higher proportion of fallers in the previous year ( $X(2) 6.2, P = 0.04$ ), reduced reaction time ( $X(2) 6.2, P = 0.04$ ), reduced sit-to-stand performance ( $X(2) 6.2, P = 0.04$ ), and a higher probability of falls [ $\chi^2(6) = 17.689, p = 0.004$ ]. FOF was lower in the eutrophic group ( $\chi^2(2) = 15,662, p < 0,001$ ) than both the obesity ( $p = 0.001$ ) and SO ( $p = 0.05$ ) groups. For total and femoral neck BMD, the eutrophic group presented significantly lower values (1.05 and 0.79 g/cm<sup>2</sup>) than the obesity group (1.10 and 0.87 g/cm<sup>2</sup>), but similar to the SO group (1.02 and 0.83 g/cm<sup>2</sup>). These results remained significant after adjustments for potential confounders.

**CONCLUSIONS:** SO specified by the ESPEN-EASO framework was associated with a higher risk of falls but not with increased FOF than obesity alone. The favorable influence of overweight and obesity on BMD seems to be attenuated in individuals with SO. Our findings support the clinical significance of the ESPEN-EASO definition.

**Language:** en

**Keywords:** Aging; Bone mineral density; Falls; Obesity; Sarcopenic obesity

## **Age-related changes in static balance in older women aged in their early sixties to their late eighties: different aging patterns in the anterior-posterior and mediolateral directions**

Sasagawa S, Arakawa A, Furuyama A, Matsumoto Y. *Front. Aging Neurosci.* 2024; 16: e1361244.

(Copyright © 2024, Frontiers Research Foundation)

**DOI:** 10.3389/fnagi.2024.1361244

**PMID:** 38655430

**PMCID:** PMC11036885

### **Abstract**

**OBJECTIVE:** The aim of this study was to cross-sectionally investigate how static balance changes throughout the aging process in older women aged from their early sixties to their late eighties.

**METHODS:** Forty-six older women (aged 62-89 years) were requested to stand barefoot and quietly on a force platform for 30 s with their eyes either open or closed. During the trials, the position of the center of foot pressure (CoP) and the acceleration of the body's center of mass (ACC) were measured. The root mean square (RMS) of the CoP and ACC values was calculated to evaluate the amplitude of postural sway and the level of regulatory activity, respectively. The mean power frequency of the ACC was also calculated to represent the temporal characteristics of regulatory activity.

**RESULTS:** In the anterior-posterior direction, there was no significant relationship between the RMS of CoP and the participants' age, whereas the RMS of ACC significantly increased with increasing age. In the mediolateral direction, however, the RMS of CoP significantly increased with increasing age, whereas the RMS of ACC did not change with age. The mean power frequency of ACC did not exhibit any age-related change in either the anterior-posterior or the mediolateral direction.

**CONCLUSION:** The results indicate that static balance in older women aged in their early sixties to their late eighties exhibits distinctly contrasting aging patterns between the anterior-posterior and mediolateral directions. To prevent falls in older women, it is necessary to elucidate the physiological mechanisms responsible for the increase in mediolateral sway that occurs throughout old age.

**Language:** en

**Keywords:** center of pressure; fall; posture; quiet standing; women

## Temporal trends and the association between self-rated oral health and falls in community-dwelling older adults in South Korea: a secondary analysis of survey data

Seo HJ, Ahn SK, Choi MJ. *BMJ Open* 2024; 14(4): e081549.

(Copyright © 2024, BMJ Publishing Group)

DOI: 10.1136/bmjopen-2023-081549

PMID: 38658001

### Abstract

**OBJECTIVE:** This study aims to examine temporal trends and the association between falls and self-rated oral health (SROH) status in community-dwelling older Korean adults.

**DESIGN:** Secondary analysis of a serial cross-sectional study.

**METHODS:** We analysed biennial data from 314 846 older adults in South Korea from 2011 to 2019 using data from the Korea Community Health Survey. Self-reported fall experience data came from the injury questionnaire question, 'Have you fallen in the past year (slipping, tripping, stumbling and falling)?'. For SROH, the participants were asked, 'How do you feel about your oral health, such as teeth and gums, in your own opinion?'. The association between SROH and falls was examined using a weighted multivariable logistic regression model adjusted for sociodemographic characteristics, health status and behaviours, and psychological factors.

**RESULTS:** Those who reported poor SROH had a lower declining slope than the other groups, although all groups showed a significantly decreasing trend in both men and women from 2011 to 2019 ( $p$  for trend < 0.001). Older adults who reported having poor SROH had a more significant history of fall accidents than the good SROH groups, controlling for potential confounding variables (adjusted OR 1.16 (95% CI 1.10 to 1.21) in men; adjusted OR 1.17 (95% CI 1.13 to 1.21) in women).

**CONCLUSIONS:** Older adults with poor SROH, especially women, had more fall accidents, making them a priority target for fall prevention strategies. This study suggests considering SROH status when identifying fall risk factors in community-dwelling older adults.

**Language:** en

**Keywords:** \*Accidental Falls/statistics & numerical data; \*Independent Living; \*Oral Health/trends; \*Self Report; aged; Aged; Aged, 80 and over; Cross-Sectional Studies; epidemiology; Female; Health Surveys; Humans; Logistic Models; Male; oral medicine; public health; Republic of Korea/epidemiology; Risk Factors

## **A novel Internet of Things based fall detection system in smart home**

Si W, Tan R, Yang G. *Int. J. Intell. Syst.* 2022; 37(12): 11299-11318.

(Copyright © 2022, Hindawi / Wiley Periodicals)

**DOI:** 10.1002/int.23043

**PMID:** unavailable

### **Abstract**

In the field of motion monitoring in smart home, the 5G technology can be applied to Internet of Things systems for facilitating our daily life. In this paper, a comprehensive study on the fall detection system based on 5G network is presented. Starting with analyzing the moving stability, a wearable foot pressure measurement system is devised. Furthermore, the center of pressure during moving is computed by using the pressure data. Besides, the signal transmitting security issue is also considered. The physical layer security authentication and the cross-layer encryption are employed and integrated within the security strategy. As a case study, we evaluate the proposed method on fall detection tasks in smart home and the experimental results establish strong evidence of a satisfying performance.

**Language:** en

**Keywords:** center of pressure; fall detection; IoT system; security strategy; smart home

## **Emergency department-based physical function measures for falls in older adults and outcomes: a secondary analysis of GAPcare**

Strauss DH, Davoodi NM, Resnik LJ, Keene S, Serina PT, Goldberg EM. *J. Geriatr. Phys. Ther.* 2024; ePub(ePub): ePub.

(Copyright © 2024, American Physical Therapy Association)

**DOI:** 10.1519/JPT.0000000000000403      **PMID:** 38656264

### **Abstract**

**BACKGROUND AND PURPOSE:** Falls are the leading reason for injury-related emergency department (ED) visits for older adults. The Geriatric Acute and Post-acute Fall Prevention Intervention (GAPcare), an in-ED intervention combining a medication therapy management session delivered by a pharmacist and a fall risk assessment and plan by a physical therapist, reduced ED revisits at 6 months among older adults presenting after a fall. Our objective was to evaluate the relationship between measures of function obtained in the ED and clinical outcomes.

**METHODS:** This was a secondary analysis of data from GAPcare, a randomized controlled trial conducted from January 2018 to October 2019 at 2 urban academic EDs. Standardized measures of function (Timed Up and Go [TUG] test, Barthel Activity of Daily Living [ADL], Activity Measure for Post Acute Care [AM-PAC] 6 clicks) were collected at the ED index visit. We performed a descriptive analysis and hypothesis testing (chi square test and analysis of variance) to assess the relationship of functional measures with outcomes (ED disposition, ED revisits for falls, and place of residence at 6 months). Emergency department disposition status refers to discharge location immediately after the ED evaluation is complete (eg, hospital admission, original residence, skilled nursing facility).

**RESULTS AND DISCUSSION:** Among 110 participants, 55 were randomized to the GAPcare intervention and 55 received usual care. Of those randomized to the intervention, 46 received physical therapy consultation. Median age was 81 years; participants were predominantly women (67%) and White (94%). Seventy-three (66%) were discharged to their original residence, 14 (13%) were discharged to a skilled nursing facility and 22 (20%) were admitted. There was no difference in ED disposition status by index visit Barthel ADLs ( $P = .371$ ); however, TUG times were faster ( $P = .016$ ), and AM-PAC 6 clicks score was higher among participants discharged to their original residence ( $P \leq .001$ ). Participants with slower TUG times at the index ED visit were more likely to reside in nursing homes by six months ( $P = .002$ ), while Barthel ADL and AM-PAC 6 clicks did not differ between those residing at home and other settings.

**CONCLUSIONS:** Measures of function collected at the index ED visit, such as the AM-PAC 6 clicks and TUG time, may be helpful at predicting clinical outcomes for older adults presenting for a fall. Based on our study findings, we suggest a novel workflow to guide the use of these clinical measures for ED patients with falls.

**Language:** en

## **Evaluation of the effectiveness of "5E" comprehensive injury prevention strategy for fall prevention among the rural elderly - six pilot villages, Yunnan Province and Chongqing Municipality, China, 2018-2023**

Sun F, Luo R, Han H. *China CDC Wkly.* 2024; 6(14): 277-281.

(Copyright © 2024, Chinese Center for Disease Control and Prevention [China CDC])

DOI: 10.46234/ccdcw2024.054

PMID: 38634102

PMCID: PMC11018707

### **Abstract**

**WHAT IS ALREADY KNOWN ABOUT THIS TOPIC?** The mortality rate and disease burden associated with falls among the elderly in China are on the rise. Interventions can play a crucial role in preventing and managing falls. **WHAT IS ADDED BY THIS REPORT?** The application of the "5E" injury prevention strategy led to a decrease in both the occurrence of falls and the likelihood of subsequent falls. Regular physical activity and maintaining a positive outlook were identified as protective measures against falls, while sleep issues and hearing impairment were found to increase the risk of falling. **WHAT ARE THE IMPLICATIONS FOR PUBLIC HEALTH PRACTICE?** The group-based comprehensive intervention strategy is crucial as it offers an innovative intervention model and empirical evidence for decreasing fall rates among elderly individuals living in rural areas.

**Language:** en

**Keywords:** "5E" Comprehensive Injury Prevention Strategy; Fall Incidence; Intervention Effect; Re-fall Risk

## **Gait speed and its associated factors among older black adults in Sub-Saharan Africa: evidence from the WHO study on Global AGEing in older adults (SAGE)**

Tawiah P, Mensah PB, Gyabaah S, Adebajji AO, Konadu E, Amoah I. PLoS One 2024; 19(4): e0295520.

(Copyright © 2024, Public Library of Science)

DOI: 10.1371/journal.pone.0295520

PMID: 38635683

### **Abstract**

Gait speed is an essential predictor of functional and cognitive decline in older adults. The study aimed to investigate the gait speed of older adults in Ghana and South Africa and to determine its associated factors, as the Sub-Saharan representatives in the World Health Organization's Study on Global AGEing in Older Adults (SAGE). A secondary analysis of data from the SAGE study which consists of nationally representative data involving participants aged  $\geq 50+$  years with smaller samples of younger adults aged 18-49 years in Ghana and South Africa was conducted. SAGE study employed a multistage, stratified clustered sample design and involved the use of a standardised questionnaire to obtain participants' (n = 5808) demographic, anthropometric and gait speed information. The standard 4 metre-gait speed was used. Median gait speed for the study group, which comprised African/Black participants aged  $\geq 50+$  years was 0.769 (Q1 = 0.571, Q3 = 0.952) m/s for males and 0.667 (Q1 = 0.500, Q3 = 0.833) m/s for females. For every unit increase in age, the odds of being in a higher-ranked gait speed category was 0.96 (95%CI 0.96, 0.97,  $p < 0.001$ ) times that of the previous age. Females had odds of 0.55 (95%CI 0.50, 0.61,  $p < 0.001$ ) of recording higher gait speed, as compared to males. Rural dwellers had odds of 1.43 (95%CI 1.29, 1.58,  $p < 0.001$ ) of being in a higher-ranked category of gait speed compared to urban dwellers. Underweight (OR = 0.85, 95%CI = 0.73-1.00,  $p < 0.05$ ) and obesity (OR = 0.53, 95%CI = 0.46-0.61,  $p < 0.001$ ) were associated with slower gait speed. Amongst functional indices, the World Health Organization Disability Assessment Schedule (WHODAS) score was the biggest determinant of gait speed. Having a "Severe/Extreme" WHODAS score had the strongest association with gait speed (OR = 0.18, 95%CI = 0.14-0.23,  $p < 0.001$ ). These gait speed results provide an essential reference for older adults' care in Ghana and South Africa.

**Language:** en

## **Bidirectional association between falls and multimorbidity in middle-aged and elderly Chinese adults: a national longitudinal study**

Tian Y, Zhou X, Jiang Y, Pan Y, Liu X, Gu X. *Sci. Rep.* 2024; 14(1): e9109.

(Copyright © 2024, Nature Publishing Group)

**DOI:** 10.1038/s41598-024-59865-z

**PMID:** 38643241

### **Abstract**

This study explores the bidirectional association between multimorbidity and falls in Chinese middle-aged and elderly adults. Participants aged 45 and above from the China Health and Retirement Longitudinal Study were included. Binary logistic regression assessed the impact of chronic conditions on fall incidence (stage I), while multinomial logistic regression examined the relationship between baseline falls and multimorbidity (stage II). The fully adjusted odds ratios (ORs) for one, two, or three or more chronic conditions were 1.34, 1.65, and 2.02, respectively. Among participants without baseline falls, 28.61% developed two or more chronic conditions during follow-up, compared to 37.4% of those with a history of falls. Fully adjusted ORs for one, two, or three or more chronic conditions in those with a history of falls were 1.21, 1.38 and 1.70, respectively. The bidirectional relationship held in sensitivity and subgroup analyses. A bidirectional relationship exists between multimorbidity and falls in Chinese middle-aged and elderly adults. Strengthening chronic condition screening and treatment in primary healthcare may reduce falls risk, and prioritizing fall prevention and intervention in daily life is recommended.

**Language:** en

**Keywords:** Bidirectional association; CHARLS; Falls; Multimorbidity

## **Association between visual acuity and prospective fall risk in generally healthy and active older adults: the 3-year DO-HEALTH Study**

Wieczorek M, Isler M, Landau K, Becker MD, Dawson-Hughes B, Kressig RW, Vellas B, Orav EJ, Rizzoli R, Kanis JA, Armbrecht G, Da Silva JAP, Egli A, Freystätter G, Bischoff-Ferrari HA. *J. Am. Med. Dir. Assoc.* 2024; ePub(ePub): ePub.

(Copyright © 2024, Lippincott Williams and Wilkins)

**DOI:** 10.1016/j.jamda.2024.03.005

**PMID:** 38640962

### **Abstract**

**OBJECTIVE:** Although aging has a strong impact on visual acuity (VA) and falls, their interaction is understudied in generally healthy older adults. This study aimed to examine if and to what extent baseline VA is associated with an increased risk of all and injurious falls over 3 years in generally healthy community-dwelling older adults.

**DESIGN:** Observational analysis of DO-HEALTH, a double-blind, randomized controlled trial. **SETTING AND PARTICIPANTS:** Multicenter trial with 7 European centers: Zurich, Basel, Geneva (Switzerland), Berlin (Germany), Innsbruck (Austria), Toulouse (France), and Coimbra (Portugal), including 2157 community-dwelling adults aged 70 years and older without any major health events in the 5 years prior to enrollment, sufficient mobility, and good cognitive status.

**METHODS:** The numbers of all and injurious falls were recorded prospectively by diary and in-person assessment every 3 months. Decreased VA at baseline was defined as better-eye VA lower than 1.0. We applied negative binomial regression models for all and injurious falls, adjusted for age, sex, prior falls, treatment allocation, study site, baseline body mass index, and use of walking aids.

**RESULTS:** Among the 2131 participants included in this analysis (mean age: 74.9 years, 61.7% were women, 82.6% at least moderately physically active), 1464 (68.7%) had decreased VA. Overall, 3290 falls including 2116 injurious falls were recorded over 3 years. Decreased VA at baseline was associated with a 22% increased incidence rate of all falls [adjusted incidence rate ratio (aIRR) = 1.22, 95% CI 1.07, 1.38, P = .003] and 20% increased incidence rate of injurious falls (aIRR = 1.20, 95% CI 1.05, 1.37, P = .007).

**CONCLUSIONS AND IMPLICATIONS:** Our findings suggest that decreased VA is an independent predictor of an about 20% increased risk of all and injurious falls, highlighting the importance of regular eye examinations and VA measurements for fall prevention, even in generally healthy and active older adults.

**Language:** en

**Keywords:** DO-HEALTH; falls; injurious falls; older adults; visual acuity