

## Safety Literature 6<sup>th</sup> September 2020

### Can an emergency department-initiated intervention prevent subsequent falls and health care use in older adults? A randomized controlled trial

Goldberg EM, Marks SJ, Resnik LJ, Long S, Mellott H, Merchant RC. *Ann. Emerg. Med.* 2020; ePub(ePub): ePub.

(Copyright © 2020, American College of Emergency Physicians, Publisher Elsevier Publishing)

DOI 10.1016/j.annemergmed.2020.07.025 PMID 32854965

#### Abstract

**STUDY OBJECTIVE:** We determine whether an emergency department (ED)-initiated fall-prevention intervention can reduce subsequent fall-related and all-cause ED visits and hospitalizations in older adults.

**METHODS:** The Geriatric Acute and Post-acute Fall Prevention intervention was a randomized controlled trial conducted from January 2018 to October 2019. Participants at 2 urban academic EDs were randomly assigned (1:1) to an intervention or usual care arm. Intervention participants received a brief, tailored, structured, pharmacy and physical therapy consultation in the ED, with automated communication of the recommendations to their primary care physicians.

**RESULTS:** Of 284 study-eligible participants, 110 noninstitutionalized older adults ( $\geq 65$  years) with a recent fall consented to participate; median age was 81 years, 67% were women, 94% were white, and 16.3% had cognitive impairment. Compared with usual care participants (n=55), intervention participants (n=55) were half as likely to experience a subsequent ED visit (adjusted incidence rate ratio 0.47 [95% CI 0.29 to 0.74]) and one third as likely to have fall-related ED visits (adjusted incidence rate ratio 0.34 [95% CI 0.15 to 0.76]) within 6 months. Intervention participants experienced half the rate of all hospitalizations (adjusted incidence rate ratio 0.57 [95% CI 0.31 to 1.04]), but confidence intervals were wide. There was no difference in fall-related hospitalizations between groups (adjusted incidence rate ratio 0.99 [95% CI 0.31 to 3.27]). Self-reported adherence to pharmacy and physical therapy recommendations was moderate; 73% of pharmacy recommendations were adhered to and 68% of physical therapy recommendations were followed.

**CONCLUSION:** Geriatric Acute and Post-acute Fall Prevention, a postfall, in-ED, multidisciplinary intervention with pharmacists and physical therapists, reduced 6-month ED encounters in 2 urban EDs. The intervention could provide a model of care to other health care systems aiming to reduce costly and burdensome fall-related events in older adults.

Language: en

## Can treadmill slip-perturbation training reduce longer-term fall risk upon overground slip exposure?

Lee A, Bhatt T, Liu X, Wang Y, Wang S, Pai YCC. J. Appl. Biomech. 2020; ePub(ePub): ePub.

(Copyright © 2020, Human Kinetics Publishers)

DOI 10.1123/jab.2019-0211 PMID 32843581

### Abstract

The purpose was to examine and compare the longer-term generalization between 2 different practice dosages for a single-session treadmill slip-perturbation training when reexposed to an overground slip 6 months later. A total of 45 older adults were conveniently assigned to either 24 or 40 slip-like treadmill perturbation trials or a third control group. Overground slips were given immediately after initial training, and at 6 months after initial training in order to examine immediate and longer-term effects. The performance (center of mass stability and vertical limb support) and fall percentage from the laboratory-induced overground slips (at initial posttraining and at 6 mo) were measured and compared between groups. Both treadmill slip-perturbation groups showed immediate generalization at the initial posttraining test and longer-term generalization at the 6-month retest. The higher-practice-dosage group performed significantly better than the control group ( $P < .05$ ), with no difference between the lower-practice-dosage and the control groups at the 6-month retest ( $P > .05$ ). A single session of treadmill slip-perturbation training showed a positive effect for reducing older adults' fall risk for laboratory-induced overground slips. A higher-practice dosage of treadmill slip perturbations could be more beneficial for further reducing fall risk.

Language: en

### Keywords

older adults; dosage; longer-term generalization; stability

## **Determining the optimal dose of reactive balance training after stroke: study protocol for a pilot randomised controlled trial**

Mansfield A, Inness EL, Danells CJ, Jagroop D, Bhatt T, Huntley AH. *BMJ Open* 2020; 10(8): e038073.

(Copyright © 2020, BMJ Publishing Group)

**DOI** 10.1136/bmjopen-2020-038073 **PMID** 32847916

### **Abstract**

**INTRODUCTION:** Falls risk poststroke is highest soon after discharge from rehabilitation. Reactive balance training (RBT) aims to improve control of reactions to prevent falling after a loss of balance. In healthy older adults, a single RBT session can lead to lasting improvements in reactive balance control and prevent falls in daily life. While increasing the dose of RBT does not appear to lead to additional benefit for healthy older adults, stroke survivors, who have more severely impaired balance control, may benefit from a higher RBT dose. Our long-term goal is to determine the optimal dose of RBT in people with subacute stroke. This assessor-blinded pilot randomised controlled trial aims to inform the design of a larger trial to address this long-term goal.

**METHODS AND ANALYSIS:** Participants (n=36) will be attending out-patient stroke rehabilitation, and will be randomly allocated to one of three groups: one, three or six RBT sessions. RBT will replace a portion of participants' regular physiotherapy so that the total physical rehabilitation time will be the same for the three groups. Balance and balance confidence will be assessed at: (1) study enrolment; (2) out-patient rehabilitation discharge; and (3) 6 months postdischarge. Participants will report falls and physical activity for 6 months postdischarge. Pilot data will be used to plan the larger trial (ie, sample size estimate using fall rates, and which groups should be included based on between-group trends in pre-to-post training effect sizes for reactive balance control measures). Pilot data will also be used to assess the feasibility of the larger trial (ie, based on the accrual rate, outcome completion rate and feasibility of prescribing specific training doses).

**ETHICS AND DISSEMINATION:** Institutional research ethics approval has been received. Study participants will receive a lay summary of results. We will also publish our findings in a peer-reviewed journal.

**TRIAL REGISTRATION NUMBER:** NCT04219696; Pre results.

Language: en

### **Keywords**

rehabilitation medicine; stroke; stroke medicine

## Falls prevention interventions for community-dwelling older people living in mainland China: a narrative systematic review

Ye P, Liu Y, Zhang J, Peng K, Pan X, Shen Y, Xiao S, Armstrong E, Er Y, Duan L, Ivers R, Keay L, Tian M. *BMC Health Serv. Res.* 2020; 20(1): e808.

(Copyright © 2020, Holtzbrinck Springer Nature Publishing Group - BMC)

DOI 10.1186/s12913-020-05645-0 PMID 32859186

### Abstract

**BACKGROUND:** Falls in community-dwelling older people have been recognised as a significant public health issue in China given the rapidly growing aged population. Although there are several reviews documenting falls prevention programs for community-dwelling older adults, no systematic reviews of the scope and quality of falls prevention interventions in Mainland China exist. Therefore, the aim of this study was to systematically review falls prevention interventions for community-dwelling older people living in Mainland China.

**METHODS:** We systematically reviewed literature from Chinese and English databases. All types of randomised controlled trials (RCTs) and quasi-experimental studies published from 1st January 1990 to 30th September 2019 were included. Observational studies and studies in care facilities and hospitals were excluded. Narrative synthesis was performed to summarise the key features of all included studies. Quality assessment was conducted using the Cochrane Risk of Bias Tool and ROBINS-I tool for randomised and non-randomised studies respectively.

**RESULTS:** A total of 1020 studies were found, and 101 studies were included in the analysis. Overall, very few high quality studies were identified, and there was insufficient rigor to generate reliable evidence on the effectiveness of interventions or their scalability. Most interventions were multiple component interventions, and most studies focused on outcomes such as self-reported falls incidence or awareness of falls prevention.

**CONCLUSION:** There is an opportunity to undertake an evaluation of a rigorously-designed, large-scale falls prevention program for community-dwelling older people in Mainland China. To help mitigate the rising burden of falls in Mainland China, recommendations for future falls prevention interventions have been made. These include: (1) target disadvantaged populations; (2) incorporate personalised interventions; and (3) investigate the effectiveness of those under-explored interventions, such as psychological, social environment, management of urinary incontinence, fluid or nutrition therapy and surgery. The study results will also potentially provide a useful evidence base for other low-and-middle income countries in a similar situation.

Language: en

### Keywords

Older people; Community; China; Interventions; Falls prevention



## **Fear priming: a method for examining postural strategies associated with fear of falling**

Stamenkovic A, van der Veen SM, Thomas JS. *Front. Aging Neurosci.* 2020; 12: e241.

(Copyright © 2020, Frontiers Research Foundation)

DOI 10.3389/fnagi.2020.00241 PMID 32848714

### **Abstract**

Fear of falling influences postural strategies used for balance, and is key in the maintenance of independent living and quality of life as adults age. However, there is a distinct need for methodology that aims to specifically address and prime fear under dynamic conditions, and to better determine the role of fear in movement preparation. This preliminary study investigated how fear priming influences fear of falling in young and older individuals, and assessed how changes in fear of falling map to movement behavior. Young ( $21.5 \pm 1.7$  years,  $n = 10$ ) and older ( $58.1 \pm 2.2$  years) participants matched for height, weight, and sex were repeatedly exposed to four different and incrementally challenging laboratory-based slipping perturbations during a self-initiated, goal-directed step and reach task. Both younger and older cohorts showed similar heightened perceptions in fear of falling after fear priming, and changes in peak joint excursions including reduced ankle flexion, and increased lumbar flexion after fear priming. Age-related changes were only evident in total mediolateral center of mass displacement, with younger participants showing greater displacement after fear priming. Despite clear differences in preparatory muscle onsets relative to reach onset seen in older participants, muscle timings or co-contraction indices were not significantly different.

**METHODS** utilizing repeated exposure to varying increases of a slip-based postural challenge can successfully prime fear of falling in individuals, regardless of age.

Language: en

### **Keywords**

fear of falling; aging; balance; fear priming; posture

## **Investigating the feasibility of using telemedicine to deliver a fall prevention program: a pilot study**

VanRavenstein K, Brotherton S, Davis B. J. Allied Health 2020; 49(3): 221-227.

(Copyright © 2020, Association of Schools of Allied Health Professions)

DOI unavailable PMID 32877481

### **Abstract**

**AIM:** This pilot study was designed to examine the feasibility of using telemedicine to deliver a fall prevention program, a modified Otago exercise program, to low-income older adults living independently in affordable housing apartments.

**METHODS:** A mixed-methods feasibility study. Participants were divided into two groups: one group participated in a 12-week modified Otago fall prevention program via telehealth, while the other group participated in the program with an on-site instructor. Performance-based measures of physical function and self-report measures for self-efficacy for exercise and social connectedness were collected pre- and post-intervention and 1 year later.

**RESULTS:** All participants completed the 12-week intervention and expressed satisfaction with both the telehealth program and the on-site instructor-led program. There were no major differences in performance or self-report measures between the two groups, showing that telehealth-delivered applications can be effective. Participants in the on-site instructor-led group performed slightly better on performance-based measures, while those in the telehealth group scored higher on self-report measures of self-efficacy and social network scales.

**CONCLUSION:** A telehealth-delivered exercise program that includes strength and balance exercises and walking was feasible to conduct with a small group of low-income older adults living in a community-based apartment complex. Recruitment and retention of participants for the study was successful, and participants expressed satisfaction with the intervention whether conducted in-person or via telehealth.

Language: en

## **Mobility but not balance limitations are associated with cognitive decline among older Hispanics**

Wadsworth PA, Chen NW, Raji M, Markides KS, Downer B. *Gerontol. Geriatr. Med.* 2020; 6: e2333721420947952.

(Copyright © 2020, The Author(s), Publisher SAGE Publishing)

**DOI** 10.1177/2333721420947952 **PMID** 32851118

### **Abstract**

Aging is associated with changes in lower-body functioning. The extent to which lower-body function is associated with cognitive changes over time is unclear, especially among older Hispanics, a high-risk population for declines in physical and cognitive functioning. We sought to determine if the association between lower-body functioning and cognitive decline over 9-years differentially varied with respect to balance, gait speed, lower-body strength (chair stands), or a summary score of the three measures. This retrospective cohort study used clinical performance data from the Hispanic Established Populations for the Epidemiologic Study of the Elderly (H-EPESE). Cognitive function was measured using the Mini-Mental Status Exam. Linear mixed modeling was used to investigate the association between lower-body function and cognitive decline, controlling for patients' demographic and health characteristics. We found that gait speed and timed chair stands but not balance were associated with accelerated cognitive decline in Mexican-Americans age 75 years and older. These parameters of lower-body function can be feasibly measured in any clinic. As limitations in lower-body functioning may be an early marker of cognitive decline, this suggests an opportunity for the development of interventions to slow cognitive and physical disablement and promote successful aging among persons older than 75 years.

Language: en

### **Keywords**

balance; gait; Cognitive aging; physical performance

## Reliability and validity of the Activities-specific Balance Confidence scale-Japanese (ABC-J) in community-dwelling stroke survivors

Ishige S, Wakui S, Miyazawa Y, Naito H. Phys. Ther. Res. 2020; 23(1): 15-22.

(Copyright © 2020, Japanese Society of Physical Therapy)

DOI 10.1298/ptr.E9982 PMID 32850274

### Abstract

**OBJECTIVE:** In Japan, there were 1.17 million people with stroke in 2014; however, studies on community rehabilitation among stroke survivors are lacking. The Activities-specific Balance Confidence (ABC) scale is used in many languages to evaluate patients undergoing stroke rehabilitation. This study aimed to investigate the reliability and validity of the Japanese ABC scale (ABC-J) version among patients  $\geq 6$  months after stroke.

**METHODS:** This cross-sectional study was conducted with 88 post-stroke patients (mean age  $66.5 \pm 9.5$  years). The ABC-J was administered with the 10-meter walk test (10MWT), Timed Up and Go Test (TUG-T), Berg Balance Scale (BBS), Geriatric Depression Scale-Short version-Japanese (GDS-S-J), and the Falls Efficacy Scale-International (FES-I). After a 1-2-week interval, the ABC-J was completed again by 69 of the patients. Reliability was investigated for reproducibility (intra-class correlation coefficient [ICC], standard error of measurement [SEM], and minimal detectable change [MDC]) and internal consistency (Cronbach's  $\alpha$ ). Concurrent and convergent validities were assessed using Spearman's rank correlation coefficients.

**RESULTS:** The ABC-J showed excellent internal consistency (Cronbach's  $\alpha = 0.95$ ) and substantial test-retest reliability (ICC = 0.92, 95% confidence interval: 0.87-0.95), with SEM and MDC of 7.14 and 19.79, respectively. The total ABC-J score was significantly correlated with 10MWT ( $r = -0.51$ ,  $p < 0.001$ ), TUG-T ( $r = -0.55$ ,  $p < 0.001$ ), BBS ( $r = 0.61$ ,  $p < 0.001$ ), GDS-S-J ( $r = -0.27$ ,  $p = 0.012$ ), and FES-I ( $r = -0.77$ ,  $p < 0.001$ ).

**CONCLUSION:** ABC-J is a valid and reliable measurement tool for investigating balance confidence among patients  $\geq 6$  months after stroke.

Language: en

### Keywords

fall; self-efficacy; psychometric property; activity daily living; balance ability



## Scale-up of the Stepping On fall prevention program among older adults in NSW: program reach and fall-related health service use

Paul SS, Li Q, Harvey L, Carroll T, Priddis A, Tiedemann A, Clemson L, Lord SR, Close JC, Sherrington C. Health Promot. J. Austr. 2020; ePub(ePub): ePub.

(Copyright © 2020, Australian Health Promotion Association, Publisher CAIRO Publishing)

DOI 10.1002/hpja.413 PMID 32860442

### Abstract

**ISSUE ADDRESSED:** We describe the reach of the scale-up of Stepping On, a fall prevention program targeting community-dwellers aged  $\geq 65$  years in NSW, along with fall-related ambulance service use and fall-related hospitalisations after scale-up.

**METHODS:** Data on program provision were received from Local Health Districts. Routinely-collected fall-related ambulance usage and hospital admissions in NSW residents aged  $\geq 65$  years between 2009 and 2015 were compared within Statistical Local Areas prior to and following implementation of Stepping On using multilevel models.

**RESULTS:** Between 2009-2014 the program was delivered in 1,077 sites to 10,096 older adults. Rates of fall-related ambulance use and hospital admissions per 100-person-years were 1-2 in people aged 66-74, 4-5 in people aged 75-84 and 12-13 in people aged  $\geq 85$ . These rates increased over time ( $p < .001$ ). The interaction between time and program delivery was not significant for fall-related ambulance use or hospital admissions. The time-related increase in fall-related ambulance usage in people aged 75-84 years may have been moderated by the Stepping On program (rate ratio 0.97, 95% CI 0.93-1.00,  $p = .045$ ).

**CONCLUSIONS:** There was no indication of a reduced rate of fall-related ambulance use or hospital admissions across the entire sample. Ambulance call-outs for falls in people aged 75-84 years may have reduced following program participation. **SO WHAT?:** Program scale-ups need to reach a large proportion of the target population with a focus on those groups contributing most to fall-related health service utilisation. Linking individual participants' health data as part of large-scale evaluations may provide better insights into program outcomes.

Language: en

### Keywords

injury; older people; program evaluation; community based intervention

## **Syncopal-type reactions tend to be delayed and result in falls among elderly blood donors**

Namba N, Ishimaru F, Kondo G, Hashizume T, Kunii N, Shibata R, Sawamura Y, Kato T. *Vox Sang.* 2020; ePub(ePub): ePub.

(Copyright © 2020, Wiley-Blackwell)

**DOI** 10.1111/vox.12981 **PMID** 32856735

### **Abstract**

**BACKGROUND:** Delayed syncopal-type complications are infrequent among blood donors, but sometimes have critical consequences, such as severe injury. We retrospectively investigated the characteristics of donors with delayed syncopal-type complications or falls.

**STUDY DESIGN AND METHODS:** We defined a delayed reaction (DR) as syncopal-type complications occurring >20 min after needle removal. Subjects were stratified by sex, age, estimated blood volume (EBV), body mass index (BMI) and frequency of donation. Multiple logistic regression analysis and propensity score weighted M estimation were performed to evaluate the covariate-adjusted risk of syncopal DRs among donors giving 400 ml of whole blood (WB). The DR rate was calculated as the number of DRs divided by the number of all syncopal-type reactions after needle removal. The risk of falls was assessed similarly. Donors who discontinued before completing phlebotomy (donation of 400 ml) were excluded.

**RESULTS:** Among 3818 syncopal-type reactions after needle removal, there were 359 DRs and 93 falls. Elderly donors and female donors with syncopal-type reactions had a significantly higher risk of DRs ( $P$  for trend < 0.001). Elderly donors with syncopal-type reactions also had a higher risk of falls ( $P$  for trend < 0.001). Among all donors with syncopal-type reactions, the risk of DRs or falls was not correlated with EBV, BMI or donation frequency.

**CONCLUSION:** In female donors and elderly donors (donating 400 ml of WB), syncopal-type reactions tended to be delayed. Elderly donors with syncopal-type reactions had a significantly higher risk of falls.

Language: en

### **Keywords**

fall; blood donor; delayed reaction; syncopal-type reaction

## Vitamin D supplement on prevention of fall and fracture: a meta-analysis of randomized controlled trials

Thanapluetiwong S, Chewcharat A, Takkavatakarn K, Praditpornsilpa K, Eiam-Ong S, Susantitaphong P. *Medicine (Baltimore)* 2020; 99(34): e21506.

(Copyright © 2020, Lippincott Williams and Wilkins)

DOI 10.1097/MD.00000000000021506 PMID 32846760

### Abstract

**BACKGROUND:** Vitamin D supplement is one of the current possible interventions to reduce fall and fracture. Despite having several studies on vitamin D supplement and fall and fracture reductions, the results are still inconclusive. We conducted a meta-analysis to examine the effect of vitamin D supplement in different forms and patient settings on fall and fracture.

**METHODS:** A systematic literature research was conducted in MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trials to identify randomized controlled trials (RCTs) to compare the effects of vitamin D supplements on fall and fracture outcomes. Random-effect models were used to compute the weighted mean difference for continuous variables and the risk ratio for binary variables.

**RESULTS:** Forty-seven RCTs with 58,424 participants were identified reporting on fall outcome. Twenty-four of 47 studies with 40,102 subjects also reported fracture outcome. Major populations were elderly women with age less than 80 years. Overall, vitamin D supplement demonstrated a significant effect on fall reduction, RR=0.948 (95% CI 0.914-0.984; P=.004, I=41.52). By subgroup analyses, only vitamin D with calcium supplement significantly reduce fall incidence, RR=0.881 (95% CI 0.821-0.945; P<.001, I=49.19). Vitamin D3 supplement decreased incidence of fall but this occurred only when vitamin D3 was supplemented with calcium. Regarding fracture outcome, vitamin D supplement failed to show fracture lowering benefit, RR=0.949 (95% CI 0.846-1.064; P=.37, I=37.92). Vitamin D along with calcium supplement could significantly lower fracture rates, RR=0.859 (95% CI 0.741-0.996; P=.045, I=25.48).

**CONCLUSIONS:** The use of vitamin D supplement, especially vitamin D3 could reduce incidence of fall. Only vitamin D with calcium supplement showed benefit in fracture reduction.

Language: en

## Activities and risk factors associated with fall-related injuries among US Army soldiers

Brooks RD, Grier T, Jones BH, Chervak MC. *BMJ Mil. Health* 2020; ePub(ePub): ePub.

(Copyright © 2020, BMJ Publishing Group)

DOI 10.1136/bmjilitary-2020-001564 PMID 32868292

### Abstract

**INTRODUCTION:** Falls/near falls are the second leading cause of hospitalisation and outpatient visits among US Army soldiers. While numerous studies have evaluated fall-related or near fall-related injuries among elderly adults, few have evaluated this association among young adults. The objective of this study is to describe the characteristics and risk factors associated with fall-related or near fall-related injuries among male US Army soldiers.

**METHODS:** This is a cross-sectional study of male US Army Airborne Division soldiers (n=5187). Electronic surveys captured demographic, lifestyle, physical training (PT), fitness and injury data during spring/summer of 2016. Multiple logistic regression was used to identify independent risk factors of fall-related or near fall-related injuries, adjusting for potential confounders.

**RESULTS:** Primary findings indicated that activities and risk factors associated with fall-related or near fall-related injuries among soldiers included younger age ( $\leq 35$  years), holding a job that required minimal lifting activities, slower 2-mile run times and not running during personal PT.

**CONCLUSIONS:** The findings from this study suggest that male US Army soldiers and other physically active men may benefit from (1) obtaining and/or maintaining higher aerobic endurance and muscular strength, and (2) training focused on preventing fall-related injuries during PT, road marching and sports/recreational activities. Moreover, prevention strategies and education should further target younger soldiers ( $\leq 35$  years old), as younger age is not modifiable.

Language: en

### Keywords

epidemiology; public health; statistics & research methods

## Exploring the causes and impacts of falls among ambulators with spinal cord injury using photovoice: a mixed-methods study

Singh H, Shibi Rosen A, Bostick G, Kaiser A, Musselman KE. *BMJ Open* 2020; 10(8): e039763.

(Copyright © 2020, BMJ Publishing Group)

DOI 10.1136/bmjopen-2020-039763 PMID 32868369

### Abstract

**OBJECTIVES:** This study explored: (1) fall circumstances experienced by ambulators with spinal cord injury (SCI) over a 6-month period, (2) the impacts of falls-related injuries and fall risk and (3) their preferences/recommendations for fall prevention.

**DESIGN:** A sequential explanatory mixed-methods design with two phases.

**SETTING:** A Canadian SCI rehabilitation hospital and community setting.

**PARTICIPANTS:** Thirty-three ambulators with SCI participated in phase 1 and eight participants that fell in phase 1 participated in phase 2.

**METHODS:** In phase 1, fall circumstances were tracked using a survey that was completed each time a participant fell during the 6-month tracking period. Phase 2 involved photovoice; participants took photographs of factors that influenced their fall risk and how their fall risk impacted their work/recreational activities. Participants discussed the photographs and topics related to fall prevention in an individual interview and a focus group.

**RESULTS:** Of the 33 participants, 21 fell in 6 months. Falls commonly occurred in the home while participants were changing positions or walking. Most falls occurred in the morning or afternoon. In phase 2, interviews and focus group discussion revealed three themes: (1) falls are caused by bodily impairments (eg, impaired reactive response during slips and trips and weakness and altered sensation in legs/feet), (2) impacts of fall-related injuries and fall risk (eg, psychosocial effects of fall-related injuries, limiting community participation due to the risk of falling and activity-dependent concern of falling) and (3) approaches to fall prevention (eg, fall prevention strategies used, components of fall prevention and utility of professional fall prevention strategies/interventions).

**CONCLUSIONS:** Fall prevention interventions/strategies should focus on minimising a person's fall risk within their home as most falls occurred in the home environment. Ambulators with SCI would benefit from education and awareness about common fall circumstances that they may encounter in their daily lives.

Language: en

### Keywords

qualitative research; rehabilitation medicine; neurological injury; protocols & guidelines

## General and central obesity operate differently as predictors of falls requiring medical care in older women: a population-based cohort study in Spain

Hermenegildo-López Y, Sandoval-Insausti H, Donat-Vargas C, Banegas JR, Rodriguez-Artalejo F, Guallar-Castillón P. Age Ageing 2020; ePub(ePub): ePub.

(Copyright © 2020, Oxford University Press)

DOI 10.1093/ageing/afaa164 PMID 32857126

### Abstract

**OBJECTIVES:** to examine the association of general and abdominal obesity with falls, falls requiring medical care and falls with fractures in older women.

**DESIGN:** a population-based prospective cohort of 1,185 women aged  $\geq 60$  in Spain, followed up from 2008 to 2010 through 2012.

**MEASURES:** weight, height and waist circumference were measured at baseline using standardised techniques. Participants were classified according to body mass index as normal weight ( $<25$ ), overweight (25-29.9) and general obesity ( $\geq 30$ ). Abdominal obesity was defined as waist circumference  $>88$  cm. In 2012, participants reported the falls experienced in the previous year. Logistic regression models were mutually adjusted for general and abdominal obesity and for main confounders.

**RESULTS:** in this cohort of older women, a total of 336 women experienced falls, 168 of them had falls requiring medical care and 64 falls with fractures. For falls, no association was found with general obesity nor abdominal obesity. However, compared with normal weight, overweight women had a decreased risk for falls requiring medical care [odds ratio (OR) 0.57; 95% confidence interval (CI) 0.34-0.94] and for falls with fractures (OR 0.27; 95% CI 0.12-0.63). The corresponding values for general obesity were 0.44 (0.24-0.81) and 0.30 (0.11-0.82). Abdominal obesity was positively associated with falls requiring medical care (OR 1.82; 95% CI 1.12-2.94) and falls with fractures (OR 2.75; 95% CI 1.18-6.44).

**CONCLUSIONS:** in older women, general obesity may protect from falls requiring medical care and falls with fractures. On the contrary, abdominal obesity increased the risk of suffering from types of falls.

Language: en

### Keywords

falls; older women; abdominal obesity; falls requiring medical care; falls with fracture; general obesity

## Identifying fall prevention content in graduate healthcare curricula

Frie BL, Brueggemann AD, Dutton LL, Pearson VI. *J. Allied Health* 2020; 49(3): e123-e129.

(Copyright © 2020, Association of Schools of Allied Health Professions)

DOI unavailable PMID 32877485

### Abstract

**ISSUE:** An interprofessional team-based approach to fall prevention is advocated to address the public health issue of fall-related injuries. The purpose of this study was to analyze fall-related curricular content across graduate physician assistant, nursing, occupational therapy, and physical therapy healthcare programs.

**METHODS:** The research team conducted a qualitative thematic analysis of fall risk, assessment, and intervention content in graduate program textbooks, curricular narrative, and course objectives.

**OUTCOME:** The four curricular themes identified were universal fall risks, varied assessments, discipline-based interventions, and minimal interprofessional approaches. All curricula universally covered fall risks. Curricular coverage of fall assessment varied by discipline. The physician assistant and nursing curricula focused on assessing fall risk and safety, while the occupational and physical therapy covered standardized functional assessments. The disciplines of physical and occupational therapy provided curricular instruction in restorative or compensatory interventions. All curricula included the interventions of patient and caregiver education and environmental modifications. Curricular coverage of an interprofessional approach to fall prevention was minimal.

**CONCLUSION:** This study identified universal fall risks, varied fall assessments, and discipline-based fall interventions across four graduate healthcare curricula. There was minimal evidence of education in an interprofessional approach to fall prevention.

Language: en

## **Impact of a specialist service in the emergency department on admission, length of stay and readmission of patients presenting with falls, syncope and dizziness**

Jusmanova K, Rice C, Bourke R, Lavan A, McMahon CG, Cunningham C, Kenny RA, Briggs R. QJM 2020; ePub(ePub): ePub.

(Copyright © 2020, Oxford University Press)

DOI 10.1093/qjmed/hcaa261 PMID 32866245

### **Abstract**

**BACKGROUND:** Up to half of patients presenting with falls, syncope or dizziness are admitted to hospital. Many are discharged without a clear diagnosis for their index episode however, and therefore a relatively high risk of readmission.

**AIM:** To examine the impact of ED-FASS (Emergency Department Falls & Syncope Service) a dedicated specialist service embedded within an Emergency Department (ED), seeing patients of all ages with falls, syncope and dizziness.

**DESIGN:** Pre and post cohort study.

**METHODS:** Admission rates, length of stay (LOS) and readmission at 3 months were examined for all patients presenting with a fall, syncope or dizziness from April-July 2018 (pre-ED-FASS) inclusive and compared to April-July 2019 inclusive (post ED-FASS).

**RESULTS:** There was a significantly lower admission rate for patients presenting in 2019 compared to 2018 (27% (453/1,676) vs. 34% (548/1,620);  $\chi^2=18.0$ ;  $p < 0.001$ ), with a 20% reduction in admissions. The mean LOS for patients admitted in 2018 was 20.7 (95% CI 17.4-24.0) days compared to 18.2 (95% CI 14.6-21.9) days in 2019 ( $t=0.98$ ;  $p=0.3294$ ). This accounts for 11,344 bed days in the 2018 study period, and 8,299 bed days used after ED-FASS. There was also a significant reduction in readmission rates within 3 months of index presentation, from 21% (109/1,620) to 16% (68/1,676) ( $\chi^2=4.68$ ;  $p=0.030$ ).

**CONCLUSION:** This study highlights the significant potential benefits of embedding dedicated multidisciplinary services at the hospital front door in terms of early specialist assessment and directing appropriate patients to effective ambulatory care pathways.

Language: en

### **Keywords**

Falls; Emergency Department; Dizziness; Syncope



## **Improving the prevention of fall from height in construction sites through the combination of technologies**

Merchán MDCR, Gómez-de-Gabriel JM, Fernández-Madriral JA, López-Arquillos A. *Int. J. Occup. Safety Ergonomics* 2020; ePub(ePub): ePub.

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**DOI** 10.1080/10803548.2020.1815393 **PMID** 32844735

### **Abstract**

Fall from heights are a cause of concern in the construction sector. An appropriate use of the harness can be the difference between an incident or a critical accident. Monitoring the proper use of harness at workplace using Bluetooth Low Energy devices (BLE) is a recent and effective approach. The aim of the paper is to identify typical limitations in a BLE monitoring system in order to propose solutions according to the existing literature. Alternative solutions found in literature showed that the integration of BLE with other technologies such as Building Information Modeling (BIM), Radio Frequency Identification (RFID), or the Global Positioning System (GPS) can improve, the effectiveness of current monitoring approaches based only on BLE and reduce rates of fall from height accidents. For a correct integration, both technological factors (cost, compatibility, data transmission) and cultural factors (social acceptance, procedures, etc.) must be taken into account.

Language: en

### **Keywords**

Construction safety; beacon; fall from height; harness; safety at work

## Modeling the neuro-mechanics of human balance when recovering from a fall: a continuous-time approach

Cerda-Lugo A, González A, Cardenas A, Piovesan D. *Biomed. Eng. Online* 2020; 19(1): e67.

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DOI 10.1186/s12938-020-00811-1 PMID 32867771

### Abstract

**BACKGROUND:** Balance control deteriorates with age and nearly 30% of the elderly population in the United States reports stability problems. Postural stability is an integral task to daily living reliant upon the control of the ankle and hip. To this end, the estimation of joint parameters can be a useful tool when analyzing compensatory actions aimed at maintaining postural stability.

**METHODS:** Using an analytical approach, this study expands on previous work and analyzes a two degrees of freedom human model. The first two modes of vibration of the system are represented by the neuro-mechanical parameters of a second-order, time-varying Kelvin-Voigt model actuated at the ankle and hip. The model is tested using a custom double inverted pendulum and healthy volunteers who were subjected to a positional step-like perturbation during quiet standing. An *in silico* sensitivity analysis of the influence of inertial parameters was also performed.

**RESULTS:** The proposed method is able to correctly identify the time-varying visco-elastic parameters of a double inverted pendulum. We show that the parameter estimation method can be applied to standing humans. These results appear to identify a subject-independent strategy to control quiet standing that combines both the modulation of stiffness, and the use of an intermittent control.

**CONCLUSIONS:** This paper presents the analysis of the non-linear system of differential equations representing the control of lumped muscle-tendon units. It utilizes motion capture measurements to obtain the estimates of the system's control parameters by constructing a simple time-dependent regressor for estimating the time-varying parameters of the control with a single perturbation. This work is a step forward into the understanding of the neuro-mechanical control parameters of human recovering from a fall. In previous literature, the analysis is either restricted to the first vibrational mode of an inverted-pendulum model or assumed to be time-invariant. The proposed method allows for the analysis of hip related movement for stability control and highlights the importance of core training.

Language: en

### Keywords

Parameter estimation; Dynamic model; Human balance

## **Perspectives of wheelchair users with spinal cord injury on fall circumstances and fall prevention: a mixed methods approach using photovoice**

Singh H, Scovil CY, Bostick G, Kaiser A, Craven BC, Jaglal SB, Musselman KE. PLoS One 2020; 15(8): e0238116.

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**DOI** 10.1371/journal.pone.0238116 **PMID** 32857793

### **Abstract**

**INTRODUCTION:** Wheelchair users with spinal cord injury are at a high risk of falls. However, the perspectives of wheelchair users with spinal cord injury on their fall circumstances and their preferences for fall prevention strategies/interventions remain understudied. Therefore, we aimed to: a) describe the circumstances of falls experienced by wheelchair users with spinal cord injury over a six-month period, b) explore their perspectives of why falls occurred in certain situations, and c) explore their perspectives on recommended content/structure of fall prevention strategies/interventions.

**METHODS:** This sequential explanatory mixed methods study had two phases. Phase I involved tracking of falls experienced by wheelchair users with spinal cord injury over six months, in which participants completed a survey after experiencing a fall to track the number/circumstance of each fall. Data from the surveys were descriptively reported. Phase II involved a photovoice focus group discussion of the survey findings and their preferences for fall prevention strategies/interventions. Data from the focus group discussion were analyzed using a thematic analysis.

**RESULTS:** Thirty-two participants completed phase I. More than half of the participants fell at least once in six months. Falls commonly occurred in the afternoon during a transfer, or when participants were wheeling over uneven ground. One-third of the falls caused an injury. Eleven participants that fell during phase I participated in the focus group. Two main themes were identified from the discussion: 1) "circumstances surrounding the falls" (e.g. when falls occurred, the home is a 'safe space') and 2) "suggestions and preferences for fall prevention strategies/interventions" (e.g. fall prevention involves all, fall prevention training available as needed).

**CONCLUSION:** Fall prevention strategies/interventions should be an integral component of rehabilitation practices across the lifespan. Participants recommend customizing fall prevention strategies/interventions to their specific needs to guide the structure, content, and delivery of targeted fall prevention programs.

Language: en

## Pre-impact fall detection with CNN-based class activation mapping method

Shi J, Chen D, Wang M. *Sensors (Basel)* 2020; 20(17): e4750.

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DOI 10.3390/s20174750 PMID 32842652

### Abstract

In this paper, we report our improvement on the prediction accuracy of pre-impact fall detection by applying a learning-based method on the real-time data from an IMU (inertial measurement unit)-sensor mounted on the waist, making it possible to achieve a high accuracy on a wearable device with the extracted features. Using the fixed threshold method is difficult for achieving satisfactory detection accuracy, due to various characteristics and behaviors in the movement of different individuals. In contrast, one could realize high-accuracy detection with machine learning-based methods, but it is difficult to apply them in the wearable devices due to the high hardware requirement. Our method merges the two methods above. We build a convolutional neural network (CNN) with a class activation mapping (CAM) method, which could highlight the class-specific region in the data and obtain a hot map of the fall data. After training on the MobiAct dataset, the model could achieve high-accuracy detection (95.55%) and obtain the region with high contributions to the classification. Then, we manually extract effective features and characteristics of this region and form our special threshold method, achieving pre-impact fall detection in real-world data. Consequently, our method achieves accuracy of 95.33% and a detection time of within 400 ms.

Language: en

### Keywords

fall detection; IMU; neural network; pre-impact; threshold-based

## Reducing fall risk for home care workers with slip resistant winter footwear

Bagheri ZS, Beltran JD, Holyoke P, Dutta T. *Appl. Ergon.* 2020; 90: e103230.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.apergo.2020.103230 PMID 32858393

### Abstract

Falls on icy surfaces are the leading cause of occupational injuries for workers exposed to outdoor winter conditions. Slip resistant footwear has been shown to reduce the risk of falls for indoor workers but until recently, there was no accepted standard for evaluating the slip resistance of winter footwear on icy surfaces. Our team recently developed a lab-based testing protocol for measuring footwear slip resistance. This protocol, called the Maximum Achievable Angle (MAA) test, measures the steepest ice-covered slope that participants can walk up and down without experiencing a slip in a simulated winter environment. This lab-based protocol has found there is wide variability in the performance of commercially available winter footwear. In particular, we have found that a new generation of footwear that incorporates composite materials in the outsole, performs much better than most other footwear. The objective of this project was to investigate whether the footwear that performed well in our lab-based testing would reduce the risk of slips and/or falls in real-world winter conditions. One hundred and ten home healthcare workers from SE Health were recruited for this study and were asked to report their exposure to icy surfaces along with the numbers of slips and numbers of falls they experienced each week using online surveys over eight weeks in the winter. Fifty participants (the intervention group) were provided winter footwear that were among the best performing in the MAA test. The remaining sixty participants (the control group) wore their own footwear for the duration of the study. A total of 563 slips and 36 falls were reported over the eight-week data collection period. The intervention group consistently reported fewer slips (127 vs 436) and fewer falls (6 vs 30) compared to the control group. We found the slip rate in the intervention group was between 68.0% and 68.7% lower than the control group. Similarly, the fall rate was between 78.5% and 81.5% lower in the intervention group compared to the control group. These findings demonstrate that footwear that performs well in the MAA test can reduce the risk of both slips and falls in real-world winter conditions.

Language: en

### Keywords

Falls; Winter; Footwear; Homecare; Slip resistance; Slip risk

## Serious falls in middle-aged veterans: development and validation of a predictive risk model

Womack JA, Murphy TE, Bathulapalli H, Smith A, Bates J, Jarad S, Redeker NS, Luther SL, Gill TM, Brandt CA, Justice AC. *J. Am. Geriatr. Soc.* 2020; ePub(ePub): ePub.

(Copyright © 2020, John Wiley and Sons)

DOI 10.1111/jgs.16773 PMID 32860222

### Abstract

**BACKGROUND/OBJECTIVES:** Due to high rates of multimorbidity, polypharmacy, and hazardous alcohol and opioid use, middle-aged Veterans are at risk for serious falls (those prompting a visit with a healthcare provider), posing significant risk to their forthcoming geriatric health and quality of life. We developed and validated a predictive model of the 6-month risk of serious falls among middle-aged Veterans.

**DESIGN:** Cohort study.

**SETTING:** Veterans Health Administration (VA).

**PARTICIPANTS:** Veterans, aged 45 to 65 years, who presented for care within the VA between 2012 and 2015 (N = 275,940).

**EXPOSURES:** The exposures of primary interest were substance use (including alcohol and prescription opioid use), multimorbidity, and polypharmacy. Hazardous alcohol use was defined as an Alcohol Use Disorders Identification Test - Consumption (AUDIT-C) score of 3 or greater for women and 4 or greater for men. We used International Classification of Diseases, Ninth Revision (ICD-9), codes to identify alcohol and illicit substance use disorders and identified prescription opioid use from pharmacy fill-refill data. We included counts of chronic medications and of physical and mental health comorbidities.

**MEASUREMENTS:** We identified serious falls using external cause of injury codes and a machine-learning algorithm that identified serious falls in radiology reports. We used multivariable logistic regression with general estimating equations to calculate risk. We used an integrated predictiveness curve to identify intervention thresholds.

**RESULTS:** Most of our sample (54%) was aged 60 years or younger. Duration of follow-up was up to 4 years. Veterans who fell were more likely to be female (11% vs 7%) and White (72% vs 68%). They experienced 43,641 serious falls during follow-up. We identified 16 key predictors of serious falls and five interaction terms. Model performance was enhanced by addition of opioid use, as evidenced by overall category-free net reclassification improvement of 0.32 (P < .001). Discrimination (C-statistic = 0.76) and calibration were excellent for both development and validation data sets.

**CONCLUSION:** We developed and internally validated a model to predict 6-month risk of serious falls among middle-aged Veterans with excellent discrimination and calibration.

Language: en

### Keywords

Veterans; middle age; serious falls

## The severity of fall injuries in Saudi Arabia: a cross-sectional study

Razik MA, Alslimah FA, Alghamdi KS, Altamimi MA, Alzhrani AA, Alqahtani NM, Alshalawi SM. Pan. Afr. Med. J. 2020; 36: 152.

(Copyright © 2020, African Field Epidemiology Network)

DOI 10.11604/pamj.2020.36.152.23944 PMID 32874416

### Abstract

**INTRODUCTION:** fall injuries constitute a major public health concern worldwide, contributing to over 646,000 deaths every year. The aim of this study was to determine the nature and severity of fall injuries at a tertiary hospital in the Kingdom of Saudi Arabia (KSA).

**Methods:** we conducted a cross-sectional study at the King Khalid Hospital and Prince Sultan Centre for Health Care in Al Kharj. We recruited the patients and followed them through the triage, admission and discharge processes. We analyzed the participant's clinical notes on the electronic health record (EHR) to obtain information relevant to the study, including the nature, cause, mechanism of injury, demographic characteristics and prognostic factors captured through the injury severity score (ISS), the Glasgow coma scale (GCS) and the presence or absence of shock.

**Results:** of 264 patients, most of the patients were children under the age of ten (25.7%), followed by young adults between the ages of twenty-one and thirty (18.2%). The ISS was associated with severe head, chest, skull, brain, scalp, rib, abdominal, pelvic and lower limb injuries. The GCS was associated with severe the head, chest, skull, brain and rib injuries ( $p < 0.005$ ). The degree of shock was also significantly associated with pelvic, head, chest, skull, brain, scalp, abdominal and upper limb injuries ( $p < 0.05$ ).

**CONCLUSION:** fall injuries in our setting are severe. Training of staff should prioritize head, chest, skull, brain, abdominal and rib injury management. As a reference hospital, minor injuries are more likely to be managed at lower levels of care.

Language: en

### Keywords

Saudi Arabia; Accidental falls; fall injuries; Glasgow coma scale; hypovolemic shock; injury severity score