

## Safety Literature 16th July 2023

### Does a fall from a standing height warrant computed tomography in an elderly patient with polytrauma?

Chowdhury D. World J. Emerg. Med. 2023; 14(4): 302-306.

(Copyright © 2023, World Journal of Emergency Medicine Press)

DOI 10.5847/wjem.j.1920-8642.2023.040 PMID 37425080

#### Abstract

The importance of performing an early primary survey in 'silver trauma' patients in the detection of injuries has been well documented in reducing the associated morbidity and mortality.[1] In the past, when whole body computed tomography (WBCT) was not commonly available, following initial examination patients would undergo chest radiograph and pelvic X-ray and then proceed to selective computed tomography (CT). With the relatively widespread availability of CT, the use of these X-rays has diminished. The reliance on clinical examination alone for the detection of underlying injuries is another matter of debate.

Physical examination of elderly patients has been shown to have a low sensitivity (as low as 0.69) to the detection of injury when compared to WBCT when used as the gold standard.[2] It is also noted that WBCT is more likely to detect further injuries that may not necessarily be detected on clinical examination alone.[2] Routine CT imaging for patients with unreliable physical examination is reported to reveal unsuspected findings in up to 38%, leading to treatment changes in 19%-26%.[3,4] The discussion about the impact of these injuries (if any) if imaging was selected solely based on clinical examination is an ever-important question that needs a rational approach. Since the probability of detecting injuries after major trauma during the clinical course of alert patients might be lowered after WBCT, in-hospital observation might be less valuable.

The main disadvantage of WBCT is the increased radiation exposure, especially in minor injury cases where a selective CT would be sufficient. In trauma patients, the proportion of patients receiving a high radiation dose of  $> 20$  mSv[5] is higher than that of patients undergoing selective CT.

The debate for selective vs. WBCT imaging continues for elderly trauma patients. Currently, there are no specific guidelines for selective CT or WBCT for the initial detection of injuries in elderly patients. Low-energy trauma, including falls from a standing height, has become the most common form of injury. The most common anatomical domains that are injured following these types of falls involve the head and cervical spine.[6] However, this is often associated with increased morbidity and mortality.[7] The balance between excessive radiation and the risk of missing injury is also a matter of debate.[8] While WBCT is more likely to detect additional injuries, the impact of the detection of these injuries and the change in management (if at all) is an important question.

Language: en

## External causes of death from death certificates in patients with dementia

Mo M, Xu H, Hoang MT, Jurado PG, Mostafaei S, Kåreholt I, Johnell K, Eriksdotter M, Garcia-Ptacek S. J. Am. Med. Dir. Assoc. 2023; ePub(ePub): ePub.

(Copyright © 2023, Lippincott Williams and Wilkins)

DOI 10.1016/j.jamda.2023.05.027 PMID 37421971

### Abstract

**OBJECTIVES:** We aim to analyze the risk of death from specific external causes, including falls, complications of medical and surgical care, unintentional injuries, and suicide, in dementia patients.

**DESIGN:** Swedish nationwide cohort study integrating 6 registers from May 1, 2007, through December 31, 2018, including the Swedish Registry for Cognitive/Dementia Disorders (SveDem). **SETTING AND PARTICIPANTS:** Population-based study. Patients diagnosed with dementia from 2007 to 2018 and up to 4 controls matched on year of birth ( $\pm 3$  years), sex, and region of residence.

**METHODS:** The exposures of this study were diagnosis of dementia and dementia subtypes. Number of deaths and causes of mortality were obtained from death certificates compiled into the Cause of Death Register. Hazard ratios (HRs) and 95% CIs were estimated using Cox and flexible models, adjusted for sociodemographics and medical and psychiatric disorders.

**RESULTS:** The study population included 235,085 patients with dementia [96,760 men (41.2%); mean age 81.5 (SD 8.5) years] and 771,019 control participants [341,994 men (44.4%); mean age 79.9 (SD 8.6) years], over 3,721,687 person-years. Compared with control participants, patients with dementia presented increased risk for unintentional injuries (HR 3.30, 95% CI 3.19-3.40) and falls (HR 2.67, 95% CI 2.54-2.80) during old age ( $\geq 75$  y), and suicide (HR 1.56, 95% CI 1.02-2.39) in middle age ( $< 65$  y). Suicide risk was 5.04 times higher (HR 6.04, 95% CI 4.22-8.66) in patients with both dementia and 2 or more psychiatric disorders relative to controls (incidence rate per person-years, 1.6 vs 0.3). For dementia subtypes, frontotemporal dementia had the highest risks of unintentional injuries (HR 4.28, 95% CI 2.80-6.52) and falls (HR 3.83, 95% CI 1.98-7.41), whereas subjects with mixed dementia were less likely to die from suicide (HR 0.11, 95% CI 0.03-0.46) and complications of medical and surgical care (HR 0.53, 95% CI 0.40-0.70) compared to controls.

**CONCLUSIONS AND IMPLICATIONS:** Suicide risk screening and psychiatric disorders management in early-onset dementia and early interventions for unintentional injuries and falls prevention in older dementia patients should be provided.

Language: en

### Keywords

dementia; suicide; falls; frontotemporal dementia; External causes of death; psychiatric disorder

**Correspondence to comment on "Comparison of the relationship between cognitive function and future falls in Chinese community-dwelling older adults with and without diabetes mellitus"**

Wu X, Guo Q. J. Formos. Med. Assoc. 2023; ePub(ePub): ePub.

(Copyright © 2023, Scientific Communications International)

**DOI** 10.1016/j.jfma.2023.06.022 **PMID** 37419752

**Abstract**

A recent study<sup>1</sup> conducted on Chinese community-dwelling older adults, both with and without diabetes mellitus, has shed light on an important aspect of their health: the association between cognitive function and future falls. This research provides valuable insights into the intricate relationship between cognitive function, diabetes mellitus, and the risk of falls. By employing a comprehensive approach, the study examined a cohort of community-dwelling older adults in China, aiming to unravel potential correlations between cognitive function, diabetes, and the likelihood of experiencing falls in the future. The findings from this research hold particular relevance for healthcare professionals, researchers, and policymakers involved in geriatric care. While this research provides important insights into this subject matter, we believe there are certain aspects that warrant further discussion and consideration.

Firstly, it is essential to consider additional factors that contribute to falls in older adults, particularly those with diabetes. This study appropriately recognizes the association between cognitive function and falls in older adults. However, it is worth emphasizing that falls are multifactorial events influenced by various factors beyond cognitive function alone. Neglecting to account for these factors may limit the study's ability to provide a comprehensive understanding of fall risk in older adults with diabetes mellitus. One notable factor is diabetic retinopathy,<sup>2</sup> a common complication of diabetes that affects the eyes and can lead to vision impairment. Impaired vision significantly impacts an individual's ability to detect obstacles and navigate their environment, increasing the risk of falls.<sup>2</sup> Thus, exploring the relationship between diabetic retinopathy and fall risk would provide valuable insights into strategies for preventing falls in older adults with diabetes.

Secondly, this study could have considered the impact of osteoporosis, a condition characterized by reduced bone density, on fall risk. Older adults with diabetes mellitus are at an increased risk of developing osteoporosis due to factors such as chronic hyperglycemia and the use of certain medications.<sup>3</sup> Osteoporosis weakens bone structure, making individuals more susceptible to fractures and falls. Therefore, including an assessment of osteoporosis and its contribution to fall risk would enhance the study's comprehensiveness.

Thirdly, muscle weakness and balance impairments are common in older adults...

Language: en

## **Fall recognition based on an IMU wearable device and fall verification through a smart speaker and the IoT**

Lin HC, Chen MJ, Lee CH, Kung LC, Huang JT. Sensors (Basel) 2023; 23(12): e5472.

(Copyright © 2023, MDPI: Multidisciplinary Digital Publishing Institute)

**DOI** 10.3390/s23125472 **PMID** 37420638

### **Abstract**

A fall is one of the most devastating events that aging people can experience. Fall-related physical injuries, hospital admission, or even mortality among the elderly are all critical health issues. As the population continues to age worldwide, there is an imperative need to develop fall detection systems. We propose a system for the recognition and verification of falls based on a chest-worn wearable device, which can be used for elderly health institutions or home care. The wearable device utilizes a built-in three-axis accelerometer and gyroscope in the nine-axis inertial sensor to determine the user's postures, such as standing, sitting, and lying down. The resultant force was obtained by calculation with three-axis acceleration. Integration of three-axis acceleration and a three-axis gyroscope can obtain a pitch angle through the gradient descent algorithm. The height value was converted from a barometer. Integration of the pitch angle with the height value can determine the behavior state including sitting down, standing up, walking, lying down, and falling. In our study, we can clearly determine the direction of the fall. Acceleration changes during the fall can determine the force of the impact. Furthermore, with the IoT (Internet of Things) and smart speakers, we can verify whether the user has fallen by asking from smart speakers. In this study, posture determination is operated directly on the wearable device through the state machine. The ability to recognize and report a fall event in real-time can help to lessen the response time of a caregiver. The family members or care provider monitor, in real-time, the user's current posture via a mobile device app or internet webpage. All collected data supports subsequent medical evaluation and further intervention.

Language: en

### **Keywords**

Internet of Things; fall recognition; fall verification; smart speaker

## **Frail patients who fall and their risk on major bleeding and intracranial haemorrhage: outcomes from the Fall and Syncope Registry**

Zwart L, Germans T, Vogels R, Simsek S, Hemels M, Jansen R. BMC Geriatr. 2023; 23(1): e422.

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**DOI** 10.1186/s12877-023-04120-9 **PMID** 37430207

### **Abstract**

**BACKGROUND:** Major bleeding, and intracranial bleeding specifically, are severe complications related to the use of anticoagulation. To what extent the risk for major bleeding is elevated among frail older people is not well known because they are underrepresented in the randomized clinical trials (RCTs). This study investigates the risk for major bleeding (MB) and intra cranial haemorrhage (ICH) in frail older people who fall.

**METHODS:** All patients 65 years and older visiting the Fall and Syncope Clinic, between November 2011 and January 2020, and underwent a MRI of the brain were eligible. Frailty was assessed with a Frailty Index, based on the accumulation of deficits model. Cerebral small vessel disease was described and evaluated as proposed in the position paper of Wardlaw and colleagues in 2013.

**RESULTS:** 479 patients were included in this analysis. Mean follow-up was 7 years per patient (ranging from 1 month to 8 years and 5 months). 368 patients (77%) were frail. A total of 81 patients used oral anticoagulation (OAC). 17 extracranial MB of which 3 were traumatic and 14 gastrointestinal, and 16 ICH occurred. There was a total of 603.4 treatment years with OAC, and 8 MBs occurred among patients on OAC (bleeding rate 1.32 per 100 treatment years), of which 2 ICHs (bleeding rate 0.33 per 100 treatment years). The risk for extracranial MB was increased by the use of antiplatelet agents (APA) (adjusted OR 6.9, CI 95% 1.2-38.3), and by the use of OAC (adjusted OR 9.8, CI 95% 1.7-56.1). The risk for ICH was only heightened by white matter hyperintensities (WMH) (adjusted OR 3.8, CI 95% 1.0-13.4). The use of APA (adjusted OR 0.9, CI 95% 0.3-3.3) or OAC (adjusted OR 0.6, CI 95% 0.1-3.3) did not elevate the risk for ICH.

**CONCLUSION:** In contrast to common belief, frail patients on OAC with repeated falls show a comparable bleeding rate as in the large RCTs, and the use of OAC did not increase the risk for ICH. However, the number of MBs was low, and of ICHs very low, despite extensive follow-up in this registry.

Language: en

### **Keywords**

Cerebral small vessel disease; Frailty; Intra cranial haemorrhage; Major bleeding; Oral anticoagulation

## **Integrated effects of Thai essential oil and balance exercise on parameters associated with falls in older adults at risk of falling: a randomized controlled study**

Areeudomwong P, Duangyod T, Sitalangka C, Buttagat V. *Ann. Geriatr. Med. Res.* 2023; 27(2): 141-150.

(Copyright © 2023, Korean Geriatrics Society)

**DOI** 10.4235/agmr.23.0008 **PMID** 37403317

### **Abstract**

**BACKGROUND:** Reducing the risk of falling by improving balance and leg strength may be a preventive strategy. This study evaluated the integrated effects of Thai essential oil and balance exercises on parameters associated with Falls in community-dwelling older adults at risk of falling.

**METHODS:** Fifty-six participants were randomly allocated to either the intervention group (IG), which performed balance exercises while smelling Thai essential oil scents of *Zanthoxylum limonella* (Dennst.) Alston, or the control group (CG), which performed balance exercises while receiving a control patch. Balance exercises were practiced for 12, 30-minute sessions over 4 weeks. Static and dynamic balance with eyes open and eyes closed (EC), leg muscle strength, agility, and fear of falling were assessed at baseline, after the 4-week intervention, and at 1 month after the last intervention session.

**RESULTS:** Both groups showed significant improvements in static and dynamic balance, ankle plantarflexor strength, and agility after the 4-week intervention ( $p < 0.05$ ), which persisted at the 1-month follow-up ( $p < 0.05$ ). Compared to the CG, the IG demonstrated significantly better static balance in terms of elliptical sway area ( $p = 0.04$ ) and center of pressure (CoP) velocity ( $p = 0.001$ ) during EC, as well as ankle plantarflexor strength ( $p = 0.01$ ). The IG also maintained a significantly greater improvement in CoP velocity during EC ( $p = 0.01$ ).

**CONCLUSION:** Integrated Thai essential oil and balance exercises improved static balance and ankle plantarflexor strength compared to the balance exercise with a control patch in older adults at risk of falling.

Language: en

### **Keywords**

Physical fitness; Accidental falls; Older adults; Martial arts; Odorants; Postural balance

## **MUS3E: a mobility ubiquitous sensor edge environment for the elderly**

Utsumi T, Arikawa M, Hashimoto M. Electronics (Basel) 2023; 12(14): e3003.

(Copyright © 2023, MDPI: Multidisciplinary Digital Publications Institute)

**DOI** 10.3390/electronics12143003 **PMID** unavailable

### **Abstract**

With the ageing of society, the number of households with older individuals or couples living alone is increasing. An “ageing-in-place” approach allows older adults to continue to live at home and receive help only when needed. However, this approach is insufficient for emergencies, such as falls, as well as for individuals with gradually deteriorating health conditions, such as frailty. Unexpected accidents significantly reduce the quality of life (QoL) of older adults. This paper proposes a new framework, the mobility ubiquitous sensor edge environment (MUS3E), to digitally transform ordinary houses to detect the movement of older individuals throughout their home environment and to notify family members and care providers of residents’ health status and safety information. The framework can be easily and inexpensively installed in any home, transforming an ordinary house into a smart home with an automated function for monitoring older residents. It uses ambient sensors such as passive infrared ray sensors to automatically measure health conditions by measuring factors such as walking speed. Residents need not interact with or control the system and can go about their daily lives. Since the sensors used in this system are mass-produced consumer products, they are inexpensive and easily replaceable, as there are many alternatives. In this study, we were able to demonstrate the practicality and feasibility of this framework using a prototype that uses open architecture Internet of Things (IoT) software (Debian GNU/Linux 11, Arduino 1.8.19, ESP8266 2.7.4, ESP32 1.0.6, PubSubClient 2.8.0, ESPPerfectTime 0.3.0, mosquitto 2.0.11) components to digitally transform the living environment of older individuals.

Language: en

## **Older farmers or illiterate older adults are more likely to fall : a community-based study from China**

Wang Q, He L, Jin Y, Chen Y, Yao Y. Georgian Med. News 2023; (338): 49-52.

(Copyright © 2023, International Academy of Science, Education, Industry and Arts)

**DOI** unavailable **PMID** 37419470

### **Abstract**

The aim of this study was to determine the incidence of falls and its risk factors among community-dwelling older adults in a community from Wuhu city (China). This cross-sectional study recruited 1075 older adults. The history of injury history was assessed in the last year. Descriptive statistics was used for distribution of injury. Risk factors of falls were measured using logistic regression analysis. The results showed that the prevalence of falls in the last year was 8.47%. According to the results, farmer and illiteracy older adults were found as risk factors for falls. In our study, falls were the highest incidence of injury among community-dwelling older adults, farmer and illiteracy older adults were high risk population of falls. Therefore, farmers and illiteracy older adults should be addressed when prevention of falls among community-dwelling older adults.

Language: en

## **Psychometric properties of the Brazilian-Portuguese version of the Falls Behavioral Scale in people with Parkinson's disease**

Almeida LRS, Vasconcelos L, Valença GT, Carvalho K, Pinto EB, Oliveira-Filho J, Canning CG. Disabil. Rehabil. 2023; ePub(ePub): ePub.

(Copyright © 2023, Informa - Taylor and Francis Group)

**DOI** 10.1080/09638288.2023.2230132 **PMID** 37403370

### **Abstract**

**PURPOSE:** To verify the psychometric properties of the Brazilian-Portuguese version of the Falls Behavioral (FaB-Brazil) Scale in Parkinson's disease (PD). **MATERIAL AND METHODS:** Participants ( $n = 96$ ) were assessed by disease-specific, self-report and functional mobility measures. Internal consistency of the FaB-Brazil scale was evaluated using Cronbach's alpha and inter-rater and test-retest reliability using intraclass correlation coefficients (ICC). The standard error of measurement (SEM), minimal detectable change (MDC), ceiling and floor effects, and convergent and discriminative validity were evaluated.

**RESULTS:** Internal consistency was moderate ( $\alpha = 0.77$ ). Excellent inter-rater ( $ICC = 0.90$ ;  $p < 0.001$ ) and test-retest ( $ICC = 0.91$ ;  $p < 0.001$ ) reliability were found. The SEM was 0.20 and MDC was 0.38. Ceiling and floor effects were not found. Convergent validity was established by the positive correlations between the FaB-Brazil scale and age, modified Hoehn and Yahr, PD duration, Movement Disorders Society-Unified Parkinson's Disease Rating Scale, Motor Aspects of Experiences of Daily Living, Timed Up & Go and 8-item Parkinson's Disease Questionnaire, and negative correlations between the FaB-Brazil scale and community mobility, Schwab & England, and Activities-specific Balance Confidence scale. Females showed greater protective behaviors than males; recurrent fallers showed greater protective behaviors than non-recurrent fallers ( $p < 0.05$ ).

**CONCLUSIONS:** The FaB-Brazil scale is reliable and valid for assessing people with PD.

Language: en

### **Keywords**

falls; fall risk; Parkinson's disease; fall-related behaviors; psychometric properties

## **The social and medical aspects of falls in elderly and senile age under eyesight deficiency**

Agarkov NM, Gurko TS, Lev IV. Probl. Sotsialnoi Gig. Istor. Med. 2023; 31(3): 400-404.

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**DOI** 10.32687/0869-866X-2023-31-3-400-404 **PMID**37427513

### **Abstract**

The aging of population is accompanied by simultaneous increasing of rate of age-associated ophthalmic diseases resulting in vision decreasing. However, visual impairment in elderly and senile age is rarely considered in the epidemiology of falls in these groups. The purpose of the study is to investigate medical social aspects of falls in older age groups with visual impairment. The retrospective methodology was applied to study falls in 4832 elderly and senile patients with visual impairment due to cataract glaucoma, diabetic retinopathy and age-related macular degeneration. The high incidence of falls in men and women aged 80 and older, amounting to 82.6 and 125.7 cases per 1000 of population of corresponding age respectively was established. The falls in elderly patients with low vision is more often registered in case of diabetic retinopathy than of glaucoma, cataract and age-related macular degeneration without significant differences at the age 50-59 years and 60-69 years. The diabetic retinopathy is the most common cause of falls requiring hospitalization in all age groups. To In reducing prevalence of falls and resulted hospitalization, to optimize traumatological care of patients of older age groups, the priority is for early identification and treatment of people with diabetic retinopathy.

Language: ru

### **Keywords**

Aged; Humans; Female; Male; Middle Aged; Accidental Falls; Aged, 80 and over; Retrospective Studies; falls; Aging; \*Cataract; \*Diabetic Retinopathy/epidemiology; \*Glaucoma; \*Macular Degeneration/epidemiology/complications; elder and senile age; ophthalmic diseases; Vision Disorders/complications

## **Therapeutic dilemmas: cognitive enhancers and risk of falling in older adults-a clinical review**

Portlock GE, Smith MD, van Poelgeest EP, Welsh TJ. Eur. Geriatr. Med. 2023; ePub(ePub): ePub.

(Copyright © 2023, Elsevier Publishing)

**DOI** 10.1007/s41999-023-00821-x **PMID** 37418063

### **Abstract**

**PURPOSE:** Cognitive enhancers are the primary pharmacological therapy prescribed to those with dementia, comprising of memantine and the acetylcholinesterase inhibitors (AChEIs). The long-term cognitive and behavioural benefits of these medications, as well as their potential contribution to falls is currently debated, with recent Delphi studies being unable to reach consensus on whether these medications should be deprescribed. In this narrative clinical review, as part of a series on deprescribing in people at risk of falls, we explore the potential falls-related side effects experienced in people taking cognitive enhancers, alongside situations where deprescribing may be appropriate.

**METHODS:** We undertook a literature search of PubMed and Google Scholar, using terms capturing falls and cognitive enhancers, as well as consulting the British National Formulary and published Summary of Medicinal Product Characteristics. These searches informed the subsequent clinical review.

**RESULTS:** Cognitive enhancers should be subject to regular review, including confirmation of appropriate treatment indication, and occurrence of side effects in the context of falls. AChEIs, in particular, are associated with a broad range of side effects that can contribute to increased falls risk. These include bradycardia, syncope and neuromuscular effects. Where these have been identified, deprescribing should be considered, as well as alternative treatment options. Deprescribing studies have shown mixed results, likely due to considerable methodological heterogeneity. Several suggested guidelines exist to aid deprescribing decisions, many of which are highlighted in this review.

**CONCLUSIONS:** The use of cognitive enhancers should be regularly reviewed and decisions to deprescribe made on a case-by-case basis, considering both the risks and benefits of stopping these medications.

Language: en

### **Keywords**

Falls; Dementia; Deprescribing; Cognitive enhancers

## **Types, functions and mechanisms of robot-assisted intervention for fall prevention: a systematic scoping review**

Sam RY, Lau YFP, Lau Y, Lau ST. Arch. Gerontol. Geriatr. 2023; 115: e105117.

(Copyright © 2023, Elsevier Publishing)

**DOI** 10.1016/j.archger.2023.105117 **PMID** 37422967

### **Abstract**

**BACKGROUND:** Any individual may experience accidental falls, particularly older adults. Although robots can prevent falls, knowledge of their fall-preventive use is limited.

**OBJECTIVE:** To explore the types, functions, and mechanisms of robot-assisted intervention for fall prevention.

**METHODS:** A systematic scoping review of global literature published from inception to January 2022 was conducted according to Arksey and O'Malley's five-step framework. Nine electronic databases, namely, PubMed, Embase, CINAHL, IEEE Xplore, the Cochrane Library, Scopus, Web of Science, PsycINFO, and ProQuest, were searched.

**RESULTS:** Seventy-one articles were found with developmental ( $n = 63$ ), pilot ( $n = 4$ ), survey ( $n = 3$ ), and proof-of-concept ( $n = 1$ ) designs across 14 countries. Six types of robot-assisted intervention were found, namely cane robots, walkers, wearables, prosthetics, exoskeletons, rollators, and other miscellaneous. Five main functions were observed including (i) detection of user fall, (ii) estimation of user state, (iii) estimation of user motion, (iv) estimation of user intentional direction, and (v) detection of user balance loss. Two categories of mechanisms of robots were found. The first category was executing initiation of incipient fall prevention such as modeling, measurement of user-robot distance, estimation of center of gravity, estimation and detection of user state, estimation of user intentional direction, and measurement of angle. The second category was achieving actualization of incipient fall prevention such as adjust optimal posture, automated braking, physical support, provision of assistive force, reposition, and control of bending angle.

**CONCLUSIONS:** Existing literature regarding robot-assisted intervention for fall prevention is in its infancy. Therefore, future research is required to assess its feasibility and effectiveness.

Language: en

### **Keywords**

Review; Accidental falls; Robotics

## Using clinical scales and digital measures to explore falls in patients with Lewy body dementia

Battioui C, Man A, Pugh M, Wang J, Dang X, Zhang H, Ardayfio P, Munsie L, Hake AM, Biglan K. Digit. Biomark. 2023; 7(1): 54-62.

(Copyright © 2023, Karger Publishers)

DOI 10.1159/000529623 PMID 37404864

### Abstract

**INTRODUCTION:** PRESENCE was a phase 2 clinical trial assessing the efficacy of mevidalen, a D1 receptor positive allosteric modulator, for symptomatic treatment of Lewy body dementia (LBD). Mevidalen demonstrated improvements in motor and non-motor features of LBD, global functioning, and actigraphy-measured activity and daytime sleep. Adverse events (AEs) of fall were numerically increased in mevidalen-treated participants.

**METHODS:** A subset of PRESENCE participants wore a wrist actigraphy device for 2-week periods pre-, during, and posttreatment. Actigraphy sleep and activity measures were derived per period and analyzed to assess for their association with participants' reports of an AE of fall. Prespecified baseline and treatment-emergent clinical characteristics were also included in the retrospective analysis of falls. Independent-samples t test and  $\chi^2$  test were performed to compare the means and proportions between individuals with/without falls.

**RESULTS:** A trend toward more falls was observed with mevidalen treatment (31/258 mevidalen-treated vs. 4/86 in placebo-treated participants:  $p = 0.12$ ). Higher body mass index (BMI) ( $p < 0.05$ ), more severe disease measured by baseline Movement Disorder Society-Unified Parkinson's Disease Rating Scale (MDS-UPDRS) part II ( $p < 0.05$ ), and a trend toward improved Alzheimer's Disease Assessment Scale-Cognitive Subscale 13 (ADAS-Cog(13)) ( $p = 0.06$ ) were associated with individuals with falls. No statistically significant associations with falls and treatment-emergent changes were observed.

**CONCLUSION:** The association of falls with worse baseline disease severity and higher BMI and overall trend toward improvements on cognitive and motor scales suggest that falls in PRESENCE may be related to increased activity in mevidalen-treated participants at greater risk for falling. Future studies to confirm this hypothesis using fall diaries and digital assessments are necessary.

Language: en

### Keywords

Falls; Risk factors; Actigraphy; Activity; Digital measures; Lewy body dementia

## **Trip-related fall risk prediction based on gait pattern in healthy older adults: a machine-learning approach**

Wang S, Nguyen TK, Bhatt T. *Sensors* (Basel) 2023; 23(12): e5536.

(Copyright © 2023, MDPI: Multidisciplinary Digital Publishing Institute)

DOI 10.3390/s23125536 PMID 37420703

### **Abstract**

Trip perturbations are proposed to be a leading cause of falls in older adults. To prevent trip-falls, trip-related fall risk should be assessed and subsequent task-specific interventions improving recovery skills from forward balance loss should be provided to the individuals at risk of trip-fall. Therefore, this study aimed to develop trip-related fall risk prediction models from one's regular gait pattern using machine-learning approaches. A total of 298 older adults ( $\geq 60$  years) who experienced a novel obstacle-induced trip perturbation in the laboratory were included in this study. Their trip outcomes were classified into three classes: no-falls ( $n = 192$ ), falls with lowering strategy (L-fall,  $n = 84$ ), and falls with elevating strategy (E-fall,  $n = 22$ ). A total of 40 gait characteristics, which could potentially affect trip outcomes, were calculated in the regular walking trial before the trip trial. The top 50% of features ( $n = 20$ ) were selected to train the prediction models using a relief-based feature selection algorithm, and an ensemble classification model was selected and trained with different numbers of features (1-20). A ten-times five-fold stratified method was utilized for cross-validation. Our results suggested that the trained models with different feature numbers showed an overall accuracy between 67% and 89% at the default cutoff and between 70% and 94% at the optimal cutoff. The prediction accuracy roughly increased along with the number of features. Among all the models, the one with 17 features could be considered the best model with the highest AUC of 0.96, and the model with 8 features could be considered the optimal model, which had a comparable AUC of 0.93 and fewer features. This study revealed that gait characteristics in regular walking could accurately predict the trip-related fall risk for healthy older adults, and the developed models could be a helpful assessment tool to identify the individuals at risk of trip-falls.

Language: en

### **Keywords**

ensemble classification; fall assessment; gait characteristics; trip

## Self-reported dizziness, falls, and self-rated health in a rural population in Denmark

Grønlund C, Djurhuus BD, Holm EA, Homøe P. Eur. Arch. Otorhinolaryngol. 2023; ePub(ePub): ePub.

(Copyright © 2023, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1007/s00405-023-08061-2 PMID 37420013

### Abstract

**PURPOSE:** To investigate associations between dizziness, hearing loss, medication, and self-perceived health in the region of Lolland-Falster in Denmark.

**METHODS:** A cross-sectional population-based study using data from questionnaires and physical examinations between February 8th, 2016, and February 13th, 2020. Individuals aged 50 years or above in the region of Lolland-Falster were randomly invited to participate.

**RESULTS:** Of 10,092 individuals (52% female), the mean age was 64.7 and 65.7 years for females and males, respectively. 20% reported dizziness during the past 30 days, and prevalence increased with age. 24% of dizzy females suffered from falls compared to 21% of males. 43% sought treatment for dizziness. Logistic regression revealed a higher odds ratio of dizziness in groups with poor self-perceived health (OR = 2.15, 95% CI [1.71, 2.72]) and very poor self-perceived health (OR = 3.62 [1.75, 7.93]) compared to moderate self-perceived health. A higher OR was found for seeking treatment for dizziness in the group that had experienced falls (OR = 3.21 [2.54, 4.07]). 40% reported hearing loss. Logistic regression revealed a higher OR for dizziness in the group with severe hearing loss (OR = 2.40 [1.77, 3.26]) and moderate hearing loss (OR = 1.63 [1.37, 1.94]) compared to no hearing loss.

**CONCLUSION:** One of five participants reported dizziness during the last month. Dizziness was negatively associated with self-perception of good health also after adjusting for comorbidities. Almost half of the dizzy participants sought treatment for dizziness and 21% experienced falls. Identification and treatment of dizziness are important to prevent falls from happening. **CLINICAL TRIAL REGISTRATION:** <http://www.CLINICALTRIALS.gov> (NCT02482896).

Language: en

### Keywords

Falls; Dizziness; Cross-sectional; Health study; Hearing loss; Lolland-Falster

## **Inpatient rehabilitation falls: comparing patients with traumatic brain injury versus patients with stroke**

García-Rudolph A, Wright MA, Devilleneuve EA, Castillo E, Opisso E, Tormos JM, Hernandez E. J. Trauma Nurs. 2023; 30(4): 202-212.

(Copyright © 2023, Society of Trauma Nurses)

**DOI** 10.1097/JTN.0000000000000730 **PMID** 37417671

### **Abstract**

**BACKGROUND:** Cognitively impaired neurological rehabilitation inpatients are at an increased risk for falls; yet, little is known regarding fall risk of different groups, such as stroke versus traumatic brain injury.

**OBJECTIVES:** To determine if rehabilitation patients' fall characteristics differ for patients with stroke versus patients with traumatic brain injury.

**METHODS:** This retrospective observational cohort study evaluates inpatients with stroke or traumatic brain injury admitted to a rehabilitation center in Barcelona, Spain, between 2005 and 2021. We assessed independence in daily activities with the Functional Independence Measure. We compared fallen versus nonfallen patients' features and examined the association between time to first fall and risk using Cox proportional hazards models.

**RESULTS:** A total of 1,269 fall events were experienced by 898 different patients with traumatic brain injury (n = 313; 34.9%) and stroke (n = 585; 65.1%). A higher proportion of falls for patients with stroke occurred while performing rehabilitation activities (20.2%-9.8%), whereas falls were significantly higher for patients with traumatic brain injury during the night shift. Fall timing revealed completely different behaviors (stroke vs. traumatic brain injury), for example, an absolute peak at 6 a.m. due to young male traumatic patients. Nonfallen patients (n = 1,363; 78.2%) were younger, with higher independence in daily activities scores, and having a larger time since injury to admission; all three were significant fall predictors.

**CONCLUSIONS:** Patients with traumatic brain injury and stroke showed different fall behaviors. Knowledge of fall patterns and characteristics in the inpatient rehabilitation setting can help design management protocols to mitigate their risk.

Language: en

## **Multi-task learning radar transformer (MLRT): a personal identification and fall detection network based on IR-UWB radar**

Jiang X, Zhang L, Li L. Sensors (Basel) 2023; 23(12): e5632.

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DOI 10.3390/s23125632 PMID 37420798

### **Abstract**

Radar-based personal identification and fall detection have received considerable attention in smart healthcare scenarios. Deep learning algorithms have been introduced to improve the performance of non-contact radar sensing applications. However, the original Transformer network is not suitable for multi-task radar-based applications to effectively extract temporal features from time-series radar signals. This article proposes the Multi-task Learning Radar Transformer (MLRT): a personal Identification and fall detection network based on IR-UWB radar. The proposed MLRT utilizes the attention mechanism of Transformer as its core to automatically extract features for personal identification and fall detection from radar time-series signals. Multi-task learning is applied to exploit the correlation between the personal identification task and the fall detection task, enhancing the performance of discrimination for both tasks. In order to suppress the impact of noise and interference, a signal processing approach is employed including DC removal and bandpass filtering, followed by clutter suppression using a RA method and Kalman filter-based trajectory estimation. An indoor radar signal dataset is generated with 11 persons under one IR-UWB radar, and the performance of MLRT is evaluated using this dataset. The measurement results show that the accuracy of MLRT improves by 8.5% and 3.6% for personal identification and fall detection, respectively, compared to state-of-the-art algorithms. The indoor radar signal dataset and the proposed MLRT source code are publicly available.

Language: en

### **Keywords**

fall detection; Impulse Radio Ultra-Wideband (IR-UWB) radar; multi-task learning; personal identification; Transformer

## **Association between fall-related serious injury and activity during fall in an acute care hospital**

Kobayashi K, Kido N, Wakabayashi S, Yamamoto K, Hihara J, Tamura M, Sakahara T. PLoS One 2023; 18(7): e0288320.

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**DOI** 10.1371/journal.pone.0288320 **PMID** 37418434

### **Abstract**

**OBJECTIVES:** Few studies have evaluated the mechanism of serious injury in acute hospitalization. Thus, the association between fall-related serious injury and activity during falls in acute care hospital remains unclear. Herein, we investigated the relationship between serious injury caused by fall and activity at the time of the fall in an acute care hospital.

**METHODS:** This retrospective cohort study was conducted at Asa Citizens Hospital. All inpatients aged 65 years and older were eligible for the study, which was conducted from April 1, 2021, through March 31, 2022. The magnitude of the association between injury severity and activity during the fall was quantified using odds ratio.

**RESULTS:** Among the 318 patients with reported falls, 268 (84.3%) had no related injury, 40 (12.6%) experienced minor injury, 3 (0.9%) experienced moderate injury, 7 (2.2%) experienced major injury. Moderate or major injuries caused by a fall was associated with the activity during the fall (odds ratio: 5.20; confidence intervals: 1.43-18.9,  $p = 0.013$ ).

**CONCLUSION:** This study recognizes that falling during ambulation caused moderate or major injuries in an acute care hospital. Our study suggests that falls while ambulating in an acute care hospital were associated not only with fractures, but also with lacerations requiring sutures and brain injuries. Among the patients with moderate or major injuries, more falls occurred outside the patient's bedroom as compared with patients with minor or no injuries. Therefore, it is important to prevent moderate or major injuries related to falls that occur while the patient is walking outside their bedroom in an acute care hospital.

Language: en

## **Association between skeletal muscle mass index and falls in patients with functional impairment**

Arai H, Nozoe M, Kamiya K, Matsumoto S, Morimoto T. Am. J. Phys. Med. Rehabil. 2023; ePub(ePub): ePub.

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**DOI** 10.1097/PHM.0000000000002249 **PMID** 37405906

### **Abstract**

**OBJECTIVE:** This study aimed to assess the association between skeletal muscle mass index and falls in patients with functional impairment.

**DESIGN:** This retrospective cohort study was implemented at a convalescent rehabilitation ward. Patients with no measurement of skeletal muscle mass index and bed-ridden patients were excluded from this study. Patients were dichotomized into the low skeletal muscle mass index group and the high skeletal muscle mass index group. The occurrence of fall was assessed according to skeletal muscle mass index groups.

**RESULTS:** Out of the 327 included patients, 231 (71%) were assigned to the low skeletal muscle mass index group. In total, 66 patients (20%) experienced at least one fall, and a total of 102 falls occurred. The incidence of falls for the low skeletal muscle mass index group was not significantly greater than that for the high skeletal muscle mass index group (4.9 per 1000 patient-days vs. 4.5 per 1000 patient-days,  $P = 0.9$ ). Low skeletal muscle mass index was not significantly associated with one or more incidents of falls (OR (95% CIs) = 0.6 (0.3-1.17)).

**CONCLUSION:** This study found that skeletal muscle mass index was not significantly associated with falls in patients undergoing convalescent rehabilitation.

Language: en

## **Discrimination between falls and blows from the localization and the number of fractures on computed tomography scans of the skull and the trunk**

Henriques M, Saliba-Serre B, Martrille L, Blum A, Chaumoitre K, Donato P, Campos N, Cunha E, Adalian P. *Forensic Sci. Res.* 2023; 8(1): 30-40.

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**DOI** 10.1093/fsr/owad006 **PMID** 37415795

### **Abstract**

The distinction between falls and blows is a common and difficult task in forensic sciences. One of the most often used criteria to address this issue is the hat brim line (HBL) rule, which states that fall-related injuries do not lie above the HBL. Some studies, however, have found that the use of HBL rule is not so relevant. This study assesses the aetiologies, the number of fractures, and their location on the skull and the trunk in a sample of 400 individuals aged 20-49 years, which were CT scanned after traumas. This may facilitate the interpretation of such injuries in skeletonized or heavily decomposed bodies in which soft tissues are no longer available. Our aim is to improve the distinction rate between falls and blows by combining several criteria and assessing their predictability. Skeletal lesions were analysed using retrospective CT scans. Cases selected comprise 235 falls and 165 blows. We registered the presence and the number of fractures in 14 skeletal anatomical regions related to the two different aetiologies. We showed that the HBL rule should be used with caution, but there is nevertheless a possibility of discussing the aetiology of blunt fractures. Possibly, parameters like the anatomical location and the number of fractures by region can be used to distinguish falls and blows.

Language: en

### **Keywords**

falls; blows; blunt force trauma; CT scan; forensic sciences; skeletal fractures