# Safety Literature 22nd October 2023

## Fall prevalence and associated risk factors among the elderly population in Tabuk City, Saudi Arabia: a cross-sectional study 2023

Alanazi A, Salih S. Cureus 2023; 15(9): e45317.



**DOI:** 10.7759/cureus.45317 **PMID:** 37846272 **PMCID:** PMC10577021

**Abstract**

Background Falls are common among older adults, and they constitute a major public health issue with high morbidity and mortality. Aim This study aimed to estimate the prevalence of falls and investigate the contributing risk factors among the elderly population in Tabuk City, Saudi Arabia.

METHODS This cross-sectional study recruited a random representative sample of the elderly aged ≥ 60 years. We collected data by interviewing the participants using a structured, Arabic-language questionnaire. It included personal information, a history of falls in the past three and 12 months, comorbidities, and environmental factors. The main outcome was a history of falls in the preceding year. Multivariable logistic regression was used to evaluate the association between potential risk factors and falls.

RESULTS The study included 296 participants. Most participants were female (66.9%), aged 60-69 years (68.2%), and married (68.9%). The self-reported prevalence of falls over the preceding 12 months was 25.3% (95% confidence interval (CI): 20.6-30.5). Older people with depressive symptoms had significantly increased vulnerability to falls (adjusted odds ratio (AOR): 0.452, 95% CI: 0.239-0.854). Environmental factors were associated with a 1.799 times (95% CI: 1.041-3.109) increased likelihood of fall, and gait impairment was the strongest risk factor (AOR: 2.775, 95% CI: 1.558-4.942).

CONCLUSIONS Falls are common among the elderly population in Tabuk City, Saudi Arabia. Gait impairment, the presence of depressive symptoms, and environmental hazards were substantially associated with falls, suggesting that most falls are preventable.

**Language:** en

**Keywords:** prevention; elderly; risk factors; falls; prevalence; saudi arabia

**Repeat fall risk in geriatric patients after fall-induced head trauma**

Alter SM, Knopp BW, Solano JJ, Hughes PG, Clayton LM, Shih RD. Cureus 2023; 15(9): e45056.



**DOI:** 10.7759/cureus.45056 **PMID:** 37829982 **PMCID:** PMC10567099

**Abstract**

Introduction There are many known risk factors for falls, with poor health and physiologic decreases in function as the major contributors to fall risk in older adults. However, risk factors for repeat falls after initial ED discharge are not well-described. This study seeks to prospectively investigate risk factors for short-term repeat falls in geriatric ED patients with fall-related head trauma who do not require hospital admission.

METHODS This is a prospective study of patients aged 65 years and older with fall-related head trauma who presented to the EDs of two community level I trauma centers. Patients were excluded for intracerebral hemorrhage, admission during initial ED visit, or death in the hospital. Patients were followed for 14 days. Patient characteristics, repeat ED visits, and reason for returns were noted.

RESULTS About 2,143 patients were identified as meeting the inclusion criteria. Within 14 days of the initial presentation, 14.1% of patients returned to the ED, with 8.3% presenting with a complaint related to the initial trauma and 2.6% with a new injury. Patients with comorbidities of dementia (OR 3.02, 95% CI, 1.72-5.33, p<0.001), stroke (OR 2.12, 95% CI, 1.05-4.27, p=0.031), and smoking (OR 4.27, 95% CI,1.76-10.37, p<0.001) were significantly more likely to sustain a new injury leading to a repeat ED visit within 14 days.

CONCLUSIONS After an ED visit due to a fall, over one in 10 patients will re-present to the ED due to a new injury or sequelae from the initial fall. In the immediate period after a fall, enhanced outpatient follow-up or risk mitigation strategies should be considered to lessen return visits and decrease morbidity.

**Language:** en

**Keywords:** geriatrics; falls; emergency medicine; head trauma; readmissions

**Complications arising from dental trauma incurred from falls involving geriatric patients: a case report**

Arroyo Bote S, Bennasar Verges C, Ribas-Perez D, Rodriguez Menacho D, Villalva Hernandez-Franch P, Barbero Navarro I, Castaño Séiquer A. Diagnostics (Basel) 2023; 13(19).



**DOI:** 10.3390/diagnostics13193021 **PMID:** 37835764 **PMCID:** PMC10571958

**Abstract**

Elderly patients have a high incidence of falls that result in facial injuries. Many cases present with dental crown fractures and soft-tissue lacerations. The initial diagnosis is especially important in this type of dental trauma, since an initial error can result in the failure to establish the correct treatment from the very beginning, worsening the prognosis, which, in the worst case, can compromise the teeth affected by the trauma. Case report: We present the case of a patient, a 79-year-old woman, who suffered an accidental fall. The patient was examined by a dentist in the emergency room. She was diagnosed with a simple crown fracture of the right upper central incisor and right upper lateral incisor without any pulpal involvement and with laceration of the lower lip. Months later, she had an episode of inflammation in the lower lip, and she developed edema and pain. An X-ray of the lower lip revealed a radiopaque mass compatible with a fragment of dental tissue due to the inclusion of remnants of the dental tissue resulting from the previous accident fall.

CONCLUSIONS: The population of geriatric patients is steadily increasing in our society, and a higher frequency of falls has been observed in this age group, affecting the maxillofacial region, with consequent dental trauma on many occasions. Therefore, as professionals, we must pay special attention to the prevention and treatment of this problem, insisting on the importance of routine investigation in the emergency visit for dental trauma, which includes a meticulous examination of the soft tissues accompanied by a radiographic examination, when the inclusion of foreign bodies is suspected.

**Language:** en

**Keywords:** dental trauma; clinical examination; crown fracture; falls in the elderly; soft tissues

**A method for simulating forward falls and controlling impact velocity**

Borrelli J, Creath RA, Rogers MW. MethodsX 2023; 11: e102399.



**DOI:** 10.1016/j.mex.2023.102399 **PMID:** 37830002 **PMCID:** PMC10565865

## Abstract

Assessment of protective arm reactions associated with forward falls are typically performed by dropping research participants from a height onto a landing surface. The impact velocity is generally modulated by controlling the total height of the fall. This contrasts with an actual fall where the fall velocity is dependent on several factors in addition to fall height and not likely predictable at the onset of the fall. A counterweight and pulley system can be used to modulate the fall velocity in simulated forward falls in a manner that is not predictable to study participants, enhancing experimental validity. However, predicting the fall velocity based on participant height and weight and counterweight mass is not straightforward. In this article, the design of the FALL simulator For Injury prevention Training and assessment (FALL FIT) system is described. A dynamic model of the FALL FIT and counterweight system is developed and model parameters are fit using nonlinear optimization and experimental data. The fitted model enables prediction of fall velocity as a function of participant height and weight and counterweight load. The method can be used to provide controllable perturbations thereby elucidating the control strategy used when protecting the body from injury in a forward fall, how the control strategy changes because of aging or dysfunction or as a method for progressive protective arm reaction training.•Construction of device to simulate forward falls with controllable impact velocity using material that are commercially available is described•A dynamic model of the FALL FIT is developed to estimate the impact velocity of a simulated forward fall using participant height and counterweight load•The dynamic model is validated using data from 3 previous studies.

**Language:** en

**Keywords:** Biomechanics; FALL simulator For Injury prevention Training and assessment; Fall-injury; Forward falls; Upper extremity

**Wearable sensors-based postural analysis and fall risk assessment among patients with diabetic foot neuropathy**

Brognara L, Sempere-Bigorra M, Mazzotti A, Artioli E, Julián-Rochina I, Cauli O. J. Tissue Viability 2023; ePub(ePub): ePub.



**DOI:** 10.1016/j.jtv.2023.10.002 **PMID:** 37852919

## Abstract

AIMS: To investigate the cross-sectional association between deep and superficial diabetic neuropathy, postural impairment assessed by wearable inertial sensors, and the risk of fall among patients with diabetic foot.

METHODS: Diabetic patients attending a University Podiatric Clinic were evaluated for the presence of deep and superficial peripheral neuropathy in sensory tests. Postural impairment was assessed using a wearable inertial sensor, and the evaluation of balance/gait and risk of fall was determined by the Tinetti Scale and Downton Index, respectively. Glycemic control was measured by glycated haemoglobin concentration and fasting glycaemia. The postural parameters measured were the anteroposterior and medio-lateral sway of the center of mass (CoM) and the sway area (area traveled by the CoM per second). The results were analyzed through a logistic regression model to assess those posture variables mostly significantly associated with neuropathy and risk of fall scales.

RESULTS: A total of 85 patients were evaluated. Spearman's rank correlation coefficients showed a strong and significant relationship ($p < 0.05$) between deep diabetic neuropathy assessed by Semmes-Weinstein monofilament, diapason and biothensiometer and postural alterations, whereas no significant correlations between superficial (painful sensitivity) neuropathy and the postural parameters. The sway path of the displacement along the anterior-posterior axis recorded during tests performed with eyes open and feet close together were significantly ($p < 0.05$) correlated with a poor glycemic (glycated haemoglobin concentration) control and each other with all diabetic neuropathy tests, fall risk scales, muscular weakness, ankle joint limitation and history of ulcers.

CONCLUSIONS: The results support the existence of a strong association between alterations of the deep somato-sensitive pathway (although depending on the tool used to measure peripheral neuropathy), glycemic control and balance impairments assessed using a wearable sensors. Wearable-based postural analysis might be part of the clinical assessment that enables the detection of balance impairments and the risk of fall in diabetic patients with diabetic peripheral neuropathy.

**Language:** en

**Keywords:** Diabetic foot; Diabetic foot neuropathy; Inertial sensors; Postural analysis; Postural instability

**Relationship between fear of falling and fall risk among older patients with stroke: a structural equation modeling**

Chen Y, Du H, Song M, Liu T, Ge P, Xu Y, Pi H. BMC Geriatr. 2023; 23(1): e647.



**DOI:** 10.1186/s12877-023-04298-y **PMID:** 37821821

**Abstract**

BACKGROUND: With reduced balance and mobility, older patients with stroke are more susceptible to fear of falling (FOF). A maladaptive form of FOF can cause excessive activity restriction, poor balance, and recurrent falls, forming a self-reinforcing vicious cycle. This study applied and adapted the FOF model to investigate the interaction between FOF and fall risk in older stroke patients.

METHODS: A cross-sectional study was conducted among 302 older stroke patients aged 60 and over. All participants were invited to complete the FOF, fall risk, physical activity, and balance tests, which were measured by the Falls Efficacy Scale International (FES-I), Self-Rated Fall Risk Questionnaire (FRQ), the long-form International Physical Activity Questionnaire (IPAQ-LF) and the Four-Stage Balance Test (FSBT) respectively. Data were analyzed using structural equation modeling.

RESULTS: The mean age of the respondents was $68.62 \pm 7.62$ years; 8.94% reported a high level of FOF, and 18.21% reported a moderate level of FOF. The structural equation model showed that FOF was directly associated with fall risk ($\beta$=-0.38, $p < 0.001$), and was indirectly associated with fall risk via physical activity ($\beta$=-0.075, $p < 0.05$) and balance ability ($\beta$=-0.123, $p < 0.05$). Depression ($\beta$=-0.47, $p < 0.001$), fall history ($\beta$=-0.13, $p < 0.05$), and female sex ($\beta$=-0.16, $p < 0.05$) affected FOF, while anxiety was not associated with FOF.

CONCLUSIONS: The increased risk of falling in older stroke patients results from a maladaptive FOF affected by depression, fall history, poor balance ability, and limited physical activity. Our results suggest that greater attention should be paid to FOF during stroke recovery and fall prevention. A multifaced intervention program encompassing physiological and psychological factors should be designed to address FOF and prevent falls.

**Language:** en

**Keywords:** Depression; Stroke; Accidental fall; Postural balance; Fear of falling

**Fear avoidance, fear of falling, and pain disability in hypermobile Ehlers-Danlos syndrome and hypermobility spectrum disorders**

Chuchin JD, Ornstein TJ. Disabil. Rehabil. 2023; ePub(ePub): ePub.



**DOI:** 10.1080/09638288.2023.2268520 **PMID:** 37843031

**Abstract**

PURPOSE: Hypermobile Ehlers-Danlos Syndrome (hEDS) and Hypermobility Spectrum Disorders (HSD) are understudied conditions characterized by hallmark hypermobility and chronic pain. Disease manifestations lead to significant disability. Understanding predictors of disability, over and above the univariate construct of pain severity, is necessary to tailor treatment. Thus, the current study examined the impact of the Fear-Avoidance Model [FAM] on disability in hEDS/HSD. Fear of falling was included as a novel fear-avoidance factor impacting disability.

METHODS: A total of 168 individuals with hEDS/HSD answered a cross-sectional online survey regarding FAM constructs, fear of falling, disability, and clinical-demographic factors. A hierarchical regression analysis was used to assess whether FAM constructs and fear of falling significantly predicted disability, over and above pain severity and age.

RESULTS: Pain catastrophizing, anxiety, and fear of falling contributed significant unique predictive relations, above age and average pain severity. Pain severity and fear of falling were the strongest unique predictors of disability.

CONCLUSIONS: This is the first study to assess the relations among FAM constructs, pain severity, and disability in hEDS/HSD, and introduces fear of falling as a novel fear-avoidance factor specific to this population. Future research should apply these findings towards individualized interventions to improve disability in hEDS/HSD.

**Language:** en

**Keywords:** Chronic pain; fear of falling; fear-avoidance model; hypermobile Ehlers-Danlos syndrome; hypermobility spectrum disorder; pain-related disability

**Exploring new balance and gait factors that are associated with osteosarcopenia in patients with a previous fall and/or fracture history**

Debruin DA, Miksa K, Vogrin S, Duque G, Sales M, Hayes A. Arch. Gerontol. Geriatr. 2023; 117: e105221.



**DOI:** 10.1016/j.archger.2023.105221 **PMID:** 37832464

## Abstract

Osteosarcopenic individuals have poor muscle function and increased bone fragility, which results in a severe detriment to health outcomes. Hence, there is a necessity to discover easily accessible factors associated with osteosarcopenia to develop timely interventions. This study aimed to determine new sensitive balance and/or gait variables that are associated with osteosarcopenia in a population of older people with a history of falls and/or fractures. In a cross-sectional cohort study, 306 men and women aged ≥65 years completed a series of questionnaires, clinical assessments and muscle strength and function tests. Subsequently, participants were separated into osteopenia, osteoporosis and osteosarcopenia, groups for comparison and further analysis. Osteosarcopenia performed worse than osteopenia and osteoporosis in grip strength, gait speed, physical function scores and in multiple gait and balance indices ($p<0.001$). During posturography testing, there were larger elliptical areas with eyes open ($p = 0.003$), and eyes closed ($p = 0.043$) and increased sway velocity on a firm platform ($p = 0.007$) in the osteosarcopenia group, compared to osteoporosis. Limits of stability and eyes open ellipse area significantly contributed to the multivariable model ($p = 0.029$ and $p = 0.038$, respectively), suggesting that these balance parameters, along with grip strength, may be useful in identifying older adults with osteosarcopenia from those with only osteopenia/osteoporosis. Older adults with osteosarcopenia and a history of falls and/or fractures demonstrated inferior strength, function, and gait characteristics. This study identified indices of balance that were sensitive discriminators for osteosarcopenia and could be easily implemented into routine assessment.

**Language:** en

**Keywords:** Falls; Gait; Balance; Osteoporosis; Osteosarcopenia

**Analysis of postural control in patients diagnosed with unilateral knee osteoarthrosis and its relationship with the risk of falls**

de Freitas REJ, de Freitas JGA, Vieira CP, Endres DC, Inacio FM, da Silva Azevedo Nora FG. Adv. Orthop. 2023; 2023: e5536304.



**DOI:** 10.1155/2023/5536304 **PMID:** 37822415 **PMCID:** PMC10564574

**Abstract**

INTRODUCTION: Knee osteoarthrosis, whether subtle or marked, appears to alter the stability and performance of the knee joint in activities of daily living that prevent the maintenance of bipedal posture. However, there is still a gap in the literature as to how knee osteoarthritis can affect static balance.

OBJECTIVE: To analyze the performance of postural control in elderly diagnosed with unilateral knee osteoarthrosis.

MATERIALS AND METHODS: 40 elderly people of both sexes participated in this study, divided into two groups containing 20 elderly each. Group 1 (G1) consists of elderly patients who have received a diagnosis of unilateral knee osteoarthritis. Despite undergoing conservative treatment, their condition has shown insufficient improvement, leading to a clinical recommendation for total knee arthroplasty (TKA). The G2 group was made up of 20 elderly with an average age of 71.09 years, considered active, who do not have a diagnosis of osteoarthritis in the knee joint and practice physical activity. With the aid of a Baroscan pressure platform, the center of pressure (COP) displacement in the anteroposterior (COPAP) direction and mediolateral direction (COPML) and the area of center of pressure displacement were evaluated during bipedal postural control with eyes open and eyes closed.

RESULTS: During postural control with eyes open and eyes closed, the G1 group showed greater displacement of the COP in the anteroposterior direction-COPAP ($p = 0.007$)-and mediolateral direction-COPML ($p = 0.033$)-when compared to the G2 group. As for the area of displacement of the COP, group G1 presented a larger area of displacement ($p = 0.002$) than group G2 during bipedal postural control with open eyes. For the condition with eyes closed, both groups showed similar behaviors, which resulted in no present statistically significant differences.

CONCLUSION: The results suggest that unilateral knee osteoarthritis influences bipedal postural control and activities of daily living that require this static balance, since information from the somatosensory system is reduced, resulting in stability of tasks that require body control and promoting the risk of falls. From a clinical perspective, the results suggest that the assessment of bipedal postural control can assist orthopedic physicians in assessing joint stability in patients with unilateral knee osteoarthrosis.

**Language:** en

**Epidemiology of major trauma in older adults within Scotland: a national perspective from the Scottish Trauma Audit Group (STAG)**

Farrow L, Diffley T, Gordon MWG, Khan A, Capek E, Anand A, Paton M, Myint PK. Injury 2023; ePub(ePub): ePub.



**DOI:** 10.1016/j.injury.2023.111065 **PMID:** 37827875

## Abstract

BACKGROUND: Major trauma in older adults (MTOA) poses distinctive health and social care challenges, further underlined by the unique socioeconomic and geographical environment of Scotland. This study provides epidemiological trends of MTOA, to provide insight into areas where further evaluation and research are required.

MATERIALS AND METHODS: Pseudonymised aggregated demographic, injury and outcome data from 2011 to 2020 were obtained from the Scottish Trauma Audit Group (STAG) Database, covering 28 hospitals across Scotland. Only individuals age ≥ 70 with an Injury Severity Score (ISS) > 15 were included.

RESULTS: There was an average of 216 annual cases of MTOA, with a 259 % rise in incidence from 2011 to 2020. This was predominantly driven by a rise in low velocity trauma (fall <2 m height; 287 % increase). The proportion of all major trauma attributable to those aged ≥70 rose from 18.5 % in 2011 to 34.6 % in 2020. Death censored median (IQR) acute hospital length of stay was 18 days (9-30). Overall, 30-day survival was 65.3 %, with no improvement seen between 2011 and 2020 (p = 0.50). Independent predictors of improved 30-day survival included Ages 70-79 & 80-89 [compared to reference ≥ 90] (OR 3.12; 95 %CI 2.24,4.31; p < 0.001 and OR 1.66; 95 %CI 1.21,2.29; p = 0.002 respectively), and Extremity injury (OR 1.89; 95 %CI 1.48,2.41; p < 0.001). Head injury (OR 0.72; 95 %CI 0.54,0.96; p = 0.027) and increasing ISS score (OR 0.88, 95 %CI 0.86,0.89; p < 0.001) were associated with lower likelihood of 30-day survival. A further model also including the admission ward (from eSTAG data November 2017 onwards) demonstrated an association with reduced 30-day survival with admission to General Surgery (OR 0.42; 95 %CI 0.19,0.93; p = 0.033), Intensive Care (OR 0.25; 95 %CI 0.10,0.60; p = 0.002) and Medical Specialities (OR 0.33; 95 %CI 0.15,0.73; p = 0.007) compared to the reference (Major Trauma). Exponential Smoothing predictions revealed a further potential 184 % rise in incidence of MTOA from 2021 to 2030 (3657 per 100,000 population at risk to 10,392 per 100,000 population at risk).

CONCLUSION: MTOA is likely to be a rising health care burden, requiring larger quantities of health and social care resource. Urgent preventative strategies are required to reduce low velocity trauma (standing height falls), as well as the high mortality and morbidity of MTOA.

**Language:** en

**Keywords:** Epidemiology; Falls; Older adults; Major trauma; Silver trauma

**Depth-imaging for gait analysis on a treadmill in older adults at risk of falling**

Hackbarth M, Koschate J, Lau S, Zieschang T. IEEE J. Transl. Eng. Health Med. 2023; 11: 479-486.



**DOI:** 10.1109/JTEHM.2023.3277890 **PMID:** 37817821 **PMCID:**PMC10561749

## Abstract

BACKGROUND: Accidental falls are a major health issue in older people. One significant and potentially modifiable risk factor is reduced gait stability. Clinicians do not have sophisticated kinematic options to measure this risk factor with simple and affordable systems. Depth-imaging with AI-pose estimation can be used for gait analysis in young healthy adults. However, is it applicable for measuring gait in older adults at a risk of falling? METHODS: In this methodological comparison 59 older adults with and without a history of falls walked on a treadmill while their gait pattern was recorded with multiple inertial measurement units and with an Azure Kinect depth-camera. Spatiotemporal gait parameters of both systems were compared for convergent validity and with a Bland-Altman plot.

RESULTS: Correlation between systems for stride length (r=.992, [Formula: see text]) and stride time (r=0.914, [Formula: see text]) was high. Bland-Altman plots revealed a moderate agreement in stride length (-0.74 ± 3.68 cm; [-7.96 cm to 6.47 cm]) and stride time (-3.7±54 ms; [-109 ms to 102 ms]).

CONCLUSION: Gait parameters in older adults with and without a history of falls can be measured with inertial measurement units and Azure Kinect cameras. Affordable and small depth-cameras agree with IMUs for gait analysis in older adults with and without an increased risk of falling. However, tolerable accuracy is limited to the average over multiple steps of spatiotemporal parameters derived from the initial foot contact. Clinical Translation Statement- Gait parameters in older adults with and without a history of falls can be measured with inertial measurement units and Azure Kinect. Affordable and small depth-cameras, developed for various purposes in research and industry, agree with IMUs in clinical gait analysis in older adults with and without an increased risk of falling. However, tolerable accuracy to assess function or monitor changes in gait is limited to the average over multiple steps of spatiotemporal parameters derived from the initial foot contact.

**Language:** en

**Keywords:** Aged; Humans; Walking; falls; Gait; older people; *Accidental Falls/prevention & control; *Gait Analysis; depth-camera; Exercise Test/methods

**A scoping review of the predictive qualities of walking speed in older adults**

Hainline G, Hainline RD, Handlery R, Fritz S. J. Geriatr. Phys. Ther. 2023



**DOI:** 10.1519/JPT.0000000000000398 **PMID:** 37820357

**Abstract**

BACKGROUND AND PURPOSE: Walking speed (WS) is an easily assessable and interpretable functional outcome measure with great utility for the physical therapist providing care to older adults. Since WS was proposed as the sixth vital sign, research into its interpretation and use has flourished. The purpose of this scoping review is to identify the current prognostic value of WS for the older adult.

METHODS: A scoping review was conducted using PubMed, CINAHL, and SPORTDiscus to find relevant articles highlighting the predictive capabilities of WS for older adults. Titles and abstracts were reviewed to identify relevant articles. Articles were excluded based on the following criteria: sample included both younger and older adults without separate analyses, sample was focused on a particular disease, if the study was published before 2017, or if the study did not report relevant cut points for interpretation of WS. The search returned 1064 results. Following removal of articles not meeting inclusion criteria and critical appraisal, relevant cut points were extracted from 47 original research publications.

RESULTS AND DISCUSSION: A preliminary review of the included articles showed that WS is a valuable prognostic tool across many health domains, including mental health, mortality, disability, pain, bone and joint health, falls, cognition, physical activity, metabolic health, risk for cardiovascular disease, socialization, and metabolic health. The fastest WS of 1.32 meters per second (m/s) served as a cutoff for decreased risk for incident development of type 2 diabetes, while the slowest WS of less than 0.2 m/s was associated with increased duration of hospitalization. Multiple studies reported on the prognostic value of WS slower than 1.0 m/s.

CONCLUSION: Although the reported range of predictive WS values was broad, multiple studies found WS of approximately 1.0 m/s to be a useful marker for delineating risk or decline across a variety of health domains. Clinicians may find it useful to use a WS slower than 1.0 m/s as a "yellow flag" to guide evaluation and intervention for their older adult clients.

**Language:** en

**Enhancing wearable gait monitoring systems: identifying optimal kinematic inputs in typical adolescents**

Kahlon AS, Verma K, Sage A, Lee SCK, Behboodi A. Sensors (Basel) 2023; 23(19).



**DOI:** 10.3390/s23198275 **PMID:** 37837105 **PMCID:** PMC10575151

## Abstract

Machine learning-based gait systems facilitate the real-time control of gait assistive technologies in neurological conditions. Improving such systems needs the identification of kinematic signals from inertial measurement unit wearables (IMUs) that are robust across different walking conditions without extensive data processing. We quantify changes in two kinematic signals, acceleration and angular velocity, from IMUs worn on the frontal plane of bilateral shanks and thighs in 30 adolescents (8-18 years) on a treadmills and outdoor overground walking at three different speeds (self-selected, slow, and fast). Primary curve-based analyses included similarity analyses such as cosine, Euclidean distance, Poincare analysis, and a newly defined bilateral symmetry dissimilarity test (BSDT). Analysis indicated that superior-inferior shank acceleration (SI shank Acc) and medial-lateral shank angular velocity (ML shank AV) demonstrated no differences to the control signal in BSDT, indicating the least variability across the different walking conditions. Both SI shank Acc and ML shank AV were also robust in Poincare analysis. Secondary parameter-based similarity analyses with conventional spatiotemporal gait parameters were also performed. This normative dataset of walking reports raw signal kinematics that demonstrate the least to most variability in switching between treadmill and outdoor walking to help guide future machine learning models to assist gait in pediatric neurological conditions.

**Language:** en

**Keywords:** adolescents; walking; wearable sensors; treadmill; gait analysis; IMU; kinematics; Poincare; similarity distance; spatiotemporal

**Unchanged incidence but change in treatment trends from 1996 to 2018: 23,718 humeral shaft fractures from the Danish National Patient Registry**

Karimi D, Qvistgaard SW, Gundtoft PH, Brorson S, Viberg B. Acta Orthop. 2023; 94: 523-529.



**DOI:** 10.2340/17453674.2023.21125 **PMID:** 37831408 **PMCID:** PMC10574250

**Abstract**

BACKGROUND AND PURPOSE: Humeral shaft fractures (HSF) can be treated surgically or non-surgically. National trends and distributions are sparsely reported. We present the temporal trends in epidemiology of adult HSF in Denmark, with the primary aim of reporting HSF incidences, and the secondary aim of reporting on the primary treatment management.

PATIENTS AND METHODS: The diagnosis (International Classification of Diseases Version 10 [ICD-10]: S42.3) and surgical procedure codes for HSF were obtained from the Danish National Patient Registry (DNPR) covering 1996-2018. The diagnosis code for HSF is validated in the DNPR with a positive predictive value of 89%. Patients aged 18 years and above were included. Surgical treatment was defined as a diagnosis of HSF combined with a surgical procedure within 3 weeks of injury. Cases without relevant registered procedures within 3 weeks were defined as nonsurgical treatment cases.

RESULTS: 23,718 HSF (62% female) were identified in the DNPR. The overall mean incidence was 25/100,000/year and was stable over 23 years. The population above 50 years accounted for 78% of all HSF. Non-surgical treatment accounted for 87% of treatments and was stable during the study period. Temporal changes were observed regarding surgical procedures; intramedullary nailing decreased from 57% to 26% and plate osteosynthesis increased from 12% to 69%.

CONCLUSION: The overall incidence for HSF remained stable from 1996 to 2018. Most cases were females aged 50 years and above. The preferred primary treatment for HSF was non-surgical for all ages. Plate osteosynthesis became more popular than intramedullary nailing over the study period.

**Language:** en

**Motivational Interviewing for Fall Prevention (MI-FP) pilot study: older Adults' readiness to participate in fall prevention**

Kiyoshi-Teo H, De Lima B, Cohen DJ, Dieckmann N, Winters-Stone K, Eckstrom E. Geriatr. Nurs. 2023; 54: 246-251.



**DOI:** 10.1016/j.gerinurse.2023.09.017 **PMID:** 37847939

**Abstract**

Older adults' readiness to participate in fall prevention behaviors is largely unknown. We evaluated the feasibility of recruitment for a fall prevention intervention and participants' readiness to participate in fall prevention activities. Patients ≥ 65 years at high fall risk were recruited. Feasibility of recruitment was assessed by reaching the goal sample size (200), and recruitment rate (50%). Surveys assessed participants' readiness to participate in fall prevention activities (confidence to manage fall risks [0-10 scale; 10 most confident] and adherence to fall prevention recommendations). We recruited 200 patients (46.3% of eligible patients), and 185 completed surveys. Participants reported high confidence (range 7.48 to 8.23) in addressing their risks. Their adherence to clinician recommendations was mixed (36.4% to 90.5%). We nearly met our recruitment goals, and found that older adults are confident to address their fall risks, but do not consistently engage in fall prevention recommendations.

**Language:** en

**Keywords:** Communication; Behavior change; Fall prevention; Older adult

**Predicting a fall based on gait anomaly detection: a comparative study of wrist-worn three-axis and mobile phone-based accelerometer sensors**

Kocuvan P, Hrastič A, Kareska A, Gams M. Sensors (Basel) 2023; 23(19).



**DOI:** 10.3390/s23198294 **PMID:** 37837123 **PMCID:** PMC10575458

## Abstract

Falls by the elderly pose considerable health hazards, leading not only to physical harm but a number of other related problems. A timely alert about a deteriorating gait, as an indication of an impending fall, can assist in fall prevention. In this investigation, a comprehensive comparative analysis was conducted between a commercially available mobile phone system and two wristband systems: one commercially available and another representing a novel approach. Each system was equipped with a singular three-axis accelerometer. The walk suggestive of a potential fall was induced by special glasses worn by the participants. The same standard machine-learning techniques were employed for the classification with all three systems based on a single three-axis accelerometer, yielding a best average accuracy of 86%, a specificity of 88%, and a sensitivity of 86% via the support vector machine (SVM) method using a wristband. A smartphone, on the other hand, achieved a best average accuracy of 73% also with an SVM using only a three-axis accelerometer sensor. The significance analysis of the mean accuracy, sensitivity, and specificity between the innovative wristband and the smartphone yielded a p-value of 0.000. Furthermore, the study applied unsupervised and semi-supervised learning methods, incorporating principal component analysis and t-distributed stochastic neighbor embedding. To sum up, both wristbands demonstrated the usability of wearable sensors in the early detection and mitigation of falls in the elderly, outperforming the smartphone.

**Language:** en

**Keywords:** elderly people; accelerometer features; ambient intelligence; gait abnormalities; PCA; personalized; predicting falls; supervised learning; t-SNE; three-axis accelerometer

**A concept analysis of fear of falling in older adults: insights from qualitative research studies**

Lee D, Tak SH. BMC Geriatr. 2023; 23(1): e651.



**DOI:** 10.1186/s12877-023-04364-5 **PMID:** 37821830

**Abstract**

BACKGROUND: Fear of falling is a persistent concern about falls that commonly occur in older adults. Recently, it has been argued that fear of falling doesn't simply mean a state of low falls efficacy, but is a concept distinct from falls efficacy. However, the two concepts are still indistinguishable. Therefore, it is necessary to understand the unique characteristics of the fear of falling. This study aims to analyze the concept of 'fear of falling' faced by older adults.

METHODS: This study is designed as a concept analysis. A concept analysis was conducted by Walker & Avant's eight-step concept analysis method. A total of 16 pieces of literature were selected by inclusion and exclusion criteria from those published in Pubmed and Scopus between 1993 and 2022 on 8 November 2022.

RESULTS: Two antecedents, four attributes, and five consequences were identified. Apprehension caused by the unpredictable nature of falls, unease related to one's vulnerability, high vigilance-related to the environment, and concern about potential harm after fall events were presented as attributes of fear of falling in older adults. There were two antecedents of fear of falling which were awareness of falls and near falls, and direct/indirect experience about falls and near falls. As consequences of fear of falling, protective effect, activities curtailment, reduction in radius of living, restricted freedom, and limited social activities were reported.

CONCLUSION: It was confirmed that falls and the fear-inducing process were fused to constitute the unique characteristics of the fear of falling. This can be presented as an important basis for future research on the fear of falling or dealing with various aspects of the fear of falling in the clinical field.

**Language:** en

**Keywords:** Older adults; Nursing; Fear of falling; Concept Analysis

**Efficacy of standard operating procedures for fall protection in hospitalized patients with schizophrenia**

Li H, Liu C, Ge Z, Mu X, Wang X, Xiu M, Wang X, Li Z. Schizophrenia (Heidelb.) 2023; 9(1): e73.



**DOI:** 10.1038/s41537-023-00396-3 **PMID:** 37848486

## Abstract

Fall-related injury is the most common cause of functional disability and mortality in the older population. Falls in patients with schizophrenia are one of the major concerns in psychiatric hospitals. This study aimed to examine the impact of standardized operating procedures (SOP) on falls in veterans with schizophrenia. Veterans with schizophrenia were allocated to the control group (n = 345) and to the fall protection standardized operating procedures (FP-SOP) group (n = 342). Patients in the control group were given routine nursing for falls, and patients in the FP-SOP group were intervened with FP-SOP plus routine nursing. All patients were observed for one year. The study methods comply with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist. We found a fall rate of 1.5% in the FP-SOP group and 4.6% in the control group, with a significant difference in the fall rate between the two groups. In addition, the difference in patient satisfaction between the two groups was statistically significant. Our findings suggest that FP-SOP is an effective strategy for fall prevention in psychiatric hospitals.

**Language:** en

**Effectiveness of exercise rehabilitation interventions on depressive symptoms in older adults post hip fracture: a systematic review and meta-analysis**

Milton-Cole R, Kazeem K, Gibson A, Guerra S, Sheehan KJ. Osteoporos. Int. 2023; ePub(ePub): ePub.



**DOI:** 10.1007/s00198-023-06923-3 **PMID:** 37831102

**Abstract**

This study determines the effectiveness of exercise rehabilitation interventions on depressive symptoms in older adults after hip fracture. Ovid MEDLINE, Embase, Global Health, APAPsych, CENTRAL, CIHAHL, PEDro and Open Grey were searched from database inception to June 10, 2022 for definitive, pilot or feasibility randomised controlled trials of rehabilitation interventions (versus any comparator) which reported depressive symptoms among older adults post hip fracture. Nonrandomised trials and those not published in English were excluded. Selection, quality appraisal (Cochrane Risk of Bias 2) and extraction in duplicate.

RESULTS were synthesised narratively and with meta-analysis (Hedge's g for intervention effect, I2 for heterogeneity). Eight trials (1146 participants) were included. Interventions were predominantly face-to-face exercise rehabilitation (range three to 56 sessions) at home versus usual care. Three trials were assigned overall low risk of bias, three some concerns and two high risk. The pooled effect of rehabilitation on depressive symptoms at intervention end favoured the intervention group (Hedges's g -0.43; 95% CI: -0.87, 0.01; four trials). Three trials demonstrated no between group difference following adjustment for baseline depressive symptoms. One trial found lower odds of depression when the intervention additionally included falls prevention, nutrition consultation and depression management. There is a potential benefit of exercise rehabilitation interventions on depressive symptoms after hip fracture. A mechanism for benefit may relate to baseline symptom severity, exercise frequency, frequency of health professional contacts, addition of a psychological component or of the quality of the underlying trials. To appropriately inform clinical guidelines, further appropriately powered trials with follow-up are warranted. TRIAL REGISTRATION: ClinicalTrials.gov Identifier: CRD42022342099.

**Language:** en

**Keywords:** Physical activity; Mood disorders; Physiotherapy; Evidence synthesis; Neck of femur

**Cognitive predictors of responsiveness to reactive step training in people with Parkinson's disease at fall-risk**

Monaghan AS, Hooyman A, Dibble LE, Mehta SH, Peterson DS. Neurosci. Lett. 2023; ePub(ePub): ePub.



**DOI:** 10.1016/j.neulet.2023.137517 **PMID:** 37832815

## Abstract

Reactive stepping can be improved in people with Parkinson's Disease (PwPD). However, there is variability in the responsiveness to such training. This study examined if cognition could predict the responsiveness of PwPD to a 2-week reactive step training intervention. 25 PwPD (70.52 years ± 7.15; Hoehn & Yahr range 1-3) at risk for falls completed a multiple baseline, open-label, uncontrolled pre-post intervention study. Reactive stepping was trained through a 2-week (6-session) intervention with repeated support surface translations. Stepping performance was measured at 2 baseline assessments (B1 and B2), immediately after the intervention (P1), and 2 months after training (P2). Primary stepping outcomes were anterior-posterior margin of stability (MOS), step length, and step latency during backward steps. The primary aim assessed whether global cognition (Scales for Outcomes in Parkinson's Disease-Cognition - SCOPA-COG & Montreal Cognitive Assessment - MoCA) was related to 2-month retention of improvements in reactive stepping after practice. The secondary aim explored whether specific cognitive domains predicted retained stepping improvements, including attention/working memory, executive function, language, memory, and visuospatial function. Greater baseline global cognition was related to better 2-month retention of step length improvements (SCOPA-COG: $p = 0.002$, $f(2) = 0.31$; MoCA: $p = 0.002$, $f(2) = 0.38$). However, only SCOPA-COG retained statistical significance after p-value adjustment for multiple comparisons $p = 0.04$). Optimal cut-point analysis revealed that a SCOPA-COG threshold of 31 or higher was optimal for identifying individuals likely to retain improvement. Specific cognitive domains did not predict changes in reactive stepping outcomes. Participants with greater baseline global cognition, particularly as measured by SCOPA-COG, demonstrated greater retention of improvements in reactive stepping. In this cohort, a SCOPA-COG threshold of 31 could predict individuals likely to benefit from the intervention. These findings highlight the potential of cognitive screening to identify people more or less likely to benefit from reactive balance training.

**Language:** en

**Keywords:** Accidental Falls; Balance; Motor Learning; Parkinson Disease; Reactive Stepping

**Observational prospective study to determine the efficacy of 'non-slip socks' vs. 'adequate footwear' regarding the number of falls observed among admitted patients**

Moreno Rodríguez RM, Solas Gómez B, Gallego Marcuello L, Diaz Martinez MDC, Fernández Del Palacio E, Santiago-Sáez A. Healthcare (Basel) 2023; 11(19): e2605.



**DOI:** 10.3390/healthcare11192605 **PMID:** 37830642

**Abstract**

BACKGROUND: Fall prevention is an important indicator of the quality of patient care. Prevention includes the use of adequate footwear. Our objective is to determine the differences in the number of falls between patients with "adequate footwear" and "non slip socks", and their associated consequences, to support their use in the prevention of falls among hospitalized patients.

METHODS: This is an observational prospective study on inpatient falls. Patient characteristics, fall circumstances, and injuries were collected through Clinical Report Forms, a review of fall reports, and medical records. Admitted patients over 18 years old were recruited from Geriatric and Internal Medicine Units over a brief period of 3 months.

RESULTS: A total of 158 hospitalized patients were recruited. In total, 77 patients (48.73%) were assigned to the non-slip socks group, and 81 (51.27%) were assigned to the adequate footwear group. There were 21 falls during the study period, all of which were experienced by the adequate footwear group ($p < 0.0001$). The mean age of the patients who fell was 83.14 (range 60-100) years old. The most frequent reasons for admission among the patients who fell were COVID-19 infection (19%) and oncological complications (19%). Overall, 61.9% of patients had a high risk of falling. Most falls (76.1%) occurred in patient rooms, and most of these occurred while wandering around. The most frequent reason for falls was slipping (14/21). For 16 of 21 patients, falls did not have immediate consequences, while 5 had contusions and 1 suffered a wound. Nobody needed to be admitted to the ER or suffered external hemorrhages or loss of consciousness.

CONCLUSIONS: Non-slip socks represent an adequate alternative to well-fitting rubber-soled footwear. It seems that non-slip socks could prevent falls among hospitalized patients; nevertheless, further studies are necessary to clarify their role in preventing hospital falls and reducing injury rates.

**Language:** en

**Keywords:** prevention; risk; healthcare; hospital

**Chronic pain in the lower extremities and low back is associated with recurrent falls in community-dwelling Japanese people aged 40-74 years**

Nagashima Y, Kitamura K, Watanabe Y, Kabasawa K, Takahashi A, Saito T, Kobayashi R, Oshiki R, Takachi R, Tsugane S, Yamazaki O, Watanabe K, Nakamura K. Arch. Phys. Med. Rehabil. 2023; ePub(ePub): ePub.



**DOI:** 10.1016/j.apmr.2023.09.021 **PMID:** 37820845

**Abstract**

OBJECTIVE: To determine the longitudinal association between chronic pain in the lower extremities and low back and the odds of recurrent falls in middle-aged and older people.

DESIGN: A cohort study. SETTING: Communities in Japan. PARTICIPANTS: Participants were 7,540 community-dwelling volunteers aged 40-74 years. The baseline survey was a self-administered questionnaire conducted between 2011-2013. Predictors were presence of chronic pain in the knee, foot/ankle, and low back, with the degree of pain categorized as none, very mild/mild, moderate, or severe/very severe. Covariates in the multivariate model of chronic pain in a site were demographics, body mass index, physical activity level, disease history, and chronic pain in the other 2 sites. Logistic regression analysis was used to calculate odds ratios (ORs). INTERVENTIONS: None. MAIN OUTCOME MEASURE(S): Recurrent falls in the year before the 5-year follow-up survey.

RESULTS: Mean participant age was 60.2 years. Higher degrees of chronic pain were associated with higher odds of recurrent falls for the knee (P=0.0002) with a higher OR of 1.48 (95% CI: 1.11-1.97), for the foot/ankle (P=0.0001) with a higher OR of 1.97 (95% CI: 1.36-2.86), and for the low back (P=0.0470) with a higher OR of 1.45 (95% CI: 1.09-1.91) in those with any degree of pain relative to those without pain. Higher degrees of chronic knee pain were associated with higher odds of recurrent falls in women (P=0.0005), but not in men (P=0.0813). Meanwhile, higher degrees of chronic low back pain were associated with the odds of recurrent falls in men (P=0.0065), but not in women (P=0.8735).

CONCLUSIONS: Chronic pain in the knee, foot/ankle, and lower back was independently and dose-dependently associated with a higher risk of recurrent falls. A marked sex-dependent difference was also noted in the association.

**Language:** en

**Keywords:** knee; accidental falls; chronic pain; cohort studies; foot; low back pain

**Modern smartphone usage can negatively impact postural balance while standing on dynamically challenging grounds**

Noll WP, Phan V, Lee H. Gait Posture 2023; ePub(ePub): ePub.



**DOI:** 10.1016/j.gaitpost.2023.10.010 **PMID:** 37852884

## Abstract

BACKGROUND: While several studies have explored the impacts of smartphone usage on postural balance, their tasks are limited to texting or calling, and the studies were performed on rigid ground. RESEARCH QUESTIONS: METHODS: Sixteen healthy young adults were recruited to perform two smartphone tasks: taking selfies and posting statuses on social media; participants were standing on four different grounds: rigid, foam-based compliant, robot-simulated compliant, and robot-simulated oscillatory grounds. The center-of-pressure (CoP) under each foot was recorded via force plates and the net CoP was calculated. Temporal, spatial, and control aspects of postural balance were analyzed by virtual time-to-contact (VTC), CoP path length (PL) and sway area (SA), and switching rate (SR), respectively. Two-way repeated measures analysis of variance (ANOVA) tests were performed for each dependent variable to compare the mean differences between smartphone tasks and ground conditions and their interaction effect. Paired t-tests with Bonferroni correction were used to determine significant differences in post-hoc analyses.

RESULTS: VTC decreased significantly whereas CoP PL and SA increased significantly during smartphone usage (all p-values <0.001). Interaction effects between task and ground condition (all p-values <0.001) were observed in all measures but SR, implying that the effect of smartphone usage on postural balance can significantly change depending on the ground condition. SIGNIFICANCE: These results highlight the potential fall risks due to the impact of modern smartphone usage on standing balance. Understanding the effect of smartphone usage on standing balance and the interaction effect with various ground conditions opens the door for potential balance assistive devices and mobile phone applications to minimize falls.

**Language:** en

**Keywords:** Balance control; Postural stability; Mobile phone usage; Standing balance; Sway

**Preventable deaths involving falls in England and Wales, 2013-22: a systematic case series of coroners' reports**

Song K, Portwood C, Jindal J, Launer D, France H, Hey M, Richards G, Dernie F. Age Ageing 2023; 52(10): afad191.



**DOI:** 10.1093/ageing/afad191 **PMID:** 37847796

**Abstract**

BACKGROUND: Falls in older people are common, leading to significant harm including death. Coroners have a duty to report cases where action should be taken to prevent future deaths, but dissemination of their findings remains poor.

OBJECTIVE: To identify preventable fall-related deaths, classify coroner concerns and explore organisational responses.

DESIGN: A retrospective systematic case series of coroners' Prevention of Future Deaths (PFD) reports, from July 2013 (inception) to November 2022. SETTING: England and Wales.

METHODS: Reproducible data collection methods were used to web-scrape and read PFD reports. Demographic information, coroner concerns and responses from organisations were extracted and descriptive statistics used to synthesise data.

RESULTS: Five hundred and twenty-seven PFDs (12.5% of PFDs) involved a fall that contributed to death. These deaths predominantly affected older people (median 82 years) in the community (72%), with subsequent death in hospital (70.8%). A high proportion of cases experienced fractures (51.6%), major bleeding (35.9%) or head injury (38.7%). Coroners frequently raised concerns regarding falls risks assessments (20.9%), failures in communication (20.3%) and documentation issues (17.5%). Only 56.7% of PFDs received a response from organisations to whom they were addressed. Organisations tended to produce new protocols (58.5%), improve training (44.6%) and commence audits (34.3%) in response to PFDs.

CONCLUSIONS: One in eight preventable deaths in England and Wales involved a fall. Addressing concerns raised by coroners should improve falls prevention and care following falls especially for older adults, but the poor response rate may indicate that lessons are not being learned. Wider dissemination of PFD findings may help reduce preventable fall-related deaths in the future.

**Language:** en

**Keywords:** safety; falls; older people; coroners

**Trends of fall-related and other fatal injuries in older adults in Finland between 1998 and 2020**

Ylitörmänen T, Nuotio MS, Kettunen H, Impinen A, Koivula R, Haikonen K. Eur. J. Public Health 2023; ePub(ePub): ePub.



**DOI:** 10.1093/eurpub/ckad177 **PMID:** 37824274

**Abstract**

BACKGROUND: The number of falls and fall-related injuries will likely increase as the number of older adults expands. Increases in total deaths due to falls have been observed over Europe. Less is known about other injuries leading to death. To examine the incidence trends of fall-related and other fatal injuries among adults aged 65 or older in Finland.

METHODS: We analyzed open data from Statistics Finland's register on the causes of death of those aged ≥65 collected between 1998 and 2020 yielding a total of 32 150 deaths due to injury using Poisson regression and distributional comparisons chi-squared tests.

RESULTS: The most common injuries leading to death among people aged ≥65 in Finland were fall related. There has been an increase in the absolute number of fall-related and other injuries, but when adjusting for person-years in population, a significant decrease can be observed. The crude rates of deaths from fall-related injuries among males annually increased 1.1-4.4% from 1998 to 2020, while the changes in rates among females ranged between -2% and 1.6%. The crude rates of other injuries ranged between -0.5% to +3.8%. Recently (2018-20), nearly 40% of the cases in males and 25% of cases in females were not fall related but comprised other types of injury mechanisms such as traffic, poisoning and drowning.

CONCLUSION: Strengthening the implementation of preventive strategies is essential to prevent injuries. To reduce injury-related mortality and disability, improvement of acute and post-acute care for injured older patients is warranted.

**Language:** en

**Gender differences found in fall-related factors among community-dwelling Korean older adults**

Zhang N, Arunachalam U. Evid. Based Nurs. 2023; ePub(ePub): ePub.



**DOI:** 10.1136/ebnurs-2023-103741 **PMID:** 37821208

## Abstract

Commentary on: Suh M, Kim DH, Cho I, Ham OK. Age and gender differences in fall-related factors affecting community-dwelling older adults. J Nurs Res. 2023 Apr 1;31(2):e270. doi: 10.1097/jnr.0000000000000545.

Implications for practice and research

Future research could explore and test the efficacy of gender-specific fall prevention protocols.

In practice, understanding that there are gender-based risk factors for falls would assist and prompt nurses and health professionals to perform assessments or interventions to specifically mitigate those risks

Context

Falls are an incredibly common issue among older adults, with potentially serious downstream consequences. Suh et al (2023) aimed to explore not only the prevalence of falls but also the factors relating to age, gender and falls. It is well established that there are gender differences in the prevalence of falls, however, the reasoning is not fully understood. This study was conducted to address the paucity in the literature …

**Language:** en

**Keywords:** evidence-based nursing; nurses- community health; nursing assessment; nursing education research; nursing research