Association of prospective falls in older people with ubiquitous step-based fall risk parameters calculated from ambulatory inertial signals: secondary data analysis

Al Abiad N, van Schooten KS, Renaudin V, Delbaere K, Robert T. JMIR Aging 2023; 6: e49587.

Abstract

BACKGROUND: In recent years, researchers have been advocating for the integration of ambulatory gait monitoring as a complementary approach to traditional fall risk assessments. However, current research relies on dedicated inertial sensors that are fixed on a specific body part. This limitation impacts the acceptance and adoption of such devices.

OBJECTIVE: Our study objective is twofold: (1) to propose a set of step-based fall risk parameters that can be obtained independently of the sensor placement by using a ubiquitous step detection method and (2) to evaluate their association with prospective falls.

METHODS: A reanalysis was conducted on the 1-week ambulatory inertial data from the StandingTall study, which was originally described by Delbaere et al. The data were from 301 community-dwelling older people and contained fall occurrences over a 12-month follow-up period. Using the ubiquitous and robust step detection method Smartstep, which is agnostic to sensor placement, a range of step-based fall risk parameters can be calculated based on walking bouts of 200 steps. These parameters are known to describe different dimensions of gait (ie, variability, complexity, intensity, and quantity). First, the correlation between parameters was studied. Then, the number of parameters was reduced through stepwise backward elimination. Finally, the association of parameters with prospective falls was assessed through a negative binomial regression model using the area under the curve metric.

RESULTS: The built model had an area under the curve of 0.69, which is comparable to models exclusively built on fixed sensor placement. A higher fall risk was noted with higher gait variability (coefficient of variance of stride time), intensity (cadence), and quantity (number of steps) and lower gait complexity (sample entropy and fractal exponent).

CONCLUSIONS: These findings highlight the potential of our method for comprehensive and accurate fall risk assessments, independent of sensor placement. This approach has promising implications for ambulatory gait monitoring and fall risk monitoring using consumer-grade devices

Language: en

Predictors and outcomes of falls in older adults presenting to the emergency room in Saudi Arabia: a cross-sectional analysis

Aleid A, Bin Shuiel HK, Alyabis NA, Alfaraj AH, Dahlan DJ, Alkhatib FM, Alotaibi MN, Almulhim KN, Al Mutair A. Cureus 2023; 15(10): e47122.

Abstract

INTRODUCTION: Saudi Arabia is witnessing a demographic shift characterized by a rising elderly population. Cases of fall in this demographic have emerged as a significant health concern, especially in emergency room (ER) settings. Despite this, there is limited research on the causes and outcomes of such incidents. This study intends to bridge the gap in understanding the factors leading to falls in elderly patients presenting to ERs and the subsequent outcomes. Such understanding is pivotal for the formulation of effective prevention strategies and enhanced healthcare services for the elderly.

METHODS: To achieve the study's objectives, we employed SPSS software for Windows, version 28.0 (IBM Corp., Armonk, NY) for data analysis. We collected demographic information, including age, gender, education, employment status, and location, to measure patient satisfaction with the quality and responsiveness of emergency care, using Likert scale responses via electronic survey conducted as a cross-sectional study from January 2023 to August 2023, summarizing it using descriptive statistics. We analyzed categorical variables by frequencies and percentages. Chi-square tests were utilized to examine differences in distribution across categories for fall factors, and a p-value below 0.05 was deemed significant. Through logistic regression, we pinpointed the predictors of falls among older adults, showcasing the strength and direction of these relationships. Adjusted odds ratios with 95% confidence intervals were documented. A perception survey was also conducted to evaluate ER patient satisfaction.

RESULTS: Our results shed light on various aspects of fall prevention and emergency care. There was a pronounced representation in age groups of 18-24 and 25-34 years, indicating the need for interventions tailored to different age groups. Patterns were identified where subjects engaged in limited physical activity and consumed alcohol infrequently. Mobility and balance problems were commonly found, stressing the need to address these issues. Chronic conditions such as hypertension and diabetes correlated with fall incidents. Additionally, sociodemographic factors like gender, education, and employment status played a role in influencing the risk of falls. Although age and location seemed to have a less pronounced effect, there exists an opportunity to enhance communication and patient participation in emergency care for improved experiences.

CONCLUSION: The findings from our study provide crucial insights into the prevention of falls and enhancement of emergency care for Saudi Arabia's elderly population. By revealing the intricate relationships between sociodemographic attributes, health indicators, chronic ailments, and incidents of falls, we emphasize the need for well-rounded interventions. There is a pressing requirement for

comprehensive fall prevention initiatives tailored to specific risk groups. Additionally, improving ER services is integral to ensuring the safety and well-being of older adults. This research can serve as a foundational resource for healthcare professionals and policymakers to devise robust strategies to reduce fall-related injuries and elevate the quality of emergency care outcomes.

Older adults' knowledge and perception of fall risk and prevention: a scoping review

Alfaro Hudak KM, Adibah N, Cutroneo E, Liotta M, Sanghera A, Weeks-Gariepy T, Strunz E, Rein DB. Age Ageing 2023; 52(11): afad220.

Abstract

BACKGROUND: Falls are a leading cause of injury and mortality among older adults. While multiple strategies are effective at reducing fall risk, uptake is low. Understanding how older adults think about fall risk and prevention activities can inform outreach initiatives and engagement.

METHODS: We systematically searched PubMed, SCOPUS and Google Scholar for articles published between January 2015 and April 2023. Studies were eligible if they reported on knowledge or perception of fall risk and/or prevention among community-dwelling older adults.

RESULTS: We included 53 studies from 20 different countries. Over half of the studies used qualitative methods, 19 used quantitative, and three used mixed methods. Most of the older adults could identify some fall risk factors and the consequences of falls. However, many older adults did not view themselves as at-risk for falls. Some older adults consider falls an inevitable part of ageing, while others believe that falls can be prevented. Cultural context may play a role in shaping these beliefs. Several studies reported on older adults' experiences and the perceived barriers and facilitators of participating in fall prevention activities.

CONCLUSION: Improving the accuracy of older adults' perceptions of their own fall risk and highlighting the fact that many falls are preventable are two key messages that may help motivate older adults to take action to prevent falls. Older adults cite their healthcare provider as a trusted source of prevention information, and clinicians can leverage this opportunity to inform and motivate older adult patients about fall prevention.

Continuing work after 64 years of age and postural balance

Blokhina NV, Dyomin AV, Ilnitski AN, Shamratov RZ. Adv. Gerontol. (1997) 2023; 36(4): 501-510.

Abstract

The objective of this study was to assess the components of postural balance among working and non-working men and women aged 65-69. A total of 120 people within the age range of 65-69 were screened. The first group included 30 female and 30 male patients who continued working beyond retirement. The second group comprised 30 women and 30 men who had ceased working by the time of the examination. For comprehensive assessment of postural balance components the computer complex of dynamic postrography "Smart Equitest Balance Manager" was used. Sensory Organization Test (SOT) and Motor Control Test (MCT) were conducted. An analysis of SOT and MCT results showed that compared to non-workers aged 65-69, working men and women of the same age range demonstrated more effective maintenance of static and static-dynamic balance, increased postural control performance, including neuromuscular control of balance, as well as optimal balancing and centre of gravity control while maintaining static and static-dynamic balance. The reduced participation of somatosensory, visual and vestibular information in postural control and visual-motor coordination will negatively impact the ability of people over 64 to continue working.

CNN-based self-attention weight extraction for fall event prediction using balance test score

Abstract

Injury, hospitalization, and even death are common consequences of falling for elderly people. Therefore, early and robust identification of people at risk of recurrent falling is crucial from a preventive point of view. This study aims to evaluate the effectiveness of an interpretable semi-supervised approach in identifying individuals at risk of falls by using the data provided by ankle-mounted IMU sensors. Our method benefits from the cause-effect link between a fall event and balance ability to pinpoint the moments with the highest fall probability. This framework also has the advantage of training on unlabeled data, and one can exploit its interpretation capacities to detect the target while only using patient metadata, especially those in relation to balance characteristics. This study shows that a visual-based self-attention model is able to infer the relationship between a fall event and loss of balance by attributing high values of weight to moments where the vertical acceleration component of the IMU sensors exceeds 5 m/s² during an especially short period. This semi-supervised approach uses interpretable features to highlight the moments of the recording that may explain the score of balance, thus revealing the moments with the highest risk of falling. Our model allows for the detection of 71% of the possible falling risk events in a window of 1 s (500 ms before and after the target) when compared with threshold-based approaches. This type of framework plays a paramount role in reducing the costs of annotation in the case of fall prevention when using wearable devices. Overall, this adaptive tool can provide valuable data to healthcare professionals, and it can assist them in enhancing fall prevention efforts on a larger scale with lower costs.

The association between falls and depressive symptoms among older adults: evidence from the China Health and Retirement Longitudinal Study

Abstract

BACKGROUND: Falls place a heavy burden on older adults and families, and there was little research on the relationship between falls and depressive symptoms among older adults in China. This study is designed to examine the association between falls and depressive symptoms in Chinese older adults.

METHODS: This study was based on 9,539 data sets from the China Health and Retirement Longitudinal Study (CHARLS) in 2018. The 10-item Center for Epidemiologic Studies-Depression Scale (CESD-10) was used to access depressive symptoms in older adults. A logistic regression model was used to calculate multivariate odds ratios (ORs) and 95% confidence intervals (CIs) for falls and depressive symptoms, adjusted for possible confounders. The Classification and regression tree (CART) demonstrates the prediction of the target variable values based on other variables.

RESULTS: In this study, 9,539 older people were selected: 60-69 years old accounted for 63.0%, 70-79 years old accounted for 29.7%, and 80 years old and above accounted for 7.3%. Male accounted for 49.7% and female for 50.3%. The rate of falls among older adults was 21.4%, and the rate of depressive symptoms was 33.9%. Adjusted ORs (OR = 1.37, 95% CI: 1.23, 1.53) showed a significant association between falls and depressive symptoms among older adults. Subgroup analysis revealed that this association was statistically significant across male (OR = 1.29, 95% CI: 1.23, 1.53) and female (OR = 1.42, 95% CI: 1.23, 1.64), 60-69 aged (OR = 1.38, 95% CI: 1.19, 1.60) and 70-79 aged (OR =1.42, 95% CI: 1.16, 1.74), rural (OR = 1.42, 95% CI: 1.25, 1.61), <15,000 CNY (OR = 1.35, 95% CI: 1.19, 1.54) and more than 25,000 CNY (OR = 1.42, 95% CI: 1.09, 1.85). Additionally, The CART model showed that the probability (73.0%) of falls was highest among older adults with depressive symptoms who self-rated poor health and female gender.

CONCLUSIONS: This cross-sectional study demonstrated a significant association between falls and depressive symptoms in Chinese older adults. The findings provide some evidence and support for risk monitoring, screening for depressive symptoms, and early prevention in the high-risk older population.

Management of osteoporosis, fracture and falls in people with multiple sclerosis: systematic review of guidelines

Grech L, Laurence K, Ebeling PR, Sim M, Zengin A. Calcif. Tissue Int. 2023; ePub(ePub): ePub.

Abstract

People with multiple sclerosis (MS) have a higher prevalence of osteoporosis, falls and fractures. Guidelines for MS populations targeting the management of osteoporosis, fracture and falls risk may help reduce the burden of musculoskeletal disease in this population. We aimed to systematically review current guidelines regarding osteoporosis prevention, screening, diagnosis and management in people with MS. In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines, a systematic review of scientific databases (MEDLINE, CINAHL, Embase and Scopus) was performed (n = 208). In addition, websites from MS organisations and societies were screened for clinical guidelines (n = 28). Following duplicate removal, screening and exclusions (n = 230), in total six guidelines were included in this review. Three of the identified guidelines were specific to managing osteoporosis in MS, while two linked vitamin D to bone health and one was focused on the effect of acute glucocorticoid use for MS exacerbations on bone health. All guidelines were found to contain inadequate recommendations for osteoporosis screening, management and treatment in people with MS given the evidence of higher prevalence of osteoporosis at an earlier age and compounding risk factors in this population. Early diagnosis and treatment of osteoporosis in people with MS is necessary as fractures lead to significant morbidity and mortality. Development of structured clinical guidelines directed at specific healthcare services will ensure screening, appropriate management, and care of bone health in people with MS.

Correlation of medial longitudinal arch height with postural stability, sensory integration, balance and fall risk among healthy young adults

Gul S, Noor Ul Huda H, Raza M, Osama M. J. Pak. Med. Assoc. 2023; 73(11): 2242-2246.

Abstract

A cross-sectional analytical study was conducted on 165 healthy young adults. With pes rectus and pes planus to correlate the medial longitudinal arch height with postural stability, sensory integration of balance and fall risk. Persons with pes cavus, congenital foot anomalies other than pes planus, leg length discrepancies, recent history of trauma, lower limb amputations, history of serious foot injury, ligamentous laxity, or an active inflammatory disorder were excluded. Outcome measurements included normalised truncated navicular height (NTNH), Chippaux Smirak index (CSI), athletic single leg stability (ASLS) index, fall risk (FR) index, postural stability (PS), clinical test of sensory integration of balance (CTSIB), and balance error scoring system (BESS). Spearman correlation and Mann Whitney U test were used for data analysis. CSI and NTNH were noted to have no significant correlation ($p < 0.05$) with PS, FR, CTSIB, ASLS and BESS among healthy young adults. Males were observed to have poorer balance and fall risk as compared to females.

The association of bone turnover markers with muscle function, falls, and frailty in older women in long-term care

Abstract

BACKGROUND: Osteoporosis and sarcopenia commonly coexist in older adults. There is strong evidence that bone and muscle impact each other through mechanical and biochemical cross-talk.

OBJECTIVES: We sought to investigate the relationship between the markers of bone remodeling including the C-terminal telopeptide of type 1 collagen (CTX) and procollagen type 1 N propeptide (P1NP) with muscle function, falls, and frailty in older women residing in long-term care (LTC) facilities.

DESIGN: A secondary analysis of a randomized controlled trial. SETTING: Residents of LTC. PARTICIPANTS: One hundred seventy-eight older women with osteoporosis. MEASUREMENTS: We measured and analyzed baseline CTX, P1NP, gait speed, sit to stand time, history of falls, and frailty index.

RESULTS: Participants had a mean age of 86.7 years and BMI of 27.6 kg/m2. The correlation (r) of CTX with gait speed and sit to stand test, as indices for muscle function, were -0.193 (p=0.0163) and 0.152 (p=0.0507), respectively. Additionally, CTX level was significantly associated with history of falls (p=0.0068), recurrent falls (p=0.0260), and frail phenotype (p=0.0126). P1NP did not have a significant association with gait speed, sit to stand test, and history of falls; however, it was associated with frail phenotype (p=0.0137). Most findings persisted after adjusting for age.

CONCLUSIONS: In older women residing in LTC facilities, CTX was associated with gait speed, falls history, and frail phenotype, whereas P1NP was only associated with frail phenotype. These findings suggest a relationship between bone remodeling and muscle function.

The semicircular canal function is preserved with little impact on falls in patients with mild Parkinson's disease

Hong JP, Kwon H, Park E, Lee SU, Lee CN, Kim BJ, Kim JS, Park KW. Parkinsonism Relat. Disord. 2023; 118: e105933.

Abstract

INTRODUCTION: Postural instability is a cardinal symptom of Parkinson's disease (PD), which suggests the vestibular system may be affected in PD. This study aimed to determine whether vestibular dysfunction is associated with the risk of falls in PD.

METHODS: We prospectively recruited patients with de-novo PD at a tertiary medical center between December 2019 and March 2023. During initial assessment, each patient was queried about falls within the preceding year. All patients underwent evaluation of video head-impulse tests (video-HITs), motion analysis, mini-mental state examination (MMSE), and Montreal Cognitive Assessment (MOCA). We determined whether head impulse gain of the vestibulo-ocular reflex (VOR) was associated with clinical severity of PD or risk of falls.

RESULTS: Overall, 133 patients (mean age ± SD = 68 ± 10, 59 men) were recruited. The median Movement Disorder Society-Unified Parkinson's Disease Rating Scale motor part (MDS-UPDRS-III) was 23 (interquartile range = 16-31), and 81 patients (61 %) scored 2 or less on the Hoehn and Yahr scale. Fallers were older ($p = 0.001$), had longer disease duration ($p = 0.001$), slower gait velocity ($p = 0.009$), higher MDS-UPDRS-III ($p < 0.001$) and H&Y scale ($p < 0.001$), lower MMSE ($p = 0.018$) and MOCA scores ($p = 0.001$) than non-fallers. Multiple logistic regression showed that MDS-UPDRS-III had a positive association with falling ($p = 0.004$). Falling was not associated with VOR gain ($p = 0.405$). The VOR gain for each semicircular canal showed no correlation with the MDS-UPDRS-III or disease duration.

CONCLUSIONS: The semicircular canal function, as determined by video-HITs, is relatively spared and has little effect on the risk of falls in patients with mild-to-moderate PD.

Language: en

Keywords: Accidental falls; Parkinson's disease; Vertigo

Proportion, pattern, and predictors of falls in older adults - a community-based observational study in rural West Bengal

Jana D, Sahu M, Paul B, Chakraborty S, Bandyopadhyay L, Das R. J. Midlife Health 2023; 14(2): 130-138.

Abstract

INTRODUCTION: In spite of falls being a major public health problem, where most of the falls are preventable, there is a lack of epidemiological investigation among those aged 50 and above, especially in developing countries. Hence, we investigate the proportion, pattern, and predictors of falls in this age group.

MATERIALS AND METHODS: This cross-sectional community-based study was done in the Uluberia-II block of Howrah district, West Bengal, from February to July 2021. A multistage cluster sampling method was used to meet the sample size. Data were collected with the help of a structured interview schedule. Predictors were estimated by the SPSS version 16 and defined in adjusted odds ratio (AOR) with a 95% confidence interval.

RESULTS: Among 170 study participants, 34.7% (59/170) experienced at least one episode of fall, while 20.6% (35/170) experienced recurrent falls in 12 months. Most (78%; 46/59) falls occurred in the home environment and due to slippage (67.8%; 40/59) on the floor. 84.7% (50/59) sustained any type of injuries, 47.5% (28/59) required either consultation of a physician or medication, and 6.8% (4/59) required hospitalization. Safety Checklist Score measured 75.3% (128/170) had a poor household environment, within that 30.6% (52/170) had a seriously poor household environment, which was an important predictor of falls ([AOR] = 3.59 [1.24-10.38]). Fear of fall (AOR = 6.18 [1.77-21.53]) measured by shortfall efficacy scale and nonformal education (AOR = 5.05 [1.33-19.07]) were also predictors of falls.

CONCLUSION: Considerable proportion of falls occurred in the past year, which can be preventable by improving modifiable environmental factors and detection of fear of fall in persons at different levels of health-care facilities.

A lightweight human fall detection network

Kan X, Zhu S, Zhang Y, Qian C. Sensors (Basel) 2023; 23(22): e9069.

Abstract

The rising issue of an aging population has intensified the focus on the health concerns of the elderly. Among these concerns, falls have emerged as a predominant health threat for this demographic. The YOLOv5 family represents the forefront of techniques for human fall detection. However, this algorithm, although advanced, grapples with issues such as computational demands, challenges in hardware integration, and vulnerability to occlusions in the designated target group. To address these limitations, we introduce a pioneering lightweight approach named CGNS-YOLO for human fall detection. Our method incorporates both the GSConv module and the GDCN module to reconfigure the neck network of YOLOv5s. The objective behind this modification is to diminish the model size, curtail floating-point computations during feature channel fusion, and bolster feature extraction efficacy, thereby enhancing hardware adaptability. We also integrate a normalization-based attention module (NAM) into the framework, which concentrates on salient fall-related data and deemphasizes less pertinent information. This strategic refinement augments the algorithm's precision. By embedding the SCYLLA Intersection over Union (SIoU) loss function, our model benefits from faster convergence and heightened detection precision. We evaluated our model using the Multicam dataset and the Le2i Fall Detection dataset. Our findings indicate a 1.2% enhancement in detection accuracy compared with the conventional YOLOv5s framework. Notably, our model realized a 20.3% decrease in parameter tally and a 29.6% drop in floating-point operations. A comprehensive instance analysis and comparative assessments underscore the method's superiority and efficacy.

Cross-cultural adaptation and psychometric property testing of the Taiwan Chinese version of the iconographical falls efficacy scale

Lee SC, Tzeng IS, Feng CT, Liang HW, Chien TH, Horng YS. J. Formos. Med. Assoc. 2023; ePub(ePub): ePub.

Abstract

BACKGROUND: The Iconographical Falls Efficacy Scale (Icon-FES) uses short phrases and images to depict activities. This study culturally adapted and validated the Taiwan Chinese version of the 30- and 10-item Icon-FESs (Icon-FESs [TW]) in community-dwelling older individuals.

METHODS: The Icon-FES (TW) was developed using forward-backward translation. A total of 120 community-dwelling older individuals were recruited. They completed the Taiwan Chinese version of the Falls Efficacy Scale-International (FES-I [TC]), the Icon-FES (TW), the Mini-Mental State Examination, and the World Health Organization Quality of Life Questionnaire Brief Version (WHOQOL-BREF) and were assessed using the Berg Balance Scale and the Short Physical Performance Battery (SPPB). The Icon-FES (TW) was recompleted 1 week later. Confirmatory factor analysis was used to evaluate the overall structure and measurement properties.

RESULTS: Cronbach's alpha values of 0.97 and 0.91 indicated that the 30- and 10-item Icon-FESs (TW) had high internal consistency. The 30- and 10-item Icon-FESs (TW) exhibited significantly high correlation with the FES-I ($r = 0.88$ and 0.84, respectively). Both versions of the Icon-FES (TW) exhibited mild correlation with the physical domain of the WHOQOL-BREF. The 30- and 10-item Icon-FESs (TW) discriminated by intensity of concern and SPPB score. Their test-retest reliability was high (intraclass correlation coefficient = 0.79 and 0.80 for the 30- and 10-item Icon-FESs (TW), respectively). Neither floor nor ceiling effects were observed

CONCLUSION: The Icon-FES (TW) is a reliable and valid questionnaire useful for assessing the levels of concern regarding falling among older adults in clinical practice and research

Correlation between executive function and walk while crossing over an obstacle under different gait phases

Abstract

BACKGROUND AND PURPOSE: Dual walking task such as crossing over an obstacle may serve as an excellent tool for predicting early cognitive decline. Thus, this study aimed to investigate correlation between walking while crossing over an obstacle and executive functions under different gait phases to validate the use of walking with an obstacle for predicting early cognitive decline.

METHODS: A cross-sectional study was conducted on 48 elderly individuals from 2 day-care centers and 3 welfare-centers in Seoul and Gyeonggi, Korea. Executive function tests (Trail Making Test, Stroop test) and dual walking tests (gait speed, cadence, stance time, gait cycle time) were performed and compared using partial correlation analysis.

RESULTS: There were significant correlations between executive function and most of the gait variables (stance time, cadence, and gait cycle time) ($p<0.05$) when crossing over an obstacle while walking. Especially, stance time exhibited significant correlations with most executive functions ($p<0.05$).

CONCLUSIONS: When evaluating executive function during walking with an obstacle, post-obstacle-crossing phase and stance time need to be observed.

A multicomponent primary-care intervention for preventing falls in older adults living in the community: the PREMIO study

Marrocco W, Galli A, Scotti S, Calabrese N, Misericordia P, Dalle Vedove A, Marrocco G, D'Ingianna AP, Pizzini A, Fini M, Tomino C, Bonassi S, Group OBOTFIMMGRP. J. Clin. Med. 2023; 12(22): e7134.

Abstract

BACKGROUND: Falls are a common cause of morbidity and functional impairment in the elderly and represent a significant health problem. General practitioners (GPs) are the first point of contact for health issues and may provide preventive services. The randomized clinical trial PREMIO was conducted by GPs to evaluate the effects of a multicomponent intervention for the prevention of falls in older adults aged ≥ 65 years at high risk of falling.

METHODS: 117 GPs enrolled 1757 patients (1116 F, 641 M) and randomized them into 2 groups (intervention and control). The intervention group received medical and behavioral counseling, home risk-factor assessment, a physical-activity program and nutritional counseling. The control group received only the nutritional counseling. Both groups were followed for one year. The primary outcome was the rate of falls at home over 12 months.

RESULTS: 1225 patients completed the study. Subjects receiving the intervention had, on average, fewer falls at home (percentage change -31.2%, $p < 0.02$) and fewer total falls (-26.0%, $p < 0.02$), although the reduction in the number of fallers was small (-3.9%, $p = 0.05$). Among the secondary endpoints, rates of general hospital or emergency-department admission and GP visits showed slight improvements (not statistically significant), while the risk of fractures was unexpectedly increased in the intervention group compared to the controls (odds ratio 2.39, $p = 0.023$).

CONCLUSIONS: Future studies and public-health interventions to prevent domestic falls among community-dwelling older people at high risk of falling could benefit from a multicomponent approach including medication review, physical exercise and home risk assessment and should include assessment of risk factors for fractures.

Sodium-glucose cotransporter-2 (SGLT2) inhibitors and the reporting of falls and fractures: an European pharmacovigilance analysis

Mascolo A, Rafaniello C, di Mauro G, Ruggiero D, Campitiello MR, Donniacuo M, Berrino PM, Rossi F, Paolisso G, Capuano A. Front. Pharmacol. 2023; 14: e1245642.

Abstract

BACKGROUND: The risk of falls and bone fractures with sodium-glucose co-transporter-2 (SGLT2) inhibitors has been characterized by conflicting evidence. Therefore, we decided to investigate the reporting probability of falls and fractures by comparing SGLT2 inhibitors with DPP4 inhibitors.

METHODS A retrospective, pharmacovigilance study of the European database of Individual Case Safety Reports (ICSRs) was conducted. Disproportionality analyses (Reporting Odds Ratio, ROR) were conducted to compare the reporting probability of falls or fracture between treatments.

RESULTS A total of 507 ICSRs reporting at least one fall or fracture with SGLT2 inhibitors were identified. The most reported SGLT2 inhibitor was canagliflozin (N = 188; 36.9%), followed by empagliflozin (N = 176; 34.5%), and dapagliflozin (N = 143; 28.0%). A total of 653 events related to fall or bone fracture were reported. Fall was the most reported event (N = 333; 51.0%). Among fractures (N = 320; 49.0%), the most reported were foot fractures (N = 40; 6.1%) and hip fractures (N = 32; 4.9%). SGLT2 inhibitors were associated with a lower reporting probability of fall than DPP4 inhibitors (ROR, 0.66; 95%CI, 0.57-0.78). The lower reporting probability of fall was also observed when the single SGLT2 inhibitor was compared to DPP4 inhibitors: dapagliflozin (ROR, 0.67; 95%CI, 0.53-0.83), canagliflozin (ROR, 0.56; 95%CI, 0.45-0.70), and empagliflozin (ROR, 0.77; 95%CI, 0.63-0.94). For fractures, canagliflozin showed a slightly significant increased reporting when compared with DPP4 inhibitors (not confirmed in the sensitivity analysis), whereas all other comparison showed no statistically significant difference.

CONCLUSION SGLT2 inhibitors were associated with a lower reporting probability of fall than DPP4 inhibitors, in accordance with the reassuring evidence about the safety profile of these drugs. Future researches will help to confirm their long-term safety profile.

The symptom experience of older adults with mobility difficulties: qualitative interviews

Abstract

Eighteen million older adults have mobility limitations, defined as difficulty walking a quarter of a mile or climbing stairs unassisted. Little is known about how symptom burden impacts mobility difficulty in older adults. Understanding the burden of symptoms responsible for mobility difficulties may be an area for intervention to improve mobility and to prevent adverse outcomes. We conducted 31 semi-structured qualitative interviews (one interview per participant) regarding the symptom burden experience associated with a current mobility difficulty. Thematic analysis revealed symptoms were limiting, were barriers to participation in daily activities, and produced a psychological and emotional burden that negatively impacted quality of life. Older adults employed various strategies to overcome the symptom burden. Participants also believed symptoms were a non-modifiable part of the aging process and at times felt disregarded by healthcare professionals. Future interventions should focus on reducing the symptom burden experience for older adults to improve mobility and prevent adverse outcomes.

Better informing everyday fall risk assessment: experimental studies with contemporary technologies

Moore J, Stuart S, McMeekin P, Walker R, Godfrey A. Lancet 2023; 402(Suppl 1): S6.

Abstract

BACKGROUND: Age-related mobility issues and frailty are a major public health concern because of an increased risk of falls. Subjective assessment of fall risk in the clinic is limited, failing to account for an individual's habitual activities in the home or community. Equally, objective mobility trackers for use in the home and community lack extrinsic (ie, environmental) data capture to comprehensively inform fall risk. We propose a contemporary approach that combines artificial intelligence (AI) and video glasses to augment current methods of fall risk assessment.

METHODS: Two case studies were performed to provide a framework to assess extrinsic factors within fall risk assessment via video glasses. The first was AI-based detection of environment and terrain type. We developed convolutional neural networks (CNN) via a bespoke dataset (>145 000 images) captured from different settings (eg, offices, high streets) via free-licenced video on social media. AI automated a textual description to uphold privacy while describing the scene (eg, indoor and carpet). In the second case study, we provided video glasses to participants within a university campus (two men, 17 women; aged 21-60 years) to capture data for automatically labelling environment and objects (eg, fall hazards) via a CNN object detection algorithm. The case studies ran from Dec 5, 2022, to March 24, 2023.

FINDINGS: To date, results show promise for the efficient, and accurate AI-based approach to better inform fall risk. Each component of the framework achieved at least 75% accuracy across a range of walks (indoor and outdoor and multiple terrains) from a dataset of 6283 new images. The AI achieved a mean average precision score of 0·93 for the identification of fall risk hazards. INTERPRETATIONS: The AI-based approach provides a contemporary means to better inform fall risk while providing an ethical means to uphold privacy. The proposed approach could have significant implications for improving overall health and quality of life, enabling ageing in place through habitual data collection with contemporary wearables to decentralise fall risk assessment. A limitation was the lack of data collection on older adults within real world, unscripted settings. However, the next phase of this research is the deployment of the AI on real-world data from a cohort of more than 40 participants within UK-based homes. FUNDING: National Institute of Health and Care Research (NIHR) Applied Research Collaboration (ARC) North-East and North Cumbria (NENC), Faculty of Engineering and Environment at Northumbria University.

Language: en

Prognostic factors for falls in Parkinson's disease: a systematic review

Abstract

BACKGROUND: Falls represent a critical concern in Parkinson's disease (PD), contributing to increased morbidity and reduced quality of life.

PURPOSE: We conducted a systematic review to assess the prognostic factors associated with falls in PD, aiming to provide a comprehensive overview of relevant demographic and clinical parameters, and aid neurologists in identifying subsets of PD patients most susceptible to falls and associated injuries.

METHODS: PubMed and Web of Science databases were searched for prospective studies assessing factors associated with falls in ambulatory PD patients across different settings, from inception to August 2023. Data extraction was conducted using CHARMS-PF checklist and risk of bias was assessed with QUIPS tool. PRISMA guidelines were followed.

RESULTS: The initial search yielded 155 references. Thirty-four studies, involving a total of 3454 PD patients, were included in the final analysis. The mean pooled age was 67.6 years, and 45.1% were women. PD patients presented mild motor impairment (UPDRS III score 27.8) with mean pooled disease duration of 5.7 years. Gait and balance disorders and history of prior falls emerged as the most consistent predictors of falls across studies. Disease duration, disease severity, dysautonomic symptoms, freezing of gait, frontal cognitive functions, and PD medication dosages yielded inconsistent findings. Conversely, dyskinesias, age, sex, and depression were unrelated to future falls in PD. Logistic regression models were most commonly employed to identify factors significantly associated with falls in PD. Substantial heterogeneity prevailed in the inclusion of confounding factors.

CONCLUSION: The evidence suggests that previous history of falls, gait disorders, and poor balance are robust prognostic markers for falls in PD.

Prevalence of frailty in Indonesia: a systematic review and meta-analysis

Abstract

BACKGROUND: Frailty increases the risks of hospitalization, injury, fall, psychological disorders, and death in older adults. Accurate estimation of the prevalence of frailty is crucial for promoting health in these individuals. Therefore, this study was conducted to estimate the prevalence of frailty and prefrailty in older adults residing in Indonesia.

METHODS: In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines, six electronic databases were searched (without any language restriction) for relevant articles from inception to February 2023. Studies on the prevalence of frailty and prefrailty in older adults (age ≥ 60 years) residing in Indonesia were included in the analysis. A random-effects model was selected a priori because of the expected high degree of heterogeneity in the study, followed by sensitivity analysis, subgroup analysis, and meta-regression. The protocol of this review study was registered in the PROSPERO database (CRD42022381132).

RESULTS: A total of 79 studies were identified, of which 20 were finally included in the analysis. The pooled prevalence of frailty and prefrailty in older adults in Indonesia was 26.8% and 55.5%, respectively. The pooled prevalence of frailty and prefrailty was 37.9% and 44.8% in nursing homes, 26.3% and 61.4% in hospitals, and 21.1% and 59.6% in community settings, respectively. Furthermore, the pooled prevalence of frailty and prefrailty was 21.6% and 64.3%, 18.7% and 62%, and 27.8% and 59.8% in studies using the Frailty Index-40, FRAIL, and Fried Frailty Phenotype questionnaires, respectively. However, the parameters did not vary significantly across measurement tools or study settings. Publication bias was not detected while the year of data collection influenced the heterogeneity between the studies.

CONCLUSIONS: To the best of our knowledge, this study is the first meta-analysis to report the prevalence of frailty and prefrailty in older adults residing in Indonesia. The gradual increase in the number of older adults with frailty or prefrailty in Indonesia is concerning. Therefore, the government, private sectors, health-care professionals, and the community must jointly design effective strategies and policies to address this problem.

Cost of U.S emergency department and inpatient visits for fall injuries in older adults

Abstract

BACKGROUND: Falls are a leading cause of injury and hospital readmissions in older adults. Understanding the distribution of acute treatment costs across inpatient and emergency department settings is critical for informed investment and evaluation of fall prevention efforts.

METHODS: This study used the 2016-2018 National Inpatient Sample and National Emergency Department Sample. Annual treatment cost of fall injury among adults 65 years and older was estimated from charges, applying cost-to-charge and professional fee ratios. Weighted multivariable generalized linear models were used to separately estimate cost for inpatient and emergency department (ED) setting by injury type and individual demographic and health characteristics after adjusting for payer and hospital level characteristics.

RESULTS: Older adults incurred an estimated 922,428 inpatient and 2.3 million ED visits annually due to falls with combined annual costs of $19.8 billion. Over half of inpatient visits for fall injury were for fracture. Notably, 23% of inpatient visits were for fractures other than hip fracture and 14% of inpatient visits were for multiple fractures with costs totaling $3.4 billion and $2.5 billion, respectively. Annual ED costs were driven by superficial injury totaling $1.5 billion. Cost of ED visits were higher for adults 85 years and older (adjusted cost ratio (aCR): 1.11, 95% Confidence Interval (CI)I: 1.11-1.12) and those with dementia (aCR: 1.14, 95% CI: 1.13-1.15). Higher inpatient and ED visit cost was also associated with high-energy falls and discharge to post-acute care.

CONCLUSION: The study found that more than 3 million older adults in the United States seek hospital care for fall injuries annually, a major concern given increasing capacity strain on hospitals and EDs. The $20 billion in annual acute treatment costs attributed to fall injury indicate an urgent need to implement evidence-based fall prevention interventions and underscores the importance of newly launched ED-based fall prevention efforts and investments in geriatric emergency departments.

Types and frequency of social participation and comprehensive frailty among community-dwelling older people in Japan

Abstract

Although research has established social participation as important for preventing frailty in older people, the association between the type and frequency of social participation and comprehensive frailty remains unclear. This study aimed to reveal the associations between types and frequency of social participation and comprehensive frailty among community-dwelling older people. This was a cross-sectional study conducted in four cities and towns (Inabe City, Nabari City, Odai Town, and Kiho Town) of Mie Prefecture, Japan, among adults who were: (i) aged ≥65 years and (ii) not certified as needing long-term care. We measured comprehensive frailty using the participants' total scores on the Kihon Checklist, developed by Ministry of Health, Labour and Welfare of Japan, which divides frailty status into three categories: robust (0-3 points), prefrail (4-7), and frail (8-25). Types and frequency of social participation were explanatory variables, and ordered logistic regression analysis adjusted for potential confounding factors identified the associations. The frailty status of the 296 participants (age 65-74 years: 44.3 %; female: 74.0 %) was as follows: frail, 21.3 %; prefrail, 40.2 %; and robust, 38.5 %. Lower level of frailty was associated with interaction using smartphones 2-3 times per month, participating in sports ≥4 times per week, participating in local improvement activities several times per year, and engaging in activities for children 2-4 times per month. Social participation among older adults at appropriate frequencies were associated with the lower level of comprehensive frailty. However, future longitudinal studies are needed using populations from more diverse countries or regions and from different cultures.

Modern view of people falling syndrome elderly and senial age (literature review)

Shcherbuk AY, Donskov VV, Shcherbuk AY, Cherepanova EV, Maday DY, Shcherbuk YA.
Adv. Gerontol. (1997) 2023; 36(4): 517-524.

Abstract

The review article analyzes scientific publications devoted to the actual problem of modern society - the syndrome of falls in elderly and senile people. The multifactorial nature of falls is demonstrated, which must be taken into account when carrying out diagnostic and therapeutic measures. The information obtained made it possible to identify the most significant conditions and diseases leading to an increase in the frequency of falls. The paper systematizes information about the causes of falls and the prevention of falls, diagnosis and complex treatment of elderly and senile patients. Attention is drawn to the victims of elderly and senile age with traumatic injuries.

Knowledge, attitude and practice on fall risk factors and prevention among rural older community-dwellers in Vietnam

Tang HT, Vu HM, Tang HT, Tran PT, Tran LV, Nguyen CD, Nguyen TQ, Nguyen CMT, Tran KQ, Luong HX. PLoS One 2023; 18(11): e0295119.

Abstract

Falls among the elderly are an important global health problem. This study assesses knowledge regarding risk factors of falls, as well as attitudes and practices towards fall prevention among older adults in the rural community. A cross-sectional study was performed in four rural communes in Thai Binh province, Vietnam. A total of 3038 older people were recruited. Knowledge was assessed by using Falls Risk Awareness Questionnaire. Questions about attitudes were based on the Health Belief Model. Other questions regarding attitudes and practices regarding fall prevention were also asked. Multivariate regression was performed to identify associated factors with knowledge, attitudes and practices.

RESULTS showed that the mean score of knowledge regarding risk factors of falls was low at 11.37/32. The highest scores were observed in terms of drug aspects, followed by medical condition and behavioural aspects. Older people mostly agreed with perceived severity, susceptibility, benefits and barriers, but their attitudes about cues to action, health motivation and actions were most neutral. Meanwhile, more than half of the participants practised recommended fall preventive measures. To conclude, health education interventions and fall prevention services that enhance community-based fall prevention knowledge, attitudes and practices for older adults should be performed to reduce the burden of falls in this population.

Language: en

Gait retraining to reduce falls: an experimental study toward scalable and personalised use in the home

Wall C, McMeekin P, Walker R, Godfrey A. Lancet 2023; 402(Suppl 1): S92.

Abstract

BACKGROUND: Age-related neurological conditions can result in poor mobility typified by gait abnormalities and falls, increasing risk of frailty and lowering quality of life. In the UK, the expense and inaccessibility of services to improve mobility through gait training (eg, auditory cueing) is a public health issue. Contemporary and scalable pervasive technologies for widespread public use could provide an affordable and accessible solution. We aimed to show the preliminary efficacy of a novel smartphone app that provides a personalised approach to mobility and gait assessment while facilitating gait training.

METHODS: In this experimental study, we recruited participants aged 22-46 years with no physical functional impairments (ie, no age-related neurological condition and who could walk unaided) from Northumbria University staff (Newcastle upon Tyne, UK) between April 19, and May 26. Participants wore a smartphone on their lower back. Inertial data from the smartphone were recorded during two walks, one at a self-selected pace and the other with a personalised auditory cue via headphones (+10% pace on walk 1). Smartphone app functionality enabled the measurement of clinically relevant gait characteristics via a Python-based Cloud server. We compared smartphone-based mobility or gait characteristics with a gold-standard reference (Opal Mobility Lab, APDM). We used Pearson and intraclass correlation coefficients (ICC(2,1)) to examine agreement between the novel app and reference. The study ran from April 4 to July 21, 2023. This study received ethics approval from the Northumbria University Ethics committee, and all participants provided written informed consent.

FINDINGS: Ten adults were recruited (six women and four men; mean age 27·4 years [SD 6·2], mean weight 79·6 kg [SD 12·7], mean height 174·7 cm [SD 7·9]). High levels of agreement were found between the smartphone app and reference, quantified by Pearson (≥0·858) and ICC values (≥0·911). The personalised cueing intervention increased the mean cadence by an average of 11%, which shows good participant adherence to cueing via an app.

INTERPRETATION: Here, we propose a contemporary approach to increase the accessibility to a health-based intervention. Preliminary findings suggest the smartphone app is a suitable tool for personalised mobility or gait assessment while facilitating gait training. Use of a scalable app could be an accessible and affordable method for improving mobility to reduce falls in the home. Here, current limitations are the lack of investigation with the smartphone app for neurological gait assessment on older adults and the lack of information on participants app experience, but this will be included in future work. The pervasive use of smartphones enables a decentralised approach to overcoming issues such as frailty and logistical challenges of travelling to bespoke clinics. FUNDING: National Institute of Health and Care Research (NIHR) Applied

Research Collaboration (ARC) North-East and North Cumbria (NENC); Faculty of Engineering and Environment at Northumbria University.

Language: en

Trajectory and sway prediction towards fall prevention

Wang W, Raitor M, Collins S, Liu CK, Kennedy M. IEEE In. Conf. Robot. Autom. 2023; 2023: 10483-10489.

Abstract

Falls are the leading cause of fatal and non-fatal injuries, particularly for older persons. Imbalance can result from the body's internal causes (illness), or external causes (active or passive perturbation). Active perturbation results from applying an external force to a person, while passive perturbation results from human motion interacting with a static obstacle. This work proposes a metric that allows for the monitoring of the persons torso and its correlation to active and passive perturbations. We show that large changes in the torso sway can be strongly correlated to active perturbations. We also show that we can reasonably predict the future path and expected change in torso sway by conditioning the expected path and torso sway on the past trajectory, torso motion, and the surrounding scene. This could have direct future applications to fall prevention.

RESULTS demonstrate that the torso sway is strongly correlated with perturbations. And our model is able to make use of the visual cues presented in the panorama and condition the prediction accordingly.

Language: en

Baseline measures of physical activity and function do not predict future fall incidence in sedentary older adults: a prospective cohort study

Whitten J, Barrett R, Carty CP, Tarabochia D, Macdonald D, Graham D. J. Aging Phys. Act. 2023; ePub(ePub): ePub.

Abstract

Physical activity (PA) and physical function (PF) are modifiable risk factors for falls in older adults, but their ability to predict future fall incidence is unclear. The purpose of this study was to determine the predictive ability of baseline measures of PA, PF, and lower limb strength on future falls. A total of 104 participants underwent baseline assessments of PA, PF, and lower limb strength. Falls were monitored prospectively for 12 months. Eighteen participants fell at least once during the 12-month follow-up. Participants recorded almost exclusively sedentary levels of activity. PA, PF, and lower limb strength did not differ between fallers and nonfallers. Twelve participants, who reported a minor musculoskeletal injury in the past 6 months, experienced a fall. The results of this study suggest that in a cohort of highly functioning, sedentary older adults, PA does not distinguish fallers from nonfallers and that the presence of a recent musculoskeletal injury appears to be a possible risk factor for falling.