

Safety Literature 23rd April 2023

A multifactorial fall risk assessment system for older people utilizing a low-cost, markerless Microsoft Kinect

Kim T, Yu X, Xiong S. Ergonomics 2023; ePub(ePub): ePub.

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DOI 10.1080/00140139.2023.2202845 **PMID** 37079340

Abstract

Falls among older people are a major health concern. This study aims to develop a multifactorial fall risk assessment system for older people using a low-cost, markerless Microsoft Kinect. A Kinect-based test battery was designed to comprehensively assess major fall risk factors. A follow-up experiment was conducted with 102 older participants to assess their fall risks. Participants were divided into high and low fall risk groups based on their prospective falls over a 6-month period.

RESULTS showed that the high fall risk group performed significantly worse on the Kinect-based test battery. The developed random forest classification model achieved an average classification accuracy of 84.7%. In addition, the individual's performance was computed as the percentile value of a normative database to visualize deficiencies and targets for intervention. These findings indicate that the developed system can not only screen out 'at risk' older individuals with good accuracy, but also identify potential fall risk factors for effective fall intervention.

Language: en

Keywords

Women; Aging; Fall Risk; Kinect Sensor; Machine Learning; Multifactorial Assessment

Ambient monitoring of gait and machine learning models for dynamic and short-term falls risk assessment in people with dementia

Adeli V, Korhani N, Sabo A, Mehdizadeh S, Mansfield A, Flint A, Iaboni A, Taati B. IEEE J. Biomed. Health Inform. 2023; ePub(ePub): ePub.

(Copyright © 2023, Institute of Electrical and Electronics Engineers)

DOI 10.1109/JBHI.2023.3267039 **PMID** 37058371

Abstract

Falls are a leading cause of morbidity and mortality in older adults with dementia residing in long-term care. Having access to a frequently updated and accurate estimate of the likelihood of a fall over a short time frame for each resident will enable care staff to provide targeted interventions to prevent falls and resulting injuries. To this end, machine learning models to estimate and frequently update the risk of a fall within the next 4 weeks were trained on longitudinal data from 54 older adult participants with dementia. Data from each participant included baseline clinical assessments of gait, mobility, and fall risk at the time of admission, daily medication intake in three medication categories, and frequent assessments of gait performed via a computer vision-based ambient monitoring system. Systematic ablations investigated the effects of various hyperparameters and feature sets and experimentally identified differential contributions from baseline clinical assessments, ambient gait analysis, and daily medication intake. In leave-one-subject-out cross-validation, the best performing model predicts the likelihood of a fall over the next 4 weeks with a sensitivity and specificity of 72.8 and 73.2, respectively, and achieved an area under the receiver operating characteristic curve (AUROC) of 76.2. By contrast, the best model excluding ambient gait features achieved an AUROC of 56.2 with a sensitivity and specificity of 51.9 and 54.0, respectively. Future research will focus on externally validating these findings to prepare for the implementation of this technology to reduce fall and fall-related injuries in long-term care.

Language: en

Association of hearing status and cognition with fall among the oldest-old Chinese: a nationally representative cohort study

Wang J, Chen XX, Liu D, Tian E, Guo ZQ, Chen JY, Kong WJ, Zhang SL. Ear Hear. 2023; ePub(ePub): ePub.

(Copyright © 2023, Lippincott Williams and Wilkins)

DOI 10.1097/AUD.0000000000001364 **PMID** 37046369

Abstract

OBJECTIVES: The oldest-old (aged ≥ 80 years) are the most rapidly growing population and age is related to hearing impairment (HI) and cognitive decline. We aimed to estimate the association between HI and fall, and the effect of different cognitive states on this association among the oldest-old Chinese population.

DESIGN: A total of 6931 Chinese oldest-old were included in the 2018 cross-cohort from the Chinese Longitudinal Healthy Longevity Survey (CLHLS). The presence of HI was identified by using a dichotomized metric of self-reported hearing status. Cognitive function was evaluated by using the modified Mini-Mental State Examination (MMSE). Cognitive impairment was defined as the MMSE score below 24 points. Data on fall history were collected by questionnaires survey from the participants or their relatives. We studied the association of hearing status and cognitive function with fall by using multivariable logistic regressions, upon adjustment of sociodemographic characteristics, lifestyles, and health conditions.

RESULTS: Our participants were aged 92 (range 80 to 117) on average, with 60.1% being women. In total, 39.1% of the participants had reported HI, 50.1% had cognitive impairment, and 26.2% had a history of falling. Participants with HI had a higher incidence of cognitive impairment (79.4%), as compared with their counterparts without HI (31.3%). Compared with those without HI, HI patients had a higher risk of falling after full adjustment for potential confounders (OR = 1.16 [95% confidence interval, CI, 1.01, 1.32], $p = 0.031$). In comparison with HI participants without cognitive impairment, HI patients with cognitive impairment had a higher fall risk (OR = 1.45 [95% CI = 1.23, 1.72], $p < 0.001$).

CONCLUSIONS: Association of hearing status and cognition with fall was, for the first time, examined on the basis of a nationally-representative oldest-old Chinese population. Poor cognitive performance was common in individuals with HI, and those with HI and cognitive impairment further increased the risk of falling.

Language: en

Associations between fall risk and handgrip strength asymmetry among older Korean women: a cross-sectional study using national survey data

Baek J, Kim Y, Kim HY. Asia Pac. J. Public Health 2023; ePub(ePub): ePub.

(Copyright © 2023, Asia-Pacific Academic Consortium for Public Health, Publisher SAGE Publishing)

DOI 10.1177/10105395231167487 **PMID** 37076999

Abstract

[The publisher has not provided an abstract for this article.]

Language: en

Diagnostic power of relative sit-to-stand muscle power, grip strength, and gait speed for identifying a history of recurrent falls and fractures in older adults

Kirk B, French C, Gebauer M, Vogrin S, Zanker J, Sales M, Duque G. Eur. Geriatr. Med. 2023; ePub(ePub): ePub.

(Copyright © 2023, Elsevier Publishing)

DOI 10.1007/s41999-023-00778-x **PMID** 37058233

Abstract

PURPOSE: To compare the diagnostic value of relative sit-to-stand muscle power with grip strength or gait speed for identifying a history of recurrent falls and fractures in older adults.

METHODS: Data from an outpatient clinic included anthropometry (height/weight), bone density, 5 times sit-to-stand time (stopwatch and standardized chair), grip strength (hydraulic dynamometer), and gait speed (4 m). Relative sit-to-stand muscle power ($W.kg^{-1}$), normalised to body mass) was calculated using a validated equation. Outcomes of falls (past 1 year) and fractures (past 5 years) were self-reported and verified by medical records wherever possible. Binary logistic regression considering for potential confounders (age, sex, BMI, Charlson comorbidity index, femoral neck bone density) and receiver operating characteristics (ROC) curves were used in statistical analysis.

RESULTS: 508 community-dwelling older adults (median age: 78 years, interquartile range: 72, 83, 75.2% women) were included. Compared to greater relative sit-to-stand muscle power ($1.62-3.78W.kg^{-1}$) for women; $2.03-3.90W.kg^{-1}$ for men), those with extremely low relative sit-to-stand muscle power were 2.35 (95% CI 1.54, 3.60, $p < 0.001$) and 2.41 (95% CI 1.25, 4.65, $p = 0.009$) times more likely to experience recurrent falls and fractures, respectively, in fully adjusted model. Compared to grip strength or gait speed, relative sit-to-stand muscle power showed the highest area under the ROC curve for identifying recurrent falls (AUC: 0.64) and fractures (AUC: 0.62). All tests showed low diagnostic power (AUC: < 0.7).

CONCLUSION: Relative sit-to-stand muscle power performed slightly (but not statistically) better than grip strength or gait speed for identifying a history of recurrent falls and fractures in older adults. However, all tests showed low diagnostic power.

Language: en

Keywords

Falls; Fractures; Sarcopenia; Clinical outcomes

Dynapenic abdominal obesity increases risk for falls among adults aged ≥ 50 years: a prospective analysis of the Irish Longitudinal Study on Ageing

Smith L, López Sánchez GF, Veronese N, Soysal P, Rahmati M, Jacob L, Kostev K, Haro JM, Alghamdi AA, Butler L, Barnett Y, Keyes H, Tully MA, Shin JI, Koyanagi A. J. Gerontol. A Biol. Sci. Med. Sci. 2023; ePub(ePub): ePub.

(Copyright © 2023, Gerontological Society of America)

DOI 10.1093/gerona/glad104 **PMID** 37071490

Abstract

BACKGROUND: There is a scarcity of studies examining the longitudinal relationship between dynapenic abdominal obesity (DAO) (i.e., impairment in muscle strength and high waist circumference) and future fall risk. Therefore, we aimed to investigate the prospective association between DAO at baseline and falls occurring during two years of follow-up in a nationally representative sample of middle-aged and older individuals from Ireland.

METHODS: Data from two consecutive waves of the Irish Longitudinal Study on Ageing (TILDA) survey were analyzed. Dynapenia was defined as handgrip strength of < 26 kg for men and < 16 kg for women. Abdominal obesity was defined as waist circumference of > 88 cm for women and > 102 cm for men. DAO was assessed at Wave 1 (2009-2011) and was defined as having both dynapenia and abdominal obesity. Falls occurring between Wave 1 and Wave 2 (2012-2013) were self-reported. Multivariable logistic regression analysis was conducted.

RESULTS: Data on 5275 individuals aged ≥ 50 years were analyzed [mean (SD) age 63.2 (8.9) years; 48.8% males]. After adjustment for potential confounders, compared to no dynapenia and no abdominal obesity at baseline, DAO was significantly associated with 1.47 (95%CI=1.14-1.89) times higher odds for falls at 2-year follow-up. Dynapenia alone (OR=1.08; 95%CI=0.84-1.40) and abdominal obesity alone (OR=1.09; 95%CI=0.91-1.29) were not significantly associated with falls at follow-up.

CONCLUSIONS: DAO increased risk for falls among middle-aged and older adults in Ireland. Interventions to prevent or reverse DAO may be beneficial for fall reduction.

Language: en

Keywords

Falls; Older adults; Abdominal obesity; Dynapenia; Dynapenic abdominal obesity; TILDA

Effects of a group-based Otago exercise program on physical functional performance and fear of falling in older adult Korean women: a quasi-experimental study

Jin Y, Kang S, Kang H. *Geriatr. Gerontol. Int.* 2023; ePub(ePub): ePub.

(Copyright © 2023, Japan Geriatrics Society, Publisher John Wiley and Sons)

DOI 10.1111/ggi.14584 **PMID** 37070667

Abstract

[The publisher has not provided an abstract for this article.]

Language: en

Fall risk screening and assessment for people living with dementia: a scoping review

Lynds ME, Arnold CM. J. Appl. Gerontol. 2023; ePub(ePub): ePub.

(Copyright © 2023, SAGE Publishing)

DOI 10.1177/07334648231168983 **PMID** 37078271

Abstract

Falls are the leading cause of injury and hospitalization for older adults in Canada and the second leading cause of unintentional injury deaths worldwide. For people living with dementia (PLWD), falls have an even greater impact, but the standard testing methods for fall risk screening and assessment are often not practical for this population. The purpose of this scoping review is to identify and summarize recent research, practice guidelines and gray literature which have considered fall risk screening and assessment for PLWD. Database search results revealed a dearth in the literature that can support researchers and healthcare providers when considering which option/s are the most suitable for PLWD. Further primary studies into the validity of using the various tests with PLWD are needed if researchers and healthcare providers are to be empowered via the literature and clinical practice guidelines to provide the best possible fall risk care for PLWD.

Language: en

Keywords

dementia; geriatrics; assessment; falls; Alzheimer's disease; screening

Instrumental evaluation of gait smoothness and history of falling in older persons: results from an exploratory case-control study

Zucchelli A, Lucente D, Filippini C, Marengoni A, Lopomo NF. Aging Clin. Exp. Res. 2023; ePub(ePub): ePub.

(Copyright © 2023, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1007/s40520-023-02403-0 **PMID** 37071388

Abstract

Gait smoothness, perceived when a person walks continuously and uninterrupted, is associated with an undisrupted gait pattern, good sensorimotor control, and a lower risk of falling. The spectral arc length (SPARC) is a quantitative metric proposed for the evaluation of movement smoothness from the signal obtained by wearable sensors. In this small exploratory case-control study, older persons with and without a history of injurious falls underwent a turn-test while wearing an accelerometer: gait smoothness was estimated by calculating SPARC during the straight and turning phases. Cases seemed to exhibit lower SPARC values during the turning phase, in comparison with control.

Language: en

Keywords

Fall risk; Gait smoothness; Older persons; SPARC

Instrumented timed up and go test (iTUG)-more than assessing time to predict falls: a systematic review

Ortega-Bastidas P, Gomez B, Aqueveque P, Luarte-Martínez S, Cano-de-la-Cuerda R. Sensors (Basel) 2023; 23(7): e3426.

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

DOI 10.3390/s23073426 **PMID** 37050485

Abstract

The Timed Up and Go (TUG) test is a widely used tool for assessing the risk of falls in older adults. However, to increase the test's predictive value, the instrumented Timed Up and Go (iTUG) test has been developed, incorporating different technological approaches. This systematic review aims to explore the evidence of the technological proposal for the segmentation and analysis of iTUG in elderlies with or without pathologies. A search was conducted in five major databases, following PRISMA guidelines. The review included 40 studies that met the eligibility criteria. The most used technology was inertial sensors (75% of the studies), with healthy elderlies (35%) and elderlies with Parkinson's disease (32.5%) being the most analyzed participants. In total, 97.5% of the studies applied automatic segmentation using rule-based algorithms. The iTUG test offers an economical and accessible alternative to increase the predictive value of TUG, identifying different variables, and can be used in clinical, community, and home settings.

Language: en

Keywords

Aged; Humans; elderly; Postural Balance; risk of falls; *Accidental Falls/prevention & control; *Parkinson Disease/diagnosis; instrumented timed up and go; Physical Therapy Modalities; Time and Motion Studies

Longitudinal associations between disaster damage and falls/fear of falling in older adults: 9-year follow-up of survivors of the 2011 Great East Japan Earthquake and Tsunami

Wang Y, Zhang C, Hikichi H, Kawachi I, Li X. *Innov. Aging* 2023; 7(3): igad020.

(Copyright © 2023, Oxford University Press)

DOI 10.1093/geroni/igad020 **PMID** 37056712

Abstract

BACKGROUND AND OBJECTIVES: Fear of falling and falls are common in older adults. However, their associations with natural disaster exposures remain poorly understood. This study aims to examine longitudinal associations between disaster damage with fear of falling/falls among older disaster survivors. **RESEARCH DESIGN AND METHODS:** In this natural experiment study, the baseline survey (4,957 valid responses) took place 7 months before the 2011 Great East Japan Earthquake and Tsunami, and 3 follow-ups were conducted in 2013, 2016, and 2020. Exposures were different types of disaster damage and community social capital. Outcomes were fear of falling and falls (including incident and recurrent falls). We used lagged outcomes in logistic models adjusting for covariates and further examined instrumental activities of daily living (IADLs) as a mediator.

RESULTS: The baseline sample had a mean (standard deviation) age of 74.8 (7.1) years; 56.4% were female. Financial hardship was associated with fear of falling (odds ratio (OR), 1.75; 95% confidence interval (CI) [1.33, 2.28]) and falls (OR, 1.29; 95% CI [1.05, 1.58]), especially recurrent falls (OR, 3.53; 95% CI [1.90, 6.57]). Relocation was inversely linked with fear of falling (OR, 0.57; 95% CI [0.34, 0.94]). Social cohesion was protectively associated with fear of falling (OR, 0.82; 95% CI [0.71, 0.95]) and falls (OR, 0.88; 95% CI [0.78, 0.98]) whereas social participation increased the risk of these issues. IADL partially mediated observed associations between disaster damage and fear of falling/falls.

DISCUSSION AND IMPLICATIONS: Experiences of material damage rather than psychological trauma were associated with falls and fear of falling, and the increased risk of recurrent falls revealed a process of cumulative disadvantage.

FINDINGS could inform targeted strategies for protecting older disaster survivors.

Language: en

Keywords

Social capital; Cumulative disadvantage; IADL; Postdisaster material hardship

Physical strength and mental health mediate the association between pain and falls (recurrent and/or injurious) among community-dwelling older adults in Singapore

Koh V, Matchar DB, Chan A. Arch. Gerontol. Geriatr. 2023; 112: e105015.

(Copyright © 2023, Elsevier Publishing)

DOI 10.1016/j.archger.2023.105015 **PMID** 37060804

Abstract

OBJECTIVE: This study aims to understand if poor physical strength and depression mediate the association between pain and recurrent and/or injurious falls in a community of older adults.

METHODS: Data was obtained from a nationally representative longitudinal cohort study conducted in Singapore, PHASE (Wave I and II), which collected information from community-dwelling older adults above 60 years old. A hurdle negative binomial regression and binomial logistic regression were used to assess the association between pain and recurrent falls, and pain and injurious falls respectively. A subsequent mediation analysis was conducted.

RESULTS: Almost half of the participants (N = 1144, 39.7%) reported having either mild, moderate, or severe pain at baseline, 166 (5.4%) participants experienced injurious falls and 144 (4.7%) participants experienced recurrent falls at Wave II. After adjusting for covariates, the presence of pain significantly influenced recurrent (OR 2.8; 95% CI: 1.8, 4.4) and injurious falls (OR: 1.8; 95% CI: 1.3, 2.5). Mediation analyses demonstrated that poor physical strength and depression had a significant mediation effect between all pain characteristics on recurrent falls. Poor physical strength partially mediates the effects of pain and injurious falls as well. However, the mediating effect of poor physical strength and depression was not observed between other pain characteristics and injurious falls.

CONCLUSIONS: The findings highlighted differences in the underlying mechanisms between pain characteristics affecting recurrent and injurious falls. These insights will be useful for identifying patients most at risk for recurrent or injurious falls, and for tailoring future community-based fall intervention programmes.

Language: en

Keywords

Depression; Accidental falls; Aging; Fall-related injuries; Joint pain; Muscle strength; Recurrent falls

Real world evidence of wearable smartbelt for mitigation of fall impact in older adult care

Tarbert RJ, Singhatat W. IEEE J. Transl. Eng. Health Med. 2023; 11: 247-251.

(Copyright © 2023, Institute of Electrical and Electronics Engineers)

DOI 10.1109/JTEHM.2023.325689 **PMID** 37077699

Abstract

Structured Abstract Falls with major injuries are a devastating occurrence for an older adult with outcomes inclusive of debility, loss of independence and increased mortality. The incidence of falls with major injuries has increased with the growth of the older adult population, and has further risen as a result of reduced physical mobility in recent years due to the Coronavirus pandemic. The standard of care in the effort to reduce major injuries from falling is provided by the CDC through an evidence-based fall risk screening, assessment and intervention initiative (STEADI: Stopping Elderly Accidents and Death Initiative) and is embedded into primary care models throughout residential and institutional settings nationwide. Though the dissemination of this practice has been successfully implemented, recent studies have shown that major injuries from falls have not been reduced. Emerging technology adapted from other industries offers adjunctive intervention in the older adult population at risk of falls and major fall injuries. Technology in the form of a wearable smartbelt that offers automatic airbag deployment to reduce impact forces to the hip region in serious hip-impacting fall scenarios was assessed in a long-term care facility. Device performance was examined in a real-world case series of residents who were identified as being at high-risk of major fall injuries within a long-term care setting. In a timeframe of almost 2 years, 35 residents wore the smartbelt, and 6 falls with airbag deployment occurred with a concomitant reduction in the overall falls with major injury rate.

Language: en

Keywords

Aged; Humans; Incidence; Falls; older adults; intervention; *Wearable Electronic Devices; *Accidental Falls/prevention & control; fall injury; hip injury; Long-Term Care; Nursing Homes; wearable technology

Relationship between falls and the use of medications and diseases in an otago exercise programme in old people living in the community in Spain

González-Pisano AC, Company-Sancho MC, Abad-Corpa E, Solé-Agusti MC, Cidoncha-Moreno M, González MMP. Healthcare (Basel) 2023; 11(7).

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

DOI 10.3390/healthcare11070998 **PMID** 37046925

Abstract

(1) Background: Falls are a significant health problem among older adults, and can result in severe injuries, disability, and even death. In Spain, the prevalence of falls is lower if the person lives in the community than if they are institutionalized. Research has shown that exercise is an effective strategy for reducing the risk of falls among older adults. The objective of this study was to study the influence of a multicomponent exercise intervention on falls in people between 65 and 80 years of age despite the presence of diseases and drug use that are risk factors for falls; (2) Methods: This is a quasi-experimental study that focuses on people aged 65-80 who attended 21 primary healthcare centres. Target: Inclusion criteria were people between 65 and 80 years of age, living in the community with independent ambulation, and who were served by the healthcare centre of their region. Variables analysed: The number and characteristics of falls, sociodemographic, drug use, and previous diseases; (3) Results: The drugs associated with falls are benzodiazepines (OR 2.58), vasodilators (OR = 2.51), and psychotropics (OR = 1.61). For one of the years, a relationship was found between the consumption of antidepressants and falls (OR = 1.83). The associated diseases were mental and behavioural (OR = 2.53); (4) Discussion: The intervention has been related to the reduction in falls in people who consumed benzodiazepines, vasodilators, and psychotropics and in people with mental disorders; (5) Conclusion: This research concludes the importance of the implementation of the Otago Exercise Programme in the prevention of falls in the elderly.

Language: en

Keywords

exercise; prevent falls; primary healthcare

Using an academic-community partnership model to deliver evidence-based falls prevention programs in a metropolitan setting: a community case study

Elrod CS, Pappa ST, Heyn PC, Wong RA. Front. Public Health 2023; 11: e1073520.

(Copyright © 2023, Frontiers Editorial Office)

DOI 10.3389/fpubh.2023.1073520 PMID 37064710

Abstract

BACKGROUND: Prevention is an effective approach for mitigating the negative health outcomes associated with falls in older adults. The Administration for Community Living (ACL) has sponsored the implementation of evidence-based falls prevention programs (EBFPPs) across the United States through cooperative agreement grants to decrease the health and economic burden of falls. Marymount University received two of these grants to deliver three EBFPPs into the northern Virginia region. This community case study describes the development of a collaboration between a university and community-based organizations to adopt and implement multiple evidence-based programming in an area where none previously existed.

METHODS: Through an academic-community partnership, EBFPPs were introduced to and implemented by senior-focused organizations. Target adopters were senior and community centers, multi-purpose senior services organizations, recreational organizations, and residential facilities serving older adults. The three EBFPPs were (1) Stay Active and Independent for Life (SAIL), (2) a Matter of Balance (MOB) and (3) Otago Exercise Program (OEP). Key interdependent project elements included: (1) fostering ongoing community organization collaboration, (2) introducing programs in the community, (3) growing and sustaining delivery sites, (4) preparing trained program leaders, and (5) building community demand for the programs.

RESULTS: From August 2016-June 2022, 5,857 older adults participated in one of the three EBFPPs. SAIL classes were offered at 33 sites and MOB workshops at 31 with over 70% of them occurring at community or senior centers. OEP was offered at 4 sites. Factors that influenced the implementation of these programs included having: key advocates at host organizations, programs embedded into site workflows, sufficient capacity and workforce, engaged invested partners, and flexibility in working with a complex set of agencies and systems with different administrative structures.

CONCLUSION: By connecting academic faculty with various community members from multiple sectors, new initiatives can be successfully implemented.

RESULTS from this ACL-funded project indicate that using an academic-community partnership model to build relationships and capacity for ongoing delivery of health promotion programming for older adults is feasible and effective in delivering EBFPPs. In addition, academic-community partnerships can develop a strong network of invested partners to foster continued support of fall prevention activities. Language: en

Keywords Aged; Humans; United States; older adults; fall prevention; implementation; *Health Promotion; *Exercise; academic-community partnership; evidence-based programs

Development and internal validation of a prediction model for falls using electronic health records in a hospital setting

Dormosh N, Damoiseaux-Volman BA, van der Velde N, Medlock SK, Romijn JA, Abu-Hanna A. J. Am. Med. Dir. Assoc. 2023; ePub(ePub): ePub.

(Copyright © 2023, Lippincott Williams and Wilkins)

DOI 10.1016/j.jamda.2023.03.006 PMID 37060922

Abstract

OBJECTIVE: Fall prevention is important in many hospitals. Current fall-risk-screening tools have limited predictive accuracy specifically for older inpatients. Their administration can be time-consuming. A reliable and easy-to-administer tool is desirable to identify older inpatients at higher fall risk. We aimed to develop and internally validate a prognostic prediction model for inpatient falls for older patients.

DESIGN: Retrospective analysis of a large cohort drawn from hospital electronic health record data. **SETTING AND PARTICIPANTS:** Older patients (≥ 70 years) admitted to a university medical center (2016 until 2021).

METHODS: The outcome was an inpatient fall (≥ 24 hours of admission). Two prediction models were developed using regularized logistic regression in 5 imputed data sets: one model without predictors indicating missing values (Model-without) and one model with these additional predictors indicating missing values (Model-with). We internally validated our whole model development strategy using 10-fold stratified cross-validation. The models were evaluated using discrimination (area under the receiver operating characteristic curve) and calibration (plot assessment). We determined whether the areas under the receiver operating characteristic curves (AUCs) of the models were significantly different using DeLong test.

RESULTS: Our data set included 21,286 admissions. In total, 470 (2.2%) had a fall after 24 hours of admission. The Model-without had 12 predictors and Model-with 13, of which 4 were indicators of missing values. The AUCs of the Model-without and Model-with were 0.676 (95% CI 0.646-0.707) and 0.695 (95% CI 0.667-0.724). The AUCs between both models were significantly different ($P = .013$). Calibration was good for both models.

CONCLUSIONS AND IMPLICATIONS: Both the Model-with and Model-without indicators of missing values showed good calibration and fair discrimination, where the Model-with performed better. Our models showed competitive performance to well-established fall-risk-screening tools, and they have the advantage of being based on routinely collected data. This may substantially reduce the burden on nurses, compared with nonautomatic fall-risk-screening tools.

Language: en

Keywords

Accidental falls; fall prevention; electronic health records; inpatient falls; prediction models; routinely collected data

Energy-aware IoT-based method for a hybrid on-wrist fall detection system using a supervised dictionary learning technique

Othmen F, Baklouti M, Lazzaretti AE, Hamdi M. Sensors (Basel) 2023; 23(7): e3567.

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

DOI 10.3390/s23073567 **PMID** 37050627

Abstract

In recent decades, falls have posed multiple critical health issues, especially for the older population, with their emerging growth. Recent research has shown that a wrist-based fall detection system offers an accessory-like comfortable solution for Internet of Things (IoT)-based monitoring. Nevertheless, an autonomous device for anywhere-anytime may present an energy consumption concern. Hence, this paper proposes a novel energy-aware IoT-based architecture for Message Queuing Telemetry Transport (MQTT)-based gateway-less monitoring for wearable fall detection. Accordingly, a hybrid double prediction technique based on Supervised Dictionary Learning was implemented to reinforce the detection efficiency of our previous works. A controlled dataset was collected for training (offline), while a real set of measurements of the proposed system was used for validation (online). It achieved a noteworthy offline and online detection performance of 99.8% and 91%, respectively, surpassing most of the related works using only an accelerometer. In the worst case, the system showed a battery consumption optimization by a minimum of 27.32 working hours, significantly higher than other research prototypes. The approach presented here proves to be promising for real applications, which require a reliable and long-term anywhere-anytime solution.

Language: en

Keywords

IoT; fall detection; elderly health care; energy efficient; Supervised Dictionary Learning; wrist-based wearable device

Preventing falls at home among people with intellectual disabilities: a scoping review

Doherty AJ, Benedetto V, Harris C, Ridley J, O'Donoghue A, James-Jenkinson L, Fidler D, Clegg A. J. Appl. Res. Intellect. Disabil. 2023; ePub(ePub): ePub.

(Copyright © 2023, John Wiley and Sons)

DOI 10.1111/jar.13104 **PMID** 37076958

Abstract

BACKGROUND: Falls are common among people with intellectual disabilities. Many falls happen within the home. Our scoping review aimed to identify evidence for falls-risk factors and falls-prevention interventions for this population.

METHOD: We conducted a multi-database search to identify any type of published study that explored falls-risk factors or falls-prevention interventions for people with intellectual disabilities. Following a process of (i) title & abstract and (ii) full-text screening, data was extracted from the included studies and described narratively.

RESULTS: Forty-one studies were included. Risks are multifactorial. There was limited evidence of medical, behavioural/psychological, or environmental interventions to address modifiable risk factors, and no evidence of the interventions' cost-effectiveness.

CONCLUSIONS: Clinically and cost effective, acceptable and accessible falls-prevention pathways should be available for people with intellectual disabilities who are at risk of falls from an earlier age than the general population.

Language: en

Keywords

prevention; falls; learning disabilities; intellectual disabilities

Use of accelerometers in determining risk of falls in individuals post-stroke: a systematic review

Clark E, Podschun L, Church K, Fleagle A, Hull P, Ohree S, Springfield M, Wood S. Clin. Rehabil. 2023; ePub(ePub): ePub.

(Copyright © 2023, SAGE Publishing)

DOI 10.1177/02692155231168303 **PMID** 37067051

Abstract

OBJECTIVE: The aim of this systematic review was to determine if the diagnostic capabilities of wearable accelerometers enhanced, provided earlier detection, or improved fall risk assessment when evaluating individuals with chronic stroke.

DATA SOURCES: CINAHL and PubMed databases were searched for articles from 2015 to 2023 utilizing key terms.

REVIEW METHODS: A team of researchers reviewed articles for bias via the Quality in Prognostic Studies tool, and further analyzed the data to answer the research question.

RESULTS: Four studies were included in the systematic review. When utilizing an accelerometer, the vertical axis was most predictive of falls, followed by the medio-lateral axis and the anterior-posterior axis. L2-3 was the most common accelerometer placement for fall risk assessment, however no uniformity existed in the literature on placement, number of accelerometers, or type. It was determined that gait symmetry, the Timed Up and Go, Berg Balance Scale, and Longitudinal Aging Study Amsterdam best predicted falls risk.

CONCLUSION: Based on limited available evidence, clinicians should continue to perform a comprehensive examination and evaluation for fall risk, that includes the use of a combination of evidence-based outcome measures and gait characteristics to develop an individualized plan of care for individuals post-stroke. However, further research is necessary to determine the added value of accelerometers as well as type, applicability of data, and placement.

Language: en

Keywords

fall risk; Accelerometer; chronic stroke; post-stroke