

Safety Literature 10th August 2020**An energy-efficient fall detection method based on FD-DNN for elderly people**

Liu L, Hou Y, He J, Lungu J, Dong R. Sensors (Basel) 2020; 20(15): e4192.

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DOI 10.3390/s20154192 **PMID** 32731465

Abstract

A fall detection module is an important component of community-based care for the elderly to reduce their health risk. It requires the accuracy of detections as well as maintains energy saving. In order to meet the above requirements, a sensing module-integrated energy-efficient sensor was developed which can sense and cache the data of human activity in sleep mode, and an interrupt-driven algorithm is proposed to transmit the data to a server integrated with ZigBee. Secondly, a deep neural network for fall detection (FD-DNN) running on the server is carefully designed to detect falls accurately. FD-DNN, which combines the convolutional neural networks (CNN) with long short-term memory (LSTM) algorithms, was tested on both with online and offline datasets. The experimental result shows that it takes advantage of CNN and LSTM, and achieved 99.17% fall detection accuracy, while its specificity and sensitivity are 99.94% and 94.09%, respectively. Meanwhile, it has the characteristics of low power consumption.

Language: en

Keywords

fall detection; energy-efficient; FD-DNN; ZigBee

Associations of blood pressure with risk of injurious falls in old age vary by functional status: a cohort study

Welmer AK, Wang R, Rizzuto D, Ek S, Vetrano DL, Qiu C. *Exp. Gerontol.* 2020; ePub(ePub): ePub.

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Abstract

OBJECTIVES: We aimed to examine to what extent blood pressure (BP) components are associated with injurious falls in older adults, and whether the possible associations differ by functional status (indicated by physical and cognitive impairment at baseline).

METHODS: This prospective cohort study included 3055 community-living participants of the Swedish National study on Aging and Care in Kungsholmen (aged ≥ 60 years). At baseline (2001-2004), we measured systolic BP (SBP) and diastolic BP (DBP), mean arterial pressure, pulse pressure (PP), and orthostatic hypotension. Physical function was assessed using tests of balance, chair stands, and walking speed. Cognitive function was assessed with the Mini-Mental State Examination. Injurious falls leading to inpatient or outpatient care during 3 and 10 years of follow-up were identified via patient registers. Data were analyzed using flexible parametric survival models adjusted for potential confounders.

RESULTS: During the 10-year follow-up period in people without functional impairment, the multi-adjusted hazard ratios (HR) of injurious falls were 1.77 (95% CI 1.02-3.07) for having SBP <130 mmHg, 1.73 (95% CI 1.05-2.83) for having SBP ≥ 160 mmHg (vs. 130-139), and 1.46 (1.05-2.02) for having higher tertile of PP (vs. lower tertile). During the 3-year follow-up period in people with functional impairment, the multi-adjusted HR of injurious falls was 1.91 (95% CI 1.17-3.13) for having SBP <130 mmHg (vs. 130-139) and 0.74 (0.59-0.94) for having higher tertile of PP (vs. lower tertile). There was no significant association between BP components and injurious falls either in people without functional impairment during the 3-year follow-up period, or in people with functional impairment during the 10-year follow-up period.

CONCLUSIONS: This large-scale Swedish study provides evidence that the associations between some specific components of BP and risk of injurious falls in older adults vary by functional status. This supports the view that a personalized approach to blood pressure management depending on functional status among older adults might be warranted in clinical settings.

Language: en

Keywords

Injury; Falls; Aging; Blood pressure; Swedish National study on Aging and Care in Kungsholmen (SNAC-K)

Balance training monitoring and individual response during unstable vs. stable balance Exergaming in elderly adults: findings from a randomized controlled trial

Bakker J, Donath L, Rein R. *Exp. Gerontol.* 2020; ePub(ePub): ePub.

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Abstract

OBJECTIVE: Exercise-based fall prevention programs mainly refer to multimodal and challenging balance exercises. Individual load monitoring and interpretations are crucial to enable adequate adaptation responses on the individual level. Thus, assessing internal responses to external stimuli throughout an intervention period need to be adequately addressed. The aim of this secondary analysis of a 3-armed randomized controlled trial was to analyze internal and external loads of unstable vs. stable balance Exergame training in healthy seniors. We intended to elucidate whether differences of external and internal load criteria occur over the intervention period.

METHODS: A total of 51 healthy seniors (females: $n = 34$; males: $n = 17$; age: 69 ± 6 years; BMI: 27 ± 5) were allocated to either volitional stepping (VOL), volitional stepping under unstable conditions (VOL + US) or an inactive control group (CON). VOL and VOL + US completed 8 weeks of Exergame based step training (three weekly sessions, 45 min each) using the Dividat Senso device. Twelve different balance Exergames were used, consisting of virtual reality like video games. The original nonswinging, stable platform was employed for VOL, whereas VOL + US used an adapted Senso mounted on a swinging Posturomed Rack. The instability level was increased for VOL + US only every second week. External (game scores) and internal (perceived efforts, using the rated perceived exertion scale (RPE)) load measures were individually recorded for every session. Statistical analysis was carried out using linear mixed-effects modelling.

RESULTS: Although VOL + US completed similar games at identical training volumes under unstable conditions, the achieved game scores did not significantly differ between both training groups ($p = 0.71$). Both intervention groups notably improved their game scores over the 8 training weeks ($p < 0.01$). A significant time \times group interaction effect was observed for perceived effort ($p < 0.01$), serving as an internal load measure. Subsequent post-hoc testing revealed significant greater perceived exertion values in each of the first 7 weeks ($p < 0.05$) in VOL + US compared to VOL. No between-group differences were found for RPE in week 8. Whereas RPE values in VOL + US decreased over time (week 1: 4.6 ± 1.9 ; week 8: 3.1 ± 1.6), VOL indicated similar RPE values for all weeks (week 1: 3.1 ± 1.3 ; week 8: 2.9 ± 1.4). A detailed analysis of all twelve games revealed that differences in perceived exertion depend on the game content: in 75% of the involved games the RPE level was significantly higher in VOL + US compared to VOL ($p < 0.05$).

CONCLUSION: Monitoring internal and external loads on individual level are paramount for gaining adequate training adaptations. Our results indicate that between-group differences in perceived efforts a) can funnel over time, b) depend on game content and c) do not necessarily affect overall scoring. Future studies should individually employ and monitor measures of perceived efforts to guarantee an adequate challenge to the balance system within exercise-based fall prevention programs.

Language: en

Keywords

Virtual reality; External; Internal; Seniors; Step training; Training load

Body fat distribution in obesity and the association with falls: a cohort study of Brazilian women aged 60 years and over

G R Neri S, Tiedemann A, B Gadelha A, M Lima R. *Maturitas* 2020; 139: 64-68.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.maturitas.2020.06.009 **PMID** 32747043

Abstract

OBJECTIVES: Obesity is associated with an increased risk of falls in older women; however, it is not certain how body fat distribution affects this relationship. This study examined the association between android and gynoid obesity and the incidence of falls in women aged 60 years and over.

STUDY DESIGN: Participants were recruited from the community in Brasilia, Brazil. At baseline, participants underwent obesity screening using dual-energy x-ray absorptiometry. Participants identified as obese (body fat percentage >42 %) were classified as android or gynoid type, based on the median of the android-gynoid fat percent ratio (0.99). Incident falls were recorded at the end of the 18-month follow-up period via participant recall. Chi-square test and modified Poisson regression were used to examine the association between obesity and falls.

RESULTS: A total of 246 participants were recruited and 204 completed the follow-up. The gynoid obese group had a larger proportion of fallers (n = 27, 41 %) than the android obese (n = 17, 24 %) and non-obese (n = 12, 18 %) groups (p = .009). Compared with non-obese women, participants with gynoid obesity were more likely to experience a fall (RR: 2.09, 95 %CI: 1.13-3.87). The risk of falling did not differ between non-obese participants and those with android obesity (RR: 1.26, 95 %CI: 0.64-2.50).

CONCLUSIONS: Gynoid obesity is associated with an increased risk of falls in women aged 60 years and over. Screening for body fat distribution as a supplement to other risk factors for falls may help to identify older adults at a greater risk of falling and to prompt early implementation of fall prevention programs.

Language: en

Keywords

Risk factors; Accidental falls; Aging; Adiposity

Effects of enriched physical activity environments on balance and fall prevention in older adults: a scoping review

Shafizadeh M, Manson J, Fowler-Davis S, Ali K, Lowe AC, Stevenson J, Parvinpour S, Davids K. J. Aging Phys. Act. 2020; ePub(ePub): ePub.

(Copyright © 2020, Human Kinetics Publishers)

DOI 10.1123/japa.2019-0395 PMID 32732456

Abstract

The incidence of falling, due to aging, is related to both personal and environmental factors. There is a clear need to understand the nature of the major risk factors and design features of a safe and navigable living environment for potential fallers. The aim of this scoping review was to identify studies that have examined the effectiveness of environments, which promote physical activity and have an impact on falls prevention. Selected studies were identified and categorized into four main topics: built environment, environment modifications, enriched environments, and task constraints. The results of this analysis showed that there are a limited number of studies aiming to enhance dynamic postural stability and fall prevention through designing more functional environments. This scoping review study suggests that the design of interventions and the evaluation of an environment to support fall prevention are topics for future research.

Language: en

Keywords

falling; constraints; enriched environments; postural stability

Epidemiological and clinical characteristics of fall-related injuries: a retrospective study

Mekkodathil A, El-Menyar A, Kanbar A, Hakim S, Ahmed K, Siddiqui T, Al-Thani H. BMC Public Health 2020; 20(1): e1186.

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

DOI 10.1186/s12889-020-09268-2 **PMID** 32727594

Abstract

BACKGROUND: Fall-related injuries are important public health problem worldwide. We aimed to describe the epidemiological and clinical characteristics of fall-related injuries in a level 1 trauma center.

METHOD: A retrospective analysis of Qatar Trauma Registry data was conducted on patients admitted for fall-related injuries between 2010 and 2017. Comparative analyses of data by gender, age-groups and height of falls were performed to describe the epidemiological and clinical characteristics of patients, and in-hospital outcomes.

RESULTS: A total of 4040 patients with fall-related injuries were identified in the study duration which corresponds to the rate of 2.34 per 10,000 population. Although the rate of fall-related injuries decreased over the years, the average number of patients per year remained high accounting for 32% of the hospitalized patients with moderate to severe injuries. Most of the injuries affected the head (36%) followed by spines (29%) and chest (23%). Males were predominant (89%), more likely to fall at workplace, fall from a greater height and have polytrauma than females. The working age-group (20-59 years) constituted the majority of injured (73%) and were more likely to fall at workplace, and to fall from higher heights compared to the older adults who sustained more fall at home. Overall in-hospital mortality was 3%. Outcomes including longer hospital length of stay and mortality were generally correlated with the height of fall except for the fall at home.

CONCLUSION: Fall-related injuries remain as significant burden even in a level 1 trauma center. Variations in the pattern of injuries by age, gender and height of fall provide important information for targeted preventive measures.

Language: en

Keywords

Injury; Trauma; Qatar; Fall; Height

Falls associate with neurodegenerative changes in ATN framework of Alzheimer's disease

Keleman A, Wisch JK, Bollinger RM, Grant EA, Benzinger TL, Morris JC, Ances BM, Stark SL. *J. Alzheimers Dis.* 2020; ePub(ePub): ePub.

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DOI 10.3233/JAD-200192 PMID 32741815

Abstract

BACKGROUND: Behavioral markers for Alzheimer's disease (AD) are not included within the widely used amyloid-tau-neurodegeneration framework.

OBJECTIVE: To determine when falls occur among cognitively normal (CN) individuals with and without preclinical AD.

METHODS: This cross-sectional study recorded falls among CN participants (n=83) over a 1-year period. Tailored calendar journals recorded falls. Biomarkers including amyloid positron emission tomography (PET) and structural and functional magnetic resonance imaging were acquired within 2 years of fall evaluations. CN participants were dichotomized by amyloid PET (using standard cutoffs). Differences in amyloid accumulation, global resting state functional connectivity (rs-fc) intra-network signature, and hippocampal volume were compared between individuals who did and did not fall using Wilcoxon rank sum tests. Among preclinical AD participants (amyloid-positive), the partial correlation between amyloid accumulation and global rs-fc intra-network signature was compared for those who did and did not fall.

RESULTS: Participants who fell had smaller hippocampal volumes (p=0.04). Among preclinical AD participants, those who fell had a negative correlation between amyloid uptake and global rs-fc intra-network signature (R=-0.75, p=0.012). A trend level positive correlation was observed between amyloid uptake and global rs-fc intra-network signature (R=0.70, p=0.081) for preclinical AD participants who did not fall.

CONCLUSION: Falls in CN older adults correlate with neurodegeneration biomarkers. Participants without falls had lower amyloid deposition and preserved global rs-fc intra-network signature. Falls most strongly correlated with presence of amyloid and loss of brain connectivity and occurred in later stages of preclinical AD.

Language: en

Keywords

falls; volumetrics; Alzheimer's disease; biomarkers; resting state functional connectivity

Femoral intertrochanteric fractures of the patients in the emergency department due to minor falls: special consideration in the middle-old to oldest-old patients

Jang JM, Choi HS, Lee JS, Jeong KY, Hong HP, Ko SH. *Ann. Geriatr. Med. Res.* 2019; 23(3): 125-132.

(Copyright © 2019, Korean Geriatrics Society)

DOI 10.4235/agmr.19.0027 PMID 32743300

Abstract

BACKGROUND: The older population (≥ 65 years) has rapidly increased in size in recent years. Among them, the middle-to-oldest-old (≥ 75 years) tend to have a poor health status. Therefore, subdivision and evaluation of older patients with traumatic injury are required. We focused on the risk of femoral intertrochanteric fractures occurring in older adults due to minor falls and compared young-old and middle-to-oldest-old populations.

Methods: The medical records of patients who visited the emergency center due to hip injuries between March 2017 and March 2019 were retrospectively analyzed. Patients were divided into older adult (≥ 65 years) and non-older (age 18-64 years) groups; the older adult group was subdivided into young-old (65-74 years), middle-old (75-84 years), and oldest-old (≥ 85 years) groups. This study investigated the occurrence rate of femoral intertrochanteric fractures and related factors.

Results: The older adult group had a higher incidence of femoral intertrochanteric fractures than that in the non-older adult group (95.3% vs. 4.7%, $p < 0.001$). However, there was no significant difference between young-old and non-older groups (58.8% vs. 41.2%, $p = 0.145$). Middle-old to oldest-old age and osteoporosis were associated with an increased incidence of femoral intertrochanteric fractures ($p < 0.001$, $p = 0.004$).

Conclusion: A higher incidence of femoral intertrochanteric fractures from minor falls was found among middle-old to oldest-old patients compared to that in young-old patients. Therefore, physicians should perform more thorough physical examinations and radiograph reading in middle-old to oldest-old patients even if the patients do not complain of pain.

Language: en

Keywords

Accidental falls; Emergency; Older adults; Intertrochanteric fractures

Higher amounts of opioids filled after surgery increase risk of serious falls and fall-related injuries among older adults

Santosa KB, Lai YL, Brummett CM, Oliver JD, Hu HM, Englesbe MJ, Blair EM, Waljee JF. *J. Gen. Intern Med.* 2020; ePub(ePub): ePub.

(Copyright © 2020, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1007/s11606-020-06015-6 PMID 32748343

Abstract

BACKGROUND: Despite increasing numbers of older adults undergoing surgery and the known risks of opioids, little is known about the potential association between opioid prescribing and serious falls and fall-related injuries after surgery.

OBJECTIVE: To determine the incidence and risk factors of serious falls and fall-related injuries after elective, outpatient surgery.

DESIGN: Retrospective cohort study of 20% national sample of Medicare claims among beneficiaries ≥ 65 years of age with Medicare Part D claims and who underwent elective outpatient surgery from January 1, 2009, through December 31, 2014.

PARTICIPANTS: Opioid-naïve patients ≥ 65 years undergoing elective, minor, outpatient surgical procedures. The exposure was opioid prescription fills in the perioperative period (i.e., 30 days before up until 3 days after surgery) converted to total oral morphine equivalents (OME) over a period 30 days prior to and 30 days after surgery.

MAIN MEASURES: Serious falls and fall-related injuries within 30 days after surgery, examined through Poisson regression analysis with reported fall and fall-related injury rates adjusted for potential confounders.

KEY RESULTS: Among 44,247 opioid-naïve surgical patients, 76.3% filled an opioid prescription in the perioperative period. Overall, 0.62% of patients suffered a serious fall or fall-related injury within 30 days after surgery. Risk factors for serious falls or fall-related injuries after surgery included older age (80-84 years: RR 1.64, 95% CI 1.12-2.40; 85 years and older: RR 1.81, 95% CI 1.25-2.86), female sex (RR 3.04, 95% CI 2.29-4.05), Medicaid eligibility (RR 1.63, 95% CI 1.17-2.26), and higher amounts of opioids filled following surgery (≥ 225 OME: RR 2.29, 95% CI 1.72-3.07).

CONCLUSIONS: Serious falls after elective, outpatient surgery are uncommon, but correlated with age, sex, Medicaid eligibility, and the amount of opioids filled in the perioperative period. Judicious prescribing of opioids after surgery is paramount and is an opportunity to improve the safety of surgical care among older individuals.

Language: en

Keywords

opioid; falls; older adults; surgery

Incidence and risk factors for falls among community-dwelling elderly subjects on a 1-year follow-up: a prospective cohort study from Ernakulam, Kerala, India

Sasidharan DK, Vijayakumar P, Raj M, Soman S, Antony L, Sudhakar A, Kabali C. *BMJ Open* 2020; 10(7): e033691.

(Copyright © 2020, BMJ Publishing Group)

DOI 10.1136/bmjopen-2019-033691 **PMID** 32737084

Abstract

OBJECTIVES: There is limited knowledge regarding epidemiology and risk of falls among the elderly living in low-income and middle-income countries. In this situation, the current study aims to report the incidence of falls and associated risk factors among free living elderly population from Kerala, India.

DESIGN: Prospective cohort study with stratified random cluster sampling.

SETTING: The study location was Ernakulam, Kerala, India, and we collected information via house visits using a questionnaire. During the research, the subjects were followed up prospectively for 1 year by phone at intervals of 3 months and missing subjects were contacted by house visits.

PARTICIPANTS: Community-dwelling elderly above 65 years of age.

RESULTS: We recruited a total of 1000 participants out of which a total of 201 (20.1%) subjects reported a fall during the follow-up. The incidence rate of falls was 31 (95% CI 27.7 to 34.6) per 100 person-years. Female sex (OR 1.48, 95% CI 1.05 to 2.10, $p=0.027$), movement disorders including Parkinsonism (OR 2.26, 95% CI 1.00 to 5.05, $p=0.048$), arthritis (OR 1.48, 95% CI 1.05 to 2.09, $p=0.026$), dependence in basic activities of daily living (OR, 3.49, 95% CI 2.00 to 6.09, $p<0.001$), not using antihypertensive medications (OR, 1.53, 95% CI 1.10 to 2.13, $p=0.012$), living alone during daytime (OR 3.27, 95% CI 1.59 to 6.71, $p=0.001$) and a history of falls in the previous year (OR, 2.25, 95% CI 1.60 to 3.15, $p<0.001$) predicted a fall in the following year.

CONCLUSIONS: One in five community-dwelling senior citizen fall annually and one in four who fall are prone to fall again in the following year. Interventions targeting falls among the elderly need to focus on modifiable risk factors such as living alone during daytime, movement disorders, arthritis and dependence on basic activities of daily living.

Language: en

Keywords

elderly; falls; cohort Study; community based study; Kerala

Magnitude, symmetry and attenuation of upper body accelerations during walking in women: the role of age, fall history and walking surface

Soleimanifar M, Mazaheri M, van Schooten KS, Asgari M, Mosallanezhad Z, Salavati M, Sedaghat-Nejad E, Parnianpour M. *Maturitas* 2020; 139: 49-56.

(Copyright © 2020, Elsevier Publishing)

DOI 10.1016/j.maturitas.2020.05.016 **PMID** 32747040

Abstract

OBJECTIVES: The present experiment examined the role of age and fall history in upper body accelerations when walking on an even and on an uneven surface.

STUDY DESIGN: An observational cross-sectional study.

MAIN OUTCOME MEASURES: The magnitude (root mean square [RMS]), symmetry (harmonic ratio) and attenuation (attenuation coefficient) of upper body accelerations were quantified as primary outcomes; gait spatiotemporal parameters were measured as secondary outcomes.

METHODS: Twenty young adults (mean \pm SD age: 29.00 ± 4.51 yrs), 20 older non-fallers (66.60 ± 5.43 yrs) and 20 older fallers (68.55 ± 4.86 yrs) walked on an even and on an uneven surface, while wearing four accelerometers attached to the forehead, pelvis, right and left shanks.

RESULTS: Older fallers exhibited increased RMS acceleration in the mediolateral direction at the pelvis level compared with young adults when walking on the even surface (0.18 ± 0.04 vs. 0.14 ± 0.02 , respectively), whereas walking on an uneven surface was associated with reduced magnitude of acceleration in older fallers (0.19 ± 0.04) compared with non-fallers (0.23 ± 0.04) and young adults (0.22 ± 0.03). Among other changes, walking on the uneven surface diminished pelvis-to-head attenuation in the mediolateral direction in older fallers (38.07 ± 14.51) compared with non-fallers (50.96 ± 11.03) and young adults (62.62 ± 8.21 ; all $p < 0.05$).

CONCLUSIONS: Reduced mediolateral accelerations in older fallers when walking on the uneven surface can be interpreted as a compensatory mechanism to preserve stability through increased body stiffness. Reduced postural flexibility in the frontal plane compromises the central role of the trunk in minimizing the impact of gait-related oscillations to the head, as evidenced by reduced mediolateral attenuation in older fallers.

Language: en

Keywords

Falls; Elderly; Sensors; Gait; Walking surface

Multifaceted falls prevention can help to reduce fall rates in high-risk and healthy community-dwelling older adults

Palmer K, Hill J, Clegg A. Evid. Based Nurs. 2020; ePub(ePub): ePub.

(Copyright © 2020, BMJ Publishing Group)

DOI 10.1136/ebnurs-2020-103291 **PMID** 32747343

Abstract

Commentary on: Seon HL, Soyoung Yu. Effectiveness of multifactorial interventions in preventing falls among older adults in the community: a systematic review and meta-analysis. *Int J Nurs Stud* 2020;106:103564. doi: 10.1016/j.ijnurstu.2020.103564.

Implications for practice and research

Multifaceted falls prevention is effective in reducing fall rates for high-risk and healthy community-dwelling older adults.

Exercise or an environmental modification component are important moderating factors in the effectiveness of multifaceted falls prevention in community-dwelling older adults.

Further high-quality research is required in the exploration of important mediating factors in the effectiveness of multifactorial interventions for falls prevention in community-dwelling older adults.

Context

A fall is defined as an event that causes a person to, unintentionally, rest on the ground and is not a result of a major intrinsic event or hazard.¹ Falls have both a significant clinical and psychological impact on the person and can place ...

Language: en

Keywords

nursing; public health

Multifactorial assessment of risk of falling in 753 post-menopausal women: a multicenter cross-sectional study by the Italian group for the study of metabolic bone diseases

Iolascon G, de Sire A, Calafiore D, Benedetti MG, Cisari C, Letizia Mauro G, Migliaccio S, Nuti R, Resmini G, Gonnelli S, Moretti A. *Clin. Interv. Aging* 2020; 15: 1077-1084.

(Copyright © 2020, Dove Press)

DOI 10.2147/CIA.S257304 PMID 32753859

Abstract

OBJECTIVE: To assess physical performance, number of falls, previous fragility fractures, and ongoing pharmacological therapy in a cohort of post-menopausal women, according to their risk of falling.

Methods: In this multicenter cross-sectional study, we recruited in a 3-year period (May 2016 to April 2019), women aged >60 years referred to seven Osteoporosis and Bone Metabolism Outpatient Services of the Italian Group for the Study of Metabolic Bone Diseases. The study population was divided into three groups according to the risk of falling, assessed through the Elderly Fall Screening Test (EFST): low risk (EFST score=0-1); moderate risk (EFST=2-3); high risk (EFST=4-5). Outcome measures were: 4-meter gait speed (4MGS); unipedal stance time (UST); number of falls in the previous year; previous fragility fractures; ongoing pharmacological therapy.

Results: We analyzed 753 women (mean aged 70.1±9.2 years): 378 (50.2%) at low risk of falling, 247 (32.8%) at moderate risk, and 128 (17.0%) at high risk. 4MGS and UST resulted as pathological in the 93.9% and 99.2%, respectively, of women at high risk. There were significant differences among groups for both outcomes ($p<0.001$). There was also a significant difference among groups ($p<0.001$) in terms of previous falls and fragility fractures. Lastly, there were significant differences ($p<0.05$) among groups in using antihypertensive drugs, antiplatelet agents, anticoagulants, antidepressants, anti-osteoporotic drugs, and vitamin D, and/or calcium supplementation.

Conclusion: Physical performance, prevalence of falls and fragility fractures, and an assessment of pharmacological therapy should be investigated in post-menopausal women because of their significant correlation with risk of falling.

Language: en

Keywords

accidental falls; osteoporosis; rehabilitation; bone; fractures; walking speed

Older adults reduce the complexity and efficiency of neuromuscular control to preserve walking balance

da Silva Costa AA, Moraes R, Hortobagyi T, Sawers A. *Exp. Gerontol.* 2020; ePub(ePub): ePub.

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DOI 10.1016/j.exger.2020.111050 PMID 32750424

Abstract

Healthy aging modifies neuromuscular control of dynamic balance. Challenging tasks could amplify such modifications, providing clinical insights. We examined the effects of age and walking condition difficulty on neuromuscular control of walking balance. We analyzed whole-body kinematics and activity of 13 right leg and trunk muscles in 17 young (11 males and 6 females; age 24 ± 3 years) and 14 older adults (3 males and 11 females; age 69 ± 4 years) while walking on a taped line on the floor and a 6-cm wide beam. Spatiotemporal parameters of gait, margin of stability, motor performance, and muscle synergies were estimated. Regardless of age, maintaining walking balance was more difficult on the beam compared to the taped line as evidenced by a shorter distance walked (17.3%), a reduction in step length (5.8%) and speed (10.3%), as well as a 40.0% smaller margin of stability during beam vs. tape walking. The number of muscle synergies was also higher during beam vs. tape walking. Compared to younger adults, older adults had larger margin of stability during beam walking. Older adults also had higher muscle co-activity within each muscle synergy and greater variance accounted for by the first muscle synergy regardless of condition. Such age-effects may be interpreted as a safer, less efficient, and less complex neuromuscular modular control strategy. In conclusion, beam walking increased the difficulty of maintaining walking balance and induced adaptations in modular control. It seems that healthy older adults reduce the complexity and efficiency of neuromuscular control of walking to preserve walking balance.

Language: en

Keywords

Older adults; Beam walking; Motor module; Muscle synergy; Neuromuscular control

Test-retest reliability and sensitivity to change of a new fall risk assessment system: a pilot study

Kim M, Kim S, Won CW. *Ann. Geriatr. Med. Res.* 2018; 22(2): 80-87.

(Copyright © 2018, Korean Geriatrics Society)

DOI 10.4235/agmr.2018.22.2.80 PMID 32743251

Abstract

BACKGROUND: The new fall risk assessment (FRA) system is a composite and comprehensive assessment tool developed to predict the risk of falls. The aim of this pilot study was to examine the new FRA system's test-retest reliability and sensitivity to change in community-dwelling older adults.

Methods: This was an observational study with a test-retest design and an 8-week fall prevention exercise program. A sample of 28 community-dwelling older adults with a mean age of 73.0 years (range, 65-80 years) participated in the study. The new FRA system was administered twice within a 7-day period for test-retest reliability expressed as intraclass correlation coefficient (ICC) and standard error of measurement (SEM) assessment. Eighteen subjects of them completed the 8-week fall prevention exercise intervention to evaluate the new FRA system's sensitivity to change.

Results: In the evaluation of interrater reliability for the new FRA system, the ICC (95% confidence interval) of the total score was 0.77 (0.47-0.98), with good reliability. The SEM was 11.61 for the total FRA score. A good to excellent reliability was observed, with ICC levels of 0.73 to 0.91 for the 4 composite scores of the new FRA system. Following the 8-week exercise intervention, the mean total FRA score (effect size, 0.58) significantly increased ($p=0.028$).

Conclusion: The new FRA system has generally moderate to excellent interrater reliability and reliable sensitivity to change in community-dwelling older adults. Our findings provide support for the reliability of the new FRA system in healthy older adults without a fall history.

Language: en

Keywords

Reliability; Older adults; Fall risk; Balance examination; Sensitivity to change

The changes in postural stability of women in early old age

Olchowik G, Czwalik A, Kowalczyk B. J. Nutr. Health Aging 2020; 24(7): 739-744.

(Copyright © 2020, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1007/s12603-020-1399-z PMID 32744570

Abstract

BACKGROUND: Age is one of the most frequent reasons mentioned for the deterioration in human postural stability. Involution processes associated with a deterioration of stability are primarily: a slowing of the motor reactions related to a decline in the average conduction rate of nerve impulses, loss of muscle mass, loss of receptors in the balance controlling organs, and a decrease in visual acuity. The aim of this study was to determine in which organ, responsible for controlling human balance, changes will already appear in early old age, and whether these changes can be diagnosed using CDP.

METHODS: The study was conducted on a group of 141 women (41 elderly aged 65.5 ± 4.6 years, 100 young women aged 20.7 ± 1.2 years). The posturographic study was carried out using the dynamic EquiTest posturograph manufactured by NeuroCom International. The study protocol included the Sensory Organisation Test (SOT), the Motor Control Test (MCT) and the Adaptation Test (ADT).

RESULTS: The SOT results show significantly greater displacements of the body's Centre of Gravity projected onto the posture plane in the anterior-posterior direction in the elderly under all test conditions. The Latencies, determined from MCT, differed significantly between the two groups under all test conditions.

CONCLUSION: In women aged over 60, the perception of stimuli received by the visual and vestibular organs is impaired and their proficiency in controlling body balance is lower. Thus, they are more likely to adopt a hip strategy to maintain balance.

Language: en

Keywords

older women; postural stability; Balance system; computerised dynamic posturography; motor strategy

The safety and feasibility of a Halliwick style of aquatic physiotherapy for falls and balance dysfunction in people with Parkinson's disease: a single blind pilot trial

Terrens AF, Soh SE, Morgan P. PLoS One 2020; 15(7): e0236391.

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Abstract

BACKGROUND: There is growing evidence that aquatic physiotherapy may be effective for people with Parkinson's Disease (PD) but most studies have investigated land based type exercises in the aquatic environment. Few studies have examined customised aquatic therapies such as the Halliwick concept which focuses on trunk rotation and core stabilisation.

OBJECTIVE: The primary aim was to determine the feasibility of a Halliwick style aquatic physiotherapy intervention for people with PD. The secondary aim was to compare the Halliwick intervention with traditional aquatic and land based physiotherapy in terms of disease severity, balance and fear of falling.

METHODS: Halliwick style aquatic, traditional aquatic and land based physiotherapy were trialled in a single blind pilot study. All interventions ran for 60 minutes per week over 12 weeks. Feasibility outcomes were safety, adherence and attrition. Secondary outcomes included the Unified Parkinson's Disease Rating Scale motor subsection (UPDRS-III), Berg Balance Scale (BBS), Mini BESTest and modified Falls Efficacy Scale (mFES).

RESULTS: 30 participants with moderate PD were recruited. Participant mean age was 72 years (SD 8.4; range 51-86) with moderate disease severity (median Hoehn & Yahr score 3; IQR 1). No falls occurred during intervention sessions, however ten participants reported falls during the study period. No other adverse consequences were reported. All groups had adherence over 85%. No within group significant differences were found in UPDRS-III, BBS or mFES scores post-intervention for all groups, but the Halliwick aquatic group improved significantly in the Mini BESTest post-intervention ($p = 0.011$, 95% CI -7.36,-1.31, $t(10) = -2.98$).

CONCLUSIONS: Despite people with PD being a vulnerable population, aquatic physiotherapy, including the Halliwick style is a safe treatment option. Promising results for balance in the Halliwick aquatic group were observed, but further studies with larger sample sizes is required to increase confidence in the results.

Language: en

Using pharmacy dispensing data to predict falls in older persons

Gemmeke M, Koster ES, Pajouheshnia R, Kruijtbosch M, Taxis K, Bouvy ML. *Br. J. Clin. Pharmacol.* 2020; ePub(ePub): ePub.

(Copyright © 2020, John Wiley and Sons)

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Abstract

AIM: Associations between individual medication use and falling in older persons are well-documented. However, a comprehensive risk score that takes into account persons' overall medication use and that can be used in daily pharmacy practice is lacking. We, therefore, aimed to determine whether pharmacy dispensing records can be used to predict falls.

METHODS: A retrospective cohort study was conducted using pharmacy dispensing data and self-reported falls among 3454 Dutch persons aged ≥ 65 years. Two different methods were used to classify medication exposure for each person: the Drug Burden Index (DBI) for cumulative anticholinergic and sedative medication exposure as well as exposure to fall risk-increasing drugs (FRIDs). Multinomial regression analyses, adjusted for age and gender, were conducted to investigate the association between medication exposure and falling classified as non-falling, single falling and recurrent falling. The predictive performances of the DBI and FRIDs exposure were estimated by the polytomous discrimination index (PDI).

RESULTS: There were 521 single fallers (15%) and 485 recurrent fallers (14%). We found significant associations between a DBI ≥ 1 and single falling (adjusted odds ratio (aOR): 1.30 [95%-confidence interval (CI): 1.02-1.66]) and recurrent falling (aOR: 1.60 [95%-CI: 1.25-2.04]). The PDI of the DBI model was 0.41 (95%-CI: 0.39-0.42) and the PDI of the FRIDs model was 0.45 (95%-CI: 0.43-0.47), indicating poor discrimination between fallers and non-fallers.

CONCLUSION: The study shows significant associations between medication use and falling. However, the medication-based models were insufficient and other factors should be included to develop a risk score for pharmacy practice.

Language: en

Keywords

elderly; falling; dispensing records; Drug burden index; fall risk-increasing drugs; risk prediction

Validity of the Korebalance® balance system in patients with postmenopausal osteoporosis

Dogruoz Karatekin B, Yasin S, Yumusakhuyly Y, Bayram F, Icagasioglu A. Medeni. Med. J. 2020; 35(2): 79-84.

(Copyright © 2020, Istanbul Medeniyet University, Publisher Logos Yayıncılık Tic)

DOI 10.5222/MMJ.2020.18828 PMID 32733755

Abstract

OBJECTIVE: Balance is impaired in postmenopausal osteoporosis. Balance can be assessed with several tests and balance assessment systems. In our study, we investigated validity of Korebalance Balance System (KBS).

Method: 52 postmenopausal osteoporotic patient evaluated with balance tests (Berg Balance Scale (BBS) and Time Up&Go Test (TUG)) and Korebalance Balance System. KBS is a balance evaluation and exercise system. The higher the score, the greater the deterioration in the balance. Static and dynamic balance evaluation results are recorded as score values. KBS, BBS and TUG compared with demographic and clinic parameters (age, 25OHvitD, menopausal age, fall history in last year, fracture history).

Results: According to Pearson r correlation analysis, Korebalance Dynamic Test (KDT) and BBS had moderately negative correlation ($r=-.38$, $p<.01$), KDT and TUG had moderately positive correlation ($r=.42$, $p<.01$). According to Spearman rho correlation analysis, Korebalance Static Test (KST) and BBS had moderately negative correlation ($r=-.30$, $p<.05$). Age and KST ($r=.33$, $p<.05$), age and KDT ($r=.31$, $p<.05$) had moderately positive correlation. No significant correlation was found with other parameters. In discriminant validity, there was no correlation between other nonfunctional demographic and clinical parameters.

Conclusion: Korebalance Balance System was found to be a convenient assessment tool with moderate convergent validity compared with BBS and TUG and has an excellent intraclass correlation.

Language: en

Keywords

osteoporosis; Balance; postmenopausal osteoporosis

A socio-spatial analysis of pedestrian falls in Aotearoa New Zealand

Watkins A, Curl A, Mavoa S, Tomintz M, Todd V, Dicker B. Soc. Sci. Med. 2020; ePub(ePub): ePub.

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Abstract

Falls are a leading cause of injury and accidental death, particularly amongst older people. Evidence of environmental risk factors for pedestrian falls among older adults could support age-friendly urban design and contribute to efforts to reduce the incidence of pedestrian falls and support outdoor mobility among older adults. Yet investigation of the environment in which pedestrian falls occur is often hampered by its reliance on participant recall and self-report information. We identified the point locations of falls occurring on the road or street among adults that were attended by an ambulance in New Zealand over a two-year period (2016-2018) and connected these to a range of social (e.g. deprivation) and environmental (e.g. slope, greenspace) risk factors. Three types of analysis were used: a descriptive analysis of fall rates, logistic regression assessing whether a patient was transported to hospital following a fall, and a negative binomial regression analysis of the pedestrian falls by small area. We found a number of differences in the built environment surrounding fall locations between age groups. Compared with younger age groups, older adults showed high fall rates closer to home, and higher fall rates in areas with many types of destinations nearby. Additionally, our results showed a higher rate of pedestrian falls in more deprived areas. People who live in more deprived areas also fell over more frequently, but the pattern is stronger based on deprivation at the fall location, rather than home location. Residents of more deprived areas were less likely to be transported to hospital following a fall. Thus, our findings have equity implications for both environments and patient experience. These patterns could not have been identified without the novel use of spatially specific fall data.

Language: en

Keywords

Geospatial analysis; Older adults; Environmental characteristics; Outdoor falls; Pedestrian falls

Association suvorexant and ramelteon use with the risk of falling: a retrospective case-control study

Ishigo T, Takada R, Kondo F, Ibe Y, Nakano K, Tateishi R, Fujii S, Katano S, Kitagawa M, Kimyo T, Nakata H, Hashimoto A, Miyamoto A. *Yakugaku Zasshi* 2020; 140(8): 1041-1049.

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DOI 10.1248/yakushi.20-00018 PMID 32741862

Abstract

Sedative hypnotics are among the classes of drugs reported to influence falls. However, the effects of the sedative hypnotic drugs, suvorexant and ramelteon, on falls are not well known. Therefore, we conducted this retrospective case-control study to examine the association of the use of these two sedative hypnotics with the risk of falls. Conducted at the Sapporo Medical University Hospital in Japan, our study included 360 patients with fall incidents and 819 randomly selected control patients. Patients in the fall group were significantly older with a lower body mass index, and had a history of falls, disabilities in activities of daily living, cognitive impairment, and delirium. Monovariate analysis revealed that patients in the fall group frequently used ramelteon [odds ratio (OR) 2.38, 95% confidence interval (CI): 1.49-3.81, $p < 0.001$], but rarely used suvorexant (OR 0.66, 95% CI: 0.29-1.39, $p = 0.317$), compared with control patients. Furthermore, multivariate analysis revealed that ramelteon use did not increase the risk of falls (adjusted OR 1.43, 95% CI: 0.82-2.48, $p = 0.207$), whereas suvorexant use significantly decreased the risk of falls (adjusted OR 0.32, 95% CI: 0.13-0.76, $p = 0.009$). Although ramelteon tends to be used in patients at a high risk of falls, it may not increase the risk of falls. In contrast, the use of suvorexant may reduce the risk of falls.

Language: ja

Keywords

fall; ramelteon; sedative hypnotics; suvorexant

Can momentum based control predict human balance recovery strategies?

Bayon C, Emmens AR, Afschrift M, Van Wouwe T, Keemink AQL, van der Kooij H, Van Asseldonk EHF. IEEE Trans. Neural Syst. Rehabil. Eng. 2020; ePub(ePub): ePub.

(Copyright © 2020, IEEE (Institute of Electrical and Electronics Engineers))

DOI 10.1109/TNSRE.2020.3005455 PMID 32746307

Abstract

Human-like balance controllers are desired for wearable exoskeletons in order to enhance human-robot interaction. Momentum-based controllers (MBC) have been successfully applied in bipeds, however, it is unknown to what degree they are able to mimic human balance responses. In this paper, we investigated the ability of an MBC to generate humanlike balance recovery strategies during stance, and compared the results to those obtained with a linear full-state feedback (FSF) law. We used experimental data consisting of balance recovery responses of nine healthy subjects to anteroposterior platform translations of three different amplitudes. The MBC was not able to mimic the combination of trunk, thigh and shank angle trajectories that humans generated to recover from a perturbation. Compared to the FSF, the MBC was better at tracking thigh angles and worse at tracking trunk angles, whereas both controllers performed similarly in tracking shank angles. Although the MBC predicted stable balance responses, the human-likeness of the simulated responses generally decreased with an increased perturbation magnitude. Specifically, the shifts from ankle to hip strategy generated by the MBC were not similar to the ones observed in the human data. Although the MBC was not superior to the FSF in predicting human-like balance, we consider the MBC to be more suitable for implementation in exoskeletons, because of its ability to handle constraints (e.g. ankle torque limits). Additionally, more research into the control of angular momentum and the implementation of constraints could eventually result in the generation of more human-like balance recovery strategies by the MBC.

Language: en

Effectiveness of physical therapy interventions in reducing fear of falling among individuals with neurological diseases: a systematic review and meta-analysis

Abou L, Alluri A, Fliflet A, Du Y, Rice LA. Arch. Phys. Med. Rehabil. 2020; ePub(ePub): ePub.

(Copyright © 2020, Elsevier Publishing)

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Abstract

OBJECTIVE: To summarize the effectiveness of physical therapy (PT) interventions to reduce fear of falling (FOF) among individuals living with neurological diseases.

DATA SOURCES: PubMed, PEDro, Scopus, Web of Science, PsycINFO, CINAHL, and SportDiscuss were searched from inception until December 2019.

STUDY SELECTION: Clinical trials with either the primary or secondary aim to reduce FOF among adults with neurological diseases were selected.

DATA EXTRACTION: Potential papers were screened for eligibility and data extracted by two independent researchers. Risk of bias was assessed by the Cochrane Risk of Bias tool for randomized clinical trials and the NIH Quality Assessment Tool for pre-post studies. A meta-analysis was performed among trials presenting with similar clinical characteristics. The Grading Recommendations, Assessment, Development and Evaluation- GRADE was used to rate the overall quality of evidence.

RESULTS: Sixty-one trials/3954 participants were included in the review and 53 trials/3524 participants in the meta-analysis. The included studies presented, in general, with a low to high risk of bias. A combination of gait and balance training was found to be significantly more effective compared to gait training alone in reducing FOF among individuals with Parkinson's Disease (PD) (Mean Difference- MD = 11.80, 95% CI, 8.22 - 15.38; $p < 0.001$). Home-based exercise and leisure exercise demonstrated significant improvement in reducing FOF over usual care in multiple sclerosis (MS) (MD = 15.27, 95% CI, 6.15 - 24.38, $p = 0.001$). No statistically significant between-groups differences were reported among individuals with stroke and spinal cord injury (SCI). The overall quality of evidence presented in this review ranges from very low to moderate according to the assessment with the GRADE approach.

CONCLUSION: Gait with lower limb training combined with balance training is effective in reducing FOF in individuals with PD. Also, home-based or leisure exercise is effective among individuals with MS. However, due to several limitations of the included studies, further research is needed to examine the effectiveness of FOF intervention among individuals with neurological diseases.

Language: en

Keywords

systematic review; fear of falling; meta-analysis; neurological diseases; physical therapy

Evaluation of an education strategy versus usual care to implement the STEADI algorithm in primary care clinics in an academic medical center

Urban K, Wright PB, Hester AL, Curran G, Rojo M, Tsai PF. Clin. Interv. Aging 2020; 15: 1059-1066.

(Copyright © 2020, Dove Press)

DOI 10.2147/CIA.S256416 PMID 32753856

Abstract

BACKGROUND: Although falls are the leading cause of morbidity and mortality in the US in the older adult population, there is little information regarding implementation of evidence-based fall prevention guidelines within primary care settings. The objective of this study was to address this gap in the literature by determining the effectiveness of the use of education and written materials as implementation strategies.

Methods: Using a prospective, mixed methods, controlled before-and-after study design, we studied the effect of the Stopping Elderly Accidents, Deaths, and Injuries (STEADI) education and written materials on knowledge and intention to use in primary care clinics as well as test the screening, assessment, and intervention behaviors. This manuscript details the quantitative findings of the study, using STEADI Knowledge Test, Continuing Professional Development (CPD) Reaction Questionnaire, and EMR Reports. We compared data between the study arms (usual implementation versus education implementation) using descriptive statistics, paired t-tests, and factorial ANOVAs.

Results: In total, data from 29 primary care staff, including physicians, APRNs, RNs, and medical assistants, were analyzed. Although we found a statistically significant difference within the education arm between immediate pretests and posttests/surveys mean scores, there was no statistically significant difference between the study arms' knowledge, intent to use STEADI, or use behaviors. The pre/immediate post education mean knowledge score increased by 1.19 ($p=0.02$) and the pre/immediate post education intent to use mean increased by 0.64 ($p=0.01$). There was no statistically significant change between the study arms over time.

Conclusion: Educational strategies, particularly written materials and an online module, did not increase the long-term use of the STEADI toolkit. Implementation research is needed to identify the strategies that are most effective for promoting the adoption of STEADI in primary care.

Language: en

Keywords

implementation; primary care providers; STEADI toolkit

Fall prevention practices and implementation strategies: examining consistency across hospital units

Turner K, Staggs VS, Potter C, Cramer E, Shorr RI, Mion LC. *J. Patient Saf.* 2020; ePub(ePub): ePub.

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DOI 10.1097/PTS.0000000000000758 PMID 32732628

Abstract

OBJECTIVE: Our study examines how consistently fall prevention practices and implementation strategies are used by U.S. hospitals.

METHODS: We conducted a cross-sectional, descriptive study of 60 general adult hospital units. We administered a survey measuring 5 domains of fall prevention practices: visibility and identification, bed modification, patient monitoring, patient safety, and education. We measured 4 domains of implementation strategies including quality management (e.g., providing data and support for quality improvement), planning (e.g., designating leadership), education (e.g., providing consultation and training), and restructuring (e.g., revising staff roles and modifying equipment).

RESULTS: Of 60 units, 43% were medical units and 57% were medical-surgical units. The hospital units varied in fall prevention practices, with practices such as keeping a patient's bed in a locked position (73% strongly agree) being used more consistently than other practices, such as scheduled toileting (15% strongly agree). Our study observed variation in fall prevention implementation strategies. For example, publicly posting fall rates (60% strongly agree) was more consistently used than having a multidisciplinary huddle after a fall event (12% strongly agree).

CONCLUSIONS: There is substantial variation in the implementation of fall prevention practices and implementation strategies across inpatient units. Our study found that resource-intensive practices (e.g., scheduled toileting) are less consistently used than less resource-intensive practices and that interdisciplinary approaches to fall prevention are limited. Future studies should examine how units tailor fall prevention practices based on patient risk factors and how units decide, based on their available resources, which implementation strategies should be used.

Language: en

Influence of hospital encounters for falls on potentially inappropriate medication use among older patients

Weeda ER, Salem Y, Assadoon M. *Geriatr. Gerontol. Int.* 2020; 20(8): 795-796.

(Copyright © 2020, Japan Geriatrics Society, Publisher John Wiley and Sons)

DOI 10.1111/ggi.13982 **PMID** 32743922

Abstract

[Abstract unavailable]

Language: en

Technology utilization in fall prevention

Oh-Park M, Doan T, Dohle C, Vermiglio-Kohn V, Abdou A. *Am. J. Phys. Med. Rehabil.* 2020; ePub(ePub): ePub.

(Copyright © 2020, Lippincott Williams and Wilkins)

DOI 10.1097/PHM.0000000000001554 PMID 32740053

Abstract

Falls, defined as unplanned descents to the floor with or without injury to an individual, remain to be one of the most challenging health conditions. Fall rate is a key quality metric of acute care hospitals, rehabilitation settings, and long-term care facilities. Fall prevention policies with proper implementation have been the focus of surveys by regulatory bodies including The Joint Commission and Centers for Medicare and Medicaid Services (CMS) for all healthcare settings.

Since October 2008, CMS stopped reimbursing hospitals for the costs related to patient falls shifting the accountability for fall prevention to the healthcare providers. Research shows that almost one-third of falls can be prevented and extensive fall prevention interventions exist. Recently, technology-based applications have been introduced in healthcare to obtain superior patient care outcomes and experience via efficiency, access, and reliability. Several areas in fall prevention deploy technology, including predictive and prescriptive analytics using big data, video monitoring and alarm technology, wearable sensors, exergame and virtual reality, robotics in home environment assessment, and personal coaching.

This review discusses an overview of these technology-based applications in various settings, focusing on the outcomes of fall reductions, cost, and other benefits.

Language: en