

Safety Literature 21st August 2022

App-based evaluation of older people's fall risk using the mHealth app Linder Mobility Analysis: exploratory study

Strutz N, Brodowski H, Kiselev J, Heimann-Steinert A, Müller-Werdan U. JMIR Aging 2022; 5(3): e36872.

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Abstract

BACKGROUND: Falls and the risk of falling in older people pose a high risk for losing independence. As the risk of falling progresses over time, it is often not adequately diagnosed due to the long intervals between contacts with health care professionals. This leads to the risk of falling being not properly detected until the first fall. App-based software able to screen fall risks of older adults and to monitor the progress and presence of fall risk factors could detect a developing fall risk at an early stage prior to the first fall. As smartphones become more common in the elderly population, this approach is easily available and feasible.

OBJECTIVE: The aim of the study is to evaluate the app Linder Mobility Analysis (LIN). The reference standards determined the risk of falling and validated functional assessments of mobility.

METHODS: The LIN app was utilized in home- and community-dwelling older adults aged 65 years or more. The Berg Balance Scale (BBS), the Tinetti Test (TIN), and the Timed Up & Go Test (TUG) were used as reference standards. In addition to descriptive statistics, data correlation and the comparison of the mean difference of analog measures (reference standards) and digital measures were tested. Spearman rank correlation analysis was performed and Bland-Altman (B-A) plots drawn.

RESULTS: Data of 42 participants could be obtained (n=25, 59.5%, women). There was a significant correlation between the LIN app and the BBS ($r=-0.587$, $P<.001$), TUG ($r=0.474$, $P=.002$), and TIN ($r=-0.464$, $P=.002$). B-A plots showed only few data points outside the predefined limits of agreement (LOA) when combining functional tests and results of LIN.

CONCLUSIONS: The digital app LIN has the potential to detect the risk of falling in older people. Further steps in establishing the validity of the LIN app should include its clinical applicability. **TRIAL REGISTRATION:** German Clinical Trials Register DRKS00025352; <https://tinyurl.com/65awrd6a>.

Language: en

Keywords

analysis; older people; accuracy; app; fall risk; mobility; mobility restriction; smartphone

Cross-sectional associations of physical frailty with fall, multiple falls and fall-injury among older Indian adults: findings from LASI, 2018

Thakkar S, T M, Srivastava S. PLoS One 2022; 17(8): e0272669.

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DOI 10.1371/journal.pone.0272669 **PMID** 35960705

Abstract

BACKGROUND: Although there has been a range of studies that focused on physical frailty and associated fall outcomes within developed countries, similar studies from developing countries have been limited. This study aimed to examine the relationship between physical frailty and the prevalence of falls, multiple falls and fall-related injuries among the ageing population within the Indian context.

METHODS: Individual-level data from the first wave of the Longitudinal Aging Study in India (LASI) with 28,285 older adults aged 60 years and above (male 48.9%) was used for this study. Physical frailty was assessed through the physical frailty phenotype adapted from Fried's criteria. Multivariable logistic regression was employed to examine the association of frailty status with falls, multiple falls, and fall-related injuries among Indian older adults.

RESULTS: The prevalence of frailty was found to be 29.94% within the sample and frail older adults had a higher prevalence of falls (15.43% vs 11.85%), multiple falls (7.73% vs 5.25%), and fall related injuries (6.68% vs 5.29%). The odds of falling among frail older adults were significantly higher in reference to the odds of falling among non-frail older adults [aOR: 1.24; CI: 1.09-1.41]. Similarly, the odds of multiple falls among frail older adults were significantly higher in reference to the odds of multiple falls among non-frail older adults [aOR: 1.24; CI: 1.05-1.48]. Moreover, the odds of fall-related injury among frail older adults were significantly higher in reference to the odds of fall-related injury among non-frail older adults [aOR: 1.21; CI: 1.01-1.45]. Falls, multiple falls and fall-related injuries were found to be significantly associated with employment and poor self-rated health, whereas, females and lone living older adults had a significantly higher likelihood of suffering from falls and multiple falls.

CONCLUSION: Older individuals with physical frailty were found to be at increased risk of falls, multiple falls and fall-related injuries in India. The findings of our study also have important clinical implications in the measures undertaken to reduce falls and enable future healthcare practitioners and policymakers to factor in the key determinant of physical frailty.

Language: en

Developing the patient falls risk report: a mixed-methods study on sharing falls-related clinical information from home care with primary care providers

Nova AA, Heckman G, Giangregorio LM, Alarakhia M. *Can. J. Aging* 2022; ePub(ePub): ePub.

(Copyright © 2022, Cambridge Press)

DOI 10.1017/S0714980822000228 **PMID** 35968902

Abstract

If interRAI home care information were shared with primary care providers, care provision and integration could be enhanced. The objective of this study was to co-develop an interRAI-based clinical information sharing tool (i.e., the Patient Falls Risk Report) with a sample of primary care providers. This mixed-methods study employed semi-structured interviews to inform the development of the Patient Falls Risk Report and online surveys based on the System Usability Scale instrument to test its usability. Most of the interview sample (n = 9) believed that the report could support patient care by sharing relevant and actionable falls-related information. However, criticisms were identified, including insufficient detail, clarity, and support for shared care planning. After incorporating suggestions for improvement, the survey sample (n = 27) determined that the report had excellent usability with an overall usability score of 83.4 (95% CI = 78.7-88.2). By prioritizing the needs of end-users, sustainable interRAI interventions can be developed to support primary care.

Language: en

Keywords

aging; falls; information sharing; vieillissement; chutes; interRAI-HC; partage d'informations; primary care; soins de première ligne; usability; utilisabilité; utilité; utility

Early risk stratification of mortality in the geriatric patients who are at high risk for bleeding and fall from a ground level: an analysis of the national data

Ahmed N, Kuo YH. *J. Inj. Violence Res.* 2022; 14(3): e1628.

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DOI 10.5249/jivr.v14i3.1628 **PMID** 35962712

Abstract

BACKGROUND: The purpose of the study is to identify the risk factors of mortality early in patients who have history of using of anticoagulants or coagulopathy and sustained a ground level fall (GLF).

METHODS: The American College of Surgeons Trauma Quality Improvement Program (ACS-TQIP) dataset of the calendar year 2013 through 2016 was accessed for the study. All elderly patients ≥ 65 years old, who were taking an anticoagulant and suffered from a GLF, were included in the study. Other patient characteristics included: sex, race, initial systolic blood pressure (SBP), hypotension (SBP less than 110 mmHg), Injury Severity Score (ISS), Glasgow Coma Scale (GCS) Score, comorbidities such as hypertension (HTN), congestive heart failure (CHF), chronic renal failure (CRF), chronic pulmonary obstructive disease (COPD) and cirrhosis. Multivariable analysis was performed to develop the risk model.

RESULTS: A total of 10,368 patients qualified for the study. Of this total, 788 (7.6%) patients died. The median [IQR] age of the patients was 80 [75-85] years. More than 90% of the patients were white. Fifty-four percent of the patients were female. Approximately 8% of the patients presented with hypotension at the time of hospital arrival. Multivariable analysis showed advanced age, male gender, high ISS, low GCS, presence of hypotension, CHF, CRF, COPD and cirrhosis were highly significant for odds of mortality.

CONCLUSIONS: Approximately 8% of the patients, who took an anticoagulant or had a history of coagulopathy and sustained a GLF, died. Certain demographics, higher injury severity and a few comorbidities were highly associated with in-hospital mortality.

Language: en

Effect of home-based exercise on falls in community-dwelling older adults: an umbrella review

Shafizadeh M, Parvinpour S, Ali K. Sport Sci. Health 2022; ePub(ePub): ePub.

(Copyright © 2022, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1007/s11332-022-00993-2 **PMID** 35967546

Abstract

AIMS: The aim of this review study was to examine the effectiveness of home-based and community-based exercise programmes in the rate of falls and improving physical functioning in community-dwelling older adults.

METHODS: All types of home-based and community-based exercise interventions were searched. From 1186 studies identified, 14 studies were selected for the umbrella review. Most studies had high methodological quality. The types of interventions were multi-functional programmes (n = 11 studies) and Otago Exercise Programme (OEP) (n = 3 studies).

RESULTS: The results showed that home-based and community-based exercise interventions can reduce falls by 22-32%. Studies that included meta-analysis showed that the clinical significance of home-based interventions in fall prevention and improving physical function was moderate to high.

CONCLUSIONS: In conclusion, home-based and community-based exercise interventions are a safe, effective, and feasible method of fall prevention that could be implemented with minimum supervision by allied health professionals to maximise autonomy, self-efficacy, and adherence in community-dwelling older adults.

Language: en

Keywords

Community; Exercise; Home intervention; Physical function

Emergency medicine (EM) can safely manage geriatric trauma patients sustaining ground level falls: fostering EM autonomy while safely offloading a busy trauma service

Skochko S, Grigorian A, Eshraghi C, Paladugu A, Nguyen N, Swentek L, Lekawa M, Fox JC, Nahmias J. *Am. J. Surg.* 2022; ePub(ePub): ePub.

(Copyright © 2022, Elsevier Publishing)

DOI 10.1016/j.amjsurg.2022.07.019 **PMID** 35961876

Abstract

OBJECTIVE: Limited data exists regarding different specialties care of geriatric (>74 years-old) trauma patients (GTPs). We created a "Tier-III" designation for ground-level fall (GLF) GTPs to be managed by EM, with a trauma consult as needed.

MATERIALS AND METHODS: A single-center comparison of PRE (1/1/2013-4/30/2016) versus POST (5/1/2016-11/30/2019) Tier-III GTP GLFs. The primary outcome was mortality. Secondary outcomes included admissions, trauma bay procedures and length of stay (LOS).

RESULTS: 1,652 patients (314-PRE vs. 1,338-POST) were included. The admission rate was lower in the POST (56.9% vs. 88.9%, $p < 0.001$) cohort. There were no differences in LOS or trauma bay procedures between cohorts ($p > 0.05$). On multivariable analysis there was similar associated risk of mortality between groups ($p = 0.68$).

CONCLUSION: The associated risk of mortality was similar between GLF GTP cohorts managed initially by EM and trauma surgeons, however the admission rate was lower in the POST group suggesting EM management may improve hospital bed utilization.

Language: en

Keywords

Trauma; Emergency medicine; Geriatric; Ground-level fall

External validation of a prediction model for falls in older people based on electronic health records in primary care

Dormosh N, Heymans MW, van der Velde N, Hugtenburg J, Maarsingh O, Slottje P, Abu-Hanna A, Schut MC. *J. Am. Med. Dir. Assoc.* 2022; ePub(ePub): ePub.

(Copyright © 2022, Lippincott Williams and Wilkins)

DOI 10.1016/j.jamda.2022.07.002 PMID 35963283

Abstract

OBJECTIVE: Early identification of older people at risk of falling is the cornerstone of fall prevention. Many fall prediction tools exist but their external validity is lacking. External validation is a prerequisite before application in clinical practice. Models developed with electronic health record (EHR) data are especially challenging because of the uncontrolled nature of routinely collected data. We aimed to externally validate our previously developed and published prediction model for falls, using a large cohort of community-dwelling older people derived from primary care EHR data.

DESIGN: Retrospective analysis of a prospective cohort drawn from EHR data. **SETTING AND PARTICIPANTS:** Pseudonymized EHR data were collected from individuals aged ≥ 65 years, who were enlisted in any of the participating 59 general practices between 2015 and 2020 in the Netherlands.

METHODS: Ten predictors were defined and obtained using the same methods as in the development study. The outcome was 1-year fall and was obtained from free text. Both reproducibility and transportability were evaluated. Model performance was assessed in terms of discrimination using the area under the receiver operating characteristic curve (ROC-AUC), and in terms of calibration, using calibration-in-the-large, calibration slope and calibration plots.

RESULTS: Among 39,342 older people, 5124 (13.4%) fell in the 1-year follow-up. The characteristics of the validation and the development cohorts were similar. ROC-AUCs of the validation and development cohort were 0.690 and 0.705, respectively. Calibration-in-the-large and calibration slope were 0.012 and 0.878, respectively. Calibration plots revealed overprediction for high-risk groups in a small number of individuals.

CONCLUSIONS AND IMPLICATIONS: Our previously developed prediction model for falls demonstrated good external validity by reproducing its predictive performance in the validation cohort. The implementation of this model in the primary care setting could be considered after impact assessment.

Language: en

Keywords

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

Falls in older adults: a practical approach

Pereira CB, Kanashiro AMK. Arq. Neuropsiquiatr. 2022; 80(5 Suppl 1): 313-323.

(Copyright © 2022, Associacao Arquivos De Neuro-Psiquitria)

DOI 10.1590/0004-282X-ANP-2022-S107 **PMID** 35976297

Abstract

BACKGROUND: Falls are a major problem in public health since they are an important cause of morbidity and mortality. To evaluate the risk of fall and prescribe preventive interventions may be a challenging task.

OBJECTIVES: The objectives of this study are to summarize the most relevant information on the topic "falls in the elderly" and to give a critical view and practical clinical approach on this topic.

METHODS: In March 2022, a search of Pubmed database was performed, using the terms "fall elderly", fall prevention", "fall risk", with the following parameters: five years, review, systematic review, meta-analysis, practice guidelines.

RESULTS: There are several risk factors for falls that can be grouped in different areas (psychosocial, demographic, medical, medication, behavioral, environmental). The clinical evaluation of an older adult prone to falls must include identification of risk factors through history and examination and identification of risk of falls through an assessment tool such as gait velocity, functional reach test, timed up and go, Berg balance test, and miniBEST test. Fall prevention strategies can be single or multiple, and physical activity is the most cited. Technology can be used to detect and prevent falls.

CONCLUSION: A systematic approach to the older patient in risk of falls is feasible and may impact fall prevention.

Language: en

Malnutrition in older adults-effect on falls and fractures: a narrative review

Kupisz-Urbanska M, Marcinowska-Suchowierska E. *Nutrients* 2022; 14(15): e3123.

(Copyright © 2022, MDPI Publishing)

DOI 10.3390/nu14153123 **PMID** 35956299

Abstract

Malnutrition in older adults impacts health status, increased mortality, and morbidity. Malnutrition may increase the development of geriatric syndromes and contribute to a higher prevalence of falls and osteoporotic fractures that lead to loss of independence and an increased rate of institutionalization. The role of malnutrition in the pathogenesis of other geriatric syndromes seems to be well established. However, the data concerning nutritional interventions are confounding. Moreover, long-term undernutrition seems to be one of the factors that strongly influences the efficacy of interventions. This review outlines the current literature on this topic, and aims to guide physicians to make proper decisions to prevent the vicious cycle of falls, fractures, and their negative outcomes in patients with malnutrition.

Language: en

Keywords

older adults; falls; fracture risk; functional decline; immobility; malnutrition

Prospective association between multimorbidity and falls and its mediators: findings from the Irish Longitudinal Study on Ageing

Jacob L, Shin JI, Kostev K, Haro JM, López-Sánchez GF, Smith L, Koyanagi A. *J. Clin. Med.* 2022; 11(15): e4470.

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DOI 10.3390/jcm11154470 **PMID** 35956086

Abstract

This study including older adults from Ireland aimed to analyze the prospective association between multimorbidity and falls and to identify the mediators in this relationship. The present study used data from two consecutive waves of the Irish Longitudinal Study on Ageing (TILDA) survey. Multimorbidity was assessed at Wave 1 (2009-2011) and was defined as the presence of at least two chronic conditions. Falls occurring at Wave 2 (2012-2013) were self-reported. Mediating variables considered were polypharmacy, cognitive impairment, sleep problems, pain, low handgrip strength, difficulty in activities of daily living (ADL), obesity, and underweight. Multivariable binary logistic regression and mediation analysis using the Karlson Holm Breen method were conducted. This study included 6900 adults aged ≥ 50 years (51.6% women; mean [SD] age 63.1 [8.9] years). Compared to no chronic conditions at baseline, there was a positive and significant association between multimorbidity and falls at follow-up, with ORs ranging from 1.32 (95% CI = 1.06-1.64) for 2 conditions to 1.92 (95% CI = 1.54-2.38) for ≥ 4 conditions. Pain (23.5%), polypharmacy (13.3%), and difficulty in ADL (10.7%) explained the largest proportion of the multimorbidity-fall relationship. Multimorbidity increased risk for incident falls in older adults from Ireland. Interventions should be implemented to reduce fall risk in people with multimorbidity, especially targeting the identified mediators.

Language: en

Keywords

older adults; Ireland; falls; prospective study; multimorbidity

Randomized controlled trial of group exercise intervention for fall risk factors reduction in nursing home residents

Pepera G, Krinta K, Mpea C, Antoniou V, Peristeropoulos A, Dimitriadis Z. *Can. J. Aging* 2022; ePub(ePub): ePub.

(Copyright © 2022, Cambridge Press)

DOI 10.1017/S0714980822000265 **PMID** 35950596

Abstract

OBJECTIVE: The aim of this study was to assess the effectiveness of a multidimensional exercise intervention on improving fall risk deterrent factors, such as overall strength and flexibility in nursing home residents.

METHODS: A multi-centre, randomized controlled trial was finally utilized in 40 older adults (>65 years) who were randomly allocated to the intervention or the control group (20 subjects in each). The intervention group attended an exercise program twice a week for eight weeks, to improve functional mobility. The control group did not receive any intervention. Measurements before and after intervention included the Hand Grip Strength (HGS) testing, the Sit-to-Stand test (SST), the Back Scratch Test (BST), and the Sit-and-Reach test (SRT).

RESULTS: MANOVA revealed significant time effects, $V = 0.336$, $F(6, 33) = 2.78$, $p = 0.027$, partial $\eta(2) = 0.336$; group effects, $V = 0.599$, $F(6, 33) = 8.22$, $p < 0.001$, partial $\eta(2) = 0.599$; and group*time interaction, $V = 0.908$, $F(6, 33) = 54.52$, $p < 0.001$, partial $\eta(2) = 0.908$. A subsequent univariate analysis did not reveal a significant time effect for any variable ($p > 0.05$). Significant group effects were observed only for SRT ($p < 0.05$). Significant group*time interactions were observed for all the examined variables ($p < 0.05$). Dependent t-tests showed that the older adults in the exercise group were significantly improved in all the examined parameters ($p < 0.05$). Except for SRT ($p > 0.05$), all the other parameters significantly deteriorated in the control group ($p < 0.05$).

CONCLUSIONS: Significant improvements were demonstrated in strength and flexibility among nursing home residents following an eight-week group exercise training program.

Language: en

Keywords

older adults; aging; entraînement par l'exercice; exercise intervention; exercise training; facteurs de risque de chute; fall risk factors; flexibilité; flexibility; force; intervention avec exercices; nursing home residents; personnes âgées; résidents de centres d'hébergement; strength; vieillissement

Receiver operating characteristic curve analysis of the Somatosensory Organization Test, Berg Balance Scale, and Fall Efficacy Scale-International for predicting falls in discharged stroke patients

Fiedorová I, Mrázková E, Zádrapová M, Tomášková H. *Int. J. Environ. Res. Public Health* 2022; 19(15): e9181.

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DOI 10.3390/ijerph19159181 **PMID** 35954533

Abstract

BACKGROUND: Although fall prevention in patients after stroke is crucial, the clinical validity of fall risk assessment tools is underresearched in this population. The study aim was to determine the cut-off scores and clinical validity of the Sensory Organization Test (SOT), the Berg Balance Scale (BBS), and the Fall Efficacy Scale-International (FES-I) in patients after stroke.

METHODS: In this prospective cross-sectional study, we analyzed data for patients admitted to a rehabilitation unit after stroke from 2018 through 2021. Participants underwent SOT, BBS, and FES-I pre-discharge, and the fall incidence was recorded for 6 months. We used an area under the receiver operating characteristic curve (AUC) to calculate predictive values.

RESULTS: Of 84 included patients (median age 68.5 (interquartile range 67-71) years), 32 (38.1%) suffered a fall. All three tests were significantly predictive of fall risk. Optimal cut-off scores were 60 points for SOT (AUC 0.686), 35 and 42 points for BBS (AUC 0.661 and 0.618, respectively), and 27 and 29 points for FES-I (AUC 0.685 and 0.677, respectively).

CONCLUSIONS: Optimal cut-off scores for SOT, BBS, and FES-I were determined for patients at risk for falls after a stroke, which all three tools classified with a good discriminatory ability.

Language: en

Keywords

balance; fall risk assessment; stroke

Personalized watch-based fall detection using a collaborative edge-cloud framework

Ngu AH, Metsis V, Coyne S, Srinivas P, Salad T, Mahmud U, Chee KH. *Int. J. Neural. Syst.* 2022; ePub(ePub): ePub.

(Copyright © 2022, World Scientific Publishing)

DOI 10.1142/S0129065722500484 **PMID** 35972790

Abstract

The majority of current smart health applications are deployed on a smartphone paired with a smartwatch. The phone is used as the computation platform or the gateway for connecting to the cloud while the watch is used mainly as the data sensing device. In the case of fall detection applications for older adults, this kind of setup is not very practical since it requires users to always keep their phones in proximity while doing the daily chores. When a person falls, in a moment of panic, it might be difficult to locate the phone in order to interact with the Fall Detection App for the purpose of indicating whether they are fine or need help. This paper demonstrates the feasibility of running a real-time personalized deep-learning-based fall detection system on a smartwatch device using a collaborative edge-cloud framework. In particular, we present the software architecture we used for the collaborative framework, demonstrate how we automate the fall detection pipeline, design an appropriate UI on the small screen of the watch, and implement strategies for the continuous data collection and automation of the personalization process with the limited computational and storage resources of a smartwatch. We also present the usability of such a system with nine real-world older adult participants.

Language: en

Keywords

deep learning; edge computing; Fall detection; model personalization; smart health

Validating the ability of a portable shoe-floor friction testing device, NextSTEPS, to predict human slips

Beschorner KE, Chanda A, Moyer BE, Reasinger A, Griffin SC, Johnston IM. *Appl. Ergon.* 2022; 106: e103854.

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DOI 10.1016/j.apergo.2022.103854 **PMID** 35973317

Abstract

Measuring shoe-floor friction is critical for assessing the safety of footwear products. Portable devices for measuring coefficient of friction (COF) are needed. This study introduces such a device and evaluates its ability to predict human slip events across shoe designs. A portable device (18 kg) was utilized to measure 66 unique shoe-floor-fluid coefficients of friction (COF). Consistent with the shoes, flooring, and fluid contaminants from the COF tests, participants (n = 66) were unexpectedly exposed to the fluid while walking. Slip predictions were made based on a separate training data set. Slip predictions were made prospectively and using logistic regression analyses. The slip predictions were valid ($p < 0.001$), 91% sensitive, and 64% specific. The logistic regression fit also revealed that the COF values predicted slip outcomes ($p = 0.006$). This device is expected to expand the capacity of researchers, product developers, forensic engineers, and safety professionals to prevent slips and enhance human safety.

Language: en

Keywords

Coefficient of friction; And falls; Footwear; Slips; Trips; Validation studies

Validity of a fall risk assessment score sheet for patients hospitalized in general wards

Hagino T, Ochiai S, Senga S, Yamashita T, Saito M, Wako M, Taniguchi N, Ando T, Haro H. Nagoya J. Med. Sci. 2022; 84(2): 311-318.

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DOI 10.18999/nagjms.84.2.311 PMID 35967934

Abstract

Falls (including fall on same level and fall to a lower level) are frequent medical accidents among hospitalized patients. We investigated the status of falls in our hospital, aiming to verify the usefulness of a fall risk assessment sheet and identify the risk factors of falls. 5219 patients who were admitted to the general wards of our hospital between April 2016 and March 2019 were studied. Patient background data and the result of risk assessment based on a fall risk assessment score sheet at admission were registered. The frequency and location of falls during hospitalization, and the impact on patients were investigated. Risk factors for falls were analyzed based on the assessment results at admission. 218 falls occurred during hospitalization in 152 of 5219 patients (2.9%). The most common location of falls was bedside (68%). Falls occurred at night in 28%. The impact of falls was level 1 in 18 patients, level 2 in 117, level 3a in 11, and level 3b in 6 (all had head injuries, and one had concurrent fracture). Fall rate was 1.1% (41/3791 patients) at risk level I, 6.8% (91/1335 patients) at level II, and 21.5% (20/93 patients) at level III. Multiple logistic regression analysis identified age, history of fall, tendency to act without pressing nurse call button, unstable gait, unstable when standing, and use of narcotic as risk factors of falls. The incidence of falls at our hospital was lower compared to previous reports, and fall risk assessment was useful overall.

Language: en

Keywords

Falls; risk assessment; risk factor