Preventing falls in dementia: the state of current research:
References and Abstracts

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BACKGROUND: Falls are a major cause of morbidity and mortality in dementia, but there have been no prospective studies of risk factors for falling specific to this patient population, and no successful falls intervention/prevention trials. This prospective study aimed to identify modifiable risk factors for falling in older people with mild to moderate dementia.

METHODS AND FINDINGS: 179 participants aged over 65 years were recruited from outpatient clinics in the UK (38 Alzheimer’s disease (AD), 32 Vascular dementia (VAD), 30 Dementia with Lewy bodies (DLB), 40 Parkinson’s disease with dementia (PDD), 39 healthy controls). A multifactorial assessment of baseline risk factors was performed and fall diaries were completed prospectively for 12 months. Dementia participants experienced nearly 8 times more incident falls (9118/1000 person-years) than controls (1023/1000 person-years; incidence density ratio: 7.58, 3.11-18.5). In dementia, significant univariate predictors of sustaining at least one fall included diagnosis of Lewy body disorder (proportional hazard ratio (HR) adjusted for age and sex: 3.33, 2.11-5.26), and history of falls in the preceding 12 months (HR: 2.52, 1.52-4.17). In multivariate analyses, significant potentially modifiable predictors were symptomatic orthostatic hypotension (HR: 2.13, 1.19-3.80), autonomic symptom score (HR per point 0-36: 1.055, 1.012-1.099), and Cornell depression score (HR per point 0-40: 1.053, 1.01-1.099). Higher levels of physical activity were protective (HR per point 0-9: 0.827, 0.716-0.956).

CONCLUSIONS: The management of symptomatic orthostatic hypotension, autonomic symptoms and depression, and the encouragement of physical activity may provide the core elements for the most fruitful strategy to reduce falls in people with dementia. Randomised controlled trials to assess such a strategy are a priority.


To determine the annual incidence of fall-related injuries among community-dwelling elderly people with dementia and to identify the factors predicting those likely to sustain such injuries, we conducted a cohort study with a one-year follow-up. As predicting factors, we paid particular attention to behavioural problems and difficulties in helping with activities of daily living based on the Assessment of Basic Care for the Demented (ABCD) scale. Thirty-five of 86 final study subjects and nine of 98 final control subjects sustained fall-related injuries. Significant factors associated with fall-related injuries to demented elderly subjects were ABCD score (adjusted odds ratio 0.73, 95% confidence interval 0.60-0.89), history of falls in the past year (3.65, 1.34-9.95), and Barthe index score (1.04, 1.00-1.08). This highlights the predictive value of better physical function but more difficult care status in relation to ADL for fall-related injuries.
Falls were assessed for 3 months using a daily fall diary in 65 (30 dementia with Lewy bodies, DLB; 35 Alzheimer’s disease, AD) dementia patients from a case register, diagnosed using operationalised clinical criteria, with established accuracy against post-mortem. Multiple falls (>5) occurred in 37% of DLB patients and 6% of those with AD, often resulting in injury. None of the standard risk assessment tools identified fallers, but they did identify multiple fallers. More detailed evaluation methods examining gait patterns, sway and neurovascular instability were not helpful. Multiple falls were associated with DLB, parkinsonism, previous falls, greater impairment of activities of daily living and older age. Falls are particularly common in DLB sufferers and may aid diagnosis. Treatment studies evaluating fall reduction strategies are a priority.

Person-centered, nonpharmacological interventions for managing Alzheimer’s/dementia-related behavioral disturbances have received significant attention. However, such interventions are quite often of a single type limiting their benefits. We develop a comprehensive nonpharmacological intervention, the Behavior-Based Ergonomic Therapy (BBET), which consists of multiple therapies. This low-cost, 24/7 program uses learning, personality, and behavioral profiles and cognitive function of each resident to develop a set of individualized therapies. These therapies are made available through an accessible resource library of music and video items, games and puzzles, and memory props to provide comfort or stimulation depending on an individual resident's assessment. The quantitative and qualitative benefits of the BBET were evaluated at the dementia care unit in a not-for-profit continuing care retirement community in west central Ohio. The 6-month pilot study reduced falls by 32.5% and markedly reduced agitation through increased resident engagement.

OBJECTIVE: to evaluate the impact of a staff-oriented intervention on the number of accidental falls in residents with and without cognitive impairment. DESIGN: clustered randomised controlled trial. METHODS: ten nursing wards from 7 nursing homes were randomised in a control (5 wards) and intervention (5 wards) group. The nurses from the intervention group received multi-faceted training about the occurrence of accidental falls, risk factors for falls and possible environmental modifications. For each fall they were asked to record the relevant risk factors, to keep a fall diary and to evaluate fall causes and possible preventive actions. For all residents, cognition and mobility were evaluated using a Mini-Mental State Examination (MMSE) and a Timed Up and Go Test (TUGT). Fall rates were recorded in an identical way for 6 months before and after the start of the intervention. MAIN OUTCOME MEASURES: primary outcome measure was the number of participants with at least one accidental fall requiring an intervention by a physician or a nurse during each period of recording. Secondary outcome was the number of falls for each participant during each period of recording. RESULTS: the relative risk of falling at least once in people of the intervention versus the control group adjusted for the pre-intervention results was 0.46 (95% CI: 0.26-0.79). There was no difference between residents with and without cognitive impairment or impaired mobility. In those falling at least once, the difference between the average number of falls in the two
interim arms was not significant (P = 0.10). CONCLUSION: a simple staff-oriented intervention had a substantial effect on the frequency of accidental falls.


The prevention of fall-related injuries in patients with Alzheimer-type dementia (ATD) is hampered by an incomplete understanding of their causes. We studied falls and fractures in 157 ATD patients, including 117 with three-year follow-up. Initially all but one patient could walk; 31% reported falls. During follow-up, 50% either fell or became unable to walk. The fracture rate during follow-up (69/1000/y) was more than three times the age- and sex-adjusted fracture rate in the general population. Features of both ATD and comorbid conditions contributed to the risk of falls and fractures. In particular, patients who experienced toxic reactions to drugs on entry into the study were more likely to report they had fallen prior to entry (odds ratio, 4.9; 95% confidence interval, 1.78 to 13.3), and patients who wandered were more likely to sustain fractures (odds ratio, 3.6; 95% confidence interval, 1.25 to 10.4) during the follow-up period, including hip fractures for which the odds ratio of 6.9 (95% confidence interval, 1.66 to 28.6) was unexpectedly high. Preventive measures may be possible, including controlling wandering, avoiding toxic reactions to drugs, and treating comorbid illnesses.


We sought to identify clinical risk factors for falls in people with advanced Alzheimer disease (AD) in a prospective longitudinal observational study set in specialized AD care units. Forty-two patients with probable or possible AD were recruited. Age, sex, Mini-Mental Status Examination, Clinical Dementia Rating Scale, Neuropsychiatric Inventory/Nursing Home, Morse Fall Scale (MFS), modified Unified Parkinson's Rating Scale (mUPDRS), and gait parameters using a GAITRite Gold Walkway System with and without dual-task performance were examined. Time to a first fall was the primary outcome measure, and independent risk factors were identified. Participating subjects were old (non-fallers age, 82.3 +/- 6.7 years; fallers: 83.1 +/- 9.6 years; p = 0.76) and predominantly women (36 female/6 male). Fallers did not differ from non-fallers on any parameter except the MFS (non-fallers: 35.6 +/- 26.1; fallers: 54.4 +/- 29.8; p = 0.04), the UPDRS (non-fallers: 4.75 +/- 3.98; fallers: 7.61 +/- 4.3; p = 0.03) and cadence (steps per minute: non-fallers: 102.3 +/- 12.3; fallers: 91.7 +/- 16; p = 0.02). Fallers and non-fallers were equally affected by dual-task performance. The hazard ratios for MFS, UPDRS, and cadence were not affected by adjusting for age, sex, MMSE, or NPI scores. In conclusion, falls in advanced AD can be predicted using simple clinical measures of motor impairment or cadence. These measures may be useful for targeting interventions.


People with dementia are at increased risk of falling. The purpose of this study was to identify predisposing risk factors for falls in older people with and without a diagnose of dementia living in residential care facilities, and to compare the results. Eighty-three residents without dementia (mean age +/- S.D.: 83.5 +/- 7.1 years) and 103 with dementia (83.6 +/- 6.3 years) in Umea, Sweden, participated. The baseline assessment included probable risk factors like walking ability, diagnoses and treatment with drugs. The follow-up period was 6 months. In people with dementia, the fall rate was higher (crude incidence rate ratio 2.55, 95% CI 1.60-4.08) and a larger proportion experienced falls (62% versus 41%). In the group without dementia 54.8% of the variation in falls was explained by a model including orthostatism,
"women walking with aid", and treatment with Angiotensin Converting Enzyme (ACE) inhibitors. In the group with dementia 25.5% of the variation in falls was explained by a model including "man walking with aid". Our results show that with the same set of common risk factors for falls a considerably lower proportion of the variation in falls can be explained in the group of people with dementia.


People with dementia have an increased risk of falling. Predisposing factors explain only a small part of the variation in falls among people with dementia. The purpose of this study was to explore circumstances that are hazardous regarding falls among people with dementia at a psychogeriatric ward. The study comprised 191 participants of whom seventy-five fell a total of 229 times. Prospective data were collected on falls. Hazardous circumstances were calculated in two ways. Firstly possible differences between day/night falls and women/men falls were calculated based on the 229 falls. Secondly time to first fall was used to estimate hazardous circumstances and was based on 75 falls. This study shows a fall rate that was equally high during the night and the day. The proportion of diurnal rhythm disturbances and activity disturbances was higher for falls at night than for falls during the day. Circumstances associated with an increased risk of falls, as shown by a short time to first fall, were anxiety, darkness, not wearing any shoes and, for women, urinary tract infection. All of these are circumstances that should be considered in future fall-related research among people with dementia.


BACKGROUND AND PURPOSE: Presence of dementia influences postural control and increases fall risk. The 7-item physical performance test (PPT) is a valid measure of balance in older adults; however, its validity has not been established in people with dementia. The purpose of this research was to establish predictive validity of the PPT for falls in people with dementia. METHODS: Subjects with dementia (N=34, mean MMSE score 18.4 + 3.3) were tested with the PPT and then followed for four months for fall occurrences. DATA ANALYSIS: A stepwise logistic regression (variables of age, previous history of a fall, and PPT score) determined predictors of a fall. Sensitivity, specificity, and likelihood ratios for each of the significant measures were calculated. RESULTS: Twelve subjects (35%) reported at least one fall in the four months. History of a fall in the previous six months was the only significant predictor of a subsequent fall (p=.044), increasing the odds by almost five times. Calculated sensitivity and specificity for history of a fall were 58% and 77% respectively and positive and negative likelihood ratios were 2.52 and .58 respectively. DISCUSSION: A fall in the previous six months was the strongest predictor of a fall in the subsequent four months in people with dementia. Score on the PPT was not a significant predictor of falls. Further research is warranted, however, since 8 of the 13 subjects falsely identified as a fallder by their PPT score (false positives) had other strong indicators of postural control dysfunction.


OBJECTIVE: Falls are common in patients with Alzheimer's disease (AD). Identification of the potential risk factors and developing preventive strategies for falls will have a significant impact in maintaining the quality of life in AD. PATIENTS: Clinical follow-up of 124 (74.1+/-6.1 years, range 62-88) mild to moderate AD patients in an outpatient memory clinic. METHODS: Postural sway, cognitive function, use of neuroleptics, severity of periventricular and deep white matter
lesions, and the presence or absence of silent brain infarctions on magnetic resonance imaging were assessed at baseline. RESULTS: A total of 104 patients (84%) completed the study. Fall events were confirmed in 42.3% (44/104). After adjustment for age, gender, and cognitive status, a high grade of periventricular white matter lesions (odds ratio 8.7 [95%CI 1.5 to 51.8], p = 0.017) and neuroleptic drug use (odds ratio 3.5 [95%CI 1.2 to 10.5], p = 0.027) were significantly associated with an increased risk of falls. CONCLUSION: Our results suggest that periventricular white matter lesions and the use of neuroleptics may be related to falls in mild to moderate AD. A comprehensive risk management of brain ischemia as well as the use of the smallest efficacious dose of neuroleptics in the treatment of behavioral and psychiatric symptoms of AD should be recommended to help reduce the risk of unexpected falls.


Repeated falls are reported as one of the clinical characteristics in dementia with Lewy bodies (DLB). We examined the incidence of fall-related injuries in 561 dementia patients with various clinical diagnoses, including DLB and Alzheimer's disease (AD), in a ward established for dementia research. The incidence of fall-related injuries was significantly higher in DLB patients (10.7%) than in AD patients (1.1%) (P < 0.001). The high incidence in those patients with DLB cannot be attributed to Parkinsonism because none of the DLB patients with injuries showed extrapyramidal sign. Our observations suggest that patients with a clinical diagnosis of DLB have a high risk of fall-related injuries, even though they do not show Parkinsonism. An appropriate clinical discrimination between DLB and AD is recommended to manage and prevent fall-related injuries.


OBJECTIVE: To quantify the association between use of antipsychotic (AP) medications and the risk of hip fracture among older adults residing in a nursing home (NH) and afflicted with dementia. DESIGN: Nested case-control study. SETTING: NHs in California, Florida, Illinois, New York, and Ohio in 2001-2002 (N=586). PARTICIPANTS: The source population consisted of long-stay Medicaid-eligible residents living in NHs with at least 20 beds, who were 65 years of age or older and had a diagnosis of dementia but were not receiving hospice care, were not comatose, bedfast, paralyzed, or in a wheelchair, and had no record of a previous hip fracture (N=69,027). There were 764 cases of hip fracture identified; up to 5 controls, matched to cases on NH and quarter of Minimum Data Set (MDS) assessment, were randomly selected from the source population (N=3582). MEASUREMENTS: Cases of hip fracture were identified and medication use was ascertained from Medicaid claims data. Resident-level characteristics, including dementia severity, were obtained from resident MDS assessments. RESULTS: Current use of APs conveyed a small increased risk of hip fracture (adjusted odds ratio=1.26; 95% confidence interval: 1.05 -1.52). When analyzed separately, users of conventional antipsychotics had a slightly higher risk of hip fracture than residents on atypical agents. Long-term use of APs conferred a greater risk of hip fracture than short-term use. CONCLUSION: APs appear to increase the risk of hip fracture among older adults with dementia residing in an NH. Hip fractures may be a contributory mechanism to the increased risk mortality observed among AP users. Copyright 2010 American Medical Directors Association. Published by Elsevier Inc. All rights reserved.
OBJECTIVES: To evaluate the effectiveness of a multifactorial fall and injury prevention program in older people with higher and lower levels of cognition.

DESIGN: A preplanned subgroup comparison of the effectiveness of a cluster-randomized, nonblinded, usual-care, controlled trial. SETTING: Nine residential facilities in Umeå, Sweden. PARTICIPANTS: All consenting residents living in the facilities, aged 65 and older, who could be assessed using the Mini-Mental State Examination (MMSE; n = 378). An MMSE score of 19 was used to divide the sample into one group with lower and one with higher level of cognition. The lower MMSE group was older (mean +/- standard deviation = 83.9 +/- 5.8 vs 82.2 +/- 7.5) and more functionally impaired (Barthel Index, median (interquartile range) 11 (6-15) vs 17 (13-18)) and had a higher risk of falling (64% vs 36%) than the higher MMSE group. INTERVENTION: A multifactorial fall prevention program comprising staff education, environmental adjustment, exercise, drug review, aids, hip protectors, and postfall problem-solving conferences. MEASUREMENTS: The number of falls, time to first fall, and number of injuries were evaluated and compared by study group (intervention vs control) and by MMSE group. RESULTS: A significant intervention effect on falls appeared in the higher MMSE group but not in the lower MMSE group (adjusted incidence rates ratio of falls P =.016 and P =.121 and adjusted hazard ratio P <.001 and P =.420, respectively). In the lower MMSE group, 10 femoral fractures were found, all of which occurred in the control group (P =.006). CONCLUSION: The higher MMSE group experienced fewer falls after this multifactorial intervention program, whereas the lower MMSE group did not respond as well to the intervention, but femoral fractures were reduced in the lower MMSE group.


OBJECTIVE: Authors evaluated the association between use/dosage of risperidone (RIS) and falls in a residential-care dementia population. METHODS: Authors performed secondary analysis of data from ambulatory patients in a randomized, double-blind, placebo-controlled, 12-week trial of three RIS dosages (0.5 mg/day, 1 mg/day, 2 mg/day). Outcomes included number of fallers, rate of falls, and time until the first fall after randomization. Additional analyses evaluated wandering as a potential moderating or mediating variable. RESULTS: The ambulatory sample included 537 subjects. Of those, 22.3% on placebo, 18.0% on RIS 0.5 mg/day, 12.7% on 1 mg/day, and 27.3% on 2 mg/day, respectively, fell during the trial. The difference between the RIS 1 mg/day group and placebo was significant, with a significantly lower hazard ratio in the RIS 1-mg/day group than placebo. Wandering was associated with an increased risk of falls. Among 205 patients with the highest levels of wandering at baseline, RIS 1 mg/day was associated with approximately a 70% reduction in risk for falls versus placebo condition. However, in those with the lowest levels of wandering at baseline, RIS 2 mg/day may have increased the risk of falls. CONCLUSIONS: Evaluating the benefits versus risks of risperidone in patients with dementia is complex and must consider multiple outcomes as a function of dose. At 1 mg/day, RIS was associated with decreased falls, especially in patients who exhibit wandering. However, at 2 mg/day, it may increase the risk of falls in ambulatory individuals with low levels of wandering.


AIM: We investigated the usefulness of the fall-predicting score, a simple screening test to identify patients at high risk of falls in outpatients with cognitive impairment.
METHODS: This was a 1-year prospective study. Seventy-nine patients (28 men and 51 women, 78.1 +/- 5.9 years old) in the Memory Impairment Outpatient Clinic of Kyorin University Hospital. History of falls in the past year, record of falls in the follow-up period (1 year), fall-predicting score, time of standing on one foot, timed Up & Go test, tandem gait, functional reach, grip strength, maximum circumference of the legs and blood laboratory tests were measured. RESULTS: Of the 79 subjects, 38 (48.1%) had experienced falls in the past year, and 29 (36.7%) experienced falls during the follow-up period. Comparing the two groups with and without a history of falls during the follow-up period, a significant difference was observed in fall-predicting score, timed Up & Go test, tandem gait and functional reach. Logistic regression analysis revealed that fall-predicting score was the only significant determinant for predicting future falls. Furthermore, fall-predicting score correlated with timed Up & Go, duration of standing on one foot, functional reach, grip strength and tandem gait. When the chi(2)-test was performed to investigate the correlation between individual items of the fall-predicting questions and falls during the follow-up period, "Do you use a stick when you walk?" and "Are there any obstacles in your house?" showed a significant difference (P < 0.05). CONCLUSION: Fall-predicting score is useful as a screening test to predict future falls in patients with cognitive decline.


OBJECTIVES: To evaluate the effect of cholinesterase inhibitors (ChEIs) and memantine on the risk of falls, syncope, and related events, defined as fracture and accidental injury. DESIGN: Meta-analysis of randomized controlled trials that were identified from MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (no language restriction, through July 2009), and manual search. SETTING: Community and nursing homes. PARTICIPANTS: Participants in fifty-four placebo-controlled randomized trials and extension studies of ChEIs and memantine that reported falls, syncope, and related events in cognitively impaired older adults. MEASUREMENTS: Falls, syncope, fracture, and accidental injury. RESULTS: ChEI use was associated with greater risk of syncope (odds ratio (OR)=1.53, 95% confidence interval (CI)=1.02-2.30) than placebo but not with other events (falls: OR=0.88, 95% CI=0.74-1.04; fracture: OR=1.39, 95% CI=0.75-2.56; accidental injury: OR=1.13, 95% CI=0.87-1.45). Memantine use was associated with fewer fractures (OR=0.21, 95% CI=0.05-0.85) but not with other events (falls: OR=0.92, 95% CI=0.72-1.18; syncope: OR=1.04, 95% CI=0.35-3.04; accidental injury: OR=0.80, 95% CI=0.56-1.12). There was no differential effect according to type and severity of cognitive impairment, residential status, or length of follow-up, although because of underreporting and small number of events, a potential benefit or risk cannot be excluded. CONCLUSION: ChEIs may increase the risk of syncope, with no effects on falls, fracture, or accidental injury in cognitively impaired older adults. Memantine may have a favorable effect on fracture, with no effects on other events. More research is needed to confirm the reduction in fractures observed for memantine. Copyright 2011, Copyright the Authors. Journal compilation Copyright 2011, The American Geriatrics Society.


OBJECTIVES: To determine the extent to which the use of a clinical informatics tool that implements prospective monitoring plans reduces the incidence of potential delirium, falls, hospitalizations potentially due to adverse drug events, and mortality. DESIGN: Randomized cluster trial. SETTING: Twenty-five nursing homes serviced
by two long-term care pharmacies. PARTICIPANTS: Residents living in nursing homes during 2003 (1,711 in 12 intervention; 1,491 in 13 usual care) and 2004 (1,769 in 12 intervention; 1,552 in 13 usual care). INTERVENTION: The pharmacy automatically generated Geriatric Risk Assessment MedGuide (GRAM) reports and automated monitoring plans for falls and delirium within 24 hours of admission or as part of the normal time frame of federally mandated drug regimen review.

MEASUREMENTS: Incidence of potential delirium, falls, hospitalizations potentially due to adverse drug events, and mortality. RESULTS: GRAM triggered monitoring plans for 491 residents. Newly admitted residents in the intervention homes experienced a lower rate of potential delirium onset than those in usual care homes (adjusted hazard ratio (HR)=0.42, 95% confidence interval (CI)=0.35-0.52), overall hospitalization (adjusted HR=0.89, 95% CI=0.72-1.09), and mortality (adjusted HR=0.88, 95% CI=0.66-1.16). In longer stay residents, the effects of the intervention were attenuated, and all estimates included unity. CONCLUSION: Using health information technology in long-term care pharmacies to identify residents who might benefit from the implementation of prospective medication monitoring care plans when complex medication regimens carry potential risks for falls and delirium may reduce adverse effects associated with appropriate medication use. Copyright 2011, Copyright the Authors. Journal compilation Copyright 2011, The American Geriatrics Society.


OBJECTIVES: To examine the frequency of environmental hazards in the homes and care environments of patients with dementia and their associations with falls. METHOD: Falls were prospectively assessed in 65 dementia patients using carer diaries, and the safety of the environment assessed by an occupational therapist using a home hazard checklist. RESULTS: Hazards were found in 20 (95%) of patients' own homes and 31 (74%) of residential or nursing home environments (care environments). Patients' homes had a mean of 5.4 hazards compared to a mean of 1.8 hazards in care environments, with two or more hazards in 90% of patients' homes and 52% of care environments. Common hazards included low chairs, an absence of grab rails (toilet area), toilets too low and a missing second banister on the stairs. There was no significant association between the number of hazards and the number of falls, although 13 (10%) falls could be attributed to a specific hazard. CONCLUSION: Rigorous assessment of the patient's environment revealed multiple rectifiable risks that were contributory to a significant minority of falls. Copyright 2000 John Wiley & Sons, Ltd.


BACKGROUND/AIMS: Elderly patients with dementia have a higher risk of falls and fractures as compared to cognitively intact elderly subjects. To investigate whether psychological distress of the caregiver might predispose older persons with Alzheimer disease (AD) to falls and fractures, we performed a prospective cohort study. METHODS: A consecutive series of 110 subjects with dementia underwent baseline and follow-up clinical and functional evaluations. The burden of the caregivers was recorded at baseline. Any intervening fall or fracture was ascertained at the 1-year follow-up. RESULTS: The caregiver burden was significantly higher in persons involved in the care of patients with AD who subsequently fell. In a multivariate regression model, the caregiver burden score predicted falls and fractures. CONCLUSION: Part of the increased risk of falls and fractures in AD might
be due to the distress of caregivers, a factor potentially amenable to treatment. Copyright 2010 S. Karger AG, Basel.


In this study, 97 patients with senile dementia of the Alzheimer type (SDAT) in a nursing home were followed over a period of 2 years, and the relationship between falls and gait function was examined. The findings indicated that the number of fallers was significantly higher in moderate-stage SDAT patients than in the mild-stage patients. In the moderate-stage SDAT patients, walking speed and stride length, measured as indices to evaluate gait function, were significantly lower, and the stride length variability was significantly higher than in mild-stage patients. When comparing the gait indices of fallers and non-fallers by the severity of dementia, a significant difference was observed only in stride length variability. The gait abnormality associated with advanced severity in dementia is believed to be a factor affecting falling. In particular, stride length variability appeared to be an effective predictor of falling.


OBJECTIVES: To evaluate the evidence for strategies to prevent falls or fractures in residents in care homes and hospital inpatients and to investigate the effect of dementia and cognitive impairment. DESIGN: Systematic review and meta-analyses of studies grouped by intervention and setting (hospital or care home). Meta-regression to investigate the effects of dementia and of study quality and design. DATA SOURCES: Medline, CINAHL, Embase, PsychInfo, Cochrane Database, Clinical Trials Register, and hand searching of references from reviews and guidelines to January 2005. RESULTS: 1207 references were identified, including 115 systematic reviews, expert reviews, or guidelines. Of the 92 full papers inspected, 43 were included. Meta-analysis for multifaceted interventions in hospital (13 studies) showed a rate ratio of 0.82 (95% confidence interval 0.68 to 0.997) for falls but no significant effect on the number of fallers or fractures. For hip protectors in care homes (11 studies) the rate ratio for hip fractures was 0.67 (0.46 to 0.98), but there was no significant effect on falls and not enough studies on fallers. For all other interventions (multifaceted interventions in care homes; removal of physical restraints in either setting; fall alarm devices in either setting; exercise in care homes; calcium/vitamin D in care homes; changes in the physical environment in either setting; medication review in hospital) meta-analysis was either unsuitable because of insufficient studies or showed no significant effect on falls, fallers, or fractures, despite strongly positive results in some individual studies. Meta-regression showed no significant association between effect size and prevalence of dementia or cognitive impairment. CONCLUSION: There is some evidence that multifaceted interventions in hospital reduce the number of falls and that use of hip protectors in care homes prevents hip fractures. There is insufficient evidence, however, for the effectiveness of other single interventions in hospitals or care homes or multifaceted interventions in care homes. [References: 29]

Risk of falling is a major concern of long-term care facilities with residents diagnosed with dementia. Use of a brief cognitive assessment focusing on visual spatial abilities could be one strategy in the prevention of falls in residents with dementia. The objective of this study was to determine if a clock test could predict a risk of falls in residents with dementia. A total of 364 individuals with dementia participated (92 men and 272 women; ages 37 to 100, mean 80.5 years, median 83 years). Each participant was given the Reality Comprehension Clock Test (RCCT) three times, and Mini Mental Status Examination (MMSE) two times to determine criterion-related validity, test-retest reliability, internal consistency; and to set and evaluate a risk of falls score based on the Visual Spatial Score (VSS) component produced by the RCCT. Significant findings included .72 (p < .01) correlation between the RCCT and the MMSE, .90 (p < .01) correlation between the first administration of the RCCT and the second administration of the RCCT; an alpha of .95 (p, < .001) and an F value of 7.6 (p < .001) producing a risk of falls initial VSS of 5 or lower compared to 9 or greater. Chi-square of 6.3 for 30 days (p, < .01), 11.08 for 60 days (p < .01) and 13.3 for 90 days (p < .01) indicated a significant difference in the number of falls occurring in the high risk group (VSS of 5 or lower) compared to the low/ no risk group (VSS of 9 or higher). A risk factor analysis suggested that residents in the higher risk group were three times more likely to have fallen than residents in the low risk group. Knowing a resident’s visual spatial ability offers health care providers an opportunity to implement a resident-specific intervention that addresses their cognitive ability and visual spatial deficit that may reduce the resident’s risk of falling.


The following article is a summary of the American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons (2010). This article provides additional discussion of the guideline process and the differences between the current guideline and the 2001 version and includes the guidelines’ recommendations, algorithm, and acknowledgments. The complete guideline is published on the American Geriatrics Society’s Web site (http://www.americangeriatrics.org/health_care_professionals/clinical_practice/clinical_guidelines_recommendations/2010/). Copyright 2011, Copyright the Authors. Journal compilation Copyright 2011, The American Geriatrics Society.


BACKGROUND: Falls are a major cause of morbidity and mortality among elderly people, and people with dementia run an increased risk of falling. The aim of this study is to identify risk factors for falls in people with dementia. METHOD: The study was performed over a six-month period in northern Sweden using a sample of 160 residents living in 20 group dwellings for people with dementia. RESULTS: Sixty-four residents (40%) sustained at least one fall during the period. The total number of falls during the study period was 191, and the fall incidence was 2.6 per person year (169 falls/130 residents). Using logistic regression analysis, the independent risk factors strongly associated with falling were: requiring help with hygiene, displaying verbally disruptive/attention-seeking behavior, able to rise from a chair, walking with assistive devices, and participating in outdoor walks. These factors explained 36.1% of the variance in falls with a concordance of 79.6%. Thirty-five percent of the falls occurred between 9 pm and 6 am, with a peak between 5 pm and 6 pm. Symptoms preceding the falls were anxiety (31.1%) and confusion (13.3%). CONCLUSION: Among residents with dementia it is important to identify those who run an increased risk of
falling and need more careful supervision, especially in the evening and during the night. In addition, the causes of anxiety and confusion have to be prevented and treated.


PURPOSE: Older adults with Alzheimer disease (AD) fall more than twice as often as those without dementia, yet few studies have assessed fall risk in this population. The purpose of the study was to determine whether a fall assessment, the Physical Performance Test 7-item (PPT 7-item), could accurately identify subjects with history of falls in a group of community-dwelling elders with mild AD. An additional purpose was to determine whether the PPT 7-item, a cognitive screen, and/or nonperformance data could predict falling in this population. METHODS: Forty-three community-dwelling elders diagnosed with mild AD completed the fall risk assessment. In addition, the following data were collected: Mini-Mental State Examination (MMSE) score, age, gender, education, gait aid use, number of falls in the past 6 months, and history of fall-related injury. RESULTS: There was a significant difference in the PPT 7-item total score between subjects with history of falls and subjects without history of falls (z = -2.04, P = .042), with items related to turning (z = -2.56, P = .01) and walking (z = -2.89, P = .004) accounting for most of the difference. However, only gait aid usage predicted falling (45.8% of the variance). CONCLUSION: While the PPT 7-item was able to detect differences in mobility between subjects with history of falls and subjects without history of falls in subjects with mild AD, total PPT 7-item score did not predict falling. Gait aid usage was more strongly related to falling in these subjects. Early detection of fall risk in individuals with mild AD is important to prevent injuries and moderate costs of care.


To estimate the number of fallers and risk factors for falls in a cohort with dementia, we did a secondary analysis of a cluster-randomized controlled trial (NutriAlz) in 11 outpatient and day care centers in Catalonia (Spain) including 626 community-dwelling patients with dementia, followed for 12 months. Participants' characteristics were assessed at baseline, at 6 and 12 months [fall in the earlier 6 mo, anthropometric data, comorbidities, Mini-Mental State Examination, Clinical Dementia Rating, Basic Activities of Daily Living (BADL), Instrumental Activities of Daily Living, Neuropsychiatric Inventory Questionnaire, Zarit Caregiver Burden Interview and Mini-Nutritional Assessment]. Multivariate logistic regression models and generalized linear models were used to explore risk factors for falls and changes in health and function. Two hundred twenty-three participants fell during the 12 months follow-up (35.62%). Risk factors identified for falls were age (odds ratio (OR)=1.03, 95% confidence interval (CI), 1.00-1.05), BADL (OR=1.18, 95% CI, 1.05-1.32), and earlier fall (OR=2.30, 95% CI, 1.57-3.35). Fallers had worse health than nonfallers, and their dependence increased significantly more in BADL during the study, compared with nonfallers. Dependence in BADL is a risk factor and a consequence of falls; interventions aimed at preventing falls in dementia patients could promote autonomy in BADL and slow its decline.


Incidence of hip fracture among patients with Alzheimer's disease (AD), especially in elderly patients, is high. To analyze risk factors of hip fracture, we prospectively studied a cohort of elderly female patients with AD. Subjects studied were 225 female patients with AD, and the average age was 76 years old. At baseline, we recorded body mass index (BMI), a score of Mini-Mental State Examination (MMSE)
and bone mineral density (BMD), and measured serum concentrations of ionized
calcium, intact parathyroid hormone (PTH), pyridinoline cross-linked carboxyterminal
telopeptide of type I collagen (ICTP), intact bone Gla protein (BGP), 25-
hydroxyvitamin (25-OHD) and 1, 25-dihydroxyvitamin D (1, 25-[OH]2D). The patients
were followed for 2 years. During the 2-year study, hip fractures occurred in 29
patients. We compared baseline variables between the 29 patients with and 176
patients without hip fracture. AD patients with lower BMD, low concentrations of
serum ionized calcium and 25-OHD (mean 3.0 ng/ml) with compensatory
hyperparathyroidism were found to have an increased risk of hip fracture. Also,
concentrations of serum ICTP and BGP were higher in the fracture group than in the
nonfracture group. Elderly female AD patients with low BMD and serum 25-OHD
concentrations <5 ng/ml with secondary hyperparathyroidism have a high risk of hip
fracture, and the risk may be reduced by vitamin D supplementation.

ergocalciferol plus calcium supplementation in elderly women with Alzheimer disease: a
randomized controlled trial." Archives of Internal Medicine 165(15): 1737-42.

BACKGROUND: A high incidence of fractures, particularly of the hip, represents an
important problem in patients with Alzheimer disease (AD), who are prone to falls
and have osteoporosis. We previously found that deficiency of 25-hydroxyvitamin D
and compensatory hyperparathyroidism cause reduced bone mineral density in
female patients with AD. We address the possibility that treatment with risedronate
sodium and ergocalciferol plus calcium supplementation may reduce the incidence of
nonvertebral fractures in elderly women with AD. METHODS: A total of 500 elderly
women with AD were randomly assigned to daily treatment with 2.5 mg of
risedronate sodium or a placebo, combined with 1000 IU of ergocalciferol and 1200
mg of elementary calcium, and followed up for 18 months. RESULTS: At baseline,
patients of both groups showed 25-hydroxyvitamin D deficiency with compensatory
hyperparathyroidism. During the study period, bone mineral density in the risedronate
group increased by 4.1% and decreased by 0.9% in the control group. Vertebral
fractures occurred in 29 patients (24 hip fractures) in the control group and 8 patients
(5 hip fractures) in the risedronate group. The relative risk in the risedronate group
compared with the control group was 0.28 (95% confidence interval, 0.13-0.59).
CONCLUSIONS: Elderly patients with AD hypovitaminosis D are at increased risk for
hip fracture. Treatment with risedronate and ergocalciferol may be safe and effective
in reducing the risk of a fracture in elderly patients with AD.

Shaw, F. E., J. Bond, et al. (2003). "Multifactorial intervention after a fall in older people with
cognitive impairment and dementia presenting to the accident and emergency department:
randomised controlled trial." BMJ 326(7380): 73.

OBJECTIVE: To determine the effectiveness of multifactorial intervention after a fall
in older patients with cognitive impairment and dementia attending the accident and
emergency department. DESIGN: Randomised controlled trial. PARTICIPANTS: 274
cognitively impaired older people (aged 65 or over) presenting to the accident and
emergency department after a fall: 130 were randomised to assessment and
intervention and 144 were randomised to assessment followed by conventional care
(control group). SETTING: Two accident and emergency departments, Newcastle
upon Tyne. MAIN OUTCOME MEASURES: Primary outcome was number of
participants who fell in year after intervention. Secondary outcomes were number of
falls (corrected for diary returns), time to first fall, injury rates, fall related attendances
at accident and emergency department, fall related hospital admissions, and
mortality. RESULTS: Intention to treat analysis showed no significant difference
between intervention and control groups in proportion of patients who fell during 1
year's follow up (74% (96/130) and 80% (115/144), relative risk ratio 0.92, 95%
confidence interval 0.81 to 1.05). No significant differences were found between
groups for secondary outcome measures. CONCLUSIONS: Multifactorial intervention was not effective in preventing falls in older people with cognitive impairment and dementia presenting to the accident and emergency department after a fall.


BACKGROUND: People with cognitive impairment and dementia have a poor outcome after a hip fracture surgery, about 30-50% of all those who sustain a hip fracture have dementia. Therefore the aim was to investigate whether a multidisciplinary postoperative intervention program could reduce postoperative complications and improve functional recovery among people with dementia.

METHODS: A randomized controlled trial with subgroup analyses among patients with dementia. Sixty-four patients with femoral neck fracture, aged >=70 years at Umea University Hospital, Sweden. The intervention consisted of staff education, individualized care planning and rehabilitation, active prevention, detection and treatment of postoperative complications, especially delirium. The staff worked in teams to apply comprehensive geriatric assessment, management and rehabilitation, including a follow-up at 4 months postoperatively. The control group followed conventional postoperative routines.

RESULTS: There were fewer postoperative complications in the intervention group such as urinary tract infections, p=0.001; nutritional problems, p=0.025; postoperative delirium, p=0.002; falls, p=0.006. At 4 months a larger proportion in the intervention group had regained their previous independent indoor walking ability performance, p=0.005. At 12 months a larger proportion in the intervention group had regained the activities of daily living (ADL) performance level they had before the fracture, p=0.027.

CONCLUSION: This study demonstrates that patients with dementia who suffer a hip fracture can benefit from multidisciplinary geriatric assessment and rehabilitation and should not be excluded from rehabilitation programs. Copyright Copyright 2011 Elsevier Ireland Ltd. All rights reserved.


BACKGROUND: The feasibility and predictive validity of balance and gait measures in more severe stages of dementia have been understudied. We evaluated the clinimetric properties of the Tinetti Performance Oriented Mobility Assessment (POMA) in nursing home residents with dementia with a specific objective of predicting falls in the short term. METHODS: Seventy-five ambulatory nursing home residents with dementia, mean age 81 +/- 8 years, participated in a prospective cohort study. All participants underwent the full POMA-test. Fall statistics were retrieved from incident reports during a three-months follow-up period. The predictive validity was expressed in terms of sensitivity and specificity. Loglinear regression analysis was used to examine the relationship between POMA scores and the occurrence of a fall.

RESULTS: The POMA showed several feasibility problems, with 41% of patients having problems in understanding one or more instructions. The inter-rater reliability of the instrument was good. The predictive validity was acceptable, with a sensitivity of 70-85% and a specificity of 51-61% for the POMA and its subtests, and an area under the curve (AUC) of 0.70 for POMA-Total (95% CI: 0.53-0.81), 0.67 for POMA-Balance (95% CI: 0.52-0.81), and 0.67 for POMA-Gait (95% CI: 0.53-0.81). After loglinear regression analysis, only POMA-T was significant in predicting a fall (adjusted HR = 1.08 per point lower; 95% CI 1.00-1.17).

CONCLUSIONS: Application of the POMA in populations with moderate to severe dementia is hampered by feasibility problems. Its implementation in clinical practice cannot therefore be recommended, despite an acceptable predictive validity. To
refine our findings, large prospective studies on the predictive validity of the POMA in populations with mild, moderate and severe dementia are needed. In addition, the performance of mobility assessment methods that are less dependent on cognition should be evaluated.


OBJECTIVES: To evaluate the feasibility and validity of gait parameters measured with an electronic walkway system in predicting short-term fall risk in nursing home residents with dementia. METHODS: 57 ambulatory nursing home residents with moderate to severe dementia participated in this prospective cohort study. We used the GAITRite(REGISTERED) 732 walkway system to assess gait parameters. Measurements were collected every 3 months over a 15 month period, with each measurement being a baseline for the subsequent measurement. Falls were retrieved from incident reports. The predictive validity of the GAITRite(REGISTERED) parameters was expressed in terms of sensitivity and specificity. Logistic regression analysis was conducted to examine the association between these parameters and falls occurrence within three months. RESULTS: Reduced velocity (OR=1.22; 95% CI 1.04-1.43) and reduced mean stride length (OR=1.19; 95% CI 1.03-1.40) were the best significant gait predictors of a fall within three months, with a sensitivity of 82% for velocity and 86% for mean stride length, and a specificity of 52% for velocity and for mean stride length. The test procedure took an average of 5 min per participant. Some verbal persuasion or physical cueing was necessary in 142 measurements (80.7%). CONCLUSION: Gait parameters as measured with an electronic walkway system can be used for the prediction of short-term fall risk in nursing home residents with moderate to severe dementia. However some form of persuasion might be needed to perform the task. To refine our findings, large prospective studies on the predictive validity of gait parameters in this type of population are needed. Copyright Copyright 2012 Elsevier B.V. All rights reserved.


The contribution of specific psychotropic drugs to fall risk in patients with dementia has not been quantified precisely until now. The authors evaluated the dose-response relationship between psychotropic drugs and falls in nursing home residents with dementia. Daily drug use and daily falls were recorded in 248 nursing home residents with dementia from January 1, 2006, to January 1, 2008. For each day of the study period, data on drug use were abstracted from the prescription database, and falls were retrieved from a standardized incident report system, resulting in a data set of 85 074 person-days. The authors found significant dose-response relationships for the use of antipsychotics (hazard ratio [HR], 2.78; 95% confidence interval [CI], 1.49-5.17), anxiolytics (1.60; 1.20-2.14), hypnotics and sedatives (2.58; 1.42-4.68), and antidepressants (2.84; 1.93-4.16). Fall risk increased significantly with 28% at 0.25 of the defined daily dose (DDD) of an antipsychotic or antidepressant, with 8% at 0.2 of the DDD of an anxiolytic, and with 56% at 0.5 of the DDD of a hypnotic or sedative; it increased further with dose increments and with combinations of psychotropics. Even at low dosages, psychotropic drugs are associated with increased fall risk in nursing home residents with dementia.


AIM: The contribution of selective serotonin re-uptake inhibitors (SSRIs) to injurious fall risk in patients with dementia has not been quantified precisely until now. Our
Objective was to determine whether a dose-response relationship exists for the use of SSRIs and injurious falls in a population of nursing home residents with dementia.

**METHODS:** Daily drug use and daily falls were recorded in 248 nursing home residents with dementia from 1 January 2006 until 1 January 2008. For each resident and for each day of the study period, data on drug use were abstracted from the prescription database, and information on falls and subsequent injuries was retrieved from a standardized incident report system, resulting in a dataset of 85,074 person-days.

**RESULTS:** We found a significant dose-response relationship between injurious falls and the use of SSRIs. The risk of an injurious fall increased significantly with 31% at 0.25 of the Defined Daily Dose (DDD) of a SSRI, 73% at 0.50 DDD, and 198% at 1.00 DDD (Hazard ratio = 2.98; 95% confidence interval 1.94, 4.57). The risk increased further in combination with a hypnotic or sedative. **CONCLUSIONS:** Even at low doses, SSRIs are associated with increased risk of an injurious fall in nursing home residents with dementia. Higher doses increase the risk further with a three-fold risk at 1.00 DDD. New treatment protocols might be needed that take into account the dose-response relationship between SSRIs and injurious falls. Copyright 2012 The Authors. British Journal of Clinical Pharmacology Copyright 2012 The British Pharmacological Society.


**BACKGROUND:** Predisposing factors alone explain only a limited proportion of the variation in fall events, especially in people with dementia. The aim of this study was to identify precipitating factors for falls among people with dementia. **METHODS:** We examined prospective fall registrations over a two-year period on a psychogeriatric hospital ward in the north of Sweden. Circumstances associated with each fall event were analyzed by independent reviewers, possible precipitating factors were documented, evaluated and the most likely precipitating factors were identified. In total, 223 patients with any type of diagnosed dementia were admitted to the ward and 91 fell at least once. Of these, 46 were women and 45 were men (mean age 80.3 years, range 60-94). **RESULTS:** A total of 298 falls were registered, 62% of which were sustained by men. The most likely factor or combination of factors could be ascertained in 247 falls (83%). Falls took place at all hours but almost half of the falls (44%) occurred during the nightshift (between 9 pm and 7 am). Acute disease or symptoms of disease and/or acute drug side-effects were, alone or in combination with other factors, judged to precipitate more than three out of four falls. **CONCLUSION:** It is possible to identify many precipitating factors that may contribute to a fall. Falls in people with dementia should be regarded as a symptom of acute disease or as a drug side-effect until proven otherwise. Prompt detection of these relevant factors is, therefore, essential.


We analyzed the number and nature of falls in a nursing home for elderly patients with dementia. Staff reported 1,343 falls over a 2-year period in 240 patients, a rate of about 4 falls per person year. The risk of falling was especially high shortly after admission and after transfer to another ward, increased with severity of the dementia and physical impairment, and decreased for very severely demented or physically handicapped patients. Men had twice the risk of falling of women. Most incidents were relatively harmless, but 33 fractures were reported. The most common causes for falls were "inadequate (use of) materials, stumbling, or slipping" (17%) and "gait and equilibrium disturbances" (16%).

BACKGROUND: Confusion and cognitive impairment, are risk factors for falls in hospital. Evidence for reducing falls in cognitively-impaired patients is limited and to date no intervention has consistently been shown to reduce falls in this group of patients. We explored characteristics associated with falls in cognitively-impaired patients in a rehabilitation setting. METHODS: In a prospective observational study, 825 consecutive patients were studied. Patient characteristics were assessed on admission. Factors predisposing to falls in cognitively-impaired patients were identified. RESULTS: Cognitively-impaired patients were more likely to be fallers or recurrent fallers and more likely to sustain an injury than cognitively intact patients. They had a higher incidence of nursing home discharges and a significantly higher mortality. Logistic regression analysis showed that an unsafe gait (P < 0.001; 95% confidence interval, 0.13-0.57) was the only independent risk factor for falls in this group of patients. There was a cumulative higher risk of falling associated with an unsafe gait demonstrable throughout the patients' stay. CONCLUSION: Unsafe gait was the only significant independent risk factor for falls among cognitively-impaired patients in a rehabilitation environment. Interventions that improve gait patterns or that enhance safety for patients with abnormal gait are required if fall reduction in this group of patients is to be achieved.


OBJECTIVES: There is lack of data on the frequency and the causes of hospitalization in mild to moderate Alzheimer's disease (AD) patients. The aims of the present study were to evaluate the frequency and the causes of hospitalization in a large prospective cohort of mild to moderate patients with AD. DESIGN: Six hundred and eighty-six AD patients from the French Network on AD (REAL.FR) were followed up and assessed every 6 months for 2 years. During follow-up, all events occurring between two visits, in particular hospital admissions or nursing home placements were carefully recorded. RESULTS: Annual incidences for hospitalizations were 26.2% (95% CI, 22.5 to 29.7). After two years, 202 subjects were hospitalized for 296 hospitalizations. 139 subjects were hospitalized once, 40 twice, 13 three times, 4 four times and 2 five times during the two-year follow-up. The duration of hospitalization was 14.3 +/- 23.5 days. For repeated hospitalizations, the time interval between the first and the second hospitalization was 176.4 days (SD 150.2) and the cause of multiple hospitalizations was most different. Fractures and falls not causing fracture were the main reasons for hospital admission (20.9%), followed by cardiovascular disorders (14.5%) and by behavioural disorders (11.0%). Admission due to associated diseases or life events was the main reason for hospitalization (75.7%). CONCLUSIONS: Hospitalization is a frequent event for AD patients even at mild to moderate stage of the disease. In this cohort, the major causes for hospital admission were due to associated diseases or life events and not due to the direct consequences of the disease itself.


OBJECTIVE: To test the effectiveness of using a full-time project nurse to assist residential aged care facilities in using evidence-based approaches to falls injury prevention. DESIGN, SETTING AND PARTICIPANTS: Cluster randomised controlled trial involving 5391 residents in 88 aged care facilities in the Hunter and Lower Mid North Coast areas of New South Wales. Residents were followed for 545 days or until death or discharge. Data were collected from July 2005 to June 2007. INTERVENTION: Employment of a project nurse to encourage best-practice falls injury prevention strategies during the 17-month intervention period. MAIN OUTCOME MEASURES: Monthly data about falls, falls injury and falls injury
prevention programs; audit of hospitalisation for fractured neck of femur. RESULTS: Despite significant increases in the provision of hip protectors and use of vitamin D supplementation in both intervention and control facilities, there was no difference in the number of falls or falls injuries between the intervention and control groups, nor a reduction in falls overall. There was also no difference between the 7-month pre-intervention period and the intervention period in the number of falls or falls injuries. Factors related to residents having an increased risk of falls with fractured neck of femur included being ambulant, having dementia, increasing age, and having a high falls risk assessment score. CONCLUSION: It is difficult to change falls risk among high-risk populations, including people with dementia. The use of important strategies such as hip protectors and vitamin D and calcium supplementation increased during the study, probably with contamination of control facilities. Longer follow-up may be required to measure the impact on falls outcomes of the strategy of using a facilitating nurse. TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry ACTRN12605000540617.