

Introduction

This book describes the physical health conditions (physical comorbidities) that occur more commonly in people with dementia than in the general population. A **comorbidity** is defined as a disease or condition that coexists with another disease. The physical comorbidities of dementia that have been identified and are investigated in this review of the literature are:

- falls
- delirium
- weight loss and malnutrition
- epilepsy
- frailty
- sleep disorders
- oral disease
- visual dysfunction
- incontinence.

Method

Using the search term “exp dementia” in MEDLINE (1966–2011), articles on physical comorbidities of dementia were identified from the medical, nursing, and psychological literature. For each physical comorbidity, specific search terms were used and then combined using Boolean techniques. Results were then restricted using the tags “human” and “English language,” and then restricted further by date to those published after 1990. All abstracts from these articles were reviewed and the results were further confined to peer-reviewed publications, to exclude less robust findings. Reference lists from these articles were hand-searched for further references.

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Results

A total of 2512 full articles was obtained, and information was extracted and summarized using the one page JAPICO (Journal, Authors, Participants, Interventions, Comparisons, Outcomes) summary method. The search covered the literature up to 2011. The information has been summarized for each comorbidity in separate chapters, and recommendations have been developed based on the available evidence. The literature has not been graded according to the level of scientific evidence, but the type of study from which the information has been obtained is described in the text, and all references are provided at the end of each chapter.

Falls

Introduction

A fall is defined as an event reported by the faller or a witness, resulting in a person inadvertently coming to rest on the ground or another lower level (Shaw, 2002). Falls are a major health issue in older people, with more than 30% of those aged 65 and over reporting a fall in the previous year (AGS et al., 2001). A single fall may precipitate a downward spiral of immobility, reduced confidence and incapacity, eventually resulting in early institutionalization and death (Rowe and Fehrenbach, 2004, AGS and BGS, 2011). Studies have consistently shown that dementia is associated with an increased risk of falls, at a rate at least twice that of cognitively intact older people, with an annual incidence of falls in people with dementia of 70–80% (van Doorn et al., 2003, Allan et al., 2009). The risk of hip fracture is also increased in this population group (Weller and Schatzker, 2004), and people with dementia recover less well after a fall than those without the disease (Shaw, 2002).

Epidemiology of falls in dementia

Early studies by Campbell et al. (1981), Buchner and Larson (1987) and Tinetti et al. (1988) showed that falls were far more common in people with cognitive impairment and dementia than in those without dementia. Indeed, Tinetti and colleagues found that cognitive impairment led to a 5-fold increase in falls in a prospective 1-year study of 336 community-dwelling older people. Van Dijk et al. (1993) reported a falls rate of 4 falls per patient per year in a 2-year study of 240 nursing home patients with dementia. A prospective cohort study with 2 years' follow-up of more than 2000 nursing home residents also found a falls rate of 4 falls per patient per year, compared with 2.3 falls per year among residents without dementia, showing that dementia conferred a relative risk of 1.74 for falling (van Doorn et al., 2003). In a cross-sectional study of 2008 older residents in geriatric care settings who were cognitively impaired, Kallin et al. (2005) found that 9.4%

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had fallen in the previous week. In a prospective study of cognitively impaired older people presenting to an emergency department with a fall, 77% of the overall group fell during the 1-year follow-up period (Shaw et al., 2003). In a prospective community-based longitudinal study of older people with an 8-year period of follow-up, Anstey et al. (2006) found a strong association between decreasing cognitive function and an increasing risk of falls. In a prospective study of 140 people with dementia and 39 healthy controls, Allan and colleagues (2009) demonstrated an 8-fold increase in falls in people with dementia over a 1-year period compared with healthy controls.

Not only are people with cognitive impairment and dementia more likely to fall, but they are also more susceptible to injuries when falling (Oleske et al., 1995, Kallin et al., 2005). Sustaining a fall was the leading reason for acute hospital admission in a 3-year prospective cohort study of 827 community-dwelling older people with dementia (Rudolph et al., 2010). People with cognitive impairment are more likely to sustain a serious injury, with the annual incidence of fractures being approximately 7%, compared with a 3% annual incidence in the older population generally (Buchner and Larson, 1987, Campbell et al., 1990). In a 1-year prospective study of 112 people over the age of 55 years with dementia and 100 control subjects, Asada et al. (1996) found that 41% of the people with dementia suffered a fall-related injury, compared with only 11% of the controls. Dementia is also associated with a 3- to 4-fold increase in the risk of hip fractures and a 3-fold increase in the 6-month post-fracture mortality rate compared with older people without dementia (Vidan et al., 2005). Fall-related injuries resulting in hospitalization are important determining factors in the discharge destination of patients with dementia. In a review of 153 hospitalized patients, Rowe and Fehrenbach (2004) found that 65% of community-dwelling patients with dementia who were admitted following a fall-related injury were later discharged to institutional care, rather than returning to their pre-admission domicile.

Several studies have shown that falls are most likely to occur in those people with moderately severe dementia who are still mobile but may need help to rise from a chair, or need a helper or a walking aid (Nakamura et al., 1996, Kallin et al., 2005). Once a person's dementia is sufficiently severe to require bed confinement, a fall is no longer likely to occur.

Etiology of falls in dementia

In the general population, the risk of falling is determined by numerous factors. These include a previous history of falls, impairments of balance, muscle strength, coordination and gait, impaired vision, functional impairment, medical conditions of the heart or brain causing fainting or low blood pressure, medication use, impaired cognition and mood, environmental hazards, and inappropriate footwear (AGS et al., 2001). These factors are all relevant to patients with dementia. In addition, there are many other possible reasons why people with cognitive impairment

or dementia have an increased risk of falls, and a systematic review of prospective studies by Harlein et al. (2009) identified disease-specific motor impairments, the type and severity of dementia suffered, behavioral disturbances, neuroleptic medication, and low bone mineral density as being additional risk factors for falls in dementia.

Gait impairment in dementia

Gait and balance abnormalities are seen commonly in dementia, particularly in people with vascular dementia, diffuse Lewy body disease (DLBD), and Parkinson's disease with dementia. Similarly, a cautious gait pattern with decreased step length and height, variability in stride length, a reduced arm swing and cadence, and a flexed posture is commonly seen in Alzheimer's disease (AD) (Allan et al., 2005, Webster et al., 2006). Impairments in coordination and balance have been shown in older people with cognitive impairment and mild AD (Franssen et al., 1999), and greater stride length variability has been shown to be associated with a higher risk of falls (Nakamura et al., 1996). Waite and colleagues (2000) examined motor performance in 92 older people with dementia, and found that people with Parkinson's disease with dementia had the poorest performance, although gait abnormalities were also seen in all other types of dementia. They suggested that the gait abnormalities seen in people with Parkinson's disease with dementia were related to pathology in the substantia nigra, and to white matter ischemia in vascular dementia. In a study of 210 older people with dementia who had presented to the emergency department with a fall, 99% were found to have an impairment of gait or balance (Shaw et al., 2003).

Normal walking has been shown to require not only intact motor and sensory systems, but also intact executive control, navigational and visuospatial abilities, and attention, in order to choose an appropriate path while recognizing and avoiding hazards (Snijders et al., 2007). Good postural stability is also important for normal walking – thus poor control of postural sway, inadequate vision, and increased reaction times can all contribute to an increased risk of falling (Lord et al., 1996). Dementia can affect all of these abilities, leading to an increased risk of falling when these functions are affected. The hippocampal area of the brain is affected early in AD, and it has been shown to play a role not only in cognition, but also in gait, with functions related to the orientation of the body in space. It has been postulated that degeneration in the hippocampus causes gait disturbances as well as memory problems in people with AD (Scherder et al., 2007). A disintegration of higher cortical sensory functions in AD, including the visuospatial integration that is necessary for a motor function such as walking, has also been suggested as a reason for impaired gait and postural control (Sheridan and Hausdorff, 2007). Additionally, those with dementia may have an unrealistic perception of their own motor abilities, resulting in impulsivity and risk-taking behavior, which also contributes to the risk of falling.

Dementia pathology

A reduced ability to perform more than one task at one time (known as dual tasking or multitasking) has been shown to predict falls risk in older people (Lundin-Olsson et al., 1998). Dementia is associated with reduced attention and the subsequent inability to perform more than one task adequately at a time. Using the dual task “talking while walking” test, Camicioli and colleagues (1997) showed slowing in the walking speed of people with dementia while performing this task, compared with older people without dementia, which they suggested may increase the risk of falls in this group. Similar findings were reported by Hauer and colleagues (2003), who compared dual tasking in younger people and older people with and without dementia, and found a marked reduction in motor performance in the subjects with dementia while dual tasking. Pettersson and colleagues (2007) demonstrated that this also occurred in people with cognitive impairment or dementia under the age of 65, with a decreased walking speed observed during the dual task test.

Neurovascular instability, a condition involving orthostatic hypotension, vasovagal syncope, and carotid sinus hypersensitivity, is a known risk factor for falls in the general population, and is also considered an important factor in the occurrence of falls in older people with dementia. Compared with cognitively intact older people, neurovascular instability shows increased prevalence in people with dementia, with orthostatic hypotension reported in up to 40% of older people with dementia (Shaw and Kenny, 2001), and carotid hypersensitivity in 28% of AD patients compared with 41% of people with DLBD (Ballard et al., 1999). Postural hypotension is commonly seen in people with DLBD and Parkinson’s disease with dementia, and was shown to be a significant risk factor for falls in a 1-year prospective study of 179 older people with mild to moderate dementia (Allan et al., 2009).

Effects of medication

Centrally active medications such as antipsychotics, antidepressants, and benzodiazepines are well known to increase the risk of falls in the population generally (Tinetti et al., 1988, Campbell et al., 1989, Leipzig et al., 1999). Given that these medications are commonly prescribed in people with dementia, the risk of falls is concurrently increased. Buchner and Larson (1987) noted the high number of falls associated with psychotropic drug prescriptions, and in a 1-year study of 124 people with AD, Horikawa and colleagues (2005) showed a 3-fold increase in falls associated with the administration of neuroleptic drugs. In their large study of 2008 older people with cognitive impairment, Kallin and colleagues (2005) showed that the risk of falls increased with the specific serotonin reuptake inhibitors, and with the atypical antipsychotic drug olanzapine. Although Asada et al. (1996) found some increased risk of falls with psychotropic medication, this association did not reach statistical significance. Tangman et al. (2010) found that the adverse effects of neuroleptics and benzodiazepines were the cause in more than half of

falls occurring in a psychogeriatric hospital. This increased risk for falls may relate to the effects of psychotropic medications on balance and reaction time, as well as heightening risk through postural hypotension, extrapyramidal side effects, and increased sedation (Shaw and Kenny, 2001).

Cholinesterase inhibitors are used as symptomatic treatment in AD and other dementias, and various studies have shown them to increase the risk of syncope and hip fracture in some older people (Gill et al., 2009). However, Kallin and colleagues (2005) did not find any association between the cholinesterase inhibitors and falls in their large study. A meta-analysis of randomized trials of the cholinesterase inhibitors and memantine, also used as a symptomatic treatment in AD, showed that the cholinesterase inhibitors may increase the chance of syncope in patients, but were not directly associated with an increased risk for falls or fractures (Kim et al., 2011).

Behavioral disturbances

Behavioral disturbances, and in particular a tendency for wandering, were identified by Buchner and Larson (1987) as contributing to falls risk in 157 older people with dementia. Resistance to care, apathy, and wandering contributed to an increased risk for falls and fall-related injuries in a study of 112 people with dementia, reported by Asada and colleagues (1996). Kallin and colleagues (2005) found that wandering, verbal disruption, attention-seeking behavior and restlessness were significantly associated with falls – as were hyperactive, paranoid, depressive, and hallucinatory symptoms. It would seem that many of these symptoms are associated with increased physical activity, leading to an increased chance of falling.

There is some evidence that the type of dementia is likely to affect the risk of falls. Ballard et al. (1999) showed that falls were more common in patients with DLBD than in AD; a finding supported by Imamura and colleagues (2000), whose prospective study of 561 patients with dementia also reflected these relative rates of falls between the dementia types. Similar results were found in the prospective study by Allan and colleagues (2009), in which falls were much more common in people with a diagnosis of DLBD and Parkinson's disease with dementia than in AD. In a 6-month study of 110 older subjects with dementia, Kanemura and colleagues (2000) found that patients with vascular dementia were twice as likely to fall as those patients with AD.

In a study designed to examine precipitating factors (rather than risk factors) for falls among dementia patients, Tangman and colleagues (2010) prospectively examined the circumstances surrounding falls occurring in older patients in a psychogeriatric hospital ward over a 2-year period. They found that the acute onset of disease and acute drug side effects were the precipitating factors accounting for the majority of the falls, with delirium and urinary tract infections implicated in one-quarter of falls. A smaller number of falls were caused by interactions with others, particularly being pushed over by another person.

Management of falls and falls risk in people with cognitive impairment and dementia

Assessment

A multifactorial assessment for falls risk is recommended for all older people who have had a fall or have gait or balance problems (AGS and BGS, 2011). As people with dementia are at increased risk of falls, it is likely that most will have had a fall in the previous year (Shaw et al., 2003). Thus an assessment of risk factors for each individual may reveal areas where risk is heightened and where modifications can be made to mitigate this risk. This assessment should include: the circumstances surrounding falls that have occurred; current medications, focusing particularly on those known to increase falls risk (including psychotropics and antihypertensives); an evaluation of gait and balance, muscle strength, heart rate and rhythm, and blood pressure and the presence of postural hypotension; and a review of footwear and environmental hazards. The presence of urinary incontinence has also been shown to be a risk factor for falls. Delbaere and colleagues (2008) suggested testing older people for their ability to stand unaided, including on a foam mat, as a key indicator of falls risk for those in residential care.

Interventions

There is strong evidence supporting interventions to prevent falls in the older population generally, but no studies have been successful in showing that falls can be prevented in people with dementia. There is also considered to be insufficient evidence to support any recommendations that aim to reduce falls risk in older people with cognitive impairment (AGS and BGS, 2011). Shaw and colleagues (2003) trialed a multifactorial assessment and intervention to prevent falls in older people with cognitive impairment or dementia after they presented to an emergency department following a fall. They found no significant effect associated with the intervention (which had been effective in a cognitively intact population), and suggested that this lack of effect may be due to different causal pathways for falls in people with dementia compared with the general population.

Studies in residential-care facilities have indicated that multifactorial interventions may be effective in preventing or reducing falls in a population of frail older people, some of whom have dementia (Feder et al., 2000). Rapp and colleagues (2008) reported a trial of a multifactorial fall-prevention program involving staff and resident education, advice on environmental modifications, recommendations for hip protectors, and progressive balance and resistance training in 725 nursing home residents. They showed a significant reduction in falls in the intervention group, and also found that this effect was much greater in those residents with cognitive impairment. Conversely, however, in a similar multifactorial fall-prevention program in residential-care facilities that included staff education, environmental modifications, physical exercise, review of medications, provision of appropriate aids, and provision of hip protectors, Jensen and colleagues (2003)

showed no significant reduction in falls in those residents with lower levels of cognition.

There are other interventions that have been reported to be successful in people with cognitive impairment. A cluster-randomized trial of a single intervention using staff-oriented training in residential-care facilities has been reported as showing a reduction in falls in the intervention group, with no marked difference observed between residents with and without cognitive impairment (Bouwen et al., 2008). Physical restraints are often used in hospitals and residential-care facilities in order to prevent a person with dementia from standing up or walking around, theoretically to prevent falls. However, the removal of physical restraints has not been shown to increase the occurrence of falls in older people with dementia in residential care (Capezuti, 2004), and the use of physical restraints (and in particular trunk restraints) has actually been shown to significantly increase the risk of falls in people with dementia in residential-care facilities (Luo et al., 2011).

It may be possible to extrapolate the evidence for interventions to reduce falls from the general population to apply to people with dementia. Although the American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons does not support this notion (AGS and BGS, 2011), and Shaw (2007) notes that the cognitively impaired population who fall may be very different from the cognitively intact older population, it seems reasonable to intervene opportunistically, and offer interventions as appropriate for each individual to reduce falls and fall-related injuries. Medication management and a reduction in psychotropic medication dosages, strength and balance training, treating any postural hypotension, treating low vitamin D levels, osteoporosis, and cataracts, conducting an occupational therapy home hazard assessment, using hip protectors and helmets, and installing fall alarms are some of the interventions that have been shown to reduce falls or fall-related injuries in the older population, and may also have transferrable use in reducing falls in older people with dementia (van Doorn et al., 2003).

Hill and colleagues (2009) suggest that to reduce falls in older people with dementia living in the community, exercise programs must incorporate movement combinations that challenge the balance system, rather than just including cardiovascular or strengthening exercises. Because it may be difficult for people in the more advanced stages of dementia to participate in complex exercise programs, they suggest targeting these programs only at those with mild to moderate dementia. However, Mirolsky-Scala and Kraemer (2009) describe a case in which an individualized balance and strengthening exercise program was developed for an older person with moderately severe dementia, taking into account her poor cognition and behavioral problems. The program resulted in clinically significant improvements in functional outcomes, and in particular her balance, illustrating the potential benefits of an individualized program in more severely affected patients. Similarly, a small study of 20 older people with dementia has shown that a physical training program to improve balance can significantly improve mobility and static balance in the intervention group, although falls were not measured (Toulotte et al., 2003).

Recommendations

- 1. Consider opportunistic screening for risk modification, although no current evidence shows that screening people with dementia for falls risk is effective in reducing their fall rate.
- 2. Remove any physical restraints, as their use is likely to worsen the risk of falls.
- 3. Although no interventions are proven to prevent falls specifically in people with dementia, consider:
 - a. reviewing medications, particularly psychotropics
 - b. assessing and treating postural hypotension
 - c. assessing and treating visual impairment due to cataracts or refraction errors
 - d. treating osteoporosis and vitamin D deficiency.
- 4. Consider introducing the use of:
 - a. exercise, particularly strength and balance training
 - b. occupational therapy home hazard assessment and environmental modification
 - c. hip protectors
 - d. falls alarms.

Case studies

Mr. E is an 84-year-old man in a dementia-specific residential aged care facility. He has moderately severe dementia and requires prompting or supervision with most activities of daily living. He loves to walk around the facility and in the gardens, but is very impulsive and has often fallen and is at risk of injuring himself. He was assessed by a physiotherapist experienced in aged care and given some simple daily balance and strengthening exercises (standing on one leg and tandem stance, and rising from a chair without using his arms) to be supervised by facility staff. Mr. E was provided with hip protectors and a light football head-guard, both of which he was happy to wear as he had played rugby in his youth. A walking frame was tried but not considered appropriate as he would forget to use it. He is now falling much less often and has sustained no injuries other than mild abrasions.

Mrs. F is a 68-year-old woman who lives with her husband in their own home. She has moderate AD, as well as hypertension and coronary artery disease with a recent myocardial infarct. She is on several antihypertensive medications, and an atypical antipsychotic medication as she had been becoming somewhat aggressive. Her husband reported that she had fallen a number of times over the past 2 months, particularly after getting up in the morning, when using the toilet, and when getting out of the car. She was found to have a significant drop in her blood pressure from sitting down to standing up, and her antihypertensive medications were reduced. Her antipsychotic medication