Fear of Falling in Ambulatory Older Adults
Screening and Interventions

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To the faculty of Washington State University:

The members of the committee appointed to examine the Intercollegiate College of Nursing research requirements and manuscript of DAN BENKER find it satisfactory and recommend that it be excepted.

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Abstract

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Fear of falling in ambulatory older adults is examined through a critical analysis of the literature. Fear of falling is a common and prevalent syndrome in older adults, both in those who have fallen and those who have not yet fallen. Fear of falling syndrome increases with age, is more prevalent in women, and is associated with depression, increased frailty, and decreased satisfaction with life. Severe fear of falling precipitates social withdrawal and leads to decreased exercise and mobility. The last sequela produces a "vicious cycle" where the individual spirals downward with progressively decreased peripheral neuromuscular function. Insights into the fear of falling syndrome and suggested screening and intervention options that can be initiated by the family nurse practitioner are emphasized. Limitations of current knowledge are discussed and recommendations for further clinical research are provided.
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Introduction

One third of adults older than 65, fall yearly and 15% of these falls require medical attention (Howland et al., 1998). One third of these falls result in bruises or abrasions and 4-6% cause fractures with about one-quarter of these being hip fractures (King et al., 1995). Forty percent of nursing home admissions include falling as a contributing factor (Tinetti & Speechley, 1989). Forty-five to seventy-five percent of long-term care residents fall annually with 15-20% of these falls resulting in physical injury and mobility impairment (Gentlemen et al., 2001). Although death is infrequent at falling, complications from falling are a leading cause of death. Pulmonary embolism occurs in 13% of those who die after fall related injuries (King et al., 1995). An estimated 9,500 older adults died in 1999 following a fall, and more older adults died from falls than pediatric and young adults died from all accidents (Baumann, 1999). Eight percent of elderly fallers seek emergency room care, and 30-40% will be admitted to the hospital with an average stay of 8-15 days (King et al., 1995).

Fear of falling develops in about 50% of those who fall and 20% of fallers avoid activities as a result (Gentlemen et al., 2001). Fear of falling (and resulting loss of independence and involuntary nursing home admission) is not limited to those with a history of falling (Arfken, et al., 1994; & Dayhoff et al., 1994). Fear of falling syndrome has been described as a debilitating psychologic condition of low perceived self-efficacy or lack of confidence in performing 10 activities-of-daily living without falling (Friedman et al., 2002). It is estimated that 25% of independent living older adults have fear of falling and fear of falling is more common than any other fear (even crime) in older adults (Childs & Kneebone, 2002). Fear of falling is a vicious cycle of self-imposed activity restriction leading to deconditioning, diminished physical
performance, functional decline, disability, increased risk for future falls, dependency, and becomes an obstacle to independent living and results in institutionalization (Friedman et al., 2002). Functional decline reduces social participation, decreases quality of life and results in greater depression and anxiety (Baumann, 1999; Chandler et al., 1996; Friedman et al., 2002; Gentlemen et al., 2001; & Howland et al., 1998). Fear of falling increases stiffening while falling which increases the chance of injury (Baumann, 1999). Falls and fear of falling are each risk factors for developing the other (Friedman et al., 2002).

Statement of Purpose

Fear of falling in ambulatory older adults is examined through a critical analysis of the literature obtained from a search of CINAHL and MEDLINE. Screening and interventions that can be initiated by the family nurse practitioner are emphasized. Pathophysiologic changes associated with decreased balance, history and physical exam assessment, and potential interventions to break the downward spiral of decreased mobility and social withdrawal are explored. Limitations of the literature are discussed and recommendations for further clinical research are provided.

Theoretical Framework and Model

The Interaction Model of Client Health Behavior (IMCHB) is a theoretical framework that can be used to guide the nurse practitioner assisting a client with possible fear of falling syndrome (Cox, 1982,1986, Cox & Roghmann, 1984). The IMCHB places special emphasis on the patient’s unique background and personal variables, and how these influence the patient’s perceptions and response to the healthcare professional. IMCHB underscores the importance of the healthcare professional individualizing care, and engaging the patient in decision-making, self
management skills and the overall care process. (See Table 1). Focusing on the client’s singularity in a partnering relationship with the healthcare professional improves patient outcomes (Cox, 1982, 1984, 1986).

Review of Literature

Pathophysiologic Changes Associated with Imbalance in the Elderly

The aging process produces a decreased sense of vibration and decreased proprioception which contributes to increased difficulties with balance (Marsh, 2000). Additionally with aging there is up to 0.5% atrophy of brain white and gray matter per year (Banasik, 2000). The neuronal loss is greatest in the neocortex, Purkinje cells of the cerebellum, and substantia nigra. Dendritic shrinking is thought to decrease synaptic messages, slow impulses, and decrease neuromuscular coordination (Banasik, 2000).

Imbalance and fear of falling contributes to immobility which in a “vicious cycle” contributes to imbalance and fear of falling. Stroke, decreased postural reflexes, diabetic peripheral neuropathy, alcohol, malnutrition (vitamins B1, B-12, E), diuretics, antihypertensives, phenothiazines, sedating antidepressants, postprandial or orthostatic hypotension, vestibulocerebellar pathology contribute to imbalance (Tinetti & Speechley, 1989). Severe anxiety or depression, weakness, pain, stiffness, muscle disuse, electrolyte disturbances, malnutrition, anemia, myopathies, neurologic disorders, arthritis, and gout contribute to immobility and hence imbalance and fear of falling (Tinetti & Speechley, 1989). (See Table 2 for a list of factors leading to immobility/imbalance).

Imbalance is the decreased ability to maintain the body in its intended orientation. Severe imbalance may affect the maintenance of posture while seated (Ganong, 1999; Olney & Aminoff,
Balance is maintained by spinocerebellar and vestibular sensory input, motor output of spinal neurons that control axial and proximal muscles and the integration of these functions in the brain stem and cerebellum. In the inner ear, the utricle and saccule are sensitive to static head position and acceleration by sensing the direction of gravitational pull, and the semicircular canals sense rotary motion. Inner ear sensation is transmitted via the vestibular nerve to the vestibular nuclei in the upper medulla and lower pons, and from there to the fastigial nuclei in the middle cerebellum.

Peripherally, Golgi tendon apparatus detect joint position and movement, and muscle spindles detect shortening or lengthening of axial and proximal limb muscles. Proprioception sensory input is transmitted via the spinocerebellar and medial lemniscal pathways to the cerebellum for integration. Visual input via the midbrain tectum, cortical input to the contralateral cerebellum via corticopontine and pontocerebellar pathways, and cerebellar output to the contralateral red nucleus, thalamus, and then motor and premotor cerebral cortex are also part of the cerebellar modulation of balance. Efferent cerebellar balance control includes output from the fastigial nuclei to the vestibular nuclei and reticular formation and from there via the vestibulospinal and reticulospinal pathways to the axial and proximal limb and trunk muscles. Sensory ataxia results from impairment of proprioception feedback to the cerebellum, basal ganglia, and cortex (Ganong, 1999; Olney & Aminoff, 1998; Rosenberg, 1998; Simon et al., 1999). (See Table 3 for an explanation of proprioceptive cerebellar modulation of balance).

Ataxia (altered coordination during voluntary movement) can present with gait impairment, unclear speech, incoordination, and tremor with movement (Ganong, 1999; Olney & Aminoff, 1998; Rosenberg, 1998; Simon et al., 1999). Focal unilateral symptomology with
headache, ipsilateral cranial nerve pathology and contralateral weakness suggests a space occupying cerebellar lesion (tumor, infarction, abscess, hemorrhage, multiple sclerosis). A bilaterally symmetrical, slowly progressing increase in ataxia symptoms suggests a biochemical, toxic, or immunologic etiology (example: alcohol, lithium, barbiturates, phenytoin, viral cerebellitis, mercury, solvents, cytotoxic chemotherapy, Lyme’s disease, vitamin B1 and B12 deficiency, paraneoplastic syndrome, hypothyroidism, hyponatremia, tabies dorsalis, inherited diseases). Paraneoplastic syndrome is mediated by autoantibodies (Yo, Ri, PCD), and may be the initial presentation of females with unidentified breast or ovarian cancer. Cerebellar ataxia (imbalance with unsteady gait) must be distinguished from vertiginous ataxia (dizziness, light-headedness, perception of movement). Rare infectious causes of ataxia include: Creutzfeldt-Jakob disease, toxoplasmosis, Legionella, Epstein-Barr virus, coxsackievirus, and echovirus (Ganong, 1999; Olney & Aminoff, 1998; Rosenberg, 1998; Simon et al., 1999). (See Table 4 for a list of biochemical, toxic, or immunologic etiologies producing bilaterally symmetrical, slowly progressing increase in ataxia symptoms).

At the macroscopic observable level, balance requires normal cognitive, neuromuscular, and cardiovascular function and the ability to adapt to an environmental challenge. Imbalance and sway increase with aging and acute compromise to any of these three systems predisposes older adults to falls (Tinetti & Speechley, 1989). Falls are commonly caused by the interplay of a patient with intrinsic deficits (impaired cognition, strength, balance, vision, sedating or hypotensive medication, alcohol) and an environmental obstacle (something to trip on). Additional intrinsic deficits include: electrolyte imbalance, postprandial hypotension, insomnia, urinary urgency, lower extremity edema [5-10 lbs extra weight], impaired sensory input,
dehydration, and variable hypoxia. (Tinetti & Speechley, 1989). It is estimated that 30% of community dwelling older adults fall each year, the proportion increases with age, and women are disproportionately represented (Tinetti & Speechley, 1989).

Fear of Falling in Ambulatory Community Dwelling Older Adults

Dayhoff et al., (1994) defined fear as the emotion attached to concrete and sudden danger of imminent physical harm. They defined fear of falling as the appraisal of what harm might occur as a result of a fall, and the perceived coping potential to control or prevent that harm. Using three different subject completed questionnaires, Dayhoff et al., (1994) convey that fear of falling decreases a patient’s activity level and hence in itself becomes a risk factor for future falls.

Arfken et al., (1994) in a descriptive study (N =1358) found that fear of falling increased with age, and was greater in women. Bone density was not a variable included in the study. Moderate fear of falling was associated with recent experience with falls, increased frailty, decreased satisfaction with life and depressed mood. Those very fearful of falling were found to have decreased social activities and mobility. Their study showed that women were more likely to express fear of falling (p <0.0001), and 45% of women over 81 years of age had fear of falling. Forty-eight percent of those very fearful of falling were somewhat to not at all satisfied with life, 25% had depression, 85% had impaired balance, and 9% had fractures in the prior year. Factors found to be independently associated with fear of falling were: falls resulting in fractures, requiring assistance to climb stairs, vision limiting ambulation, fair or poor self-rated health and falls besides a trip or slip. (See Table 5 for odds ratios associated with fear of falling).

Chandler et al., (1996) studied 149 older men and found that fear of falling is not limited to those with a history of falling, but that it is associated with impaired mobility, increased
disability, decreased physical performance and increased depression. Fear of falling is not necessarily predictive of future falls. The use of walkers was not a variable included in the study. They found a significant increase in 10 ft. walk times and reduction in life space (bedroom, home, neighborhood) in those very afraid of falling (p <0.04). Depression was significantly greater (p = 0.03), and functional reach, activities-of-daily living and activity level were significantly decreased (p <0.02). They concluded that depression correlates with fear of falling and that fear of falling was present in 36% of those who had no history of falling.

Fessell and colleagues (1997) reported on a study involving 570 individuals (76% female, 82% white, average age 65) with rheumatoid arthritis. Over 50% of the participants had fear of falling and 38% modified activities due to that fear. Correlates of fear of falling were female gender (p <0.05), depression (p <0.01), poor physical function (p <0.05) and minor fall related injuries (bruise, bleeding, sprain, strain, [p <0.05]). Limiting activities due to fear of falling was associated with worse self rated health, poor physical function, and a high number of painful joints. In their one year study, 31% fell once and 16% fell more than twice. Of those who actually did fall, 18% had fractures and 16% had head injuries. Activity limitation was greatest in walking (40%, especially outdoors, alone, or on rough surfaces), yard work and gardening, and going up and downstairs. Falling more than twice was significantly correlated with fear of falling (p <0.01), while falling only once was not. Sixty-three percent of those with fear of falling had not fallen in the previous year. Visiting a physician for a fall was highly correlated with fear of falling (p <0.05). Interestingly, fear of falling was not correlated with a previous fall fracture or head injury, but was highly correlated with bruises, bleeding, sprains and strains (p <0.05). Fessell et al., suggested that using caution or limiting time spent in a certain activity may be an early
adaptive response to low or moderate levels of fear of falling. Avoiding or giving up the activity altogether may come later and suggests a greater magnitude of fear combined with a higher level of self-perceived disability. (See Table 5)

Friedman et al., (2002) studied 2,212 community dwelling older adults, ages 65 to 84 with mini mental status exam scores over 18 in a longitudinal prediction study. Their research focus was to determine whether fear of falling precedes falls or whether falls precede fear of falling. Falling was defined as unintentionally coming to rest on the ground or other level such as a chair. Their results indicated that falls at baseline predicted fear of falling 20 months later (p <0.0005) and fear of falling at baseline predicted falls within the next 20 months (p <0.0005). They concluded that a history of falling or fear of falling are each a risk for developing the other in a vicious spiraling cycle of falls, fear of falling and functional decline. Female gender, history of stroke, Parkinson’s disease, arthritis, history of hip fracture, vertigo and comorbidity all predicted falls. Female, older age, being a previous faller, and more than four medications predicted fear of falling (p <0.05). Incontinence and pharmacologic class of medication were not variables included in the study. The proposed mechanism for fear of falling precipitating falls was through gait changes, activity restriction, deconditioning, and decreased function. Friedman et al., also found that in patients with fear of falling, those who did cut back on activities had a significantly higher likelihood of becoming a faller (odds ratio 2:1, p <0.0001) than those who did not lessen activities. They concluded that fear of falling is not an acute reaction from a fall, but a recognition of being at risk for a fall and its adverse outcomes. (See Table 5).

Gentleman et al., (2001) did a psychologic group 60 minute, once weekly, 10 week intervention pilot study with six participants (mostly female, widowed, and older than 76) and
used the Falls Efficacy Scale (alpha = 0.9) to measure self-confidence. The Neugarten Life Satisfaction Index was used to measure the individual’s sense of life satisfaction. Improved self-confidence and life satisfaction were the target outcomes. Themes covered in group were: factors causing falls, how to prevent falls, psychologic consequences of falls, and fear of falling. Participants expressed feelings of being “stupid”, “lousy”, “like a jerk” about falling and their own fall prevention strategies were: going slower, concentrating, alertness, requesting help, increasing lighting, and decreasing environmental obstacles. Full and active participant interaction occurred after the fourth (of 10) meetings and 50% showed enhanced self confidence and life satisfaction at the end of the 10 weeks. Additionally, increased socialization and concern for others was displayed.

Howland et al., (1998) studied 266 older adults (mean age 76, 77% female, 97% white, 87% living alone, 36% using a walking aid, 29% with dizziness, 26% with vision problems) and used The Social Integration Scale to measure the degree of contact with friends and relatives. They found that 55% had fear of falling and 56% curtailed activities due to this fear. Fear of falling was associated with being older, female, having a fall in the past three months, a fall requiring medical attention, dizziness, vision problems, using a walking aid, lower perception of health, more chronic pain, lower mental health and less socially integrated (p <0.05). Activity curtailment was associated with: the intensity of fear of falling, knowing a friend or relative who had a serious fall, being less likely to talk to friends about falls, use of a walking aid, lower self perception of health, increased body pain, lower mental health and being less likely to rely on others in times of crisis (social support) (p <0.05).

King et al., (1995) found that up to 14% of fallers were unable to get up for at least five
10

minutes after the fall and up to 3% had a lie time of greater than 20 minutes - some for more than three hours. Their review of the literature showed a range of 40-73% of fallers and 20-46% of non falling older adults reported fear of falling. Fear of falling was associated with difficulty climbing stairs, poor vision, activities of daily living restriction, poor self related health, decreased mobility, decreased life satisfaction, older age, female gender and depression. In their study, 41% of community dwelling older adults had environmentally related falls and 13% were attributed to weakness or disorders of gait or balance. In contrast, 26% of nursing home falls were due to weakness, balance or gait disorders and 25% were due to dizziness or vertigo. Sixteen percent of nursing home falls were attributed to environmental obstacles. In their study, risks for falls included: older age, cognitive impairment, arthritis, foot problems, stroke, lung disease, medication use, Parkinson’s disease, dizziness, decreased muscle strength, imbalance and gait abnormalities. Falling increased with acute illness (e.g., pneumonia) or exacerbation of a chronic condition (e.g., congestive heart failure). Seventy-eight percent of patients with four or more risk factors fell within one year. (See Table 5).

Childes et al., (2002) divided causes of falls into extrinsic (loose carpets, bad lighting etc.) and intrinsic (medications, medical illness, sensory impairment, gait and balance disorders etc.). They postulated a “threshold model” wherein a number of risk factors are present and then the addition of a small additional factor precipitates a fall. Childes et al., defined fear of falling as “low perceived self-efficacy at avoiding falls during essential nonhazardous activities of daily living” (p. 225). They concluded that it is more common in women, patients with poor self perception of physical health and reduced cognition. The lower self confidence resulted in avoidance of activity, muscle wasting and increased risk of falling. Childes et al., concluded that
the immediate effects of fear of falling are: anxiety when the individual attempts to move and increased muscle tension and distracting negative thoughts. A reduction of potential neuromuscular resources for the task at hand is the result. Relief from anxiety by activity avoidance was postulated as a powerful reinforcer of inactivity. (Table 6 describes the Childs et al. cognitive behavioral model of fear of falling as a risk factor for future falls). They recognized that to use the cognitive model requires the patient to acknowledge their fear of falling, which might be difficult and irritating for some patients.

Lachman et al., (1998) developed an instrument (alpha = 0.9) that assesses 11 activities to determine the role of fear of falling in activity restriction. Findings indicated that major consequences of fear of falling are: activity restriction, deconditioning and muscle atrophy, limited social contact, immobility, debilitating anxiety and increased risk for future falls. Lachman et al., feel their instrument has advantages over previous instruments (Falls Efficacy Scale, and Activities Specific Balance Confidence Scale), because it contains items that focus on exercise and social activity. Their instrument was tested on residents of public housing in six Massachusetts communities. Three-quarters of the 270 subjects were female, the mean age was 76, and 22 activities-of-daily living or instrumental activities-of-daily living were represented. Study results indicated that the highest fear of falling was associated with going outside when it was slippery, movement up-and-down stairs, reaching for something overhead and taking a tub bath.

Assessment of Imbalance and Fear of Falling

Client characteristics influence the client-professional interaction. Prior research provides evidence that the characteristics in Table 5 (for example) increase fear of falling which is highly correlated with fall risk (Arfken et al., 1994; Fessel et al., 1997; Friedman et al., 2002; & King et
al., 1995). These become evidence-based clues for a clinician assessment. Nurse practitioners can have a significant impact on older client's health and quality of life by appropriately assessing and intervening with older adults who have a fear of falling.

Common red flag history correlates with fear of falling include: depression, anxiety, stroke, Parkinson's disease, sedative use, requiring assistance to climb stairs, a history of falls (especially falls requiring medical treatment), less social integration and infrequent (<3/wk) residential departures. Red flag physical characteristics include: female gender, older age, poor vision, use of ambulation assistive devices and impaired balance, strength or gait (Arfken et al., 1994; Fessel et al., 1997; Friedman et al., 2002; & King et al., 1995). A synthesis of common characteristics found by more than one author that correlate with fear of falling are categorized by the Interaction Model of Client Health Behavior (IMCHB) in Table 7.

A key point to consider while assessing a patient for fear of falling is the difficulty a health care provider may find in recognizing fear of falling due to the patient already eliminating activities with which they have had difficulty (Childs et al., 2002). The second major topic to entertain is the risk factors for osteoporotic hip fracture in women. These include: decreased bone density, older age, history of maternal hip fracture, increased height, poor self-rated health, use of long-acting benzodiazepines, anticonvulsants or caffeine and a previous fracture after the age of 50. Additional risk factors for osteoporotic hip fracture include: a history of hyperthyroidism, less than four hours per day standing, an inability to rise from a chair without using one's arms, poor visual depth perception or contrast sensitivity and tachycardia at rest. Decreased bone density in the femoral neck and increased length of femoral neck are strong predictors of hip fracture risk (King et al., 1995).
Evaluation of a patient for fear of falling begins with a thorough history then a physical exam and selected ancillary laboratory testing. (Table 8 describes an assessment instrument for falls and fear of falling). The screening history includes: female gender, older age, family history of maternal hip fracture, previous fracture after the age of 50, history of hyperthyroidism, arthritis, gout, Parkinson’s disease or current malnutrition. Currently used medications should be recorded looking especially for sedating medication (e.g. benzodiazepines, anticonvulsants, psychotropics, antihistamines), pharmaceuticals that induce vestibular dysfunction (e.g. aminoglycosides, aspirin, quinidine) and caffeine use. The interview can then proceed to a series of closed questions. These include: 1) does the patient spend less than four hours per day standing? 2) can the patient descend steps, step overstep, with no railing? Do they require assistance to climb stairs? 3) is the patient able to sit independently? 4) can the patient rise from a chair without using her/his arms? 5) has the patient had a near fall episode, or a fall resulting in a fracture or other injury? 6) does the patient have poor vision that limits ambulation 7) can the patient walk ten blocks? Do they need an ambulation device? (Arfken et al., 1994; Baumann, 1999; Chandler et al.,1996; Fessel et al., 1997; & King et al., 1995).

Additional history screening should inquire about external (environmental) factors that increase the risk of falling. These include asking about icy walkways, poor sidewalks and steps, inadequate lighting, slippery floors, loose carpets and footwear (Baumann, 1999). Next the interview should focus on the psychologic aspects of fear of falling. Useful questions include: 1) assessing life space history by asking the patient if in the last week they have gone outside the bedroom, residence, or neighborhood without help. A patient who leaves her/his residence less than three times per week indicates an increased risk for fear of falling. 2) has the patient limited
walking or stair climbing due to fear of falling? 3) do they have poor self-rated health? 4) have they had two or more falls in the past year? Have there been minor injuries from a fall in the past? Have they seen a physician for a fall? The interview can then proceed to asking direct questions about the presence of depression or anxiety and is the patient afraid of falling (Arfken et al., 1994; Chandler et al., 1996; Fessel et al., 1997; King et al., 1995; & Friedman et al., 2002).

Vital signs should include the patient’s height, body mass index and assessment for tachycardia and orthostatic hypotension. The neurologic exam focuses on postural stability and includes testing for the presence and accurate identification of vibration sense of the great toe, reflexes, proprioception in the lower limbs, and reaction time. Vision is tested for near and distance acuity, contrast sensitivity, depth perception, stereo acuity and visual fields. Lower extremity muscle strength is tested for ankle dorsiflexion, knee flexion and extension, and hip abduction, adduction, flexion and extension. A handheld dynamometer is useful. The examination could proceed next to balance testing for postural stability. Balance testing includes using parallel, tandem and semi tandem stances to be maintained for ten seconds with the eyes open and then closed. Balance could also be tested with a side-by-side stance for 30 seconds with eyes open, arms folded across the chest and feet close but not touching. Decreased one legged stance time with increased spontaneous sway and lateral spontaneous sway amplitude under blindfolded conditions are predictive of future falling. Physical performance is assessed with: a timed ten foot walk, functional reach to measure dynamic balance, sitting balance, sitting reach, transfer, picking up an object from the floor, rising from a chair, walking, turning, stopping suddenly, stepping over a shoebox, and ascending and descending stairs. Gait changes associated with fear of falling include: decreased stride length, decreased gait speed travel time to walk a 4
meter straight path, increased double stance time, decreased clinical gait scores and increased stride width. Increased stride width is the most predictive of falls (Arlken et al., 1994; Baumann, 1999; Chandler et al., 1996; Friedman et al., 2002; & King et al., 1995).

The psychologic exam includes screening for cognitive impairment, poor self-rated health and depression using the 30-item Geriatric Depression Scale or another instrument. Because emotions can distort rational thinking producing self-defeating thoughts, the examination should screen for exaggerated fears and a globalized sense of danger or anxiety disorder. The patient could complete (at home) and bring to their second appointment the Falls Efficacy Scale (Tinetti et al., 1990) or The Survey of Activities and Fear of Falling in the Elderly (Lackman et al., 1998) to assess for fear of falling because patients may lack awareness of their fear of falling and avoid discussion (Childs et al., 2002). The 20 item Fear of Falling Questionnaire (Dayhoff et al., 1994) measures appraisal of harm and coping potential related to potential falls and the emotion of fear to assess if patients fear of falling is based on realistic verses unrealistic appraisals of danger. If the fear is realistic, then suggest self-protective behaviors to the patient. Unrealistic fears indicate a need to help the patient reappraise the potential harm to decrease their fear of falling and hence decrease the patient’s self restriction (Arlken et al., 1994; Childs et al., 2002; Baumann, 1999; Dayhoff et al., 1994; Friedman et al., 2002; & Lackman et al., 1998).

Selected ancillary laboratory testing includes screening for potential electrolyte abnormalities, malnutrition (vitamins B1, B12, E), anemia, abnormal thyroid function, hyperparathyroidism, infectious/immunologic studies, if indicated and bone density (especially femoral neck) and radiologic exam for increased length of femoral neck (Baumann, 1999; & King et al., 1995). ICD-9 coding for reimbursement for assessment and interventions of patients
suffering from falls or fear of falling syndrome is dependent on exam findings and proposed treatment. Table 9 provides a reference for potential ICD-9 codes related to falls and fear of falling.

Management Interventions for Fear of Falling

The Interaction Model of Client Health Behavior (IMCHB) guides the nurse practitioner in management of fear of falling by focusing on the key elements of client-professional interaction. These include: 1) affective support, 2) health information, 3) decisional control and 4) professional/technical competence. Affective support includes adopting the philosophy of falls reduction versus falls prevention. This paradigm offers skeptical patients assurance that the intervention program has value, encourages open discussion of their fears and gives the patient permission to admit to falls without feeling blamed or "stupid." After treating known environmental, medical and psychologic-social contributors, the treatment goal should be increased patient confidence and independence through cognitive restructuring and support networks (Childs et al., 2002).

Environmental interventions include a home safety assessment by a visiting nurse or physical therapist to reduce environmental obstacles and provide recommendations including: 1) wear shoes with firm, nonskid, nonfriction soles and low heels (avoid stocking feet and loose slippers), 2) remove tripping objects (cords, clothes, shoes etc.) off floor, use shallow pile carpet, avoid throw rugs or rugs with nonskid backing, nonskid wax, tacked down carpet edges, 3) remove tripping hazards in yard (pavement cracks, rocks, tools, holes, etc.) and use safety with slippery surfaces (ice, wet leaves), 4) use walking aids, wheelchairs, bathroom grab bars for tub, shower, toilet, rubber mats in tub or shower, shower chair with handheld shower, raised toilet
seat, and promptly cleaning up spills on floor, 5) maintain adequate lighting (elderly need twice as
much), such as night lights, absence of glare, 6) maintain stairs in good repair with rise of ideally
no more than six inches per step, with sufficient lighting, bilateral handrails, and bottom and top
stairs clearly marked with bright tape, 7) store cabinet items (kitchen, bathroom, bedroom etc.) so
that reaching up and bending over are not necessary, 8) a firm and nonmovable kitchen table, 9)
energy absorbing floors and 10) the use of hip pads. Portable phones and lightweight radio call
systems are also useful (Baumann, 1999; Rosenberg, 1998; & Tinetti & Speechley, 1989).

Medical interventions include treating known neurologic, psychiatric, cardiovascular,
orthopedic, and osteoporotic problems (bone density measurement, Fosamax, Evista, calcium
carbonate). Treatable causes of ataxia and fear of falling include: 1) malignancies (directly
through mass effect in posterior fossa or through paraneoplastic degeneration [autoantibodies], 2)
malabsorption or malnutrition syndromes [screen for vitamin E, B1, B12 deficiencies] and 3)
hypothyroidism. Additional treatable etiologies include: 1) depression or anxiety, 2) tabes dorsalis
[check cerebrospinal fluid for syphilitic infection], 3) antibody titers for Lyme disease and
Legionella and appropriate antibiotic therapy and 4) genetic counseling for spinocerebellar ataxia
syndromes (Baumann, 1999; Chandler et al., 1996; Howland et al., 1998; King et al., 1995;

Additional medical interventions include: 1) improve visual acuity through refraction
correction and cataract extraction, 2) improve hearing through cerumen removal, reduction in
background noise, audiology evaluation for hearing aid and 3) evaluate for proprioception
dysfunction, peripheral neuropathy (DM) and cervical spondylosis. Additional suggestions
include: 1) treat reversible dementia and avoid centrally active and sedative medication, 2) reduce
orthostatic hypotension with rehydration, medication assessment, and management of situational factors [meals, body position], 3) provide podiatry for foot disorders and 4) treat lower extremity edema. Further management includes: 1) evaluate vestibular function, 2) avoid medications affecting the vestibular system and 3) reevaluate medications to obtain the lowest number of medications at the lowest effective dose with shortest action, least centrally acting and least associated with postural hypotension (e.g., avoid alcohol, benzodiazepines, barbiturates, phenothiazines, sedating antidepressants or antihistamines, centrally acting antihypertensives, judicious use of diuretics, anticonvulsants, antiarrhythmics) (Baumann, 1999; Chandler et al., 1996; Howland et al., 1998; King et al., 1995; Resnick, 1998; Rosenberg, 1998; & Tinetti & Speechley, 1989).

Physical therapy can provide physical and nonphysical interventions to increase the patient’s confidence in their mobility and skills. Physical therapy interventions include: 1) gait training to help alleviate fear of falling, 2) balance exercise and training and 3) fitting for appropriate mobility assistive devices (e.g. walkers). Additional services include: 1) bone strengthening through weight bearing exercises, 2) muscle strengthening (especially muscles supporting the ankles), 3) range of motion exercises and 4) postural hypotension physical therapy (dorsiflexion exercises, pressure graded stockings, tilt table). Low intensity group exercise that combines exercise with cognitive instruction improves balance, strength, endurance and provides teaching for how to get oneself up off the floor after a fall (Baumann, 1999; Chandler et al., 1996; King et al., 1995; & Tinetti & Speechley, 1989).

Psychologic interventions include treating depression and anxiety and are aimed at increasing the patient’s life satisfaction and confidence in their mobility through realistic appraisal
of both their environment and actual abilities. Social and psychologic interventions are crucial for reducing falls and fear of falling. Those with fear of falling who cut back on their activities have a significantly higher likelihood of becoming a faller. Patients with less social support (defined as able to rely on friends and family in crisis) feel particularly vulnerable to losing independence and are more likely to curtail activities. Once fear of falling develops, especially if activities are limited, it is highly likely to persist. This suggests aggressive prophylactic measures to abort the onset of fear of falling (Baumann, 1999; Chandler et al., 1996; Friedman et al., 2002; Gentleman et al., 2001; & Howland et al., 1998).

Cognitive restructuring behavioral group programs provide social support networks and utilize multiple modalities to assist the patient. These modalities include: 1) videotapes with people discussing their fears, 2) lecture, 3) group discussion, 4) mutual problem solving, 5) role playing, 6) exercise training (e.g., Chinese Tai Chi exercise), 7) assertiveness training, 8) home assessment and 9) behavioral contracting. Peer leadership encourages the patient by exposing them to others who have experienced falls and have effectively coped with their fear of falling and remained active (Baumann, 1999; Chandler et al., 1996; Friedman et al., 2002; Gentleman et al., 2001; & Howland et al., 1998).

**Implications for Further Clinical Research**

The Interaction Model of Client Health Behavior (IMCHB) identifies five types of outcomes following client-professional interactions: 1) Utilization of health care services, 2) Clinical health status indicators, 3) Severity of health care problems, 4) Adherence to the recommended care regimen and 5) Satisfaction with care. Successful fear of falling interventions may result in lower health care utilization via fall and injury reduction and improved clinical health.
status indicators such as increased functional ability after therapy services aimed at strength and gait training. Additional benefits could include less severe health problems, increased compliance with recommended treatment and improved patient satisfaction with their life and medical care.

Unfortunately, available research related to fear of falling is limited to descriptive-correlational studies. Randomized clinical trials are needed to test the impact of interventions on fear of falling and subsequent outcomes. There have been some successful interventions to decrease falls (Baumann, 1999; Gentleman et al., 2001; Legters, 2002; Riley, 2000; Schoenfelder, 2000; & Wolf et al., 2001). These provide beginning evidence for the effectiveness of some interventions. More research is needed including research that measures fear of falling as well as falls/fall risk due to a “vicious cycle” of fear of falling precipitating social withdrawal leading to decreased exercise and mobility and a downward spiral into progressively decreasing peripheral neuromuscular function. Specific further research suggestions follow.

Perusal of the research literature suggests six major topical areas for further research: 1) the sample population itself, 2) the psychosocial natural history of disease, 3) the physical natural history of disease, 4) measurement or study methodology considerations, 5) treatment and 6) novel theoretical models.

Future research with a more diverse sample would be useful. Many previous studies contained a very high percentage of white females, and studies with a higher percentage of males, nonwhites and a broader educational and cultural background would be beneficial. Specifically, a better understanding of fear of falling gender differences on performance and disability is needed. Many previous studies had a sample population with minimal cognitive impairment (e.g., Friedman et al., 2002; Gentleman et al., 2001). Further research studying patients with lower
mental status exam scores would be beneficial. Some previous study instruments suffered from a less than optimal response rate (e.g., Lachmann et al., 1998 [63%]) indicating a likely positive bias and limiting generalizability. Many previous studies only included participants capable of speaking English, and a broader and more diverse sample base would be illustrative.

More prospective studies to track the development of fear of falling and the psychosocial natural history of disease would be advantageous. Friedman et al., (2002) found that falls and fear of falling are each risk factors for developing the other. Research on fear of falling and the activity restriction that results from the vicarious experience of knowing someone who fell would be educational. Prospective studies would help determine if activity curtailment in fear of falling is a cause or result of the lack of social support. It would be advantageous to know how long the psychologic trauma from a fall persists. If psychologic trauma lasts greater than one year, then a year is an insufficient criteria to distinguish a faller from a non faller. Further study could explore the depths of this fear and anxiety that appears to anticipate changes for the worst. Prospective studies could address the question of whether fear of falling is a realistic perception of loss of function or does fear of falling change a person's response to postural disturbances causing ineffective or accentuated responses and hence precipitate falls.

Measurement or study methodologic considerations would encourage more prospective studies to delineate physical and nonphysical causes of fear of falling syndrome. Psychologic group studies with a more diverse and larger sample size would increase knowledge. Prospective research to explore causal pathways between falling, fear of falling, physical function, activity modification, postural control and specifically its measurement would be helpful. It would be useful to know to what extent those very fearful of falling are more likely to participate in a study,
than those less fearful. It would be educational to know to what extent performance-based balance testing is biased, due to fear of attempting the balance test.

There is a significant body of research on falling, but insufficient research on fear of falling and strategies to reduce that fear. Fear of falling is a predictor for becoming a faller and a potentially modifiable variable, but it remains unclear how to mitigate fear of falling once it has occurred. Beneficial research would determine if different types of interventions are necessary for those with versus without self-imposed activity restriction based on their fear of falling. Investigation to determine how to encourage healthy caution for activities related to falling versus unhealthy fear, and teaching strategies about getting up from the floor after a fall would have high utility. Lastly, hip padding protectors have reduced the risk of hip fractures by 53%, but only 24% of patients wore padding regularly in one study. Research on cosmetically appealing padding so that it will be worn would be salutary.

The previously described (see also Table 6) novel cognitive behavioral model of fear of falling provided by Childs et al., (2002) provides a cause-effect psychologic hypothetical model that could be tested in numerous ways and is conducive to cognitive-behavioral therapy. The first hypothesis amenable to testing is the time course between: 1) initiation of movement preceding anxiety, 2) anxiety precipitating distraction, 3) distraction reducing attentional resources and 4) reduced resources exceeding a threshold for a fall. A second hypothesis to test is the time course of: 1) increasing bodily awareness causing stiffening, 2) stiffening reducing attentional resources and 3) reduced resources precipitating a fall. A third testable hypothesis is the contribution to inactivity resulting from relief from anxiety that occurs through avoidance (e.g. avoidance => relief from anxiety => inactivity). A fourth testable conjecture is the contribution of the number
and extent of “shaky” experiences confirming the patient’s belief of fall risk.

Assessing clients with fear of falling requires a holistic nursing framework. The Interaction Model of Client Health Behavior (IMCHB) provides this theoretical foundation for guiding research and clinical practice. The IMCHB could be useful in addressing the relationships between quality of life and the patient’s unique background variables, intrinsic motivation, cognitive appraisal and affective response. Further, it can serve as a framework for intervention studies.

Summary

Evidence suggests that fear of falling is a common and prevalent syndrome in older adults, both in those who have fallen and not yet fallen. Fear of falling increases with age and frailty, is more prevalent in women, is associated with depression and decreased satisfaction with life, and leads to self-imposed activity restriction. Activity restriction leads to social withdrawal and decreased exercise and mobility with progressive reduction in peripheral neuromuscular function. Screening tips for fear of falling and practical intervention guidelines for practitioners were provided. The Interaction Model of Client Health Behavior focuses on the client’s singularity in a partnering relationship with the nurse practitioner and can guide the clinician in screening and interventions. Screening for external factors (e.g. home assessment), internal factors (e.g. medical problems), physical examination parameters and psychologic assessment were reviewed. Home assessment, physical therapy, medical interventions, and cognitive behavioral psychologic management were discussed. The multifactoral pathways leading to fear of falling were explored, and the many gaps in the literature led to recommendations for further theoretically based studies to determine causative pathways and treatment interventions. Client perceptions related to fear of
falling should be explored using the Interaction Model of Client Health Behavior to achieve optimum health outcomes.
Table 1

Conceptual Theoretical Framework and Model (from Cox, 1982)

**Background Variables of patient**
1) Demographic characteristics
2) Social influence
3) Previous health-care experience
4) Environmental resources

**Patient:** 1) Intrinsic motivation
             2) Cognitive appraisal
             3) Affective response

**Elements of Client Professional Interaction**
1) Affective support
2) Health information
3) Decisional control
4) Professional/technical competence

**Elements of Health Outcome**
1) Utilization of health care services
2) Clinical health status indicators
3) Severity of health care problems
4) Adherence to the recommended care regimen
5) Satisfaction with care
Table 2
Pathology Leading to Immobility/Imbalance:
- Stroke
- Decreased Postural Reflexes
- Diabetic Peripheral Neuropathy
- Alcohol
- Malnutrition (Vitamin B1, B12, E)
- Diuretics
- Antihypertensives
- Phenothiazines
- Sedating Antidepressants
- Postprandial or Orthostatic Hypotension
- Vestibulocerebellar Pathology
- Severe Anxiety or Depression
- Weakness
- Pain
- Stiffness
- Muscle Disuse
- Electrolyte Disturbances
- Malnutrition
- Anemia
- Myopathies
- Neurologic Disorders
- Arthritis
- Gout
Table 3
Proprioceptive Cerebellar Modulation of Balance:

A) Joint position & movement => Golgi tendon apparatus ------>
   Shortening/lengthening of axial/proximal limb muscles => muscle spindles =>
   spinocerebellar & medial meniscal pathways => cerebellum => integration.

B) Visual input => midbrain tectum => cerebellum => integration.

C) Cortical input => corticopontine & pontocerebellar pathways => contralateral cerebellum =>
   => integration.

D) Cerebellar output => contralateral red nucleus, thalamus => motor & premotor cerebral cortex.

E) Cerebellar fastigial nuclei output => vestibular nuclei & reticular formation =>
   vestibulospinal & reticulospinal pathways => axial & proximal limb & trunk muscles.
Table 4
Biochemical, Toxic, or Immunologic Etiologies Producing Bilaterally Symmetrical, Slowly Progressing Increase in Ataxia Symptoms:

- Alcohol
- Lithium
- Barbiturates
- Phenytoin
- Viral Cerebellitis
- Mercury
- Solvents
- Cytotoxic Chemotherapy
- Lyme’s Disease
- Vitamin B1 and B12 Deficiency
- Hypothyroidism
- Hyponatremia
- Tabes Dorsalis
- Inherited Diseases

Paraneoplastic syndrome (This is mediated by autoantibodies Yo, Ri, PCD and may be the initial presentation of females with unidentified breast or ovarian cancer.)

Rare infectious causes of ataxia include:
- Creutzfeldt Jakob Disease
- Toxoplasmosis
- Legionella
- Epstein Barr Virus
- Coxsackie virus
- Echovirus
Table 5
Odds Ratios Associated with Fear of Falling
From Arfken et al., (1994):

<table>
<thead>
<tr>
<th>Item:</th>
<th>Moderately Fearful: Not Fearful Odds Ratio:</th>
<th>Very Fearful: Not Fearful Odds Ratio:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrequently (&lt;3x/wk) leave building but not yard</td>
<td>1.07</td>
<td>6.05</td>
</tr>
<tr>
<td>Less then very satisfied with life</td>
<td>1.82</td>
<td>3.08</td>
</tr>
<tr>
<td>Depressed mood (&gt; 11 on Geriatric Depression Scale)</td>
<td>2.2</td>
<td>3.18</td>
</tr>
<tr>
<td>Impaired balance</td>
<td>1.75</td>
<td>4.44</td>
</tr>
<tr>
<td>Requiring assistance to climb stairs</td>
<td>3.65</td>
<td>4.66</td>
</tr>
<tr>
<td>Vision limiting ambulation</td>
<td>1.11</td>
<td>4.79</td>
</tr>
<tr>
<td>Fair or poor self-rated health</td>
<td>1.94</td>
<td>3.72</td>
</tr>
<tr>
<td>Use of assistive device to ambulate</td>
<td>2.82</td>
<td>9.87</td>
</tr>
<tr>
<td>Fall with medical treatment</td>
<td>2.29</td>
<td>6.31</td>
</tr>
<tr>
<td>Fall resulting in fracture</td>
<td>4.23</td>
<td>28.16</td>
</tr>
<tr>
<td>Delay in getting up after a fall of more than one minute</td>
<td>1.36</td>
<td>4.52</td>
</tr>
</tbody>
</table>

From Fessel et al., (1997):

<table>
<thead>
<tr>
<th>Item:</th>
<th>Fear of falling odds ratio</th>
<th>Limiting activity due to fear of falling odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1.63 (p &lt;0.05)</td>
<td>-</td>
</tr>
<tr>
<td>Fell and strained muscle</td>
<td>2.46 (p &lt;0.05)</td>
<td>-</td>
</tr>
<tr>
<td>Pain in lower extremity joint</td>
<td>1.2 (p &lt;0.01)</td>
<td>-</td>
</tr>
<tr>
<td>Fair or poor self rated health</td>
<td>-</td>
<td>1.63 (p &lt;0.05)</td>
</tr>
</tbody>
</table>
From Friedman et al., (2002):

<table>
<thead>
<tr>
<th>Predictor:</th>
<th>Fall predictor odds ratio (p &lt;0.05)</th>
<th>Fear of falling predictor odds ratio (p &lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of falling at baseline and who did cut back on activities</td>
<td>2.10</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td>1.53</td>
<td>2.0</td>
</tr>
<tr>
<td>Stroke history</td>
<td>1.61</td>
<td>1.54</td>
</tr>
<tr>
<td>Parkinson’s disease</td>
<td>4.18</td>
<td>-</td>
</tr>
<tr>
<td>Falls at baseline</td>
<td>2.51</td>
<td>1.58</td>
</tr>
<tr>
<td>Fear of falling at baseline</td>
<td>1.78</td>
<td>5.4</td>
</tr>
</tbody>
</table>

From King et al., (1995):

<table>
<thead>
<tr>
<th>Risk Factor:</th>
<th>Odds ratio for falling:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parkinson’s disease</td>
<td>9.5</td>
</tr>
<tr>
<td>Older age</td>
<td>2.5</td>
</tr>
<tr>
<td>Female with stroke</td>
<td>13.6</td>
</tr>
<tr>
<td>Arthritis</td>
<td>2.7</td>
</tr>
<tr>
<td>Impaired balance or strength</td>
<td>2.6 - 3.4</td>
</tr>
<tr>
<td>Impaired gait</td>
<td>2.7</td>
</tr>
<tr>
<td>Previous faller</td>
<td>2.4 - 3.1</td>
</tr>
<tr>
<td>Female with &gt; 4 medications</td>
<td>4.5</td>
</tr>
<tr>
<td>Sedative psychotropics</td>
<td>28.3</td>
</tr>
</tbody>
</table>
Table 6

Cognitive Behavioral Model of Fear of Falling As a Risk Factor for Future Falls (Childs et al., 2002):

Immediate Risk  ==>  ==>  ==>  ==>  Longer Term Risk

Worry about falling

- Increased bodily awareness
- Increased negative thoughts
- Reduced activity or avoidance of activity
- Increased poor self perception
- Lowered body strength

Increased risk of falling
Table 7
The Interaction Model of Client Health Behavior and Characteristics Correlated with Fear of Falling

**Background Variables of Patient:**

1 Demographic/Physical patient characteristics:
   - Infrequently (<3x/wk) leaving the building but not yard
   - Delay in getting up after a fall of more than one minute
   - Impaired balance or strength
   - Fell and strained muscle, bruise, bleeding
   - Impaired gait
   - Fall resulting in fracture
   - Vertigo or dizziness
   - Cognitive impairment
   - Reduced functional reach
   - Decreased activity level
   - More than 4 medications
   - Older age
   - Falls at baseline
   - Stroke history
   - Parkinson’s disease
   - Pain in lower extremity joint
   - Female
   - Vision limiting ambulation
   - Requiring assistance to climb stairs

2 Social influence:
   - Decreased social activities
   - Less socially integrated
   - Knowing a friend or relative who had a serious fall
   - Being less likely to talk to friends about falls
   - Being less likely to rely on others during times of crisis

3 Previous health-care experience:
   - Fall with medical treatment

4 Environment resources:
   - Use of assistive device to ambulate

**Patient Characteristics:**

1 Intrinsic motivation:
   - Fear of falling at baseline and who did not cut back on activities
2 Cognitive appraisal:
  - Fair or poor self-rated health
  - Perceived coping potential to control or prevent harm
  - Cut back on activities to avoid falling

3 Affective response:
  - Less than very satisfied with life
  - Depressed mood
  - Fear of falling at baseline
  - Sedative psychotropics
  - Recent experience with fall
  - Debilitating anxiety
Table 8
Assessment Instrument for Falls and Fear of Falling (from Arfken et al., 1994; Chandler et al., 1996; Fessel et al., 1997; King et al., 1995; & Friedman et al., 2002)

Physical History:
1) Gender
2) Age
3) Family history of maternal hip fracture
4) Previous fracture after the age of 50
5) History of hyperthyroidism
6) History of arthritis
7) History of gout
8) Parkinson’s disease
9) Current malnutrition
10) Currently used medications
11) Does the patient spend less than four hours per day standing?
12) Can the patient descend steps, step over step, with no railing?
13) Do they require assistance to climb stairs?
14) Is the patient able to sit independently?
15) Can the patient rise from a chair without using her/his arms?
16) Has the patient had a near fall episode, or a fall resulting in a fracture or other injury?
17) Does the patient have poor vision that limits ambulation
18) Can the patient walk ten blocks?
19) Do they need an ambulation device?

Psychologic and Environmental History:
1) Ask about icy walkways, poor sidewalks and steps, inadequate lighting, slippery floors, loose carpets and footwear.
2) Assess for life space by asking the patient if in the last week they have gone outside the bedroom, residence, or neighborhood without help. (Leaving residence <3x/week = increased risk for fear of falling).
3) Has the patient limited walking or stair climbing due to fear of falling?
4) Does patient have poor self-rated health?
5) Has patient had two or more falls in the past year?
6) Have there been minor injuries from a fall in the past?
7) Have they seen a physician for a fall?
8) Is there depression or anxiety?
9) Ask patient closed question: “are they afraid of falling?”

Physical Exam:
1) Height
2) Body mass index
3) Tachycardia?
4) Orthostatic hypotension?
5) Presence and accurate identification of vibration sense on the great toe.
6) Reflexes
7) Proprioception in the lower limbs
8) Reaction time
9) Vision: acuity (near and distance), contrast sensitivity, depth perception, stereo acuity and visual fields.
10) Lower extremity muscle strength: ankle dorsiflexion, knee flexion and extension, and hip abduction, adduction, flexion and extension.
11) Balance testing: use parallel, tandem and semi tandem stances to be maintained for ten seconds with the eyes open and then closed.
12) Balance testing: Side-by-side stance for 30 seconds with eyes open, arms folded across the chest and feet close but not touching.
13) Physical performance assessment: a timed ten foot walk, functional reach to measure dynamic balance, sitting balance, sitting reach, transfer, picking up an object from the floor, rising from a chair, walking, turning, stopping suddenly, stepping over a shoebox, and ascending and descending stairs.
14) Gait assessment: stride length, gait speed travel time to walk a 4 m straight path, double stance time, clinical gait scores and stride width.

Psychological Exam:
1) Screen for cognitive impairment.
2) Screen for poor self-rated health.
3) Depression (30 item Geriatric Depression Scale).
4) Screen for exaggerated fears and a globalized sense of danger or anxiety disorder.
5) Assess for fear of falling: a) Falls Efficacy Scale, b) The Survey of Activities and Fear of Falling in the Elderly, c) Fear of Falling Questionnaire

Lab/Testing:
1) Electrolyte abnormalities
2) Malnutrition (vitamin B1, B12, E)
3) Anemia
4) Abnormal thyroid function
5) Hyperparathyroidism
6) Infectious/immunologic studies if indicated
7) Bone density (especially femoral neck)
8) Radiologic exam for increased length of femoral neck
Table 9
Related ICD-9CM Codes for Falls and Fear of Falling (from Department Of Health and Human Services, 1994; and Ferri, 2001):

<table>
<thead>
<tr>
<th>Condition</th>
<th>ICD-9</th>
<th>Condition</th>
<th>ICD-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panic disorder without agoraphobia</td>
<td>41.0</td>
<td>Panic disorder</td>
<td>300.01</td>
</tr>
<tr>
<td>Hypothyroidism, acquired</td>
<td>244</td>
<td>Conversion disorder</td>
<td>300.11</td>
</tr>
<tr>
<td>Hypoglycemia, NOS</td>
<td>251.2</td>
<td>Phobia, unspecified</td>
<td>300.20</td>
</tr>
<tr>
<td>Hypermagnesemia</td>
<td>275.2</td>
<td>Musculoskeletal malfunction</td>
<td>306.0</td>
</tr>
<tr>
<td>Hypomagnesemia</td>
<td>275.2</td>
<td>Alzheimer’s disease</td>
<td>331.0</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>275.41</td>
<td>Ataxia, cerebral</td>
<td>331.89</td>
</tr>
<tr>
<td>Hypercalcemia</td>
<td>275.42</td>
<td>Idiopathic Parkinson’s disease</td>
<td>332.0</td>
</tr>
<tr>
<td>Hypernatremia</td>
<td>276.0</td>
<td>Parkinson’s disease, secondary</td>
<td>332.1</td>
</tr>
<tr>
<td>Hyponatremia</td>
<td>276.1</td>
<td>Primary cerebellar degeneration</td>
<td>334.2</td>
</tr>
<tr>
<td>Dehydration</td>
<td>276.5</td>
<td>Ataxia, cerebellar, NOS</td>
<td>334.3</td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>276.7</td>
<td>Spino-cerebellar disease,</td>
<td>334.9</td>
</tr>
<tr>
<td>Hypokalemia</td>
<td>276.8</td>
<td>unspecified</td>
<td></td>
</tr>
<tr>
<td>Anemia, iron deficiency due to inadequate intake</td>
<td>280.1</td>
<td>Multiple sclerosis</td>
<td>340</td>
</tr>
<tr>
<td>Anemia, megaloblastic, nutritional</td>
<td>281.8</td>
<td>Hemiplegia</td>
<td>342</td>
</tr>
<tr>
<td>Anemia, NOS</td>
<td>285.9</td>
<td>Polynéuropathy, DM 2</td>
<td>350.60</td>
</tr>
<tr>
<td>Dementia, senile</td>
<td>290.0</td>
<td>Polynéuropathy, DM 1</td>
<td>350.61</td>
</tr>
<tr>
<td>Dementia, presenile</td>
<td>290.1</td>
<td>Lower extremity neuropathy</td>
<td>355.10</td>
</tr>
<tr>
<td>Drug-induced dementia</td>
<td>292.82</td>
<td>Neuropathy, NOS</td>
<td>355.9</td>
</tr>
<tr>
<td>Major depressive disorder, single episode</td>
<td>296.2</td>
<td>Cataract, senile</td>
<td>366.1</td>
</tr>
<tr>
<td>Paranoid state, NOS</td>
<td>297.9</td>
<td>Myopia</td>
<td>367.1</td>
</tr>
<tr>
<td>Condition</td>
<td>Code</td>
<td>Diagnosis/Description</td>
<td>Code</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------</td>
<td>---------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Anxiety, unspecified</td>
<td>300.00</td>
<td>Presbyopia</td>
<td>367.4</td>
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<tr>
<td>Visual field defect, unspecified</td>
<td>368.4</td>
<td>Gait disorder due to ankle/foot abnormality</td>
<td>719.77</td>
</tr>
<tr>
<td>Night blindness, unspecified</td>
<td>368.6</td>
<td>Muscle wasting and disuse atrophy NOS</td>
<td>728.2</td>
</tr>
<tr>
<td>Profound visual impairment, uncorrectable</td>
<td>369</td>
<td>Muscle weakness</td>
<td>728.9</td>
</tr>
<tr>
<td>Vision loss, NOS</td>
<td>369.9</td>
<td>Syncope and collapse</td>
<td>780.2</td>
</tr>
<tr>
<td>Meniere's disease</td>
<td>386.0</td>
<td>Vertigo, NOS</td>
<td>780.4</td>
</tr>
<tr>
<td>Vertigo, peripheral</td>
<td>386.10</td>
<td>Malaise and fatigue</td>
<td>780.7</td>
</tr>
<tr>
<td>Vertigo, benign paroxysmal positional</td>
<td>386.11</td>
<td>Tremor, NOS</td>
<td>781.0</td>
</tr>
<tr>
<td>Vertigo, vestibular</td>
<td>386.12</td>
<td>Gait abnormality</td>
<td>781.2</td>
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<tr>
<td>Acute stroke</td>
<td>436</td>
<td>Ataxia, NOS</td>
<td>781.3</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
<td>458</td>
<td>Abnormal posture</td>
<td>781.9</td>
</tr>
<tr>
<td>Arthritis, rheumatoid</td>
<td>714.0</td>
<td>Edema, lower extremities</td>
<td>782.3</td>
</tr>
<tr>
<td>Osteoarthritis, multiple sites</td>
<td>715.09</td>
<td>Musculoskeletal, nonspecific abnormal radiologic finding</td>
<td>793.7</td>
</tr>
<tr>
<td>Arthritis, degenerative, NOS</td>
<td>715.9</td>
<td>Brain/CNS nonspecific abnormal functional study</td>
<td>794.00</td>
</tr>
<tr>
<td>Arthralgia, pelvic/thigh</td>
<td>719.45</td>
<td>Peripheral nervous system nonspecific abnormal nerve test</td>
<td>794.1</td>
</tr>
<tr>
<td>Arthralgia, lower leg</td>
<td>719.46</td>
<td>Abnormal reflex</td>
<td>796.1</td>
</tr>
<tr>
<td>Arthralgia, ankle/foot</td>
<td>719.47</td>
<td>Nonspecific low blood pressure reading</td>
<td>796.3</td>
</tr>
<tr>
<td>Gait disorder due to hip, femur abnormality</td>
<td>719.75</td>
<td>Debility, unspecified</td>
<td>799.3</td>
</tr>
<tr>
<td>Gait disorder due to lower leg joint abnormality</td>
<td>719.76</td>
<td>Other acute reactions to stress (brief or acute posttraumatic stress disorder)</td>
<td>308.3</td>
</tr>
</tbody>
</table>
Table 9 (continued)
V Codes (reasons patients seek medical care) Related to Falls and Fear of Falling (from Department Of Health and Human Services, 1994; and Ferri, 2001):

<table>
<thead>
<tr>
<th>Reason patient seeks medical care:</th>
<th>V code:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical problem with limbs</td>
<td>V 49.1</td>
</tr>
<tr>
<td>Motor problems with limbs</td>
<td>V 49.2</td>
</tr>
<tr>
<td>Sensory problems with limbs</td>
<td>V 49.3</td>
</tr>
<tr>
<td>Wheelchair fitting and adjustment</td>
<td>V 53.8</td>
</tr>
<tr>
<td>Physical therapy and rehab care</td>
<td>V 57.1</td>
</tr>
<tr>
<td>Housing/Homecare inadequacy</td>
<td>V 60</td>
</tr>
<tr>
<td>Counseling - not elsewhere classified</td>
<td>V 65.4</td>
</tr>
<tr>
<td>Routine general medical exam</td>
<td>V 70.0</td>
</tr>
</tbody>
</table>
Table 10
Management Interventions for Fear of Falling (Baumann, 1999; Chandler et al., 1996; Friedman et al., 2002; Gentleman et al., 2001; Howland et al., 1998; King et al., 1995; Resnick, 1998; Rosenberg, 1998; & Tinetti & Speechlely, 1989).

Environmental Interventions:
1) Portable phone or lightweight radio call system
2) Home safety assessment
3) Wear shoes with firm, nonskid, nonfriction soles and low heels (avoid stocking feet and loose slippers).
4) Remove tripping objects (cords, clothes, shoes etc.).
5) Use shallow pile carpet
6) Avoid throw rugs or rugs with nonskid backing, nonskid wax and tack down carpet edges.
7) Remove tripping hazards in yard (pavement cracks, rocks, tools, holes, etc.).
8) Use safety with slippery surfaces (ice, wet leaves).
9) Use walking aids, wheelchairs, bathroom grab bars for tub, shower, toilet, rubber mats in tub or shower, shower chair with handheld shower, raised toilet seat.
10) Promptly clean up spills on floor.
11) Maintain adequate lighting (elderly need twice as much), night lights, absence of glare.
12) Maintain stairs in good repair, rise ideally < 6 inches/step, good lighting, bilateral handrails, and bottom and top stairs clearly marked with bright tape.
13) Store cabinet items (kitchen, bathroom, bedroom etc.) so that reaching up and bending over are not necessary.
14) Firm and nonmovable kitchen table.
15) Energy absorbing floors.
16) Protective hip padding.

Medical Interventions:
Treat:
1) Known neurologic, psychiatric, cardiovascular, orthopedic, and osteoporotic problems (bone density measurement, Fosamax, Evista, calcium carbonate).
2) Malignancies.
3) Malabsorption or malnutrition syndromes [screen for vitamin E, B1, B12 deficiencies].
4) Hypothyroidism.
5) Depression or anxiety.
6) Tabes dorsalis [check CSF for syphilitic infection].
7) Lyme disease and Legionella (check antibody titers & appropriate antibiotic therapy).
8) Genetic counseling for spinocerebellar ataxia syndromes.
9) Improve visual acuity through refraction correction and cataract extraction.
10) Improve hearing through cerumen removal, reduction in background noise, and audiology evaluation for hearing aid.
11) Evaluate for proprioception dysfunction, peripheral neuropathy (DM) and cervical spondylosis.
12) Treat reversible dementia and avoid centrally active and sedative medication.
13) Reduce orthostatic hypotension with rehydration, medication assessment, and management of situational factors [meals, body position].
14) Provide podiatry evaluation for foot disorders.
15) Treat lower extremity edema.
16) Evaluate vestibular function.
17) Avoid medications affecting the vestibular system.
18) Reevaluate medications to obtain the lowest number of medications at the lowest effective dose with shortest action, least centrally acting and least associated with postural hypotension (avoid alcohol, benzodiazepines, barbiturates, phenothiazines, sedating antidepressants or antihistamines, centrally acting antihypertensives, judicious use of diuretics, anticonvulsants, antiarrhythmics, etc.)

Physical Therapy Interventions:
1) Gait training.
2) Balance exercise and training.
3) Fitting for appropriate mobility assistive devices (e.g. walkers).
4) Bone strengthening through weight bearing exercises.
5) Muscle strengthening (especially muscles supporting the ankles).
6) Range of motion exercises.
7) Postural hypotension physical therapy (dorsiflexion exercises, pressure graded stockings, tilt table).
8) Low intensity group exercise.
9) Teaching for how to get oneself up off the floor after a fall.

Psychologic/Social Interventions:
1) Treat depression and anxiety.
2) Realistic appraisal of patients environment and actual abilities.
3) Cognitive restructuring behavioral group programs provide social support networks.
4) Videotapes with people discussing their fears.
5) Didactic teaching in group.
6) Group discussion.
7) Mutual problem solving.
8) Role playing.
9) Exercise training (e.g. Chinese Tai Chi exercise).
10) Assertiveness training.
11) Home assessment.
12) Behavioral contracting.
13) Peer leadership encourages the patient by exposing them to others who have experienced falls and have effectively coped with their fear of falling and remained active.
References


behavior. Research and Nursing and Health, 7, 275-285.


