

Mobility and Safety in the Multiple Myeloma Survivor: Survivorship Care Plan of the International Myeloma Foundation Nurse Leadership Board

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As in many other cancers, survivorship of multiple myeloma involves handling treatment, recovery from therapeutic interventions, the effects of the disease, and ongoing therapies. Although mobility challenges vary among survivors of multiple myeloma, these patients have an increased risk of impaired mobility because of side effects of therapy and the pathology of the disease, as well as other factors (e.g., increasing age). Health maintenance increasingly is becoming a part of the cancer control continuum, and nurses have the opportunity to help survivors of multiple myeloma optimize their functional mobility and safety, thereby preserving quality of life. The purpose of these practice recommendations is to provide the healthcare professional with information on mobility, fall risk, and planned activity as an integral part of the plan of care for patients with multiple myeloma. Tools for nurses and physicians for assessing and evaluating the newly diagnosed patient, the patient undergoing treatment, and the long-term survivor of multiple myeloma will be provided.

Multiple myeloma is a disease of the plasma cells found in the bone marrow and occurs most often in patients aged 60–70 years (Nau & Lewis, 2008). Among the signs and symptoms of multiple myeloma that affect mobility and safety, anemia and bone disease occur in as many as 90% of patients (Roodman, 2008). Almost all patients with multiple myeloma develop bone disease consisting of osteolytic bone lesions. At diagnosis and throughout treatment, these result in decreased mobility, pain, metabolic disturbances from bone loss, neurologic compromises, weakness, and fatigue. Lack of mobility and activity becomes a substantial hindrance to optimizing therapeutic interventions and may cause complications in the therapeutic setting, which in turn will have consequences for long-term prognosis (Roodman, 2008).

At a Glance

- ◆ As patients with multiple myeloma survive longer, they experience disease-related health issues, treatment-related side effects, and comorbid conditions that can decrease their functional mobility and safety.
- ◆ Nurses have the potential to improve the quality of life of patients with multiple myeloma by regularly monitoring laboratory and radiographic tests, assessing patients' risk for falls and injury, and improving functional mobility by advocating safe activity and exercise programs.
- ◆ Practice recommendations have been developed to provide healthcare professionals with information on mobility, fall risk, and planned activity.

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As with other individuals aged 65 years and older (regardless of health status), patients with multiple myeloma have particular risk factors related to falls. An estimated 33% of older adults fall each year, and the likelihood of falling increases as the patient ages; the actual number of older adults who fall and are not injured is unknown. The Centers for Disease Control and Prevention (CDC) estimated that, in 2008, about 16% of all U.S. adults in that age group fell at least once, and 31% of those who fell sustained an injury. Among older adults, falls are the leading cause of injury-related deaths (CDC, 2008, 2010). In patients with multiple myeloma, falls frequently lead to fractures, which often is the event leading to a diagnosis of multiple myeloma (Melton et al., 2004).

People with multiple myeloma are surviving longer because of newly available treatment options such as the novel agents bortezomib, lenalidomide, and thalidomide, with an increased survival benefit particularly noted in patients diagnosed in the past 5–10 years and those diagnosed at a younger age (Brenner, Gondos, & Pulte, 2009). Therefore, mobility, fall-risk assessment, and planned activity should form an integral part of the long-term care plan for patients with multiple myeloma.

Given the skeletal issues and risk of injury, long-term care planning for survivors of multiple myeloma should include scheduled assessments, a well-defined plan that includes evaluations for reducing symptoms and enhancing functional capacity, and appropriate interventions for improving overall health (Hacker, 2009; Knobf, Musanti, & Dorward, 2007). Healthcare providers for patients with multiple myeloma assess, prevent, and treat the acute and chronic problems of the disease and the treatment-associated issues. Nursing interventions are crucial in optimizing these actions by maintaining and restoring function. Physicians and nurses need to take a proactive role in assessing

patients' functional levels and fall risks, consult accordingly with physical and occupational therapists involved in patient care, and communicate with patients (see Figure 1). The positive aspects of having an activity plan are numerous. Nurses and physicians also should be aware of the serious sequelae of immobility and injury that may lead to the demise of the patient. Equally important is the need to appreciate the physical limitations resulting from the consequences of multiple myeloma and its treatment.

General Assessment

Evaluation of the patient's baseline history and physical assessment should be performed. Determination of the extent of bone disease should precede prescribing an exercise program. Although a metastatic bone survey (complete skeletal x-radiogram) has been considered the gold standard for imaging myeloma bone disease, plain radiograms are insensitive and cannot be used to detect low levels of bone decalcification (Bartel et al., 2009; Roodman, 2008). Computed tomography (CT) scans, magnetic resonance imaging (MRI), and positron-emission tomography (PET) scanning are more sensitive for estimating bone involvement and indicate the need for referral to orthopedic specialists in selected patients (Roodman, 2008). Bone mineral density scans are beneficial in evaluating osteopenia at baseline and annually for guiding the use of bisphosphonates (Coleman, Coon, et al., 2003) (see Table 1). Laboratory abnormalities, comorbid conditions (e.g., cardiovascular disease, neuropathies, other neurologic issues, pain, gastrointestinal symptoms, problems with vision), and medications also should be reviewed regarding their effect on the patient's function.

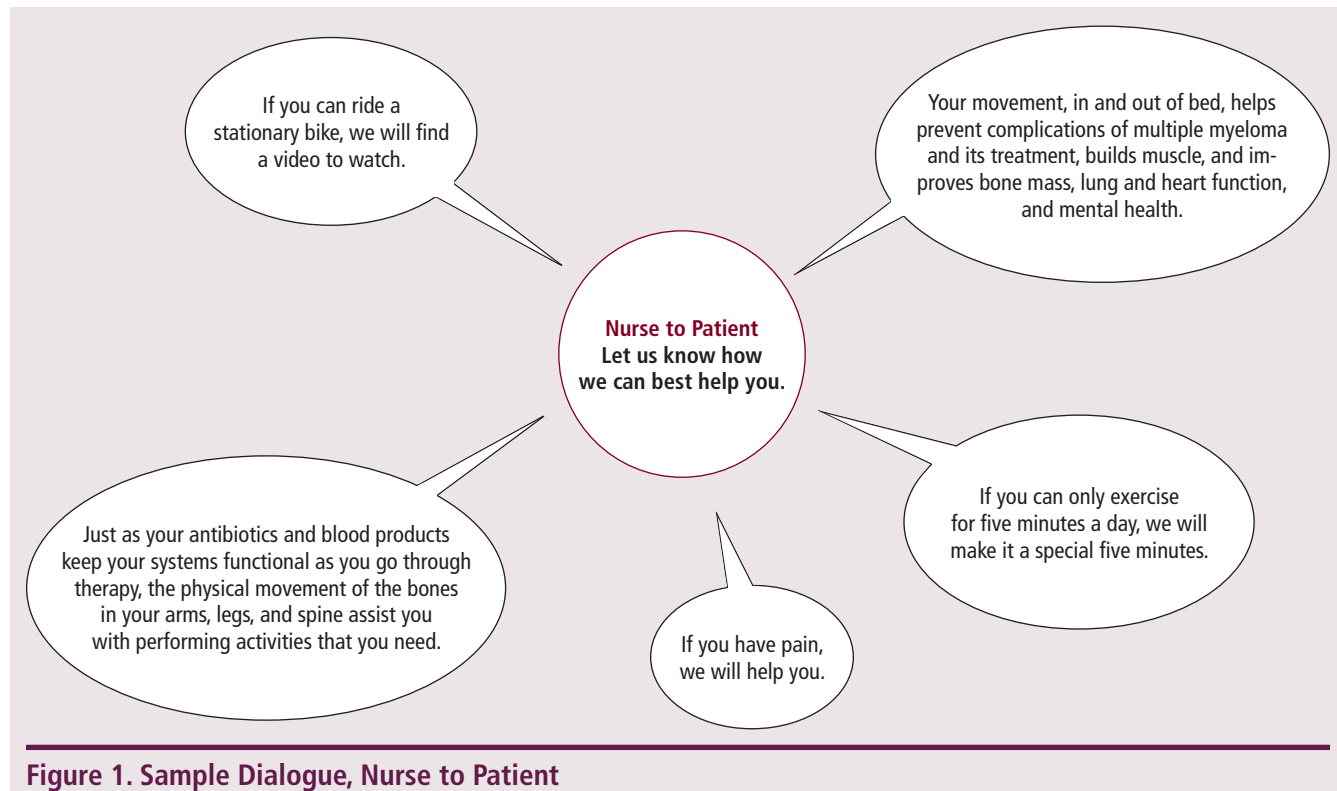


Figure 1. Sample Dialogue, Nurse to Patient

Table 1. Factors Associated With Reduced Mobility and Increased Risk of Falling

FACTOR	EFFECT
Age	Aging is associated with changes in body composition, including an increase and redistribution of adipose tissue and a decrease in muscle and bone mass. These changes can impair mobility, increase risk of falls and frailty, and promote functional decline (Singh, 2002).
Alcohol use	Identification of alcohol use, a common problem in older adults, is difficult. Alcohol use may lead to falls, fractures, global state alteration, multiple drug interactions, loss of activities of daily living, and neuropsychological alterations (Bux et al., 2007).
Comorbidities	
• Arthritis	Arthritis, often a disease of older adults, may predispose patients with multiple myeloma to fall-related fractures (Rubenstein & Josephson, 2006).
• Cardiovascular	Orthostatic hypotension may result from a variety of factors, including medication, fluid or blood loss, or adrenal insufficiency, and can lead to falls, fractures, functional decline, and myocardial ischemia (Gupta & Lipstiz, 2007).
• Dementia	Dementia is a frequent disease in older adults and places individuals at risk for falling. Causes include cognitive and behavioral disorders, visual and motor problems, gait and balance disturbances, malnutrition, adverse effects of medication, and fear of falling (Thurman et al., 2008).
• Diabetes	Studies have shown that type 1 and type 2 diabetes are associated with an increased risk of hip fracture and other fractures. More frequent falls may account for some of the increased risk, but reduced bone strength also may play a role (Schwartz & Sellmeyer, 2007).
• Hormonal deficiency	Low levels of sex hormones are associated with impaired mobility and low muscle strength in men, but not in women. Low levels of sex hormones were not associated with the incidence of falls in men or women (Schaap et al., 2005).
• Kyphosis or osteoporosis	Hyperkyphotic posture is an independent risk factor for falls in older adults, men more so than women (Kado et al., 2007). Steroids, nutritional deficits, and androgen or estrogen deficiencies can contribute to this risk factor. The use of bisphosphonates may decrease osteoporosis.
• Sensory	Poor vision adds to the risk of injury in older adults (Centers for Disease Control and Prevention, 2008).
• Urinary incontinence	Urinary incontinence may be related to spinal injury, compression fractures, neuropathic changes from multiple myeloma, or anatomic changes such as benign prostatic hypertrophy or bladder prolapse (Asplund, 2005).
Depression and anxiety related to chronic disease	Poor functional ability and depression may be associated with the risk of falling (Overcash, 2007; Rubenstein & Josephson, 2006). Apathy, fear of failure, and possible suicidal thoughts can lessen the patient's interest in participation. Fear of falling may inhibit confidence in participation.
Environment	Many falls happen at home; for women, it most commonly occurs while performing household duties. A fatal fall down the stairs without an underlying, severe cause (e.g., myocardial infarction, stroke, brain tumor) or alcohol influence is rare (Bux et al., 2007). Descending stairs is a risky and demanding task for older adults. A slip between the foot or shoe sole and the stair surface may play a role in stair-related falls (Christina & Cavanagh, 2002).
Medications	Medications may have multiple side effects that may increase the risk of falling (Wilkins, 1999). Opioids, antidepressants, anxiolytics, and sleep aids can cause dizziness and somnolence (Rubenstein & Josephson, 2006). Bisphosphonates and growth factors may cause temporary bone pain that can limit mobility (Maxwell, 2007).
Nutrition and hydration	Poor vitamin D status may be associated with muscle weakness, functional deficits, and risk of falling and osteoporosis (Moore & Kiebzak, 2007). Nutritional deficiency is associated with the onset of accelerated weight loss with decreased muscle mass and strength, which can lead to falls in older adults (Kinney, 2004; Overcash, 2008). Dehydration can cause postural hypotension, increasing the risk of falls and decreasing activity.
Patient's health outlook	Adopting healthy aging policies may extend years of quality life for older patients (Peel et al., 2007). Use of regular strength and balance training, reduction of psychotropic medication, and dietary supplementation with vitamin D and calcium are helpful in preventing falls among older adults (Kannus et al., 2005; Overcash, 2008). Peripheral neuropathy—common in patients with diabetes and a sequela of chemotherapy—can affect gait and balance (Petit & Upender, 2003).

(Continued on the next page)

Table 1. Factors Associated With Reduced Mobility and Increased Risk of Falling (Continued)

FACTOR	EFFECT
Poor footwear or foot problems	The effect of footwear on postural stability can be a risk factor for falling (Menz & Lord, 1999). Slip-resistant shoes for indoor use may not provide the same protection on ice or slippery surfaces (Dawson et al., 2002). Painful feet can increase the risk of falls and hamper mobility (Robbins et al., 1997). Foot position awareness is related to stability and declines with advancing years (Menz et al., 2006). Risk of falling indoors can be associated with going barefoot or wearing only socks or slippers (Kerse et al., 2004).
Social support system	Living alone later in life is a potential health risk. People are more likely to have poor health, poor vision, difficulties with daily living, worse memory, poorer diet, risk of social isolation, and multiple falls (Kharicha et al., 2007).
Weather	The effects of weather include winter ice and snow, and winter-weather wrought bone loss, often unpredictable; whereas the summer may bring heat exhaustion and dehydration; rain may increase the overall hazards because it is not seasonal and often is unpredictable (Gao & Abeysekera, 2004).

Because patients with multiple myeloma often have problems that may affect their mobility, their ability to function safely can change over time. For example, a patient may have a spinal lytic lesion successfully treated by vertebroplasty, but may have a new onset of peripheral neuropathy from chemotherapy (see Table 2). Patients also may experience physical changes related to treatment, such as peripheral neuropathy, muscle wasting, fatigue, gastrointestinal issues, and others (see Table 3). These, along with other patient factors, may interfere with daily functioning and mobility. Therefore, ongoing fall and current-function assessments as well as an updated exercise plan at every patient encounter all are crucial (Coon & Coleman, 2004a).

Table 2. Multiple Myeloma-Specific Risk Factors Affecting Mobility

MYELOMA-RELATED PATIENT PROBLEMS	EFFECT ON MOBILITY AND SAFETY
Amyloid deposition in vital organs	Inability to participate in activities because of organ function restrictions
Bone disease <ul style="list-style-type: none"> • Vertebral compression fracture with or without spinal cord compression • Painful bony lesions • Hypercalcemia 	Self-limiting mobility from pain, loss of sensation of the lower extremities, and bowel and bladder incontinence Side effects of opioids and steroids Somnolence, confusion
Fatigue and weakness (e.g., steroid-induced proximal muscle weakness, anemia)	Lack of desire or ability to participate in activity and inability to ambulate safely
Gastrointestinal issues (e.g., nausea, vomiting, constipation, diarrhea)	Mobility restrictions caused by symptoms (e.g., electrolyte imbalance [such as hyponatremia], dehydration, anorexia, weight loss)
Neuropathic changes	Self-limiting mobility from discomfort and lack of sensation
Shortness of breath (e.g., from anemia, pulmonary compromise)	Lack of ability to withstand extended activity; may require oxygen

The rate of falls in patients with multiple myeloma has not been reported; however, these patients may be prone to several fall-risk factors as listed in Tables 1 and 2 (Ganz, Bao, Shekelle, & Rubenstein, 2007). Fall risk cannot necessarily be predicted based on a single factor. A research-based, reliable, sensitive, and practical assessment tool should be used to assess fall risk in any healthcare setting (Overcash, 2007; Perell et al., 2001). The Hendrich Fall Risk Model (Hendrich, Nyhuus, Kippenbrock, & Soja, 1995; Perell et al., 2001), Morse Fall Scale (Morse, Morse, & Tylko, 1989; Perell et al., 2001), and the timed Get Up and Go test are examples of tools that can be used in the inpatient or outpatient settings (Lundin-Olsson, Nyberg, & Gustafson, 1998; Podsiadlo & Richardson, 1991; Shumway-Cook, Brauer, & Woolacott, 2000) (see Appendices A, B, and C).

Evidence-Based Support for Promoting Activity and Proper Nutrition

Many evidence-based studies support the benefits of physical activity and exercise on physical, psychological, and emotional health in cancer survivors. Along the care continuum, physical benefits include improved cardiorespiratory fitness, muscle strength, endurance, immune function, and weight management (Carlson, Speca, Faris, & Patel, 2007; Clark et al., 2007; Courneya & Friedenreich, 2007; Ingram & Visovsky, 2007; Oldervoll et al., 2006). Higher levels of vigor and relaxation have been observed with moderate stretching exercise, such as yoga (Carson et al., 2007; Culos-Reed, Carlson, Daroux, & Hatley-Aldous, 2006). Adequate nutrition and exercise are highly recommended for cancer survivors (Wiseman, 2008). The supportive care literature has not focused comprehensively on these aspects of health in the context of patients with multiple myeloma.

Survivors who report more exercise during these periods report a higher quality of life (Jones et al., 2004). An adequate mobility program for survivors of multiple myeloma should be one component of the treatment of the disease and health maintenance and contribute to general overall well-being. A low percentage of survivors of multiple myeloma are exercising regularly either during active or off-treatment periods.

Exercise intervention studies in survivors of multiple myeloma who participate in exercise programs show that it can

be done safely and may be effective for decreasing fatigue and mood disturbance as well as improving sleep (Coleman, Coon, et al., 2003). Patients with multiple myeloma undergoing aggressive treatment, such as a stem cell transplantation, can safely participate in an individualized strengthening and endurance exercise program (Coleman et al., 2008).

Promoting Safety Through Physical Activity

Planned physical activity should be part of an overall health program that includes exercise, nutrition, and weight management. Complementary therapies such as support groups and nutritional supplements also may be included (Doyle et al., 2006; Everett, 2008; Jones & Demark-Wahnefried, 2006). Patients with multiple myeloma may not have participated previously in physical activity; however, evidence of obesity and lack of physical activity as causes of multiple myeloma are not conclusive (Birmann, Giovannucci, Rosner, & Anderson, 2007). All assessments prior to an activity or exercise plan should include patient's previous activities and exercise preferences, which may be unique and varied (Jones & Courneya, 2002).

Improvement in functional ability, strength, and balance clearly reduces the risk of falls and injury in those at highest risk (Doyle et al., 2006; Rubenstein & Josephson, 2006; Voukelatos, Cumming, Lord, & Rissel, 2007). Risk factors for falls and injury in older adults are multifactorial, and prevention warrants interventions tailored to the individual patient. Studies have demonstrated that strength and balance training is paramount in reducing the risk of falls and fall-related injuries (Kannus, Sievanen, Palvanen, Jarvinen, & Parkkari, 2005; Voukelatos et al., 2007).

For patients with mobility problems and a potential risk of falling, the following should be specifically addressed.

- Determine immediate needs for safety (e.g., hospital-fall precautions program, in-home assistance, use of assistive devices).
- Treat or manage the underlying disorder (e.g., neuropathy).
- Assess and adjust medications.
- Recommend an exercise program that includes training in gait and balance, and stretching.
- Assess and modify daily routines.
- Assess safety of home environment.

As with many types of cancer, multiple myeloma can be considered a chronic disease that often affects the patient's and family's routines and lifestyle. A patient may have been active previously, but now has been labeled as high risk for falling by the healthcare team and doesn't want to adhere to restrictions such as calling for help or using a walker. A patient with bone disease compromising spinal stability or with the potential for fracture may be uncertain of appropriate activities. A sedentary individual may not understand the importance of exercise on bone health. Clinicians should recommend safe activities as part of the plan of care for every patient.

Safe mobility and physical activity programs should be tailored to the needs of individual patients. In any setting, the immediate need for patient safety (e.g., prevention of falling) should be the priority. For example, in an acute-care setting, the use of a walker or cane, verbal reminders to the patient to call for help, frequent rounding, and the use of bed-exit alarms all may be helpful in immediately reducing the risk of falling. The home environment

Table 3. Side Effects of Multiple Myeloma Therapies That Affect Mobility^a

SIDE EFFECT	SPECIFIC SEQUELAE
Cardiovascular and respiratory issues	<ul style="list-style-type: none"> • Deep vein thrombosis and/or pulmonary embolism are risk factors with thalidomide and dexamethasone (23%) versus dexamethasone alone (5%) (Celgene Corp., 2010b) or lenalidomide and dexamethasone (9%) versus dexamethasone alone (4%) (Celgene Corp., 2010a). • May limit walking and other activities, as may long-term anticoagulation use • Orthostatic hypotension (13% with bortezomib) (Millennium: The Takeda Oncology Company, 2010)
Fatigue and somnolence	<ul style="list-style-type: none"> • May be related to anemia, electrolyte imbalances, malnutrition, and inactivity • Somnolence is a frequent side effect of thalidomide (Armoiry et al., 2008; Celgene Corp., 2010b).
Myelosuppression	<ul style="list-style-type: none"> • Thrombocytopenia: Bortezomib alone (35%) versus dexamethasone (11%) (Millennium: The Takeda Oncology Company, 2010); lenalidomide and dexamethasone (22%) versus dexamethasone (11%) (Celgene Corp., 2010a) • Neutropenia: Lenalidomide and dexamethasone (42%) versus dexamethasone (6%) (Celgene Corp., 2010a); bortezomib alone (19%) versus dexamethasone (2%) (Millennium: The Takeda Oncology Company, 2010); associated with greater risk of infection (Miceli et al., 2008) • Anemia: Lenalidomide and dexamethasone (31%) versus dexamethasone alone (24%) (Celgene Corp., 2010a); bortezomib alone (26%) versus dexamethasone (22%) (Millennium: The Takeda Oncology Company, 2010); may cause decreased energy levels, shortness of breath, syncopal episodes, and a lack of motivation (Rome, 2011).
Neuropathy	<ul style="list-style-type: none"> • Sensory and motor symptoms: Question the patient for an accurate assessment. • Ataxia • Thalidomide: All sensory neuropathy events; 54% for thalidomide and dexamethasone versus 28% for dexamethasone alone in a clinical trial (Celgene Corp., 2010b) • Bortezomib: All peripheral neuropathy events; 36% for bortezomib versus 9% for dexamethasone in a clinical trial (Millennium: The Takeda Oncology Company, 2010) • Lenalidomide: All neuropathy events; 7% for lenalidomide and dexamethasone versus 4% for dexamethasone alone (Celgene Corp., 2010a)
Steroid-specific side effects	<ul style="list-style-type: none"> • Hyperglycemia, decreased visual acuity, muscle weakness (proximal myopathy) and cramping, and loss of bone density • Impaired physical mobility, decreased activity, decreased exercise tolerance, and increased risk for injury • Redistribution of adipose tissue and possible effect on balance • Steroid rebound effect (fatigue) (Faiman et al., 2008)

^a Does not include all therapies, such as high-dose chemotherapy and stem cell transplantation.

Patient Tear-Out Tool

Long-Term Survivor Mobility Plan: Assessments

History and physical examinations

Quarterly physical examination and review of medications; at minimum, have an annual review. Note any changes.

Blood tests

Complete blood count and blood chemistry at each visit. Determine calcium, vitamin D, hormone levels (e.g., thyroid, other hormone levels) as needed.

Bone surveys or other imaging

Skeletal survey annually or earlier if you have new skeletal symptoms. Additional tests may be needed before starting an exercise program.

Functional tests for strength and balance and home safety

Evaluation of gait, strength, and balance; the Get Up and Go test. Anyone who has fallen or is at risk for falling should have a plan to prevent falls, including an assessment of the home and other safety issues. Neurophysiologic testing may be advised, as well as physical medicine and rehabilitation or physical therapy consultation.

Evaluation for planned physical activity and exercise

Quarterly review of daily physical activities, including balance, strengthening activities, and exercise, should be conducted. Referrals to specific programs for planned physical activity should be provided, taking into account lifestyle, interests, and present health assessment (e.g., low blood counts, pain, arthritis, neuropathy).

Nutrition and hydration

Weight gain or loss should be evaluated at every visit. A review of dietary patterns and symptoms affecting intake of fluid and nutrients (e.g., nausea, vomiting, diarrhea) should be conducted at each visit. Consultation with a clinical dietitian may be beneficial.

Evaluation of psychosocial well-being

Evaluation of psychosocial well-being, support, and the presence of fatigue, sleep disturbances, anxiety, and depression should be conducted at each visit. Consultation with a licensed mental health practitioner may be warranted.

Medications

- Medications that may affect muscle strength, bone loss, balance, gait, somnolence, or dizziness should be reviewed with the healthcare provider at every visit and minimized if possible.
- Bisphosphonates (zoledronic acid and pamidronate) often are used to prevent bone fractures. They should be used with caution and a kidney function test should be conducted before each dose.
- Erythropoiesis-stimulating agents such as darbepoetin and erythropoietin are used to treat anemia. These should be used with caution and a complete blood count must be conducted before each dose.

Note. This patient education tool may be reproduced for noncommercial use.

orthopedic specialist to assess bone compromise and determine activity tolerance may be needed. The American College of Sports Medicine and the American Heart Association have published minimum recommendations for physical activity (see Table 4), which state that people with chronic conditions should be as physically active as their abilities and conditions allow. Exercise programs may need to be adapted for the individual survivor, and survivors should develop a regular physical activity plan with a health professional to manage risks and to take therapeutic needs into account (Haskell et al., 2007; Ingram & Visovsky, 2007; Schmitz et al., 2010).

Specifically prescribed physical therapy programs, whether performed in the hospital, at home, or as an outpatient, have the benefit of a licensed practitioner who has experience in working with patients with special medical considerations. The healthcare provider should bear in mind that while several studies show that many types of activity and exercise programs can safely be performed by patients with cancer, special consideration is required for a survivor of multiple myeloma, particularly in the presence of peripheral neuropathy or bone disease. For example, although yoga may allow participants to work at their own pace and incorporate gentle poses and stretching suitable for patients with functional limitations, particular poses may be contraindicated for specific patients, such as a balancing pose for a person with neuropathy (DiStasio, 2008). Activity recommendations should be carefully assessed for efficacy and safety for each patient (Cohen & Eisenberg, 2002).

Physical Activity Recommendations

should be assessed and modified to maximize safe mobility. Nursing staff should consider a home health assessment to provide recommendations on possible home modifications, such as rug placement, handrails, and grab bars. Consultation with a spine or

Following a thorough physical, laboratory, and diagnostic assessment, general instructions and considerations tailored to the patient should be developed immediately. Before advocating an activity or exercise regimen, the patient's personal motivation

Table 4. Minimum Recommendations for Physical Activity in Adults

AGE AND FUNCTIONAL STATUS	MODERATE INTENSITY ^a	VIGOROUS INTENSITY	MUSCLE STRENGTHENING	FLEXIBILITY ACTIVITY	BALANCE EXERCISE
18–65 years	30 minutes, five days per week	25 minutes, three days per week	2–3 nonconsecutive days per week, 8–10 exercises (8–12 repetitions each)	Stretch major muscle groups and tendons on days that other exercises are performed.	–
65 years or older or 50–64 years with a chronic condition	30 minutes, five days per week	25 minutes, three days per week	2–3 nonconsecutive days per week, 8–10 exercises (10–15 repetitions each)	Stretch major muscle groups and tendons on days that other exercises are performed.	For patients who have substantial risk of falls

^a Combinations of moderate and vigorous intensity can be performed to meet the recommended weekly minimum.

Note. Based on information from Clark et al., 2007; Haskell et al., 2007; Jones et al., 2004; Schmitz et al., 2010.

For patients with multiple myeloma, remaining as physically active as possible is very important. Exercise can help keep muscles functioning and prevent problems associated with long-term bed rest, such as stiff joints, breathing problems, constipation, skin sores, poor appetite, inability to sleep, and general fatigue. The following are exercise recommendations for patients with multiple myeloma.

What to do:

- Do as much daily self-care as possible.
- Take a walk every day.
- Try to do a specific prescribed activity regimen that is approved by your doctor.
- Eat a nutritious diet, drink plenty of fluids, and get plenty of rest.
- Keep a log or journal of your activity.
- Notify your healthcare provider about sudden onset of pain, progressive weakness, headaches, blurred vision, numbness, and tingling.

What not to do:

- Stay in bed with little movement.
- Let others do for you what you can do for yourself.
- Force yourself to exercise if you are having symptoms from your disease or treatment.
- Try to perform any exercise without first asking the nurse, doctor, or physical therapist.
- Move any joint or body part if it is painful.

Figure 2. General Exercise Education for Patients With Multiple Myeloma

to participate (e.g., the belief that the exercise will help them) and factors such as social support should be considered as these may be important facilitators for exercise adherence. Flexibility and simplicity are essential when designing exercise programs for patients. Professional and family encouragement and support also are needed (Coleman, Hall-Barrow, Coon, & Stewart, 2003; Coon & Coleman, 2004a, 2004b; Jones et al., 2006). Figure 2 contains information on patient and family exercise education.

Recommendations for an exercise program should be developed from the healthcare team perspective prior to discussion with the patient and family. The healthcare team should comprise occupational and physical therapists, the physician, nurse practitioners, and nurses. An exercise prescription should consist of the four components of the FITT principle (American College of Sports Medicine, 2006).

- **F**requency: the number of sessions per week
- **I**ntensity: how hard the person is exercising
- **T**ime: the duration of the exercise session
- **T**ype: the activity mode

Before starting any program, the healthcare provider should ask certain questions to assist the patient, family, and caregiver in considering the patient's specific needs and to evaluate potential programs and activities (DiStasio, 2008) (see Figure 3).

The three types of exercise categories are aerobic, resistance, and flexibility. The choice of exercise depends on the person's goals, health status, exercise history, and multiple myeloma experience. Studies of patients with multiple myeloma have included an aerobic component, usually walking, plus strength resistance training using exercise stretch bands. Running or cycling must be done carefully to avoid a fall that could lead to severe complications (Coleman, Coon, et al., 2003). Table 5 contains a review of different types of exercises, the benefit of each, and examples.

Healthcare providers should offer encouragement to patients. They also need to consider physical and psychosocial limitations such as travel, individual motivation, and the patient's health belief system. Involving friends and family members and having patients keep a log or diary of how they are feeling along with their activity level and how their goals are met helps foster accountability (Coon & Coleman, 2004b; Jones & Courneya, 2002; Jones et al., 2004, 2006; Maxwell, 2007).

Patients also need to be educated about when to modify or abstain from their exercise regimen (see Figure 4). For example, when patients are neutropenic (absolute neutrophil count of less than $1,000 \times 10^9/L$) or have a fever, they may continue to exercise but should avoid group participation; if they have low platelets, a greater concern for strenuous activity and maintaining security of balance should be emphasized. Patients with balance problems may need to use a chair or wall for balance for standing during yoga or tai chi. Patients must be cautioned to listen to their own bodies and abstain from activities that cause discomfort.

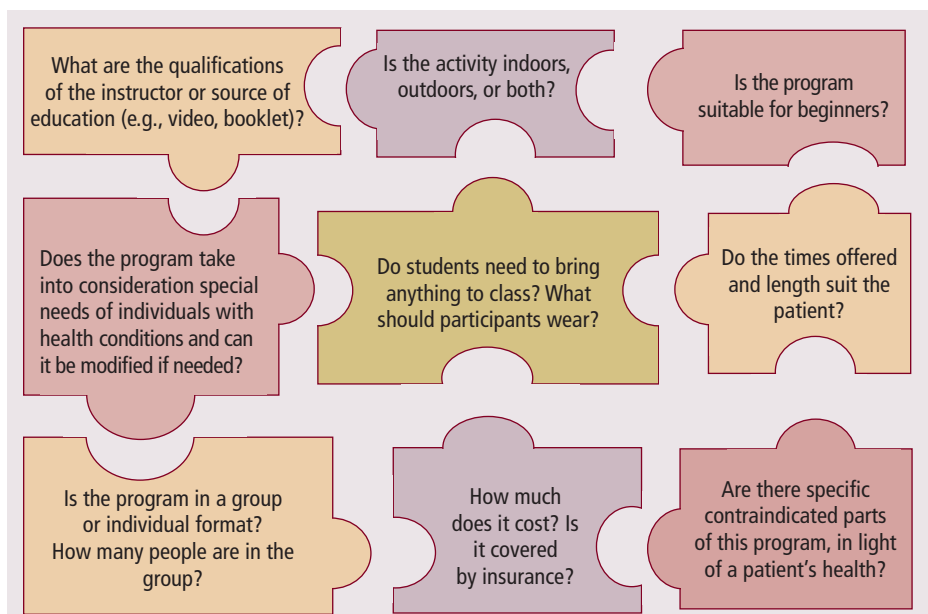


Figure 3. Preprogram Questions for Developing Exercise Plans for Patients With Multiple Myeloma

Note. Based on information from DiStasio, 2008.

Table 5. Types of Exercises and Benefits

TYPE OF EXERCISE	BENEFIT	EXAMPLES
Aerobic	Improves cardiorespiratory system	Walking (motivators include walking with a dog, a significant other, or a friend or listening to music), cycling, swimming, elliptical machines, aerobic classes, sports (e.g., tennis, golf)
Flexibility training	Maintains or improves length of the muscle	Traditional stretching, yoga, tai chi, and pilates
Resistance training	Improves muscular strength, endurance, or power	Weight machines, free weights, exercise balls, and elastic bands

Note. Based on information from Coleman, Coon, et al., 2003a; Haskell et al., 2007.

Ongoing Assessment and Readjustment

Ongoing assessment includes review of laboratory and diagnostic tests to determine the degree of anemia, fracture risk, and disease status. Assessing the patient's risk of falling, nutrition and hydration status, and medications is important for promoting safe activity. Adequate management of comorbidities also can promote functional mobility (Everett, 2008; Kannus et al., 2005; Maxwell, 2007; Wisloff, Kvam, Hjorth, & Lenhoff, 2007). The clinician should assess the patient's ability to adhere to an exercise regimen, bearing in mind that cancer rehabilitation seldom is linear. Survivors of multiple myeloma may have varied problems and symptoms over time, such as pain or neuropathies (Tariman, Love, McCullagh, Sandifer, & the International Myeloma Foundation Nurse Leadership Board, 2008). In addition, maintaining a weekly exercise log helps patients track the frequency, intensity, and duration of the exercises. Based on patients' documented exercise performance, programs could be altered to best accommodate their physical functioning (i.e., if the patient is feeling very fatigued, the intensity of the exercises can be lowered accordingly).

Resources

The CDC has a multitude of resources to promote exercise and reduce the risk of falling. Printable color handouts and posters are available online from the CDC (www.cdc.gov/HomeandRecreationalSafety/Falls/index-fs.html) and the American Cancer Society (www.cancer.org/Search/index?q=falls&all=1). Larger institutions may consider developing a specific cancer rehabilitation program or providing a list of local approved exercise and activity programs. A lending library of exercise books, CDs, or videotapes also may be helpful (Schwartz, 2004). In addition, the LIVESTRONG Foundation and the YMCA have partnered to provide exercise programs specifically designed for cancer survivors (see www.livestrong.org/What-We-Do/Our-Actions/Programs-Partnerships/LIVESTRONG-at-the-YMCA).

Summary

Patients with multiple myeloma are surviving longer than ever before and have an increased risk for impaired mobility because

of their disease, treatments, comorbidities, and age. Nurses, along with other members of the healthcare team, can help patients be accountable for improving their overall health behaviors, including their functional mobility and safety, by advocating for the use of appropriate activity and exercise programs. Assessments of laboratory and radiographic tests, risk of falls and injury, and functional mobility all should be done at baseline and with every patient encounter. Multiple myeloma disease- and treatment-related side effects and comorbid conditions should be addressed to maximize

function and safety. A tailored program for each patient that includes appropriate physical activity, supportive medications,

Modify Physical Activity

- Patients suffering from compromised immune function, such as severe neutropenia (absolute neutrophil count of less than 1,000) (Cancer Therapy Evaluation Program, 2003), should avoid gyms and other public places until their white blood cell counts return to safe levels. Those who have had a stem cell transplantation may have additional restrictions.
- Patients with severe fatigue from therapy may not feel up to an exercise program; therefore, they may be encouraged to do stretching or other simple activities. Although studies suggest that fatigue may be reduced by activity, performing activities while extremely fatigued could result in injury.
- Patients with acute symptoms from chemotherapy (e.g., severe nausea, diarrhea, pain) can consider modifying exercise but should continue with some planned activities as tolerated.
- Significant peripheral neuropathies or ataxia may reduce patients' ability to use the affected limbs because of weakness or loss of balance. They may do better with a stationary reclining bicycle than walking on a treadmill (Doyle et al., 2006; Young-McCaughan & Arzola, 2007).

Delay or Stop Physical Activity

- Any patient with acute cardiovascular, neurologic, or pulmonary symptoms (i.e., irregular pulse, blood pressure issues, chest pain, dyspnea, dizziness, blurred vision, and fainting) should not exercise and should immediately seek medical attention.
- Patients with severe anemia (hemoglobin less than 8 g/dl) (Cancer Therapy Evaluation Program [CTEP], 2003) or severe thrombocytopenia (platelets of less than 50,000) (CTEP, 2003) should delay exercise other than activities of daily living until the condition is improved unless approved by a physician.
- If swimming is included in a patient's exercise plan, the effect of chlorine from swimming pools and sun exposure should be considered. These factors also may be contraindicated with certain radiation and chemotherapy treatments.
- Patients with indwelling catheters should not exercise in the water because of the risk of microbial exposure.
- Patients with indwelling catheters should not participate in resistance training of muscles in the area of the catheter to avoid dislodging it.

Figure 4. Physical Activity Modifications for the Survivor

Clinician Tear-Out Tool Long-Term Survivor Mobility Plan: Assessments

General

Baseline history, physical, and laboratory abnormalities; age and nutrition and alcohol and drug use; neurologic function and visual acuity; comorbid conditions and medications; magnetic resonance images or other radiologic imaging with bone density scans; depression, anxiety, or insomnia; and social support system, environment, and weather

Side effects of disease or therapeutics on mobility

Surgical orthopedic procedures, footwear, or foot problems; fatigue or weakness; and respiratory deficits

Safety and fall risk

Use Morse, Hendrich II, and Get Up and Go fall assessment tools.

General Exercise Guidelines

Patient's needs

1. Qualifications of the instructor and/or source of education
2. Does the program take into consideration your special needs, and can it be modified if needed?
3. Are there specific contraindicated parts of this program in light of your current health?
4. Is the program suitable for beginners?
5. Is the program in a group or individual format? How many people are in the group?
6. Do the times offered and length suit you?
7. Do students need to bring anything to class? What should you wear?
8. How much does it cost? Is it covered by insurance?
9. Is the activity indoors or outdoors?

Note. This clinician education tool may be reproduced for noncommercial use.

and dietary components should be implemented. Patients, family members, and caregivers should be instructed to tailor activities daily based on the patient's health status and to share questions and concerns with the healthcare team. Nurses, along with other clinicians, patients, family members, and caregivers, have the opportunity to preserve and improve the quality of life of patients with multiple myeloma.

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References

- American College of Sports Medicine. (2006). ASCMFitSociety® page. Retrieved from www.acsm.org/AM/Template.cfm?Section=About_ACSM&CONTENTID=6905&TEMPLATE=/CM/ContentDisplay.cfm
- Armoiry, X., Aulagner, G., & Facon, T. (2008). Lenalidomide in the treatment of multiple myeloma: A review. *Journal of Clinical Pharmacology and Therapeutics*, 33, 219–226.
- Asplund, R. (2005). Nocturia in relation to sleep, health and medical treatment in the elderly. *British Journal of Urology International*, 96(Suppl.), 15–21.
- Bartel, T.B., Haessler, J., Brown, T.L.Y., Shaughnessy, J.D., van Rhee, F., Anaissie, E., . . . Barlogie, B. (2009). F18-fluorodeoxyglucose positron emission tomography in the context of other imaging techniques and prognostic factors in multiple myeloma. *Blood*, 114, 2068–2076. doi:10.1182/blood-2009-03-213280
- Birmann, B.M., Giovannucci, E., Rosner, B., & Anderson, K.C. (2007). Body mass index, physical activity, and risk of multiple myeloma. *Cancer Epidemiology Biomarkers and Prevention*, 16, 1474–1477. doi:10.1158/1055-9965.EPI-07-0143
- Brenner, H., Gondos, A., & Pulte, D. (2009). Expected long-term survival of patients diagnosed with multiple myeloma in 2006–2010. *Haematologica*, 94, 270–275. doi:10.3324/haematol.13782
- Bux, R., Parzeller, M., & Bratzke, H. (2007). Causes and circumstances of fatal falls downstairs. *Forensic Science International*, 171(2–3), 122–126. doi:10.1016/j.forsciint.2006.10.010
- Cancer Therapy Evaluation Program. (2003). CTEP: Common terminology criteria for adverse events [version 3.0]. Retrieved from <http://ctep.cancer.gov>
- Carlson, L.E., Specca, M., Faris, P., & Patel, K.D. (2007). One year pre-post intervention follow-up of psychological, immune, endocrine, and blood pressure outcomes of mindfulness-based stress reduction (MBSR) in breast and prostate cancer outpatients. *Brain Behavior and Immunity*, 21, 1038–1049. doi:10.1016/j.bbi.2007.04.002
- Carson, J.W., Carson, K.M., Porter, L.S., Keefe, F.J., Shaw, H., & Miller, J.M. (2007). Yoga for women with metastatic breast cancer: Results from a pilot study. *Journal of Pain and Symptom Management*, 33, 331–341. doi:10.1016/j.jpainsymman.2006.08.009
- Celgene Corp. (2010a). *Revlimid® (lenalidomide)* [Product information]. Summit, NJ: Author.
- Celgene Corp. (2010b). *Thalomid® (thalidomide)* [Product information]. Summit, NJ: Author.
- Centers for Disease Control and Prevention. (2008). Self-reported falls and fall-related injuries among persons aged 65 years—United States, 2006. *Morbidity and Mortality Weekly Reports*, 57, 225–229.
- Centers for Disease Control and Prevention. (2010). Falls among older adults: An overview. Retrieved from www.cdc.gov/homeandrecreationalafety/falls/adultfalls.html
- Christina, J.A., & Cavanagh, P.R. (2002). Ground reaction forces and frictional demands during stair descent: Effects of age and illumination. *Gait and Posture*, 15, 153–158. doi:10.1016/S0966-6362(01)00164-3
- Clark, M.M., Vickers, K.S., Hathaway, J.C., Smith, M., Looker, S.A., Petersen, L.R., . . . Loprinzi, C.L. (2007). Physical activity in patients with advanced-stage cancer actively receiving chemotherapy. *Journal of Supportive Oncology*, 5, 487–493.
- Cohen, M.H., & Eisenberg, D.M. (2002). Potential physician malpractice liability associated with complementary and integrative medical therapies. *Annals of Internal Medicine*, 136, 596–603.
- Coleman, E.A., Coon, S., Hall-Barrow, J., Richard, K., Gaylor, D., & Stewart, B. (2003). Feasibility of exercise during treatment for multiple myeloma. *Cancer Nursing*, 26, 410–419. doi:10.1097/00002820-200310000-00012
- Coleman, E.A., Coon, S.K., Kennedy, R.L., Lockhart, K.D., Stewart, C.B., Anaissie, E.J., & Barlogie, B. (2008). Effects of exercise in combination with epoetin alfa during high-dose chemotherapy and autologous peripheral blood stem cell transplantation for multiple myeloma [Online exclusive]. *Oncology Nursing Forum*, 35, E53–E61. doi:10.1188/08.ONF.E53-E61
- Coleman, E.A., Hall-Barrow, J., Coon, S.K., & Stewart, C.B. (2003).

- Facilitating exercise adherence for patients with multiple myeloma. *Clinical Journal of Oncology Nursing*, 7, 529-540. doi:10.1188/03.CJON.529-534
- Coon, S.K. & Coleman, E.A. (2004a). Exercise decisions within the context of multiple myeloma, transplant, and fatigue. *Cancer Nursing*, 27, 108-118. doi:10.1097/00002820-200403000-00003
- Coon, S.K., & Coleman, E.A. (2004b). Keep moving: Patients with myeloma talk about exercise and fatigue. *Oncology Nursing Forum*, 31, 1127-1135. doi:10.1188/04.ONF.1127-1135
- Courneya, K.S., & Friedenreich, C.M. (2007). Physical activity and cancer control. *Seminars in Oncology Nursing*, 23, 242-252. doi:10.1016/j.soncn.2007.08.002
- Culos-Reed, S.N., Carlson, L.E., Daroux, L.M., & Hatley-Aldous, S. (2006). A pilot study of yoga for breast cancer survivors: Physical and psychological benefits. *Psycho-Oncology*, 15, 891-897. doi:10.1002/pon.1021
- Dawson, J., Thorogood, M., Marks, S.A., Juszczak, E., Dodd, C., Lavis, G., & Fitzpatrick, R. (2002). The prevalence of foot problems in older women: A cause for concern. *Journal of Public Health Medicine*, 24, 77-84. doi:10.1093/pubmed/24.2.77
- DiStasio, S.A. (2008). Integrating yoga into cancer care. *Clinical Journal of Oncology Nursing*, 12, 125-129. doi:10.1188/08.CJON.125-130
- Doyle, C., Kushi, L.H., Byers, T., Courneya, K.S., Demark-Wahnefried, W., Grant, B., . . . the 2006 Nutrition, Physical Activity, and Cancer Survivorship Advisory Committee. (2006). Nutrition and physical activity during and after cancer treatment: An American Cancer Society guide for informed choices. *CA: Cancer Journal for Clinicians*, 56, 323-353. doi:10.3322/canjclin.56.6.323
- Everett, P. (2008). The prevalence of vitamin D deficiency and insufficiency in a hematology-oncology clinic. *Clinical Journal of Oncology Nursing*, 12, 33-35. doi:10.1188/08.CJON.33-35
- Faiman, B., Bilotti, E., Mangan, P.A., Rogers, K., & the International Myeloma Foundation Nurse Leadership Board. (2008). Steroid-associated side effects in patients with multiple myeloma: Consensus Statement of the IMF Nurse Leadership Board. *Clinical Journal of Oncology Nursing*, 12(3, Suppl.), 53-62. doi:10.1188/08.CJON.S1.53-62
- Ganz, D.A., Bao, Y., Shekelle, P.G., & Rubenstein, L.Z. (2007). Will my patient fall? *JAMA*, 297, 77-86. doi:10.1001/jama.297.1.77
- Gao, C., & Abeysekera, J. (2004). A systems perspective of slip and fall accidents on icy and snowy surfaces. *Ergonomics*, 47, 573-598. doi:10.1080/00140130410081658718
- Gupta, V., & Lipstiz, L.A. (2007). Orthostatic hypotension in the elderly: Diagnosis and treatment. *American Journal of Medicine*, 120, 841-847. doi:10.1016/j.amjmed.2007.02.023
- Hacker, E. (2009). Exercise and quality of life: Strengthening the connections. *Clinical Journal of Oncology Nursing*, 13, 31-39. doi:10.1188/09.CJON.31-39
- Haskell, W.L., Lee, I.M., Pate, R., Powell, K.E., Blair, S.N., Franklin, B.A., . . . Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medicine and Science in Sports and Exercise*, 39, 1423-1434. doi:10.1249/mss.0b013e3180616b27
- Hendrich, A. (2007). Predicting patient falls using the Henrich II Fall Risk Model in clinical practice. *American Journal of Nursing*, 107, 50-59.
- Hendrich, A., Nyhuis, A., Kippenbrock, T., & Soja, M.E. (1995). Hospital falls: Development of predictive model for clinical practice. *Applied Nursing Research*, 8(3), 129-139. doi:10.1016/S0897-1897(95)80592-3
- Ingram, C., & Visovsky, C. (2007). Exercise intervention to modify physiologic risk factors in cancer survivors. *Seminars in Oncology Nursing*, 23, 275-284. doi:10.1016/j.soncn.2007.08.005
- Jones, L.W., Courneya, K.S., Vallance, J.K., Ladha, A.B., Mant, M.J., Belch, A.R., & Reiman, T. (2004). Association between exercise and quality of life in multiple myeloma cancer survivors. *Supportive Care in Cancer*, 12, 780-788. doi:10.1007/s00520-004-0668-4
- Jones, L.W., Courneya, K.S., Vallance, J.K., Ladha, A.B., Mant, M.J., Belch, A.R., & Reiman, T. (2006). Understanding the determinants of exercise intentions in multiple myeloma cancer survivors: An application of the theory of planned behavior. *Cancer Nursing*, 29(3), 167-175. doi:10.1097/00002820-200605000-00001
- Jones, L.W., & Demark-Wahnefried, W. (2006). Diet, exercise, and complementary therapies after primary treatment for cancer. *Lancet Oncology*, 7, 1017-1026. doi:10.1016/S1470-2045(06)70976-7
- Jones, L.W.Y., & Courneya, K.S. (2002). Exercise counseling and programming preferences of cancer survivors. *Cancer Practice*, 10(4), 208-215. doi:10.1046/j.1523-5394.2002.104003.x
- Kado, D.M., Huang, M.H., Nguyen, C.B., Barrett-Connor, E., & Greendale, G.A. (2007). Hyperkyphotic posture and risk of injurious falls in older persons: The Rancho Bernardo Study. *Journal of Gerontology*, 62, 652-657.
- Kannus, P., Sievanen, H., Palvanen, M., Jarvinen, T., & Parkkari, J. (2005). Prevention of falls and consequent injuries in elderly people. *Lancet*, 366, 1885-1893. doi:10.1016/S0140-6736(05)67604-0
- Kerse, N., Butler, M., Robinson, E., & Todd, M. (2004). Wearing slippers, falls, and injury in residential care. *Australia New Zealand Journal of Public Health*, 28(2), 180-187.
- Kharicha, K., Iliffe, S., Harari, D., Swift, C., Gillmann, G., & Stuck, A.E. (2007). Health risk appraisal in older people. 1: Are older people living alone an "at risk" group? *British Journal of General Practice*, 57, 267-268.
- Kinney, J.M. (2004). Nutritional frailty, sarcopenia, and falls in the elderly. *Current Opinions in Clinical Nutrition and Metabolic Care*, 7, 15-20. doi:10.1097/00075197-200401000-00004
- Knobf, M.T., Musanti, R., & Dorward, J. (2007). Exercise and quality of life outcomes in patient with cancer. *Seminars in Oncology Nursing*, 23(4), 285-296. doi:10.1016/j.soncn.2007.08.007
- Lundin-Olsson, L., Nyberg, L., & Gustafson, Y. (1998). Attention, frailty, and falls: The effect of a manual task on basic mobility. *Journal of the American Geriatrics Society*, 46, 758-761.
- Maxwell, C. (2007). Role of the nurse in preserving patients' independence. *European Journal of Oncology Nursing*, 11(Suppl. 2), S38-S41. doi:10.1016/j.ejon.2007.07.004
- Melton, L.J., III, Rajkumar, S.V., Khosia, S., Achenbach, S.J., Oberg, A.L., & Kyle, R.A. (2004). Fracture risk in monoclonal gammopathy of undetermined significance. *Journal of Bone and Mineral Research*, 19, 25-30. doi:10.1359/jbmr.0301212
- Menz, H.B., & Lord, S.R. (1999). Footwear and postural stability in older people. *Journal of the American Podiatric Medical Association*, 89(7), 346-357.
- Menz, H.B., Morris, M.E., & Lord, S.R. (2006). Footwear characteristics and risk of indoor and outdoor falls in older people. *Gerontology*, 52(3), 174-180. doi:10.1159/000091827
- Miceli, T., Colson, K., Gavino, M., Lilleby, K., & the International Myeloma Foundation Nurse Leadership Board. (2008). Myelosuppression associated with novel therapies in patients with multiple myeloma. *Clinical Journal of Oncology Nursing*, 2(3, Suppl.), 13-19. doi:10.1188/08.CJON.S1.13-19
- Millennium: The Takeda Oncology Company. (2010). *Velcade® (bortezomib)* [Product information]. Cambridge, MA: Author.

Moore, N.L., & Kiebzak, G.M. (2007). Suboptimal vitamin D status is a highly prevalent but treatable condition in both hospitalized patients and the general population. *Journal of the American Academy of Nurse Practitioners, 19*, 642-651.

Morse, J.M., Morse, R., & Tylko, S. (1989). Development of a scale to identify the fall-prone patient. *Canadian Journal of Aging, 8*, 366-377. doi:10.1017/S0714980800008576

Nau, K.C., & Lewis, W.D. (2008). Multiple myeloma: Diagnosis and treatment. *American Family Physician, 78*, 853-859.

Oldervoll, L.M., Loge, J.H., Paltiel, H., Asp, M.B., Vidvei, U., Wiken, A.N., . . . Kaasa, S. (2006). The effect of a physical exercise program in palliative care: A phase II study. *Journal of Pain and Symptom Management, 31*, 421-430. doi:10.1016/j.jpainsymman.2005.10.004

Overcash, J. (2007). Prediction of falls in older adults with cancer: A preliminary study. *Oncology Nursing Forum, 34*, 341-346. doi:10.1188/07.ONF.341-346

Overcash, J. (2008). Vitamin D in older patients with cancer. *Clinical Journal of Oncology Nursing, 12*, 655-662. doi:10.1188/08.CJON.655-662

Peel, N.M., Bartlett, H.P., & McClure, R.J. (2007). Healthy aging as an intervention to minimize injury from falls among older people. *Annals of the New York Academy of Science, 1114*, 162-169.

Perell, K.L., Nelson, A., Goldman, R.L., Luther, S.L., Prieto-Lewis, N., & Rubenstein, L.Z. (2001). Fall risk assessment measures: An analytic review. *Journal of Gerontology, 56A*(12), M761-M766.

Petit, W.A., Jr., & Upender, R.P. (2003). Medical evaluation and treatment of diabetic peripheral neuropathy. *Clinical Podiatric Medicine and Surgery, 20*, 671-688. doi:10.1016/S0891-8422(03)00068-5

Podsiadlo, D., & Richardson, S. (1991). The timed "Up and Go": A test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society, 39*, 142-148.

Robbins, S., Waked, E., Allard, P., McClaran, J., & Krouglicof, N. (1997). Foot position awareness in younger and older men: The influence of footwear sole properties. *Journal of the American Geriatrics Society, 45*, 61-66.

Rome, S.I. (2011). Nursing management: Hematologic problems. In S. Lewis, S.R. Dirksen, M.M. Heitkemper, L. Bucher, & I.M. Camera (Eds.), *Medical-surgical nursing: Assessment and management of clinical problems* (8th ed., pp. 661-713). St. Louis, MO: Mosby.

Roodman, G.D. (2008). Skeletal imaging and management of bone disease. *Hematology. American Society of Hematology Education Program, 313-319*.

Rubenstein, L.Z., & Josephson, K.R. (2006). Falls and their prevention in elderly people: What does the evidence show? *Medical Clinics of North America, 90*, 807-824.

Schaap, L.A., Pluijm, S.M., Smit, J.H., van Schoor, N.M., Visser, M., Gooren, L.J., & Lips, P. (2005). The association of sex hormone levels with poor mobility, low muscle strength, and incidence of falls among older men and women. *Clinical Endocrinology (Oxford), 63*, 152-160. doi:10.1111/j.1365-2265.2005.02315.x

Schmitz, K.H., Courneya, K.S., Matthews, C., Demark-Wahnefried, W., Glavao, D.A., Pinto, B.M., . . . Schartz, A.L. (2010). American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Medicine and Science in Sports and Exercise, 42*, 1409-1426. doi:10.1249/MSS.0b013e3181e0c112

Schwartz, A.L. (2004). *Cancer fitness: Exercise programs for patients and survivors*. Emeryville, CA: Simon and Schuster.

Schwartz, A.V., & Sellmeyer, D.E. (2007). Diabetes, fracture, and bone fragility. *Current Osteoporosis Reports, 5*, 105-111.

Shumway-Cook, A., Brauer, S., & Woollacott, M. (2000). Predicting the probability for falls in community-dwelling older adults using the timed up and go test. *Physical Therapy, 80*, 896-903.

Singh, M.A.F. (2002). Benefits of exercise and dietary measures to optimize shifts in body composition with age. *Asia Pacific Journal of Clinical Nutrition, 11*(Suppl. 3), S642-S652.

Tariman, J.D., Love, G., McCullagh, E., Sandifer, S., & the International Myeloma Foundation Nurse Leadership Board. (2008). Peripheral neuropathy associated with novel therapies in patients with multiple myeloma. *Clinical Journal of Oncology Nursing, 12*(3, Suppl.), 29-36. doi:10.1188/08.CJON.S1.29-35

Thurman, D.J., Stevens, J.A., & Rao, J.K. (2008). Practice parameter: Assessing patient in a neurology practice for risk of falls. *Neurology, 70*, 473-479. doi:10.1212/01.wnl.0000299085.18976.20

Voukelatos, A., Cumming, R.G., Lord, S.R., & Rissel, C. (2007). A randomized controlled trial of tai chi for the prevention of falls: The Central Sydney Tai Chi Trial. *Journal of the American Geriatrics Society, 55*, 1185-1191. doi:10.1111/j.1532-5415.2007.01244.x

Wilkins, K. (1999). Medications and fall-related fractures in the elderly. *Health Reports, 11*, 42-45.

Wiseman, M. (2008). The Second World Cancer Research Fund/ American Institute for Cancer Research expert report. Food, nutrition, physical activity, and the prevention of cancer: A global perspective. *Proceedings of the Nutrition Society, 67*, 253-256.

Wisloff, F., Kvam, A.K., Hjorth, M., & Lenhoff, S. (2007). Serum calcium is an independent predictor of quality of life in multiple myeloma. *European Journal of Hematology, 78*, 29-34.

Young-McCaughan, S., & Arzola, S.M. (2007). Exercise intervention research for patients with cancer on treatment. *Seminars in Oncology Nursing, 23*(4), 264-274. doi:10.1016/j.soncn.2007.08.004

Appendix A. Falls Risk Assessment Tool: Morse

Item		Score	
1. History of falling	No	0	_____
	Yes	25	
2. Secondary diagnosis	No	0	_____
	Yes	15	
3. Ambulatory aid	None, bed rest, or nurse assist	0	_____
	Crutches, cane, or walker	15	
	Furniture	30	
4. IV therapy or saline lock	No	0	_____
	Yes	20	
5. Gait	Normal, bed rest, or wheelchair	0	_____
	Weak	10	
	Impaired	20	
6. Mental status	Oriented to own ability	0	_____
	Overestimates or forgets limitations	15	
		Total	_____

Note. Patients with a total score of 45 or higher are at a high risk of falling.

Note. From *Preventing Patient Falls* (p. 55), by J.M. Morse, 1997, Thousand Oaks, CA: Sage. Copyright 1997 by Sage. Adapted with permission.

Appendix B. Falls Risk Assessment Tool: Hendrich II

Symptom Categories	Score
Confusion and disorientation Impulsive or unpredictable behavior; hallucinations; agitation; changes in attention, cognition, psychomotor activity, level of consciousness, and sleep-aware cycles; unrealistic, inappropriate, or unusual behavior; disorientation to person, place, or time; and inability to follow directions or retain instructions in self-care or activities of daily living	4
Depression Prolonged feelings of helplessness, hopelessness, or being overwhelmed; tearfulness; flat affect or lack of interest; loss of interest in life events; melancholic mood; withdrawal; and a patient statement of depression	2
Medications Antiepileptic Benzodiazepine	2 1
Altered elimination Urinary or fecal incontinence, urgency or stress incontinence, diarrhea, frequent urination, and nocturia	1
Dizziness or vertigo Based on the patient's report of the room spinning, patient feels like he or she is spinning, or patient is observed to sway in a small circle when standing still	1
Gender Male	1

Sum of five or higher indicates a high risk of falling. _____
Note. Based on information from Hendrich, 2007.

Appendix C. Falls Risk Assessment Tool: Get Up and Go Test

The **Get Up and Go Test** requires that the patient stand up from sitting in an arm chair, walk 3 meters (10 feet), turn, walk back, and sit down.

Description
Patient is able to rise in a single movement without using her or his hands
Patient pushes up with hands and rises in one attempt
Patient pushes up multiple times but ultimately is able to rise
Patient is unable to get up without assistance

Note. The patient who takes more than 20 seconds is at less risk of falling; a patient who takes 20 or more seconds may be considered at high risk for falling.

Note. Based on information from Podsiadlo & Richardson, 1991.

