Evidence-Based Exercise Prescription for Balance and Falls Prevention: A Current Review of the Literature

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ABSTRACT

Falls are the leading cause of emergency department visits, hospital admissions, and unintentional death for older adults. Balance and strength impairments are common falls risk factors for community-dwelling older adults. Though physical therapists commonly treat balance and strength, standardized falls screening has not been fully incorporated into physical therapy practice and there is much variation in the frequency, intensity, and duration of therapy prescribed to achieve optimal results. For community-dwelling older adults, a progressive exercise program that focuses on moderate to high-intensity balance exercises appears to be one of the most effective interventions to prevent falls. For more frail older adults in institutional settings, exercise programs in addition to multifactorial interventions appear to show promise as effective falls prevention interventions. The minimum dose of exercise to protect an older adult against falls is 50 hours. This article describes the current best practices for physical therapists to effectively improve balance and manage falls risk in patients. The unique challenges and opportunities for physical therapists to incorporate evidence-based fall-prevention strategies are discussed. Innovative practice models incorporating evidence-based fall-prevention programs and partnerships with public health and aging service providers to create a continuum of care and achieve the optimal dose of balance training are presented.

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INTRODUCTION

Falls are the public health epidemic of this decade. More than 30% of people aged 65 years and older and more than 50% of people aged 80 years and older will fall this year.[1] Falls are the leading cause of traumatic brain injury and fractures in older adults.[1] For individuals aged 65 and older, falls outpace motor vehicle accidents as the leading cause of unintentional death by several thousands.[2] Falls are the leading cause of emergency department visits by older adults, and the number one cause of hospital admissions due to trauma.[1] It is estimated the average cost of a hospital admission due to a fall is $20,000. By 2030, an estimated $54 billion will be spent on health care in direct and indirect medical costs due to falls.[3]

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Terminology

Developing effective interventions to manage falls risk in older adults has posed a significant challenge to researchers and clinicians, requiring complex solutions. To better understand the arguments presented in this article, readers should be familiar with the definitions of terms being used in the fall risk reduction literature.

A *multifactorial intervention* is any program or protocol that includes the assessment of and interventions for more than one of the multiple risk factors that might contribute to likelihood of falling. A multifactorial intervention may involve contributions from several health disciplines, such as physicians, pharmacists, physical therapists, nurses, and social work professionals.[4]

A *single-factor intervention* typically focuses on one of the risk factors associated with likelihood of falling. A single-factor intervention might include only balance training activities, medication management, or home safety education.[5]

A *multicomponent exercise program* is an exercise intervention that incorporates multiple components; it may include activities targeting performance (strength, muscle endurance, power), balance and postural control, and walking or cardiovascular endurance.[6,7]

A *single-component exercise program* consists of only one modality of exercise: strength training or balance activities, or walking.[6,7]

A *balance training program* is an intervention that is designed to progressively improve an individual's balance skills.[8]

Moderate challenge balance exercise programs include two of the three modes of balance exercises: (1) movement around the individual's center of mass; (2) using a narrow base of support; (3) with minimal upper extremity support. A *high challenge balance program* would include all three modes of balance exercises.[9]

A structured exercise intervention or program is scripted, and is composed of key components (warm-up, balance, gait training, etc) delivered in a consistent manner over a

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defined period of time. These programs are designed to be progressive and challenging as an individual masters different strength, balance, and coordination skills.

Best practice programs are exercise programs, often offered at senior centers and wellness facilities, composed of evidence-based components. These programs in their entirety have not been tested in randomized controlled trials.[10]

Evidence-based programs are interventions that have been translated and tested in the community setting in randomized controlled trials and found to be effective in reducing risk of falling. These programs are highly scripted, target specific populations (ie, older adults with fear of falling, older adults with chronic disease) and include specific implementation instructions. They are designed to be delivered in a standardized way to insure similar outcomes are achieved regardless of instructor or setting.[10]

The terms "Best Practice" and "Evidence-Based" come from the public health domain. These terms were developed to classify behavioral change programs. Because falls have become a public health concern, these terms are now being used to describe effective fall prevention research interventions as they are translated for clinical practice and/or disseminated into the community setting.

The most effective research interventions report reductions of 35% to 40% in fall rates. It should be made clear that the term *falls prevention* refers to the optimal management of falls risk to prevent the falls that can be prevented. It is estimated that the maximum reduction in fall rates due to an intervention is between 30% and 40%.[5] A certain number of older adults will still fall, regardless of interventions, but every effort must be taken to minimize risk.

Purpose

This integrative review article will present the most current evidence on effective fall-prevention management for physical therapists.

RISK FACTORS AND SCREENING

Poor balance and difficulty in walking are common impairments that contribute to older adults' high risk of falling.[11-13] The American Geriatrics Society (AGS) published clinical guidelines in 2001, subsequently expanded and revised in 2011, that recommended all adults aged 65 years and older be screened for falls.[14] If an older adult reports a fall in the previous year, a more in-depth evaluation is warranted, and appropriate interventions implemented to minimize risk of future falls.[2] The extent to which physical therapists and other health professionals have adopted the AGS recommendation is not known. A study of 2002 Medicare Beneficiary data[15] reported 22% of Medicare beneficiaries fell at least once each year (6.86 million people), and 10% or more falling multiple times (ie, those with history of recurrent falls, 3.1 million people). Less than half of those who fell actually discussed their fall with a health care provider.[15] The AGS clinical guidelines were created to identify those with history of recurrent falls deemed at higher risk of injury and hospitalization.[2,11,13,14] The results from this study suggest health care providers had limited adoption of the guidelines. By not identifying high-risk individuals, an opportunity to implement appropriate interventions to mitigate the risk of future falls was missed, ultimately negatively impacting patient outcomes.

Multiple factors contribute to an older adult's risk of falling. A systematic review of 33 studies identified 17 independent contributing factors to falls risk in community-dwelling older adults.[11] To complicate matters further, it appears there is a significant interaction between risk factors and an individual's level of function.[7,16,17] For example, the risk factors of urinary incontinence, cognitive impairment, and fear of falling may have a greater impact on falls risk for low-functioning individuals with multiple other comorbidities[18-21] than for high-functioning individuals living independently in the community.[11,14,22] Understanding the complex interaction between function and risk factors is the basis for developing targeted interventions to achieve desired outcomes. Effective fall-prevention interventions account for contributing risk factors, triage factors based on impairments, and implement appropriate interventions.

The visual impairment trial provides an excellent example of how a targeted intervention can result in effective outcomes, specifically reducing the risk of falling.[23] Researchers assessed the efficacy of two fall-prevention interventions (a home modification program and a home-based exercise program) for older adults with severe visual impairment living independently in the community. Significantly less falls were experienced by those randomized to the home safety group, and there was minimal to no reduction in number of falls in the exercise group.[23] Even though previous studies had demonstrated the home exercise program to effectively reduce the rates of falls in older adults without visual impairment,[8,24,25] improving strength and balance as a first intervention in those who were visually impaired was not effective. An appropriate sequence of interventions may have been referral to an ophthalmologist to perform a visual assessment, modification of the home to remove all hazards that the individual could not see, and then implementation of a strengthening program.

The AGS published a 2011 update of the guidelines.[26] The guidelines still specify all older adults be screened annually for falls by a health care provider, but now have expanded to include screening for balance and mobility impairments.[26] The screen consists of (1) asking the older person if they have experienced a fall over the past year (yes or no), (2) asking if they are experiencing difficulty with walking or with their balance (yes or no), and/or (3) observing whether performance of walking and balance is compromised (yes or no) using the Timed Up and Go test or other balance assessment.[26] If one or more of these screens are "positive" the individual should be referred for a comprehensive multifactorial fall-risk assessment (Table 1).

Ideally, physical therapists should screen all older adults seen in their practice setting for the risk of falling. If the screen is positive, this would trigger a comprehensive fall-risk assessment as a part of the physical therapy evaluation. In addition

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Table 1. American Geriatric Society comprehensive fall-risk assessment

1. Obtain relevant history, physical examination, cognitive, and functional assessment
2. Determine multifactorial falls risk:
• History of falls
• Medication review
• Gait, balance, mobility assessment
• Visual acuity
• Other neurological impairments
• Muscle strength
• Heart rate and rhythm
• Postural hypotension
• Feet and footwear
• Environmental hazards

to assessing risk factors within the scope of practice, attention should be given to screening for risk factors outside the scope of practice (eg, polypharmacy, visual impairment, postural hypotension, among others) with referral for further evaluation to the appropriate health care provider.

The AGS multifactorial assessment protocol provides valuable insight on all risk factors associated with falls. Several reliable and validated tools are available to assess balance and mobility across the continuum of function (Berg Balance Scale,[27] Performance-Oriented Mobility Assessment,[28,29] Dynamic Gait Index,[30] Timed Up and Go,[31,32] etc). However, these tools do not take into account the medical risk factors associated with falling, which may in part explain the fair to moderate ability of these tools to predict a fall.[26,29,32-34] These tools are important when assessing balance and gait impairment, but each tool only provides information on specific aspects of falls risk. Once risk factors are assessed and the evaluation is completed, the physical therapist can create appropriate interventions for the patient. (For more information about the utility of balance and physical performance measures to assess falls risk, visit www.PTNow.org.)

CURRENT STATE OF PRACTICE

The AGS guidelines were published with the goal of standardizing practice around fall-risk screening, assessment, and intervention.[26] Across practice settings within the profession of physical therapy, there is much variation in fall-risk assessment, management, and intervention. A study investigating fall-management strategies used by physical therapists in home care practice found that although knowledgeable about risk factors associated with falling, less than 50% of respondents linked interventions to risk factors or referred patients to other providers.[35] Another study investigating effectiveness of physical therapy referral as a component of a multifactorial intervention found 84% of participants (n = 136) were referred to physical therapy for gait and balance impairment, but one-third of those referred did not seek care because of transportation issues, cost incurred, or a belief that therapy would not be beneficial.[36] Nearly 50% of those who attended physical therapy sessions received instruction in balance exercises only once during the entire episode of care, and only a few patients received a home exercise program to maintain or continue progress.[15,36]

No published study to date has demonstrated that physical therapy as a single intervention is more effective than structured exercise programs to prevent falls. This may be due to the inherent variability in physical therapy practice, as well as the apparent importance of the length of the duration of the intervention (minimum of 12 weeks for optimal outcomes).[9]

A study of outpatient physical therapy care compared physical performance measures and balance confidence measures of older adults (mean age = 82.7, SD = 5.6 years) participating in a structured balance exercise training protocol that was integrated into a "standard of care" physical therapy intervention to older adults receiving individualized physical therapy care. Both interventions were delivered twice a week over a 6-week period. The researchers reported slightly better outcomes in the physical performance measures and significantly better outcomes improvements in balance confidence measures for those in the exercise group compared with the physical therapy group. A similar study assessed outcomes for more frail older adults (mean age = 82.4, SD = 4.8 years) admitted to the acute care or rehabilitation setting due to a fall. This study compared typical physical therapy (twice a week for 3 months) to the same care along with a progressive exercise program (three times a week for 3 months). The researchers reported that individuals in the exercise interventions demonstrated significant improvements in balance, strength, and functional motor performance. More importantly, the individuals receiving usual PT care alone did not demonstrate any significant improvements in these measures.[37]

It appears structured exercise interventions that are delivered either by a physical therapist[4,6,24,25,38,39] or by a trained individual supervised by a physical therapist[40-42] may be one of the most effective interventions to prevent falls. The role of therapists in these interventions was to lead structured, progressive exercise programs over a period of 3 to 12 months. Outcomes include improvements in physical performance measures and significant reductions in fall rates.[24,25,39,40]

Creating a plan of care that lasts 3 months or more is not common within the current health care system. Yet, the information reported in a recent Cochrane review[6] and a meta-analysis published by Sherrington[9] support longer interventions that are exercise-based are highly effective in managing falls in community-dwelling older adults. This information may dictate a paradigm shift in how physical therapists effectively manage falls risk. This shift may require integrating structured and progressive exercise protocols into an individual's plan of care, and innovative partnerships with other providers to create longer duration interventions for patients at risk of falling.

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BEST PRACTICE

Until recently, there existed little to no consensus on the intensity, duration, and total dose for effective fall-prevention practices. Conflicting evidence may account for the variations seen in physical therapy practice. There are many unanswered questions about the most effective interventions, especially in skilled nursing, assisted living, and hospital settings. Recent meta-analyses and Cochrane reviews suggest for community-dwelling older adults, progressive exercise regimes that focus on strength and balance are effective interventions to address risk and rate of falling.[6,9,43] The recommendations are different for older adults who are frail, or reside in residential care or skilled nursing facilities. For these individuals, exercise alone is not an effective intervention, and in some cases has resulted in an increase in fall rates.[7,44] However, when exercise is incorporated into a multifactorial intervention delivered by a multidisciplinary team, the risk of falling is reduced.[7] This difference is probably due to the increase in medical complexity and greater level of functional impairment of these particular patients.

EXERCISE PRESCRIPTION FOR COMMUNITY-DWELLING OLDER ADULTS

Even though the literature supports exercise as one of the most effective interventions for community-dwelling older adults, all risk factors must be assessed and triaged appropriately. The physical therapist must use clinical judgment to determine which, if any, risk factors should be addressed first before starting a physical therapy intervention or balance and strength training program. As an example, consider the older individual who presents with wearing bifocals,[45] being depressed,[13] and exhibiting fear of falling,[46] in addition to poor balance and leg muscle weakness as risk factors for falls. The physical therapist may recommend a visit to an ophthalmologist for proper eyewear or to the physician to evaluate the depression before starting an exercise-based interventions. The therapist might address the fear of falling during physical therapy sessions, or refer the individual to behavioral change programs in the community (eg, Matter of Balance[47]). For these particular risk factors, and others including cognitive impairment, polypharmacy, exercise may not be the most appropriate, effective, or safe initial intervention to implement in falls risk management program.

Exercise Dose

Sherrington's meta-analysis of 44 studies determined the minimum dose of exercise to effectively reduce the risk and rate of falls is 50 hours.[9] The delivery of the dose of exercise was dependent on the trial, with trials achieving the 50 hours over a period of 3 months,[24] 6 months,[40,48-50] or longer.[40] Interventions that achieved the minimum dose over 6 months or less may be slightly more effective than those that extend over a 12-month period.[9,51] Interventions that delivered a lower total dose of exercise (typically lasting less than 12 weeks) did not consistently reduce the rate or risk of falling.[9,52-54] In addition, it appears individuals who start an exercise program to improve balance, but do not achieve the minimum dose may actually be at a higher risk of falling.[55] It may be that the gains achieved in strength and balance are enough to improve mobility, but not enough to achieve a protective effect if the individual's resulting increased activity level exceeds his or her balance ability.

Achieving 50 hours of balance exercise within current physical therapy practice settings and funding models is extremely challenging. Use of validated home exercise programs from one of the published randomized controlled trials may be a strategy to achieve the 50-hour dose during a plan of care.[24,40,50] The Otago Exercise Program,[8] for example, demonstrated a 40% reduction in falls over a 1-year period for those in the intervention group. The program includes a brief series of full body warm-up exercises, and then 17 exercises that target leg strength (knee extension, knee flexion, hip abduction, standing squats, chair rises, toe/heel raises), balance (single leg stand, tandem stance), and walking performance (backwards walking, turning, heel walk/toe walk).[8] The program can be completed in 30 to 45 minutes, and was originally designed for delivery in the home setting. The exercises are appropriate for individuals with high to moderate levels of functional limitations and impairment, but may not challenge individuals with low levels of impairment and higher levels of overall function.[8]

Another strategy to achieve optimal dose is to partner with other providers (kinesiologists, physical therapy assistants) and community-based organizations (YMCAs, senior centers, parks, and recreation departments) to offer a best practice balance improvement program or an evidence-based fall-prevention program recognized by the Centers for Disease Control in the "Compendium of Effective Community-Based Interventions."[56] Stepping On, Tai Chi Moving for Better Balance, and the Otago Exercise Program are 3 of the 14 studies recognized as effective in reducing fall risk in the CDC Compendium. These particular programs have training manuals to guide implementation with fidelity to the original program. These programs have been selected by the CDC for a dissemination pilot study in three states from 2011–2013.

Mode of Exercise

It does appear that the mode of exercise selected will have the greatest impact on outcomes. The Sherrington meta-analysis reported moderate to high challenge balance training was the only mode of exercise that had a significant protective effect on the rates of falls (estimated 25% reduction in fall rates). The other modes assessed, strength training, stretching, and walking, as single interventions, did not have a significant protective effect on the rates of falls.[9] This finding is consistent with a previous meta-analysis of eight trials that reported individuals participating in exercise programs that included balance exercises had a pooled estimated 17% lower falls risk compared with interventions with other forms of exercise.[57] On the basis of this information, balance training

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appears to be one of the most effective interventions to improve balance and prevent falls; it may include static and dynamic activities and functional balance activities (gait training, dual-task activities, reaching, turning).[9] The most effective activities are performed while standing, with minimal upper extremity support, and designed to be progressively more challenging.[9] In addition to balance exercise, researchers has assessed the effect of training specific systems to improve balance (perturbation training, etc).[58-60] These interventions have demonstrated that different aspects of balance can be improved, but additional research needs to be done to determine if training a specific balance system translates to fewer falls.

Static activities

Exercises that challenge the center of mass (eg, reaching while standing) while the feet remain fixed, and exercises that practice a narrow base of support (eg, tandem series, single-leg stance) have been included in effective interventions.[24,39,40,49-51,61-65] The activities are typically progressed from a wide base of support in standing to a narrower base. For greater challenge, a sensory component can be included (standing on an unstable surface or standing with the eyes closed) Repetition, progression, and continually challenging the patient is key over the duration of the intervention.[24,39,40,49-51,61-65]

Dynamic activities

Activities that challenge the center of mass while the feet are in motion are dynamic activities. Dynamic activities tend to be functional, and may include reaching, turning in a circle, standing, and stair-stepping.[66-68] Many of the motions incorporated into Tai Chi training are dynamic activities; incorporating slow controlled motions of the upper extremities and torso while stepping and weight shifting. Several research studies assessing Tai Chi as an intervention to improve balance and prevent falls have reported favorable outcomes.[50,69,70] However, it does appear that to be effective, the minimal dose must be achieved. Interventions that are less than 12 weeks typically are not as effective in improving balance and preventing falls as those of 12 weeks or greater.[71-73]

Though Tai Chi does appear to be an effective fall prevention intervention, the participant of many studies of Tai Chi have been high-functioning community-dwelling older adults, and the instructors have been trained Tai Chi masters. Two studies assessing the impact of a Tai Chi intervention in a nursing home setting reported no significant differences in falls between those in the Tai Chi group and the control group.[74-77] For community-dwelling individuals, the qualities of an effective Tai Chi instructor need to be defined in the research. It is not known if only Tai Chi masters can achieve optimal results, or if physical therapists or kinesiologists can be trained to deliver Tai chi movements and achieve similar outcomes.

Dynamic gait training

Dynamic gait training can be incorporated into progression of intervention using dance steps, circling, figure eights, directional changes on command, obstacle courses, and dual-task training.[8,39,40,62,65]

Dual-task training

Dual-task training involves doing a primary task (maintaining postural control or walking speed) while performing a secondary task (eg, a cognitive challenge such as counting backwards, or a manual task such as carrying an item).[78] Dual-task training challenges the ability to allocate attention to two things at once while maintaining performance.[78,79] Older adults who have difficulty performing walking and talking tasks are at a higher risk of falling.[80,81] Dual-task performance can be improved with training.[82,83] Dual tasks for balance training interventions may include having a conversation while walking with a focus on maintaining walking speed,[84] walking and counting,[85] or walking while performing a manual task such as carrying a full cup of liquid, multiple objects, or simulated laundry.[78] It appears that when training dual-task, incorporating variable priority instructions (switching the attentional focus between trials, ie, trial one, focus on maintaining walking speed; trial two, focus on the counting task) can have a greater impact on outcomes.[86] In a randomized controlled trial on the effects of single-task versus dual-task training on balance performance in older adults, Silsupadol et al found that changing the focus of the dual-task priority instructions from a priority on cognitive to a priority on the physical task resulted in greater improvements of performance.[86]

Strength training

Strength is a key element of fall prevention; however, strength training alone without a balance component is not an effective strategy to prevent falls.[43] A recent meta-analysis identified the key components of strength training that translate to improved balance and reduced falls risk including: (1) A focus on lower-extremity and postural muscles; (2) Minimal upper-extremity support; (3) Delivered at either a moderate or high intensity to achieve the desired results. A few strength training interventions have resulted in more injuries compared with balance training interventions.[6,43,87]

Walking

Evidence suggests that walking as an intervention for those at high risk of falls, or done without concurrent balance training may result in a higher risk of falling.[9,17,88] Walking as an exercise should not be included in the beginning of a fall-prevention program, when the focus needs to be on strength and balance. However, walking is one of the safest and easiest forms of aerobic exercise across all populations, and may be an appropriate addition to a fall-prevention program in higher functioning individuals.[48] The Otago Exercise Program provides an excellent example of how and when walking should be incorporated into a balance program. Individuals begin with home-based strength and balance exercises, and typically after 4 weeks were instructed to include three 30-minute walking sessions per week into their exercise routine.[24]

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Perturbation and compensatory stepping training

Maintaining one's balance requires control during volitional movement and also the ability to recover from a loss of balance. Incorporating perturbation training may be an effective way to improve reaction times[58,89,90] and improve stepping strategies.[59,60] This type of training requires specialized equipment, and must be administered in a one-to-one session by a physical therapist. Individuals who completed a 30-minute perturbation-based balance training program three times a week for 6 weeks took fewer multistep reactions and had fewer foot collisions when the base of support was changed (the force plate moved to mimic a slip or change in surface) compared to controls in a flexibility and relaxation group.[60] However, when the center of mass was changed (individuals were hooked up to a cable, and the cable was manipulated to alter their center of mass as in a trip) there were no significant differences in performance between the two groups. Those in the intervention group also demonstrated a decreased need for upper body support during a perturbation.[60] Perturbation may be a feasible intervention in a clinical setting, and it may result in improved reaction times and greater efficiency in recovering balance. However, little evidence exists to support perturbation training translates to fewer falls. To date, only one study that this author is aware of has demonstrated that improved reaction times and stepping strategies did significantly reduce falls rates in frail older adults.[58]

Frequency and duration of exercise

There is no consensus in the clinical research literature on optimal frequency and duration for effective exercise interventions. Reported frequencies range from once to three times weekly, and duration range from 12 weeks to one year.[6,9] The one consistent finding across studies is that the interventions have established and followed a standardized routine (same components each time, ie, warm-up, balance, strength, etc) with a systematic progression of the difficulty of the exercises, so the individual is challenged over the intervention period.

EXERCISE PRESCRIPTION FOR FRAIL OR INSTITUTIONALIZED OLDER ADULTS

Exercise to improve balance must be part of a multifactorial intervention assessing all risk factors in frail older adults. Individuals in skilled nursing facilities have the same risk factors as community dwellers; however, the risk factors of incontinence, stroke, dementia, depression, and use of sedating medications[18-21,91] are far more prevalent. Fall-prevention interventions that were either solely exercise-based or physical therapy–based either had no significant protective effects[17,92] or actually resulted in an increase in falls.[44] The greater number of comorbidities and the complexity involved in patient care provides insight as to why an exercise-only intervention may not be effective.

When exercise is included as part of a multifactorial intervention, the guidelines are similar to those for community-dwelling older adults: the intervention should focus primarily on balance and balance challenge exercises, the exercises should be done while standing, and should be progressed over a period of time.[7] Exercise interventions to improve balance and strength have been demonstrated as feasible and safe in both frail older adults and those with significant cognitive impairment.[93-98]

Exercise Dose

The minimum dose of exercise for frail or institutionalized older adults has yet to be determined. It does appear that exercise interventions may have a greater impact on outcomes for this population over a shorter period of time, but this may be due to the greater number of impairments at baseline compared to community dwellers. Interventions that have demonstrated significant improvements in functional measures have been a minimum of 8 weeks and a maximum of 1 year in duration.[67,99,100] Shorter interventions (8 weeks or less) with fewer frequencies (twice a week or less) do not consistently demonstrate significant changes in outcome measures.[54,101,102]

Mode of Exercise

Effective exercise interventions to improve balance and strength are those that incorporate functional balance training, high intensity strength training, and gait training.[67,103] Even supervised power training has proven to be safe and effective in this population.[104-106] Perturbation training in conjunction with gait and balance training appears to be an effective way to decrease the rate of falls, but may not have a significant impact on risk factors.[58,107,108]

Frequency and Duration of Exercise

Optimal frequency and duration is not known at this time. Common themes include consistency (attending a class a certain number of times per week), a structured progression, and a program tailored to the needs of the individual and progressed appropriately.[101,102] For example, an individual with significant functional impairment may benefit more from a functional exercise program with a slow progression; whereas an individual with significant cognitive impairment will benefit from a structured exercise program in which the same exercises are done the same way each time.

CONCLUSION

The research supports the most effective interventions to manage falls risk are those that incorporate exercise. For optimal results, the exercise program needs to be structured, progressed, and must achieve the minimum dose of exercise. The information presented in this article has several implications to clinical practice:

Exercise interventions should be structured. We must strive for greater consistency between treatment sessions, or ensure the patient is doing a regimented home exercise program faithfully. The home exercise program should be structured, progressive and incorporate center of mass, narrow base of support, and minimal upper extremity assistance. Exercises should become more challenging (two-hand

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support, one-hand support, no hands) to challenge the patient's skills. Once mastered, exercises can be varied for an even greater challenge.

Fall-prevention interventions should be individually tailored to challenge the patient on the basis of level of his or her impairments. Therapists need to coordinate with other health care professionals to insure all risk factors are addressed. Exercises should be prescribed that challenge balance based on risk factors and impairment level.

Intervention must achieve the optimal dose. One of the greatest challenges of fall prevention is the duration of intervention necessary to achieve optimal outcomes. The exercises can be delivered in the clinic, home, or in group exercise classes; the most important thing is that the exercises are actually done by the patient. Researchers have reported that effective programs have been delivered either by a physical therapist, or an individual trained and supervised by a physical therapist.

Effective fall management requires a paradigm shift in how physical therapists provide care (Figure 1). Consider an older adult referred to physical therapy with a medical diagnosis of adhesive capsulitis. During the initial evaluation, the therapist administers a falls screen, and discovers the capsulitis is due to a shoulder injury incurred when the patient fell at home. The therapist performs the Timed Up and Go test, and the patient has difficulty rising from a chair and performs the task in 15 seconds. In addition to assessing the shoulder joint, the therapist will ideally institute a comprehensive fall-risk assessment. When the medication screen identifies the patient is taking eight medications, three of which can affect reaction time and increase risk of falls, the therapists contacts the physician with a request for a new diagnosis of balance impairment, and clearance for participation in physical therapy based on a medication review. The shoulder injury and falls risk become the focus of the episode of care, and clinical goals are expanded to include falls prevention. There will be a finite goal of improving the shoulder function and a longer-term goal of fall-risk management. The therapist will improve the individual's balance and functional mobility to the point of safe participation in an evidence-based program, where these improvements can be further progressed and sustained. The patient will ultimately be discharged to a maintenance program when the dose of balance training has been achieved.

This change in paradigm dictates that physical therapy shifts from *episodic* care—treat the diagnosis, progress to a functional level, discharge to an independent self-directed program—to a *continuum* of care—patients progressed to meet their functional goals, transitioned to an in-house or community bridge program, discharge to a fitness or a home exercise program. While the individual is in transition, he or she remains in contact with the therapist to continue progress. The therapist may not formally discharge the patient until independence is achieved with the appropriate exercise program. By extending beyond the traditional therapy model, the optimal dose of exercise is achieved. There is a greater potential for patients to maintain progress, continue to improve upon their abilities, sustain meaningful and permanent changes in risk factors, and ultimately reduce falls risk.

Instituting effective fall-prevention interventions provides opportunities to create partnerships and collaborations with health care professionals and community providers. For example, the Centers for Disease Control and the National Council on Aging have recognized falls as an important issue that must be addressed. Both of these organizations have identified evidence-based fall-prevention programs (Otago Exercise Program, Stepping On, and Tai Chi Moving for Better Balance) that will be piloted in three states in 2012. The programs will be offered through senior and community centers (Stepping On, Tai Chi) and also in the home (Otago Exercise Program). Some programs will be delivered by physical therapists, and some by trained fitness professionals and community providers. If proven

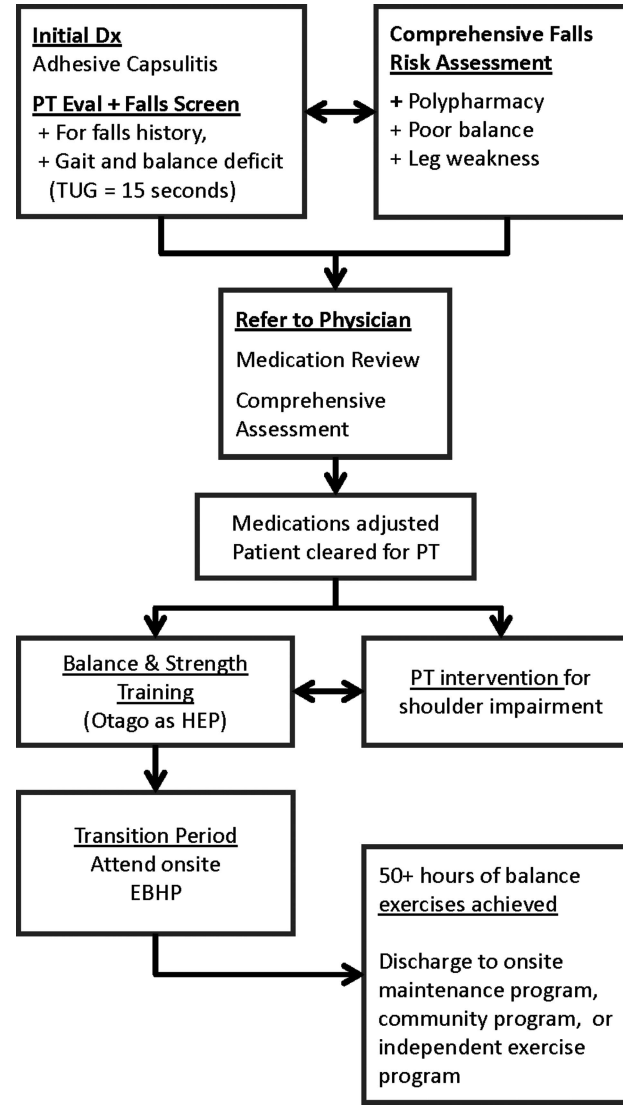

Figure 1. Proposed model to integrate falls screening and assessment into a plan of care, and to create a continuum of care for effective fall-risk management.

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effective when disseminated in the community, the programs will be disseminated nationally in the coming years. Effective falls prevention provides opportunities to partner with kinesiologists and exercise physiologists who have training in evidence-based and best practice balance improvement programs. These types of multidisciplinary partnerships are innovative models to effectively and efficiently create a continuum of care with the potential of having a significant impact on falls in older adult patients.

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