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Primary Care Fall Risk Assessment for Elderly West Virginians

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Abstract

West Virginia is ranked second nationally for the percent of its population ≥ 65 years of age. The elderly are especially susceptible to falls with fall risk increasing as age increases. Because falls are the number one cause of injury-related morbidity and mortality in the West Virginia elderly, evaluation of fall risk is a critical component of the patient evaluation in the primary care setting. We therefore highlight fall risk assessments that require no specialized equipment or training and can easily be completed at an established office visit. High quality clinical practice guidelines supported by the American Geriatric Society recommend yearly fall risk evaluation in the elderly. Those seniors at greatest risk of falls will benefit from the standardized therapy protocols outlined and referral to a balance treatment center. Patients with low-to-moderate fall risk attributed to muscle weakness or fatigue should be prescribed lower extremity strengthening exercises, such as kitchen counter exercises, to improve strength and balance.

Introduction

In the state of West Virginia, falls are the number one cause of injury for persons over the age of 65.¹ Per annum, 30% of those over 65 will experience a fall, and up to 50% of those over 85 will experience a fall.² It is therefore concerning that our population is old and getting older. Currently 16.0% of West Virginia's population is 65 and older; second highest in the country (Florida is first with 17.3% ≥ 65 years of age).³ Additionally our population over the age of 65 is expanding, with the number of people over the age of 85 increasing at an even faster rate.³ This data indicates that falls are an escalating health threat for our state. As the fall risk increases, so do the healthcare expenditures for the resultant injury related morbidity and mortality. The national cost attributed to fall-related injuries in seniors was a staggering \$12.6 billion in 2005 and over \$30 billion in direct medical costs in 2010.^{4,5} The one year mortality among the elderly over the age of 60, after hospitalization due to a fall-related fracture, is 25%.⁶ Given the increased risk of morbidity and mortality, as well as the costs to society following a fall, the need for targeted screening and intervention for this population is paramount.⁶ Muscle weakness is the most prominent modifiable risk factor for falling.^{2,7-9} The mechanism of neuromuscular activation declines in seniors and produces decreased production of power and reduced mobility.¹⁰⁻¹³ The senior therefore experiences easy fatigue of lower extremity muscles during mobility tasks which poses challenges with locomotion due to balance and gait impairments.¹⁴⁻¹⁶ Perceived difficulties with locomotor activities discourage the elderly individual from participating in these activities, worsening neuromuscular activation and muscle function.¹⁷ This cyclical

process can lead to irreversible changes creating a significant risk for falling and sustaining injuries that can further worsen their overall health status.¹⁸ Since lower extremity weakness is a statistically significant risk factor for falls, screening for such weakness becomes an instrumental tool in breaking the establishment of this negative feedback loop.¹⁴ Screening for, and identifying, fall risk is important because many interventions have a positive effect on increasing balance and reducing fall and injury risk.^{7,19-26} This paper provides evidence-based strategies to screen more people in the risk assessment process.²⁷ Thus, finding a simple, reliable, and efficient fall risk assessment tool for West Virginia healthcare providers is critical for identifying and treating those elderly who are at greatest risk for falls.

Patients over the age of 65 should be assessed yearly for fall risk.²⁸ The initial fall risk assessment should include three questions to determine previous fall history: (1) Has the patient had two or more falls in the past 12 months? (2) Have any acute falls required an emergency room visit? and (3) Has the patient had any difficulty with walking or balance?¹ The strongest predictors for falls were a prior history of falls, poor vision, anxiety, nervousness or fear of falling, and antipsychotic medication use.²⁹ Therefore, inquiry concerning other fall risks (i.e. medications, vision, heart rate and rhythm) should be considered prior to asking a patient to perform a fall risk assessment test.³⁰ The guidelines from the American and British Geriatric Societies describe four of the most widely accepted fall risk assessment tests that can be used to evaluate gait and balance: the Timed Up and Go Test, Get Up and Go Test, the Berg Balance

Table 1. American and British Geriatric Society recommend fall risk assessment tests

Scales	Advantages	Disadvantages
Timed Up and Go ³²	-Less than 1 minute to perform -Minimal resources needed -High inter-rater/test-retest reliability ^{35,42} -High specificity -Can stratify scores into risk categories	-Only one task is evaluated -No identification of type of balance problem
Get Up and Go ³¹	-Can identify type of balance or gait issue	-15 minutes to perform -Requires special tools to perform test
Berg Balance Scale ³³	-High inter- and intra- rater reliability -Good specificity ⁴²	-15 minutes to perform -Poor sensitivity ⁴² -No identification of type of balance problem
Performance-Oriented Mobility Assessment (Tinetti Balance and Gait Assessment) ^{2,44}	-High inter-rater reliability -Good sensitivity ⁴² -Can stratify scores into risk categories	-15 minutes to perform -Poor specificity ⁴² -No identification of type of balance problem

Scale, and the Performance-Oriented Mobility Assessment.^{2,31-33}

Fall Risk Assessment Tests

The fall risk assessment test for use in a rural setting depends on several factors: time constraints, required resources, inter- and intra-rater reliability, specificity and sensitivity. The best test would be able to be performed in a short time, combining high inter- and intra-rater reliability with high specificity (proportion of non-fallers correctly classified as low risk) and sensitivity (proportion of fallers correctly classified as high risk).³⁴

Although a discussion is provided for all four fall risk assessment tests, the most feasible test to assess fall risk in a rural West Virginia setting is the Timed Up and Go (TUG) test (**Table I**). The TUG test measures, in seconds, the time it takes a person to stand up from a standard arm chair (seat height ~46cm), walk 3 meters (9ft 10in), turn, walk back to the chair, and return to a sitting position.³⁵ The time starts when the person's back leaves the back of the chair and stops after returning to the initial position. The TUG test may be performed using a walking aid if required. It is recommended to complete two trials of the test and use the best result.³⁵ Older adults that take 14 seconds or more to

perform the TUG test are at a high risk for falling (83-87% prediction rate) with the test having specificity of 96.6% and sensitivity of 83.3% when using a 12.34 second high-risk cutoff score.^{19,36,37} A test score of between 10 and 14 seconds indicates a moderate risk of falling and a score of ≥ 14 seconds or more indicates a high fall risk.³⁶ Measuring the time needed to perform the test in seconds provides an objective score, which eliminates rater scoring bias. As previously stated, the TUG test should be used in conjunction with patient history to improve the predictive ability of identifying those at most risk of falls.³⁴ Additional tests can be added to the patient evaluation if one obtains a positive TUG test; stratification of risk is addressed in the next section.

The Get Up and Go Test requires specialized equipment and assesses mean sway path, gait speed, step length, stride width, stepping frequency, and double support/stride time.³¹ Mean sway path is measured using a Kistler Force Platform with feet apart and eyes open for 30 seconds in the antero-posterior and lateral planes. The other measurements are taken while the subject walks for a short distance. The scoring is dependent upon the scorer's perception. This test is more difficult to perform in

the rural primary care setting due to specialized equipment requirements. However, the Get Up and Go Test may be used to identify specific abnormalities in gait and stature that are responsible for previous falls and can be performed at specialized balance centers for patients with a positive TUG test.³⁸

The Berg Balance Scale (BBS) is considered the gold standard for balance assessment but requires a significant amount of time to complete 14 tasks to generate a performance-based measure of balance and should not be used alone for categorizing fall risk.^{39,40} It can therefore be included in a comprehensive balance assessment following a positive TUG test. However, the BBS does not demand reactive postural control (as tested with TUG), which is impaired in high fall risk patients.^{33,41} The BBS does have a high degree of agreement among raters, reproducible results, and is a quantitative evaluation. However, it has poor sensitivity with the subjective nature of BBS producing variability in the clinical relevance of fall risk.⁴² Of note, the TUG test has a strong correlation with the BBS and safely predicts a person's functional mobility.⁴³

The Performance-Oriented Mobility Assessment test evaluates balance and gait of an older adult.

Balance (nine items) and gait (seven items) are scored using an ordinal scale from zero to two based on the older person's abilities to perform each task.⁴⁴ The assessment requires approximately 15 minutes to perform, has good inter-rater reliability and sensitivity, but has poor specificity.⁴² A person's total gait score can be stratified into low, medium, and high fall risk categories; however, the scoring of each task is subjective to the clinician's perception. Time of administration and subjective versus objective scoring are the biggest limitations to using this test in a rural office setting.

Fall Risk Stratification and Treatment

The TUG test can safely predict the functional mobility of an older person.⁸ Functional mobility is defined as the balance and gait maneuvers used in everyday life.³⁶ Using the TUG test, older persons can be stratified into moderate (between 10 and 14 seconds) and high-risk (≥ 14 seconds) sub-groups. For those individuals scoring ≥ 14 seconds on the TUG test, the risk of fall is so great that a referral to balance treatment center, or a physical therapist specialized in balance deficits, is recommended. Unsupervised home-based exercises should not be the primary treatment modality for this high-risk subgroup. Instead, consider advancement to home-based protocols based on the outcome of supervised individual treatment programs.

For individuals who score in the moderate risk category (TUG score between 10 and 14 seconds), physical therapy programs focusing on lower extremity strengthening and balance retraining decrease fall risk.²⁴ In fact, exercise has been shown to modify fall risk as effectively as multifactorial programs.²⁵ In a rural setting where physical therapy options are limited, simple "kitchen counter" exercises

that improve strength and balance should be considered for people in the moderate risk category (**Figure 1**, <http://bit.ly/ZdhWeU>). "Kitchen counter" exercises should be performed in a standing position while holding onto a sturdy structure, such as a countertop. The following 6 exercises can be performed to strengthen the lower extremities: knee raise, knee bend, kick back, side kick, one-leg stand, and heel raise.^{45,46} Each exercise should be performed on both sides, at a comfortable pace (4 sets of one minute each with one minute rest period between each set), and under the supervision of another person if possible.

Additional Considerations

It is worth noting that our discussion of fall risk and treatment is limited to those fall risk factors related to muscle weakness and fatigue. However, other systems' involvement in the fall risk of a patient (e.g. vestibular, cardiovascular, etc.) should be addressed during the primary care office visit for an elderly patient. Additionally, current data indicates that one of the most cost effective strategies for fall risk reduction is identification and correction of vitamin D deficiency.⁴⁷ Thus, no matter which test or tests are used, fall risk is multifactorial and any treatment program should also address any vision changes, mental illness and medications that may impact fall risk.


As with any test, the TUG test has limitations. A recent meta-analysis indicated that TUG is a more powerful predictor of fall risk for lower-functioning populations (those that would score greater than 10 seconds on the test) versus higher functioning elderly patients.⁴⁸ This does not change the recommendations discussed. Though we believe the TUG test to be the best option for primary care providers in our state, due to its ease of administration and

its power in discrimination among lower-functioning community-dwelling adults, there is currently no widely accepted test for fall risk assessment.^{48,49} Also, numerous sources cite the positive effects of exercise in reducing falls in the elderly, but these effects lessen in individuals with advanced states of instability.⁵⁰ Therefore, the prescribed "kitchen counter" leg strengthening exercises are only applicable to people in the moderate risk category (TUG score between 10 and 14 seconds); those in the high risk category require more supervised care from a health care and/or trained balance professional who will customize the most appropriate treatment protocol focusing on the duration and type of exercise.^{25,49} This approach is supported by a recent meta-analysis of randomized-controlled trials that included 4305 elderly participants where the effect of fall-prevention exercises were assessed.⁵¹ These exercise programs all emphasized balance training and reduced falls that caused injuries by 37%, reduced falls leading to serious injuries by 43%, and reduced broken bones by 61%.

Conclusions

West Virginia has the second highest percentage of population that is ≥ 65 years and falls are the number one cause of injury-related morbidity and death in this population. We describe the TUG test as an easy-to-use means for assessing fall risk in elderly patients during a routine office visit. The TUG test provides a simple way to reliably, specifically, and sensitively determine the likelihood of a fall. A TUG score between 10 and 14 seconds indicates moderate risk for fall, while a score ≥ 14 seconds indicates high fall risk. For patients with high fall risk, referral to a balance treatment center is recommended. Patients with low-to-moderate fall risk attributed to muscle weakness or fatigue should


Figure 1. Exercises to promote balance. A handout for patients of these “kitchen counter” exercises can be obtained at <http://bit.ly/ZdhWeU>.



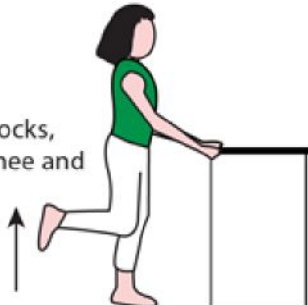
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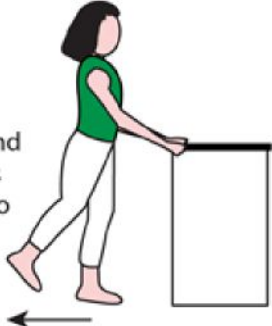
Knee Raise
Lift knee towards chest and return to standing



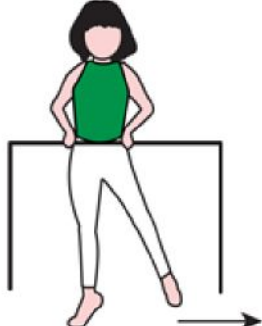
Knee Bend
Lift heel towards buttocks, while bending your knee and return to standing.




Kick Back
Keep knee straight and kick leg back as far as possible and return to standing.



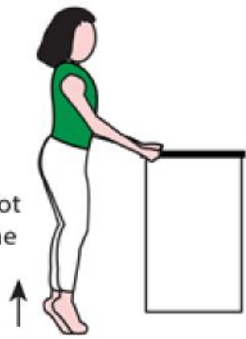
Side Kick
Kick leg to the side as far as possible and return to standing



One-Leg Stand
One-Leg Stand: Stand on one leg with support for one minute. Alternate leg each repetition. Rest 1 minute in between each stand.



Heel Raise
Heel raises: Lift yourself onto your toes and return to flat-foot stand and perform for one minute.



Four sets of one minute each with one minute rest period between each set

be prescribed lower extremity strengthening exercises, such as kitchen counter exercises, to improve strength and balance. Yearly assessment of fall risk is recommended for this population.

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