Gait, Balance, and Fall Prevention

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Falls are an increasing problem as people age. The healthcare costs of falls (hospitalization, surgery, rehabilitation, equipment, homehealth services, and institutionalization) can be as high as $500 million a year. The emotional, physical, and personal costs to the individual are even higher. Most falls could be prevented by a vigilant physician anticipating, assessing, and correcting fall risks, which may be medical, mechanical, or environmental. The impact of chronic disease and medication, balance and gait, and home risks should be assessed routinely. Balance and gait can be usefully evaluated with the Get Up and Go test and the Tinetti Balance and Gait test. The test results will indicate areas of further investigation. A healthcare team approach using physician specialists, allied health professionals, and ancillary services will provide the maximum benefit to the patient. Fall prevention through proper assessment and intervention will not only decrease morbidity and mortality, but will also help maintain patient independence and quality of life, a primary goal of geriatric care.

Falls are an important public health concern. They can result in serious injuries, enduring disabilities, drastic lifestyle changes, escalating healthcare expenses, and even death. Fall-associated healthcare costs in the United States have been estimated as high as $500 million a year (1). This does not even begin to assess the individual morbidity involved (disability, dependence, depression, unemployment, inactivity). Fall prevention should be of paramount concern to healthcare professionals and should be reevaluated on a regular basis.

Falls may happen to anyone, but their incidence does increase with age. Some estimate that about 33% of community-dwelling elderly (65 or older) fall at least once a year. This increases to about 50% for those in nursing homes. Forty percent (40%) of these people require hospitalization, 10% to 25% of whom have serious outcomes (2). Those of us who care for the elderly need to be especially vigilant, considering that patients often excuse these falls as 'annoying minor trips' and fail to report them (3). We must aggressively anticipate, observe, question, and test our patients in an attempt to prevent and remedy problems that can lead to falls.

The entire healthcare team can be used to assess fall risk, but evaluation begins with the physician at the office visit. While caring for the medical conditions common in the elderly (diabetes, hypertension, arthritis, dementia, Parkinson's, macular degeneration, etc.), we should anticipate and try to mitigate their effects on gait and balance. Decreases in proprioception, visual acuity, joint mobility, judgment, and orthostatic hypotension are additive to the changes in gait that occur with age (wider stance, smaller steps, slower gait, decreased arm counterbalance), increasing all fall risk. While we regularly check for and try to correct these disease-related changes, we should also increase our assessment of gait and balance changes themselves. This can begin with direct questioning and observation and progress to formal testing.

During the visit patients should be asked, "Have you tripped or fallen recently or more frequently?" This opens discussion of events and causes and determines the patient's attitude about the falls. Nonchalance and trepidation can be equally damaging to the patient. The first prevents them from taking precautions and using aids; the second decreases mobility and exercise from fear. Both lead to increased falls.

Balance and Gait Testing

Informal assessment begins with observation (Figure 1). Does the patient require assistance walking down the hall or getting from the chair to the examination table? Is the gait continuous and fluid, or is it halting and unsteady? This also extends to evaluation of footwear. Ill-fitting shoes, slick soles, and high heels compound a patient's intrinsic fall risk. The planned history and physical for the scheduled visit can then be expanded to search for deficits and possible causes.

Formal screening begins with the "Get Up and Go" test (4), a standardized evaluation of a patient's movement in the

examination room. The "Get Up and Go" test requires the patient to get up from a chair and return to a seated position in the chair after walking 3 meters and turning around. It can be scored qualitatively on a scale from l (normal) to 5 (severe) or quantitatively by timing each step. This test may be administered by a nurse or medical assistant who can then alert the physician to patients with poor performance. Physician time can then be focused on administering a more extensive evaluation to those showing increased risk.

The Tinetti Balance and Gait test is a standardized evaluation of mobility and stability (Table 1) (5). To those familiar with the test, its scores convey a picture of the degree of difficulty a patient is experiencing. Balance and gait are assessed and scored individually in a 16-item test. The physician's familiarity with the test components allows test administration in a smooth and efficient

Figure 1. The normal gait cycle. Reprinted by permission of the Massachusetts Medical Society from Sudarsky L, Gait disorders in the elderly, N Engl J Med 1990; 1441-1445. Copyright 1990 Massachusetts Medical Society. All rights reserved.

manner. Balance, which is assessed first, is judged while sitting, arising, standing (immediate and prolonged), and turning. Additionally, maintenance of balance is tested against attempts at disruption (nudge) and without a horizon reference (eyes closed). These indicate body control and strength.

In gait testing, right and left feet are evaluated separately for swing (step length) and clearance, and then compared. Each foot should completely clear the floor and should step completely ahead of the other foot. Comparison includes step symmetry and continuity. Additionally during walking, the path deviation, trunk stability, and stance (normal or wide-based) are evaluated.

A score is determined for each section; the total score is the sum of the two sections. Points are lost to varying degrees for requiring assistance, using an aid (cane, walker, furniture), multiple attempts, staggering, asymmetry, sway, and deviation. At first, it seems inherently unfair to consistently subtract points for using an aid (cane, walker), which is used to prevent falls. However, considering that this test determines relative fall risk, and illuminates the potential etiology of this risk, it is understandable that the need for a walking aid demonstrates a patient already at increased risk. A score of 22 or less (total 28) indicates a patient at risk.
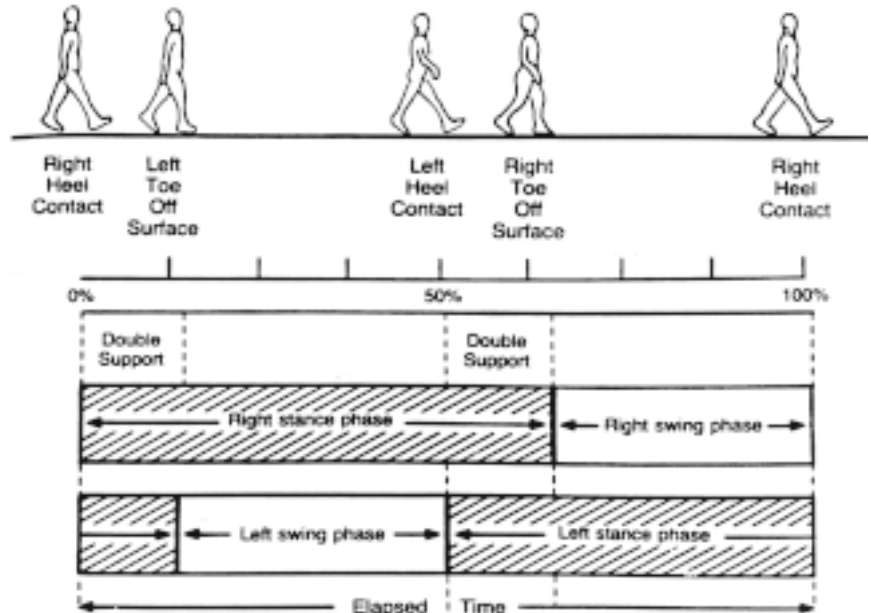
The true value of this test to the practitioner, the healthcare team, and others is not in the numerical score but in the accompanying comments. These comments should list the individual items with deficiencies and the nature of the deficiencies. Tinetti isolates and tests each element of balance and gait, making it easier to create a differential diagnosis for each deficiency. This helps direct further evaluation to determine the etiology. Colleagues in Rheumatology, Orthopedics, Neurology, Ophthalmology, Vascular Medicine, and Physical Medicine and Rehabilitation are invaluable in this determination. Once the etiology is identified, remedy, mitigation, and fall prevention can begin.
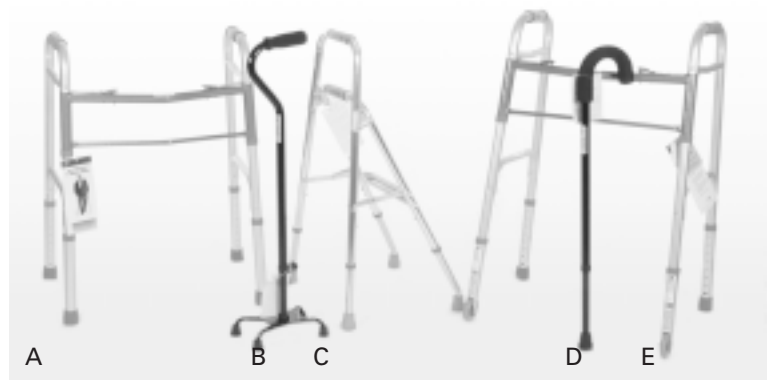

Figure 2. Examples of walking aids A) walker, B) quad-cane, C) hemi-walker, D) cane, E) rolling walker.

Table 1. Performance-oriented assessment of balance. Adapted from Tinetti ME, J Am Geriatr Soc 1986; 34: 119-126. Reprinted by permission of Blackwell Science, Inc.

Balance	Gait

Instructions: Subject is seated in hard armless chair. The following maneuvers are tested.
 	
1. Sitting Balance
  Leans or slides in chair = 0
  Steady, safe = 1
2. Arise
  Unable without help = 0
  Able but uses arms to help = 1
  Able without use of arms = 2
3. Attempts to rise
  Unable without help = 0
  Able, but requires more than 1 attempt = 1
  Able to rise with 1 attempt = 2
4. Immediate standing balance (first 5 seconds)
  Unsteady (staggers, moves feet), marked trunk sway = 0
  Steady but uses walker or cane or grabs other object for support = 1
  Steady without walker or cane or other support = 2
5. Standing balance
  Unsteady = 0
  Steady, but wide stance (heels > 4" apart) or uses cane or other support = 1
  Narrow stance without support = 2
6. Nudge (subject stands with feet as close together as possible), examiner pushes lightly on subject's sternum with palm of hand 3 times.
  Begins to fall = 0
  Staggers, but catches self = 1
  Steady = 2
7. Eyes closed (same position as #6)
  Unsteady = 0
  Steady = 1
8. Turn 360°
  Discontinuous steps = 0
  Continuous = 1
  Steady = 2
9. Sit down
  Unsafe, misjudged distance; falls into chair = 0
  Uses arms or not a smooth motion = 1
  Safe, smooth motion = 2
 	
Balance Score ____/16
	Instructions: Subject stands with examiner; walks down hallway or across room (about 25') at "usual" pace, then back at "rapid, but safe" pace.
	
	10. Initiation of gait (immediately after told to 'go')
	  Any hesitancy at start = 0
	  No hesitancy = 1
	11. Step length and height
	  A. Right foot swing
	    Does not pass L stance foot with step = 0
	    Passes L stance foot = 1
	    R foot does not clear floor completely with step = 0
	    R foot completely clears floor = 1
	  B. Left foot swing
	    Does not pass R foot stance with step = 0
	    Passes R stance foot = 1
	    L foot does not clear floor completely with step = 0
	    L foot completely clears floor = 1
	12. Step symmetry
	  R and L step length not equal (estimate) = 0
	  R and L step appear equal = 1
	13. Step continuity
	  Stopping or discontinuity between steps = 0
	  Steps appear continuous = 1
	14. Path (Observe excursion of one foot over about 10 feet)
	  Marked deviation = 0
	  Mild/moderate deviation or uses walking aid = 1
	  Straight without walking aid = 2
	15. Trunk
	  Marked sway or uses walking aid = 0
	  No sway but flexion of knees or back or spreads arms out while walking = 1
	  No sway, flexion, abnormal arm spread, or walking aid = 2
	16. Walk stance
	  Heels apart = 0
	  Heels almost touching while walking = 1
	
	Gait Score: ____/12

Total Score: ___/28

Intervention

At this point, medication or other intervention for the specific etiology of instability may not be enough. The patient may need a gait aid such as a cane or walker. Also, often without testing a patient, a family member recognizing a problem will simply ask for a prescription for a cane, walker, or wheelchair. The patient may just begin using a discarded aid from another family member. Physicians must help patients and family realize that there is more to using an aid than a prescription or purchase. Canes, walkers, and even wheelchairs must be measured for the patient. The correct type of cane (single, four-pronged) or walker (hemi, regular, or rolling) (Figure 2) must be determined for each patient and deficit (4). Additionally, patients must be instructed in the proper use of such items in various circumstances (stairs, etc.). The patient's instinctive choice and use is often incorrect. Incorrect aids, fit, or use will actually increase falls. When the need for an aid is determined, the patient should be sent to a physical therapist who is expert in determining the proper aid and fit and can instruct the patient in its safe use. Many physical therapy departments have special fall assessment clinics and rehabilitation and conditioning programs. Improving muscle strength and balance through repetitive exercise has been shown to decrease the incidence and severity of falls.

Often physical therapy departments or home health agencies will also perform in-home evaluation of extrinsic or environmental factors which could lead to falls. The home can be assessed for risks (area rugs, stairs, obstacles, poor lighting) and needs (grab bars, tub rails, transfer benches). This will allow the factors to be minimized or eliminated, risks pointed out to patients and family, and home aids to be added.

Conclusion

One of the main goals of geriatric care is to help the patient maintain a quality independent lifestyle for as long as possible. Clearly, falls can drastically and dramatically change a patient's independence and quality of life both temporarily and permanently. Many falls can be avoided. Physicians caring for older adults must be alert for warning signs and assess and intermittently reassess a patient's fall risk. In doing so, they should utilize specialists, other healthcare professionals, and ancillary services in an effort to achieve the best outcomes.

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