Falls and Gait Disturbances in Older Patients

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Objectives

• Understand that falls have serious detrimental consequences for older patients
• List risk factors for falls
• Evaluate an older person at risk for falling
• Describe interventions that can reduce future fall risk
• Recognize gait disorders that can lead to falling
• Evaluate a patient with a gait disturbance

Case study: Patient is a 75 y.o. male with a history of PMR who has been treated with prednisone for the last two years. He walks into your office today unaided and without any noticeable gait abnormality, but reports balance problems. His meds include HCTZ, glyburide, prednisone and ASA. What is his risk of falling in the next year?
Fall Facts

- Falls are the leading cause of injury-related deaths in adults \( \geq 65 \).
- 27,000 persons \( \geq 65 \) die from falls annually (2014 estimate).
- Falls cause the majority of hip fractures.
- Multifactorial interventions to prevent falls are effective, reducing fall rate 12 falls per 100 person-months (30-40%)}

Causes of Falls in Older Persons

<table>
<thead>
<tr>
<th>Cause</th>
<th>Mean (%)*</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident and environment-related</td>
<td>31</td>
<td>1 to 53</td>
</tr>
<tr>
<td>Gait and balance disorders or weakness</td>
<td>17</td>
<td>4 to 39</td>
</tr>
<tr>
<td>Dizziness and vertigo</td>
<td>13</td>
<td>0 to 30</td>
</tr>
<tr>
<td>Drop attack</td>
<td>9</td>
<td>0 to 52</td>
</tr>
<tr>
<td>Confusion</td>
<td>5</td>
<td>0 to 14</td>
</tr>
<tr>
<td>Postural hypotension</td>
<td>3</td>
<td>0 to 24</td>
</tr>
<tr>
<td>Visual disorder</td>
<td>2</td>
<td>0 to 5</td>
</tr>
<tr>
<td>Syncope</td>
<td>0.3</td>
<td>0 to 3</td>
</tr>
<tr>
<td>Other specified causes†</td>
<td>15</td>
<td>2 to 39</td>
</tr>
<tr>
<td>Unknown</td>
<td>5</td>
<td>0 to 21</td>
</tr>
</tbody>
</table>

* - Mean calculated from the 3,628 reported falls.
† - Includes: arthritis, acute illness, drugs, alcohol, pain, dizziness and falling from bed.


Falling in Patient 65yrs and older

- Pretest probability in one year is: 27% ( CI 19-36%)
- Findings that would bring annual risk of fall to 50% include:
  - Faller in past year LR range 2.3-2.8.
  - Faller in past month LR 3.8.
  - Clinically detected abnormality of gait or balance LR range 1.7-2.4.

- Ganz DA et al JAMA,297,1: 77-86, 2007
Which of these patients should be screened or evaluated for falls?

A. 85 year old female with an antalgic gait
B. 72 year old male who fell while weeding his garden last month
C. 80 year old female presenting to the ED with a hip fracture
D. 78 year old male complaining of dizziness
E. All of the above

AGS/BGS Guideline for Prevention of Falls in Older Adults

- Gait and balance deficits should be evaluated in patients reporting a single fall.
- Persons who screen positive for falls or fall risk should have evaluation of gait and balance as part of the multifactorial fall risk assessment.


Screening Questions

- Have you fallen in the past year?
- Do you feel unsteady when standing or walking?
- Do you worry about falling?

Answering “yes” to any of these is a positive screen.
How do you evaluate a fall?

• Think of the fall as a chief complaint
  – When, where, how?
  – Any preceding symptoms?
  – Any witnesses?
  – Any injuries?

Assessment of Fall Risk includes history of fall plus:

• Medication review
• Assess BADLs and IADLs
• Measure orthostatic blood pressures
• Assess vision
• Cognitive and neuro evaluation
• Heart and heart rhythm
• Environmental hazards (feet and footwear)
• Evaluate gait and balance.

Medications Most Strongly Linked to Fall Risk

• Anticholinergics
• Anticonvulsants
• Antihistamines
• Antidepressants
• Antihypertensives
• Antipsychotics
• Benzodiazepines
• Muscle relaxants
• Opioids
• Sedative-hypnotics

Abnormal Gait is a Risk Factor

• For: falls, immobility, dementia, loss of independence and death.
• Risk of death or institutionalization (5 yrs)
  *HR 2.16
  *Patients with moderate to severe abnormalities HR 3.18.

• Verghese J. JAGS 54: 255-261, 2006
Key Points-Gait Disorders

- Common, predictor of functional decline
- Cause is usually multifactorial.
- Common contributors in primary care:
  - pain, stiffness, dizziness, numbness, weakness
  and sensation of abnormal movement.
- Common conditions:
  - DJD, acquired MSK deformities, claudication,
  stroke, postural hypotension, impairments
  following orthopedic surgery.

Key Points- continued

- Conditions seen by neurologists: frontal gait
  disorders (NPH, CVD processes), sensory
  disorders (vestibular, visual), parkinsonism,
  cerebellar disorders, neuropathies.
- Evaluation: detailed physical and functional
  performance evaluation.
- Interventions: medical, surgical, exercise.
- Residual impairment is often present.
Epidemiology of Gait Impairment

- 20% non-institutionalized older adults.
- 54% in adults aged 85 and over.
- Age-related gait changes (decreased speed) apparent at age 75 or 80.
- Majority of gait disorders connected with underlying diseases – e.g., stroke, hip fracture or cancer.

Epidemiology of Gait Disorders

- Incidence: 169 per 1000 person-years.
- Males = Females
- Prevalence: 35% of elders, peaks 80-84yr
  Neuro: 15.7% peaks 85yrs & older
    (stroke HR 2.6, hypertension HR 1.9)
  Non-Neuro: 20.8% peaks 80-84yrs
    (arthritis HR 3.0)

Walking is one of the most repetitive and “hard wired” human movements.

- Stride time variability <3% in healthy adults
- Higher gait variability in frailty, Parkinson’s disease and Alzheimer’s disease

Essential Gait Disorder

- Decreased stride length.
- Broad-based.
- Reduced arm swing.
- Stooded posture.
- Decreased flexion of hips and knees.
- Stiffness in turning.
- Difficulty initiating steps.
- [Disorder vs as-yet-undiagnosed disease]
Assessment by Sensorimotor Level

• Low: proprioceptive, vestibular and visual disorders; body deformities, pain and focal weakness.
• Middle: cerebellar ataxia, parkinsonism, hemiplegia/paresis and paraplegia/paresis
• High: cautious gait, mild Alzheimer’s, cerebrovascular disease, NPH.

Classifying Abnormal Gaits

• Neurological
• Non-neurological
• Combined

Neurological Gaits

• Unsteady – swaying or losing balance.
• Ataxic (cerebellar) – wide based, intention tremor.
• Neuropathic – foot drop, sensory loss, absent reflexes.
• Frontal – short step, wide base, difficulty lifting feet.
### Neurological Gaits

- Parkinsonian - en bloc turns.
- Hemiparetic – circumduction of leg.
- Spastic – both legs circumduct, scissoring.

### Non-Neurological Gaits

- Arthritis
- Cardiac disease
- Chronic Lung disease
- Peripheral Vascular disease
- Combined Gait Disorders

### Impairment of Gait or Balance: findings that predict falls in 1 yr

- Self-reported mobility problem LR 1.7
- Inability to perform tandem stand (10 sec) LR 2.0.
- Inability to perform tandem walk (2 m) LR 2.4.
- >13 sec. to walk 10 meters LR 2.0.

- Ganz DA et al. JAMA, 297,1:77-86, 07.

### Testing Gait and Balance

- Static balance
- Dynamic balance
- Walking velocity
- Specific gait abnormalities
### Static Balance
- **Stance**
  - side by side
  - semi-tandem
  - tandem (10 sec)
- One leg balance for 5 seconds.
- One leg balance with Eyes Closed Test

### Dynamic Balance
- Ability to anticipate changes and coordinate muscle activity in response to perturbations of stability.
- Functional Reach – <6” : OR 4 (>2 falls in 6 mos)
- Sternal Nudge.
- Limits of Stability (leaning in different directions) – need force platform and computer.

### Walking Velocity
- Gait speed declines @ rate of 12-16% per decade after age 60.
- Slow or impaired walkers ( <0.6 m/sec)
- Fast or unimpaired walkers ( >1.0 m/sec)
- Timed walking tasks:
  * selected gait velocity
  * walking speed reserve
- 6 meter walk or TUG (14 sec = fall risk)
Gait Speed and Survival

- Pooled analysis of 9 cohort studies
- 34,485 community dwelling adults
- Mean age of 73.5 years
- Followed for 6 to 21 years
- Mean gait speed of 0.92 m/sec

Studenski S, Perera S, et al. Gait Speed and Survival in Older Adults JAMA 2011; 305 (1): 50-58

Results

- Overall: 5 year survival was 84.8%
  10 year survival was 59.7%
- Survival increased across the full range of gait speeds (per 0.1m/s).
- At age 75 years 10 year survival is:
  Men – 19% to 87%
  Women – 35% to 91%

Predicted Survival based on age, gender and gait speed

- As accurate as age, gender plus →
  - use of mobility aids, self reported function
  - chronic conditions, smoking hx, blood pressure, BMI, hospitalizations

Clinical Implications of Gait Speed

- Identify patients likely to live 5 or 10 years
- Predict early mortality ( speed <0.6 m/s)
- Characterize overall health
- Decline may indicate new health problem
- May stratify risks from surgery or chemotherapy
- Can be implemented in practice.
Grim Reaper’s Walking Speed

- Study of health men 70 and older (N=1705)
- Use ROC curves for walking speed in relation to mortality over 5 years.
- Death’s preferred walking speed: 0.82 m/s.
- No subjects died if walking speed greater than 1.36 m/s or 5 km/hr.

### Gait Abnormalities
- **Circumduction** - Outward swing of leg in semicircle from the hip.
- **Equinovarus** – Excessive plantar flexion and inversion of the ankle.
- **Festination** – Acceleration of gait.
- **Foot drop** – Loss of ankle dorsiflexion
- **Foot slap** – Early, frequent audible foot-floor contact with steppage gait compensation.

### Gait Abnormalities (cont)
- **Genu recurvatum** – Hyperextension of the knee.
- **Propulsion** – Falling forward.
- **Retropulsion** – Falling backward.
- **Scissoring** – Hip adduction such that the knees cross in front of each other.
- **Steppage gait** – Exaggerated hip flexion, knee extension and foot lifting.

### Gait Abnormalities (cont)
- **Trendelenburg gait** – Shift of the trunk over the affected hip, which drops because of hip abductor weakness.
- **Turn en bloc** – Moving the whole body while turning.
### Interventions for Gait Disorders
- Treat underlying disease (hip replacement, shunting NPH, PT for weakness)
- Well-fitting shoes with low heels, thin firm soles and high fixed heel collar support.
- Mobility aids.
- “Furniture surfing”

### Interventions for Falling
- Treat underlying disease
- Assess for home safety modifications (e.g., install grab bars, remove throw rugs)
- Improve strength and balance
- Optimize medications

### Healthcare Team
- Orthotics/prosthetics
- Occupational therapy
- Physical therapy
- Home care and/or home assessment
- Consulting physicians: neurology, orthopedics, etc.

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*He Can No Longer at the Age of 98*, Francisco Goya, 1819-23
Case study follow-up

- The patient is at high risk for falls. His pretest probability is about 27%. He has a LR of approximately 2 for report of balance problems and there is additional risk related to HCTZ use. His post-test probability of falling is at least 50%. Does he have osteoporosis related to his prednisone use which may worsen the consequences of any fall?

Bottom Line

- By performing fall assessment on a patient who screens positive (history of fall or report of a mobility problem) and then treating the patient’s risk factors for falling, falls can be reduced by 30-40%.

References