Fall Prevention in the Elderly

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Disclosure

• I wish I did but... I have nothing to disclose
Objectives

Upon completion of this presentation, participants should be able to:

1. **Identify three types of risk factors which result in falls of older adults.**

2. **Describe three components of a multifactorial approach to preventing falls in the elderly.**

3. **List three evidence-based recommendations for preventing falls in the elderly.**
But it wasn’t a fall...was it?

• A fall is defined as: landing on the ground or some other lower surface when you didn’t intend to be there.

• Includes slips, trips, and falls.

• Includes being lowered to the ground by other people (long term care setting).

• Involves disease states and physiological changes affecting balance.
Age related decline in homeostasis:

- Aging cardiovascular function
  - Increased autonomic dysfunction
  - Arrhythmias: tachy-brady syndromes, afib, sick sinus, AV block
  - Carotid sinus sensitivity
  - Postural hypotension
Age related decline in homeostasis:

• Aging physiology affecting Gait and Balance
  • Usually multifactorial
  • Dysfunction in >one system (neurological, muscular, skeletal, etc.)
  • Structure and function are intimately related
  • Complex systems tend to break down “piecemeal”
Balance is complex...

• Three sensory systems provide input for balance control
• Somatosensory input
• Most rapidly conducting fibers
  – proprioceptive and cutaneous input
  - 1a afferents from muscle spindles (muscle length) and
  - 1b afferents from Golgi tendons (muscle tension)
  - faulty input due to peripheral neuropathy
Balance is complex...

• Visual –
  - reduce contrast (cataracts)
  - reduced central vision loss (retinopathy)

• Vestibular –
  - reduced quality input from otolith, position sense, spatial orientation.
  - Dysfunction is 2.3 times more likely in patients with diabetes
Balance is complex...

• **Musculoskeletal system** –
  • muscle mass, strength
  • endurance,
  • Injury, inflammation, arthritis

• **Cognitive System** –
  • twice as likely to fall vs cognitively intact individuals
  • 2.7 times more risk for hip fracture
  • Impacts rehabilitation
Homeostatic balance....

Postural Stability
- sensory
- proprioception
- vestibular changes

Homeostatic mechanisms

Age related decline in Balance, Gait and Cardiovascular Function
One third...

• Multiple community-based surveys suggest about 30% of adults older than 65 years of age fall once a year.

• Found in both frail and healthy elderly in the community.

• Evidence suggests that the healthier elderly may be even more at risk due to a more active lifestyle.

• Majority of these falls have no intrinsic cause.

Age Ageing 2006; 35
About 50% fall more than once...

• Half of all elderly fallers have multiple falls.

• One out of every 10 falls results in serious injury (i.e., fractures).

• Therefore, the single biggest risk factor for fall is having a prior fall.

• 70% of falls are unwitnessed.

Stevens JA et al. Inj prevention 2006
Falls in Older Adults...

• The leading cause of traumatic brain injury (TBI).

• Trend towards increased intracranial injuries with greater mortality from TBI than younger cohorts

• Hip fractures lead to greater risk of death, disability and costs.

• Shabot MM, Johnson CLJ Traum 1995
• Thompson HJ, McCormick W et al. J Am Geriatrc Soc 2006
“Very elderly” (>80 years of age)...

- Increased severity of injuries vs. younger cohorts aged 65 and up
- Increased overall mortality vs. younger cohorts
- More falls in long term care setting 50-60%

- Shabot MM, Johnson CLJ Traum 1995
Types of Risk Factors for Falls

• Physical
  • Aging physiology, disease, impaired homeostasis
  • Frailty

• Behavioral
  • Things people do (or don’t do)
  • Sedentary lifestyle, “Weekend warriors”

• Environmental
  • Home, neighborhood, community
  • Potential or actual hazards
Risk Factors for Falls

• **Modifiable:**
  - Inactivity
  - Environment*
  - Iatrogenesis
  - Medications
  - Isolation

• **Unmodifiable:**
  - Age
  - Gender
  - Ethnicity
  - Environment*
Falls affect quality of life trajectory

• Much of successful aging depends upon function

• Decreased function leads to loss of independence.

• Loss of independence leads to decreased social activity and decreased quality of life.
Hospitalized for a fall?

• Disability outcomes > vs other conditions.

• Worse mobility and independent activities of daily living (IADL’s) over time.

• Disability for hip fractures at 6 months post fall > than prior to fall.

• Elderly hospitalized for non-fall conditions returned to premorbid level of function significantly sooner.

Impact on function is very significant

• Fall-related injuries are associated with:
  • decline in functional status,
  • increased likelihood of nursing home placement,
  • greater use of medical services.

• Those having at least one fall experienced:
  • decline in basic and instrumental activities of daily living.
  • activity restriction was 1.6 times higher in recent fallers vs non-fallers.
  • “Fear of falling” impacts health and restricts function and social activity.

What can predispose to falls...

A. Visual impairment
B. Stroke
C. Peripheral neuropathy
D. Alzheimer’s Disease
E. All of the above
Threats can upset the balance....

**Illness:**
- Fever, dehydration
- Neuropathy
- Arrhythmia, cognition

**Medications:**
- Benzodiazepines
- Antidepressants
- Cardiovascular meds

**Environment:**
- New lodgings
- Area rugs
- Recent travel

Postural Stability
- sensory
- proprioception
- vestibular changes

Homeostatic mechanisms

Age related decline in Balance, Gait and Cardiovascular Function
Prevention

“Falling is a health condition meeting all criteria for prevention: high frequency, evidence of preventability, and high burden of morbidity”

Tinetti ME, Willliams CS

Journal of Gerontology 1998 (53) 2
Review of the Evidence...

• All multifactorial interventions for community-based residents should have an exercise component

• A health care professional should perform environmental adaptations/modifications, not only assessment.

• Medication reduction is emphasized for all older adults, not only for those with multiple medications.

• American geriatrics Society/British Geriatrics Society Clinical Practice Guidelines. JAGS 2010
Screening...

- Screen includes 3 basic questions:
  - Two or more falls in past 12 months?
  - Presenting with acute fall?
  - Difficulty with walking or balance?

- If ‘NO” to all questions:
  - Is there a single fall in past 12 months?
  - If “no” reassess periodically
  - If “yes” evaluate gait and balance, and if abnormal determine multifactorial fall risk and appropriate interventions.
Screening...

- Screen includes 3 basic questions:
  - Two or more falls in past 12 months?
  - Presenting with acute fall?
  - Difficulty with walking or balance?

- If ‘Yes” to any question, determine multifactorial fall risk and appropriate interventions.

- Multiple options: Annual Wellness Visit, other templates targeting falls/gait screening.
Screening for falls: **Positive**

History, exam, cognitive and functional assessment.

**Determine Multifactorial Fall risk:**
- History of falls
- Medications
- Gait, balance, mobility
- Vision
- Heart rate/rhythm
- Postural hypotension
- Feet/footwear
- Environmental hazards

(+) Abnormal gait or stability

**Multicomponent Intervention addressing identified risk:**
- Vision
- Medications
- Manage postural hypotension
- Supplement vitamin D
- Manage footwear
- Modify home
- Provide education

Vision...

• Visual acuity problems are common in older adults
• Remedial abnormalities should be treated
• Mixed evidence that referral for correction was effective in reducing falls.

• Cataracts-
  • Decreased contrast
  • Lower rate of falls for immediate vs. delayed surgery for cataracts.

Managing foot/footwear issues

- Foot problems are associated with impaired balance and function.
- Predispose to falls: Moderate/severe bunions, toe deformities, ulcers
- Foot position awareness is also significantly poorer in older adults.
- Higher risk is associated with
  - high heels
  - poor fit
  - worn soles
  - Not laced
- Recommended as part of multifactorial intervention.
- Assessments and recommendations were also included in home hazard studies.
Optimizing Medical Care

• Multiple systems (muscular, skeletal, neurologic, psychiatric etc.)
• Relevant history, exam, cognitive, and functional assessment
• BP sitting/standing
• Evaluate medication dosage and appropriateness

Medication Review

- Medications – consistently associated with risk of falls.
  - More medications → increased risk of interactions
  - Certain medications are more associated with falls.
- Strongest risk association is for polypharmacy and psychotropic medications
  - Discontinuation as a single or part of multifactorial intervention is effective.
  - Antidepressants – including SSRI’s.
- Evaluate appropriateness / dose.
- Beer’s list
- START/STOPP

Tinetti et al. JAMA Internal Med. 2014 (174)
Postural Hypotension

- 87 year old female with CHF: sitting BP 110/68, after 2 minutes standing BP: 98/64 on carvedilol 12.5mg p.o. bid

- Cardiovascular medications – particularly anti-hypertensives increased rate of serious injuries and postural hypotension.

- Medications – consistently associated with risk of falls.
  - More medications → increased risk of interactions
  - Reducing / simplifying medication have been shown to be components of successful fall reduction programs.

Tinetti et al. JAMA Internal Med. 2014 (174)
Heart Rate / Arrhythmias

• Most common disorders are:
  • carotid sinus hypersensitivity,
  • vasovagal syndrome,
  • Brady-arrhythmias (sick sinus, AV block)

• Transient loss of consciousness with amnesia – syncope.
  • Associated with postural and carotid sinus hypersensitivity.
  • 70% of falls are unwitnessed
  • May report “fall” vs. syncope

• Transient hypotension due to primary hypotension or arrhythmia.
  • Affect people with co-morbid gait and balance issues
  • May cause falls without frank syncope
Heart rate / Arrhythmias

• Medication review to prevent bradycardia.

• Cardiac pacing - for symptomatic bradycardia associated with decreased falls in several RTC’s.

• Dual chamber cardiac pacing if appropriate for bradycardia and conduction disorders.
Home Safety Evaluation

• Mixed evidence to support as a single strategy.
• A component of multiple successful fall prevention programs.
• Strong evidence when part of a multifactorial intervention program.
• May be particularly effective in high risk, frailer patients.
• Tends to be underutilized in primary care practices.

Vitamin D

• Indicated for bone health

• At least 800 IU daily

• Most people start with 800 - 1000 IU.

• Mixed evidence for fall prevention

Who is at risk for Vitamin D deficiency?

• 25(OH) D less than 30 nmol/L
• Low sunlight exposure
• Renal conversion of 25(OH) D to active form
• Absorption from digestive tract is inadequate
• Associated with mild allergy, lactose intolerance and veganism.
Beneficial Effects of Vitamin D

• Goes well beyond bone health and rickets.
• Mixed evidence for fall prevention by meta-analysis and RCTs.
• Some studies show benefit even when serum levels are normal
• Impacts muscle contractility and possibly neural and muscular function.
• Older adults should routinely be offered supplementation.
• May prevent falls in people who are deficient.

Bischoff-Ferarri HA JAMA 2004 (28), Bischoff-Ferarri et al BMJ 2009 (339)
Providing education

• All fall prevention programs include educational and health behavior components.

• Education of caregiver and patient may augment sustainability of primary and secondary prevention.

• Cognitive deficits may be challenging.

• As part of multifactorial intervention (home environment, foot wear, transferring).

• Should **not** be provided as a single intervention
Exercise

• Exercise programs associated with fewer falls in multiple RCTs.
• Even more effective when implemented along with other interventions.
• Most reduction in fall rate emphasized *balance, resistance* (strength), *gait* and *coordination* training.
• Most positive trials duration was > 12 weeks, 1-3 times per week
• Should be initiated with caution – some programs may increase rate of falls.

Chang JT et al. BMJ 2004(328)
Fall Prevention Does Work

• Rate of falling can be reduced by as much as 40%.
• Successful programs are multifactorial
• Preventive strategies have several common characteristics:
  • Exercise regimen
  • Home/environmental modification
  • Medication review
  • Behavioral recommendations
  • Cost effectiveness

Enhancing Stability / Mitigating Risks

Exercise:
- Resistance
- Balance
- Flexibility

Postural Stability
- sensory
- proprioception
- vestibular changes

Home Safety Evaluation:
by PT/OT
Reduce hazard

Medical:
Optimizing medications

Age related decline in Balance, Gait and Cardiovascular Function

Homeostatic mechanisms
How good are we doing?

• An academic primary care practice assessment of fall risk factors in 2016:
  • 73% of risk factors were addressed if identified
  • Vitamin D – addressed most frequently (78% of the time)
  • Followed by postural hypotension, lower extremity strength, feet/footwear, gait/balance and vision.

  • Home safety – addressed only 24% of the time
  • Medications – addressed only 21% of the time

**Evidence Based Recommendations**

<table>
<thead>
<tr>
<th>Description</th>
<th>Evidence Rating</th>
<th>References</th>
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<tr>
<td>Home environment assessment and intervention, carried out by a healthcare</td>
<td>A</td>
<td>1, 2, 6</td>
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<tr>
<td>professional, should be included for elders who have fallen or are at risk</td>
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<td>for falling</td>
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<tr>
<td>Medication reduction/simplifying is a consistent component of successful</td>
<td>A</td>
<td>1-2,4,11</td>
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<td>falls reduction programs.</td>
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<td>Exercise should be included as a component of a multifactorial fall</td>
<td>A</td>
<td>7-9</td>
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<td>prevention in community dwelling elderly.</td>
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References


