Fall Prevention and hip protectors

Osteoporosis CME 2010

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Presenter Disclosure Information

Edgar Pierluissi

No relevant disclosures

Presentation Outline

• Case presentation
• Prevalence and Consequences of Falls
• Risk factors
• Screening
• Prevention
• Hip protectors
• Summary

Factors leading to a fall
- Mobility impairments
- Perception impairments
- Depression/mood alterations
- Chronic disease/malnutrition
- Environment

Factors modifying a fall
- Protective responses
- Ambulatory aids
- Local shock absorbers
- Environmental control
- Obstacles

Factors decreasing bone strength
- Decreased bone mass
- Impaired bone structure
- Impaired bone quality

Fig 1. Conceptual model of factors influencing the risk of falling and fractures.

Best Practice and Res Clin Rheum 2009
Case presentation

76 y/o woman seen in clinic.

A bone densitometry report indicates femoral neck osteoporosis. She is on HCTZ, ASA, glyburide, and temazepam prn for sleep. One fall in the last year.

Since falls are the major mechanism of hip fracture, what is her risk for falling and how can we mitigate this risk?

Prevalence and Consequences of Falls

• ~1/3 of those over 65 will fall in the next year
• ~1/2 of those over 80 will fall in the next year

Falls, Fall-related Injuries and Death

- 1.8 million persons ≥65 to ED/year with fall-related injuries
- 1,800,000 injured
- 1,350,000 discharged from ED
- 433,000 hospitalized
- 19,800 died

NEJM 348:42-49,2003
Clin Ger Med 18:141-158,2002

Fractures Due to Fall in Older Women

Prevalence and Consequences of Falls

- About one out of five hip fracture patients dies within a year of their injury.
- Up to one in four adults who lived independently before their hip fracture needs to stay in a nursing home for at least a year after their injury.

Consequences of falls

- Fear of Falling
  - Decreased physical and social activity
  - Decreased self-reported health
  - Depression
- Costs
  - 19 billion dollars in 2000 (12B-hosp, 4B-ED, 3B-Visit)
  - Indirect and direct est 54B by 2020

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### Intrinsic Factors
- Medical conditions
  - Sensory impairment
  - Weakness & imbalance
  - Functional & cognitive impairment

### Extrinsic Factors
- Medications
- Improper use of assistive devices
- Environmental hazards
- Risk taking behavior

#### Results of Univariate Analyses of Most Common Risk Factors Identified in 16 Studies That Examined Risk Factors

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Significant/Total</th>
<th>Mean RR-OR</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle weakness</td>
<td>10/11</td>
<td>4.4</td>
<td>1.5-10.3</td>
</tr>
<tr>
<td>History of falls</td>
<td>12/13</td>
<td>3.0</td>
<td>1.7-7.0</td>
</tr>
<tr>
<td>Gait deficit</td>
<td>10/12</td>
<td>2.9</td>
<td>1.3-5.6</td>
</tr>
<tr>
<td>Balance deficit</td>
<td>8/11</td>
<td>2.9</td>
<td>1.6-5.4</td>
</tr>
<tr>
<td>Assistive device</td>
<td>8/8</td>
<td>2.6</td>
<td>1.2-4.6</td>
</tr>
<tr>
<td>Visual deficit</td>
<td>6/12</td>
<td>2.5</td>
<td>1.6-3.5</td>
</tr>
<tr>
<td>Arthritis</td>
<td>3/7</td>
<td>2.4</td>
<td>1.9-2.9</td>
</tr>
<tr>
<td>Impaired ADL</td>
<td>8/9</td>
<td>2.3</td>
<td>1.5-3.1</td>
</tr>
<tr>
<td>Depression</td>
<td>3/6</td>
<td>2.2</td>
<td>1.7-2.5</td>
</tr>
<tr>
<td>Cognitive impairment</td>
<td>4/11</td>
<td>1.8</td>
<td>1.0-2.3</td>
</tr>
<tr>
<td>Age &gt;80</td>
<td>5/8</td>
<td>1.7</td>
<td>1.1-2.5</td>
</tr>
</tbody>
</table>

#### Risk factors for future falls

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous fall in last year</td>
<td>2.8-3.8</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
<td>-</td>
</tr>
<tr>
<td>Visual acuity</td>
<td>≤2</td>
</tr>
<tr>
<td>Gait and Balance</td>
<td>2</td>
</tr>
<tr>
<td>Medications</td>
<td>1.7</td>
</tr>
<tr>
<td>Assess basic and instrumental activities of daily living</td>
<td>2-4</td>
</tr>
<tr>
<td>Assess cognition</td>
<td>4-17</td>
</tr>
</tbody>
</table>

#### The More Risk Factors: The Higher the Fall Risk

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedative use</td>
<td>28.3</td>
</tr>
<tr>
<td>Cognitive impairment</td>
<td>5.0</td>
</tr>
<tr>
<td>LE disability</td>
<td>3.8</td>
</tr>
<tr>
<td>Palmodental reflex</td>
<td>3.0</td>
</tr>
<tr>
<td>Gait/balance abnormality</td>
<td>1.9</td>
</tr>
<tr>
<td>Foot problems</td>
<td></td>
</tr>
</tbody>
</table>

Fall risk increased linearly, from 8% with none to 78% in patients with ≥4 risk factors.
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Guidelines for Fall Prevention

- Guideline for the Prevention of Falls in Older Persons
  - American Geriatrics Society
  - British Geriatrics Society
  - American Academy of Orthopaedic Surgeons
- JAGS 49:664–672, 2001
- Practice Parameter: Assessing patients in a neurology practice for risk of falls
  - American Academy of Neurology
- Neurology 2008;70:473-479

A. Inquire about falls in the past year (Level A)

B. Review history for risk factors for falling
Neurological:
(Levels A & B)
  - stroke
dementia
gait/mobility problem
parkinsonism
peripheral neuropathy
assistive device
LE sensorimotor loss

JAGS 2001

Neurology 2008;70:473-479
Screening

- Ask about falls in the prior year
- Observe for gait or balance problems in getting up from chair
- If yes or problems => Falls Evaluation

Falls Evaluation

- Falls history and circumstances
- Assessment of:
  - gait, balance and mobility, and muscle weakness
  - perceived functional ability and fear relating to falling
  - visual impairment
  - cognitive impairment and neurological examination
  - home hazards
- Cardiovascular examination and medication review.

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Prevention

- Multifactorial assessment, followed by interventions targeting the identified risk factors.
- Several interventions have solid evidence to support their use.

Effective Interventions

- Exercise: (reduced # falls and #fallers)
  - Multiple component group exercise
  - Tai Chi group exercise
  - Individually prescribed home-based program
- Multifactorial risk factor program (reduced #falls)
- Home hazard assessment & modification in higher risk (only in those with visual impairment and high risk of falling)

Interventions with Unknown Effectiveness

- Medications: (reduced # falls, not fallers)
  - Withdrawal of psychotropic medication; educational program for 1°care MDs
  - Cardiac pacing for fallers with cardioinhibitory carotid sinus hypersensitivity (reduced #falls)
  - Vitamin D may reduce falls in those with low D levels
- Vitamin D with or without calcium in those with adequate levels
- Home hazard modification in those without fall history
- Hormone replacement therapy
- Correction of visual deficiency
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Hip Protectors

- Designed to absorb and/or shunt away the impact toward the soft tissues to keep the force on the trochanter below the fracture threshold.

Hip protectors for fracture prevention

- Pooled data indicate a marginally significant effectiveness of hip protectors in frail older people in institutional care.

- Provision of hip protectors does not reduce the incidence of hip fractures in older people who remain ambulant in the community.
Efficacy of a Hip Protector to Prevent Hip Fracture in Nursing Home Residents
The HIP PRO Randomized Controlled Trial

- Unique design
- Hip protector demonstrated superior capacity to reduce peak impact force in simulated experiments
- Nursing home residents wore a hip protector on 1 hip only; each participant served as own control
- Better ascertainment of adherence with 3 unannounced visits to all participants

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Efficacy of a Hip Protector to Prevent Hip Fracture in Nursing Home Residents
The HIP PRO Randomized Controlled Trial

- 37 nursing homes, 1042 patients, 20 month followup
- Study stopped due to lack of efficacy
- Overall adherence was 73.8%

<table>
<thead>
<tr>
<th></th>
<th>Protected hips</th>
<th>Unprotected hips</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Fracture (all subjects)</td>
<td>3.1% ; 1.8%-4.4%</td>
<td>2.5% ; 1.3%-3.7%</td>
<td>0.70</td>
</tr>
<tr>
<td>Hip Fracture (&gt;80% adherence)</td>
<td>5.3% ; 2.6%-8.8%</td>
<td>3.5% ; 1.3%-5.7%</td>
<td>0.42</td>
</tr>
</tbody>
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Falls-Summary

- Falls are common in older adults.
- Falls precipitate most fractures in older adults.
- Falls can be prevented.
- Ask older adults about falls in the last year and observe gait and balance.
- Refer patients at risk for future falls to effective fall prevention approaches.
- Hip protectors not proven to reduce fracture risk.

Case Presentation

Patient is at high risk for future falls (probability at least 60%)
Complete Falls evaluation
Stop or taper benzodiazepine
Refer for exercise program (multicomponent exercise, Tai Chi, or individually prescribed home based exercise program)
Home evaluation for safety
Measure vitamin D.