Shifting the focus from osteoporosis to falls (prevention) in the elderly

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Prevalence of Osteoporosis

- Based on NHANES III, 54% of the women 50 to 64 years of age are estimated to have low bone mass or osteoporosis (T score –1.0 standard deviations or lower).
- These statistics increase as women age.
- Up to 86% of women 65 years of age and older have low bone mass or osteoporosis.


Epidemiology of falls and fractures

- Approximately 30% of people over 65 years of age and living in the community fall each year; the number is higher in institutions.
- Although less than one fall in 10 results in a fracture, a fifth of fall incidents require medical attention.


- A key concern is not simply the high incidence of falls in older persons (young children and athletes have an even higher incidence of falls) but rather the combination of high incidence and a high susceptibility to injury.

- This propensity for fall-related injury in elderly persons stems from a high prevalence of comorbid diseases (e.g., osteoporosis) and age-related physiological decline (e.g., slower reflexes) that make even a relatively mild fall potentially dangerous

Viscous Cycle

- Fall
- Fear
- Immobility
- Deconditioning
- Higher Risk for Falls

Why are falls important?
**Hip Fracture Outcomes**

- 24% mortality rate within first year*
- 50% of patients are unable to walk without assistance†
- ~ 33% are totally dependent‡

†Riggs BL, Melton LJ III. Bone. 1995;17(5 suppl):505S-511S.

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**RISK FACTORS FOR FALLING**

can be classified as either:

- **Intrinsic**
- **Extrinsic**
- **Exposure to risk**

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**Intrinsic vs. extrinsic risk factors**

“We are all trippers.”

- Over half of falls experienced in the home are due to environmental hazards – e.g. trips, slips, unsafe or unlit stairs.
- A decline in a person’s **intrinsic** risk factors (declining function and balance) means that the **extrinsic** risk factors (loose mat, slippery floor) no longer cause a correctable trip; they cause an injurious fall.

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**Exposure to risk**

Some studies suggest a U-shaped association, that is, the most inactive and the most active people are at the highest risk of falls 24-28.
Risk factors for falls that cannot be modified

- Age
- Gender
- Social class
- Chronic medical conditions
- Irreversible vision problems
- Osteoporosis (without treatment)

Targeting the modifiable risk factors for falling

- Low strength and power
- Medical condition
- Medications
- Incontinence
- Cognitive impairment
- Balance/gait
- Postural hypotension
- Vision/hearing

- Foot care
- Poor housing
- Depression
- Previous falls
- Fear of falling
- Functional capacity
- Poor hearing
- Poor diet

Improving risk factors – duration vs. outcome

- Gait (8 weeks)
- Balance (Static 8 weeks + Dynamic 8 weeks)
- Muscle strength (8-12 weeks)
- Muscle power (12 weeks)
- Endurance (26 weeks)
- Transfer (6 months)
- Postural hypotension (24 weeks)
- Bone strength (1 year for femur and lumbar spine)

(Netton and McLaughlin, 1996)

Therapeutic Options

- Antiresorptive Therapy
  - Calcitonin
  - Raloxifene
  - Bisphosphonates
    - Alendronate
    - Risedronate
    - Ibandronate
    - Zoledronic Acid
    - Denosumab

- Anabolic Therapy
  - Parathyroid hormone (1,84 PTH)
  - Teriparatide (1,34 PTH)

Strontium ranelate

Vitamin D – Falls prevention

Meta-analysis

Drugs BMD and vertebral fracture risk
Drugs and non-vertebral fracture risk

- Bisphosphonates: Benefits and Risks

**Benefits**
- Fracture reduction
- BMD increase
- Non-hormonal

**Risks**
- Nausea
- Upper gastrointestinal irritation
- Myalgias and arthralgias
- Atrial fibrillation

**Predictive value of bone density measurements**
- The planar scanning principle of dual energy x-ray absorptiometry, and assumptions in processing the scan data, can underestimate or overestimate bone mineral density by 20-50%.
- Over 80% of low trauma fractures occur in people who do not have osteoporosis (defined as T score ≤−2.5).
- Even if a T score of −1.5 is used to define osteoporosis, 75% of fractures would still occur in people without osteoporosis.
A 1 SD reduction in bone mineral density increases the fracture risk 2-2.5 times.

By contrast, a sideways fall increases the risk of hip fracture three to five times, and when such a fall causes an impact to the greater trochanter of the proximal femur, hip fracture risk is raised about 30 times.

How active are older people?

Levels of sedentary behaviour among WOMEN aged 50+, England

Putting it into practice
Recommendations and guidelines

Effective interventions

- Tinetti et al, 1994
- FICSIT Trials: Province et al, 1995
- Wolf et al, 1996
- Campbell et al, 1997
- PROFET: Close et al, 1999
- FaME Project: Skelton, 2001
- Day et al, 2002

(Skelton, Young et al, 1999)
The multifactorial fall risk assessment should be followed by direct interventions tailored to the identified risk factors, coupled with an appropriate exercise program.\[A\]

Exercise, particularly balance, strength, and gait training \[A\]

- Included 111 studies (55,303 participants).
- Multiple-component group exercise reduces rate of falls and risk of falling (RR 0.83, 95% CI 0.72-0.97)
- Tai Chi as a group exercise reduces rate of falls and risk of falling (RR 0.65, 95% CI 0.51-0.82).
- Individually prescribed exercise carried out at home reduces rate of falls and risk of falling (RR 0.77, 95% CI 0.61-0.97), but there is no evidence to support this intervention in people with severe visual impairment or mobility problems after a stroke, Parkinson’s disease, or after a hip fracture.\[A\]

The findings from the meta-analysis more likely reflect problems inherent to meta-analyses themselves, rather than problems in the rationale or effectiveness of the multifactorial intervention programs.

these multifactorial falls prevention studies have had many between-studies differences and limitations to be fairly and reasonably included in one meta-analysis (Kannus, P, email interview with BoneKEy)
Recommendations for Greek people

- Low intensity balance exercises (tandem walking and standing on one’s foot) combined with coordination exercises.
- Advise to perform strengthening in the quadriceps, hip extensors, abductors & back and arms’ muscles.
- Older people who have had recurrent falls should be offered long-term exercise and balance training (B).


Clinical Evaluation

- Ask routinely about falls in the past year and about their frequency, characteristics, and context.
- Observe for deficits in gait and balance and consider for suitability to benefit from interventions to improve strength and balance.

Recommended Components of Clinical Assessment and Management for Older Persons Living in the Community Who Are at Risk for Falling.


The dual role of Rehabilitation

Research in Greece

Conclusions

- Numerous studies show that among older people falling, not osteoporosis, is the strongest risk factor for fracture.
- strength and balance training, followed by
- reduction in the number and doses of psychotropic drugs,
- dietary supplementation with vitamin D and calcium, and,
- in high risk populations, assessment and modification of home hazards.

Chair-based exercise – effective at targeting risk factors

Improvements in:
- strength (Fiatarone et al 1990; McMurdo et al 1993; Skelton et al 1995, 1996)
- power (Skelton et al, 1995)
- static balance (Skelton et al, 1996)
- rehabilitation following hip fracture (Nicholson et al, 1997)

Also reductions in:
- depression (McMurdo et al, 1993)
- arthritic pain (Hochberg et al, 1995)
- postural hypotension (Miller et al, 1999)
- body fat (Nicholson et al, 1997)
- risk of future falls (Allen et al, 1999)

Particularly valuable for frailer older people
- Stabilises lower spine.
- Greater range of movement.
- Minimises load-bearing.
- Reduces balance problems.
- Increases confidence.

Physical Examination

- Blood Pressure (orthostatic)
- Visual Acuity
- Cervical ROM
- Cognition
- Cerebellar/peripheral/propiroception
- Muscle strength and tone
- Joint ROM
- Feet and Footwear

Gait and Balance Assessment

- Get up and Go
- One-leg balance
- Tinetti
- Functional Reach