Virtual Education Forum:
Tips for Avoiding An Osteoporotic Fracture While Living Your Everyday Life

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Virtual Education Forum: Evaluation

www.surveymonkey.com/s/virtualeducationforum
Objectives
By the end of this session, participants will be able to:

1. Describe how daily activities may increase the functional risk for osteoporotic fracture

2. Identify strategies to modify typical movement patterns or daily tasks so these are done safely
Causes of Fracture

• Load exceeds the strength of the bone

(Dempster DW et al, J Bone Miner Res 1986)
Most Common Sites of Osteoporotic Fracture

- Spine (vertebral body)
- Wrist (distal radius)
- Hip (proximal femur)
- Shoulder (proximal humerus)
Know Your Risk

- Peak Bone Mass
- Amount of Bone Loss
- Structure
- Turnover
- Damage Accumulation
- Matrix Quality
- Mineralization

Bone Density

Bone Quality

Bone Strength

Fractures

Trauma
10-year Fracture Risk

CAROC Basal Risk

• Clinical factors ↑ fracture risk independent of BMD.
• The most important are:
  • Fragility fractures after age 40y*
  • Systemic glucocorticoid therapy >3 months duration in the past year (prednisone-equivalent dose of >7.5mg daily).
• Each ↑ risk categorization to next level; *history of hip fracture, vertebral fracture, or multiple fractures = high risk

### Exercises & Vertebral Fx

<table>
<thead>
<tr>
<th>Type of Exercise</th>
<th>New Fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal extension (back arches, lifts)</td>
<td>16%</td>
</tr>
<tr>
<td>Spinal flexion (crunches, etc)</td>
<td>89%</td>
</tr>
<tr>
<td>Both types</td>
<td>53%</td>
</tr>
<tr>
<td>No exercise</td>
<td>67%</td>
</tr>
</tbody>
</table>

*For women with a previous fx  Sinaki M, Mikkelsen BA 1984*
Reality Check!
24 Hours in a Day

Semanik et al Arthritis & Rheumatism 2004
Mechanical loads on the spine influenced by:

- Body posture or activity
- Falls
- Person’s height & weight
- Muscle forces
- Spinal curvature
- Intervertebral disc degeneration
- Neuromuscular control

Christiansen & Bouxsein Current Osteoporosis Report 2010; 8:198–204
Mechanical loads on the osteoporotic spine

- Studies in animal models of osteoporosis have shown that micro-cracks occur with repetitive subthreshold loading.

(Yoganandon et al 1988; Gordon et al 1991; Sheffler 1995; Muller et al 1998; Zioupos 2001)
• Compared to load on the LS
  • Sitting upright (not slouched), the force is the same at all levels
  • Lying on stomach, the force is significantly ↓ in LT
  • Standing upright (not slouched), the force is significantly ↑ in MT
  • Standing upright holding 20kg (10kg in each hand), the force is significantly ↑ in MT & LT
  • Standing bent forward 30° holding 20kg, the force is significantly ↓ in MT & LT

Quiz Time!

Which position places the most load on the spine in the lower back?

= 10kg weight (5kg in each hand)

Of the four positions, this one places the most load on the lumbar (low back) spine. The load starts to increase in the lower thoracic spine (T10) and increases at each lower level of the spine.

“After the Fracture: Information about Pain and Practical Tips for Movement”

www.osteoporosis.ca
Quiz Time!

Which position places the most load on mid and lower thoracic spine?

= 10kg weight (5kg in each hand)

Of the 4 positions, B places a similar high load on the spine (mid thoracic to the lower lumbar region). In the lowest 3 lumbar levels, loads are only slightly higher for position D.

\[ \text{= 10kg weight (5kg in each hand)} \]

Hang on Norma!

Do these biomechanical and computer modeling studies apply to people with osteoporosis?

What if I can’t sit/stand with an ‘upright spine’?

Do I really need to change how I move?
Movements to avoid

• Bending spine forward
• Twisting (rotating upper OR lower body past midline)
• Holding uneven loads away from the midline of the body
• Carrying excessive weight (>10lb)
• Activities or movements that put you off balance
Safe Functional Motion test

Physical Performance Domains
1. Spine loading
2. Balance
3. Upper body strength
4. Lower body strength
5. Upper body flexibility
6. Lower body flexibility

Recknor et al Physiotherapy Canada. 2013; 65:75-83
People (n=847) were observed while they did 10 tasks in the way they do them at home. Histories of fragility fracture and injurious falls were recorded.

Higher scores ('safer movement') were associated with fewer spine/hip fractures and injurious falls.

But was physical function poorer because of the fractures and/or falls?

Recknor et al Physiotherapy Canada. 2013; 65:75-83
Safe Functional Motion test

- People were observed while they did 10 tasks in the way they do them at home. Recorded gender, age, hip BMD, history of spine fracture &/or injurious falls, & bone medication use.
- Reassessed at 1y (878) and 3y (503) for new spine fracture(s).
- Higher scores (‘safer movement’) were associated with fewer spine fractures (1y: 18%; 3y: 27%)

MacIntyre et al. Osteoporosis International 2013; In Press
Other problems affect physical performance

Pain in hip/knee or lack of flexibility
- may bend at spine vs squat

Weak leg muscles
- may drop into a chair vs easing the load onto the spine

Balance problems
- may twist spine or use jarring stepping reactions to avoid falling
Consider your level of risk, then decide if you need to:

- remediate the impairment
- use adaptive equipment
- modify the environment
- modify the activity
- learn a new movement pattern
Correct the impairment:
- balance training
- vestibular rehabilitation
- muscle strengthening exercises
- flexibility/stretching exercises
- improve reaction time
- postural correction
- pain management
- control coexisting health conditions
Use adaptive equipment:
- long handled dustpan
- reachers
- long handled shoe horn
- sock aid
- cane/walker (appropriate for the person and used appropriately)
Modify the environment:
- height of hanging rods, closet & cupboard shelves, flower beds
- move items you use more frequently and/or are heavier to shelves between your waist and shoulder height
- use a sturdy step stool to reach higher shelves
Modify the activity:
- delegate
- use cart
- make more frequent trips with lighter loads
- select different footwear
- use a fanny pack or back pack rather than a purse with a single shoulder strap
- plan and pace
Modify the movement pattern:

“After the Fracture: Information about Pain and Practical Tips for Movement”

www.osteoporosis.ca
Bone medications reduce your risk for fracture but functional risk is still important to consider.

General advice only; Seek specific guidance from your health professionals (OTs & PTs specialize in safe functional movement).

Discuss strategies for ‘safer motion’ with family & friends.
Wishing you ‘safe motion’ in your daily life.

Thank You!
Key References

• Christiansen BA, Bouxsein ML. Biomechanics of vertebral fractures and the vertebral facture cascade. Current Osteoporosis Report 2010; 8:198–204


• Recknor CP, Grant SL, Recknor JC, MacIntyre NJ. Scores on the Safe Functional Motion test are associated with prevalent fractures and fall history. Physiother Can 2013;65:75-83

• MacIntyre NJ, Recknor CP, Grant SL, Recknor JC. Scores on the Safe Functional Motion test predict incident vertebral compression fracture. Osteoporos Int Accepted June 14, 2013

• www.osteoporosis.ca