Osteoporosis Canada

Ostéoporose Canada

Fracture=Bone Attack:

Linking Hip Fractures to Osteoporosis Care

Angela M. Cheung, MD, PhD, FRCPC

Professor of Medicine, University of Toronto

Potential Conflicts of Interests

Industry –

Grants (to UHN) or honorarium from Amgen, Eli Lilly

Non-industry –

Chair – Osteoporosis Canada Scientific Advisory Council

Chair – Canadian Bone Strength Working Group

Director, University of Toronto CESHA

Director, UHN /MSH Osteoporosis Program

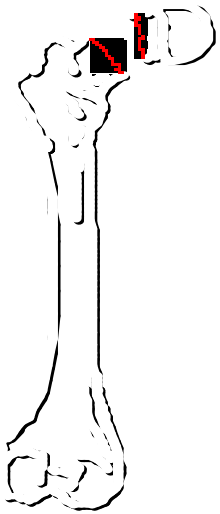
Three Take-Home Messages

1. Hip Fractures are caused by Osteoporosis and Falls
2. Large Care Gap – we need to do better
3. There are established guidelines on how to reduce mortality and fractures in patients who have had a hip fracture

Osteoporosis Canada
Ostéoporose Canada

A Fracture Occurs When:

Load > **Bone Strength** + **Muscle Responses**



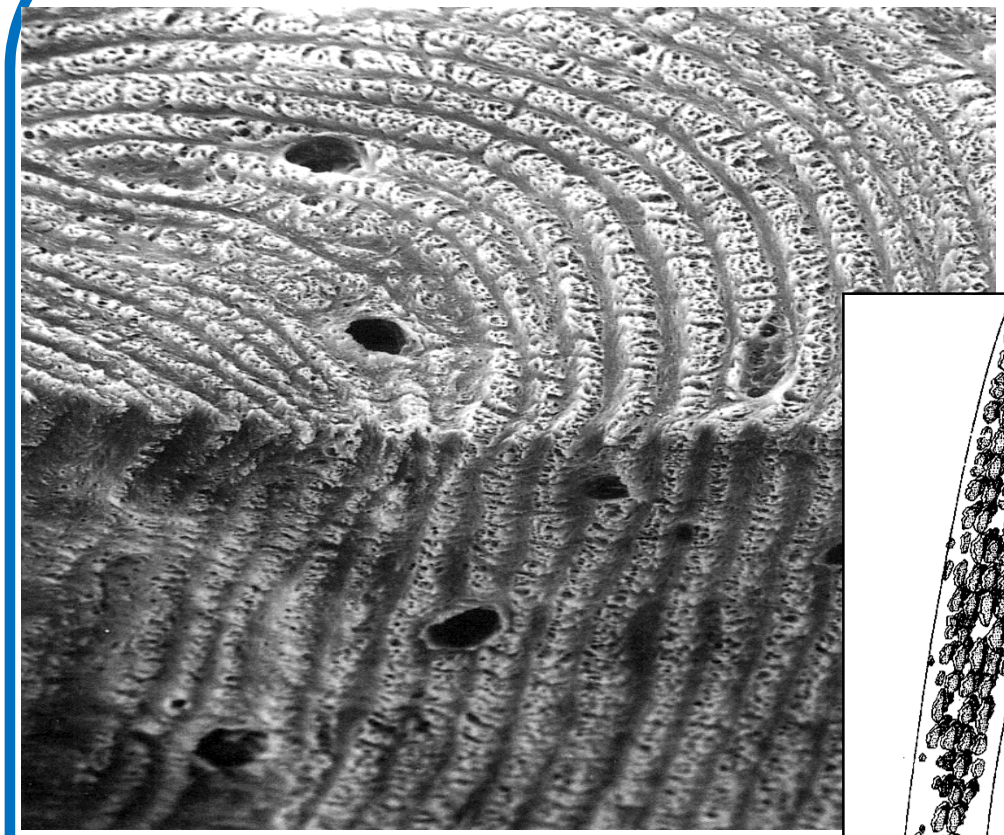
1. Structural properties
2. Material properties

1. Balance & Falls
2. Padding

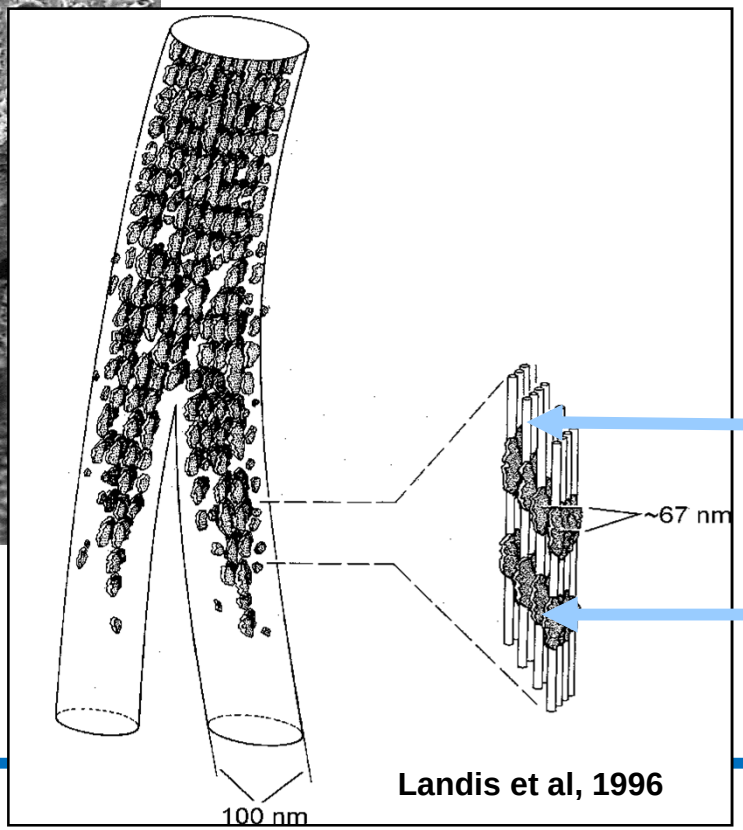
Cheung AM & Detsky AS. JAMA 2008; 299 (12): 1468-1470

Osteoporosis Canada
Ostéoporose Canada

Bone is a Complex Organ



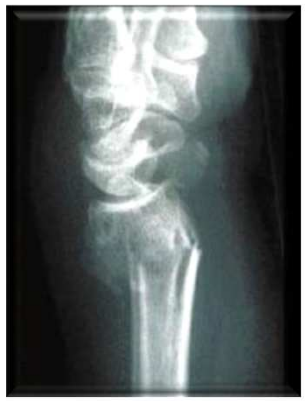
FRACTURE = Bone Attack!



Slide Courtesy of P. Amann

Consequences of Osteoporosis

- In women > 50, the lifetime risk of hip fracture is 12.1%[1]



Fracture begets future fractures

Deteriorated Quality of life

Pain, immobility, disability

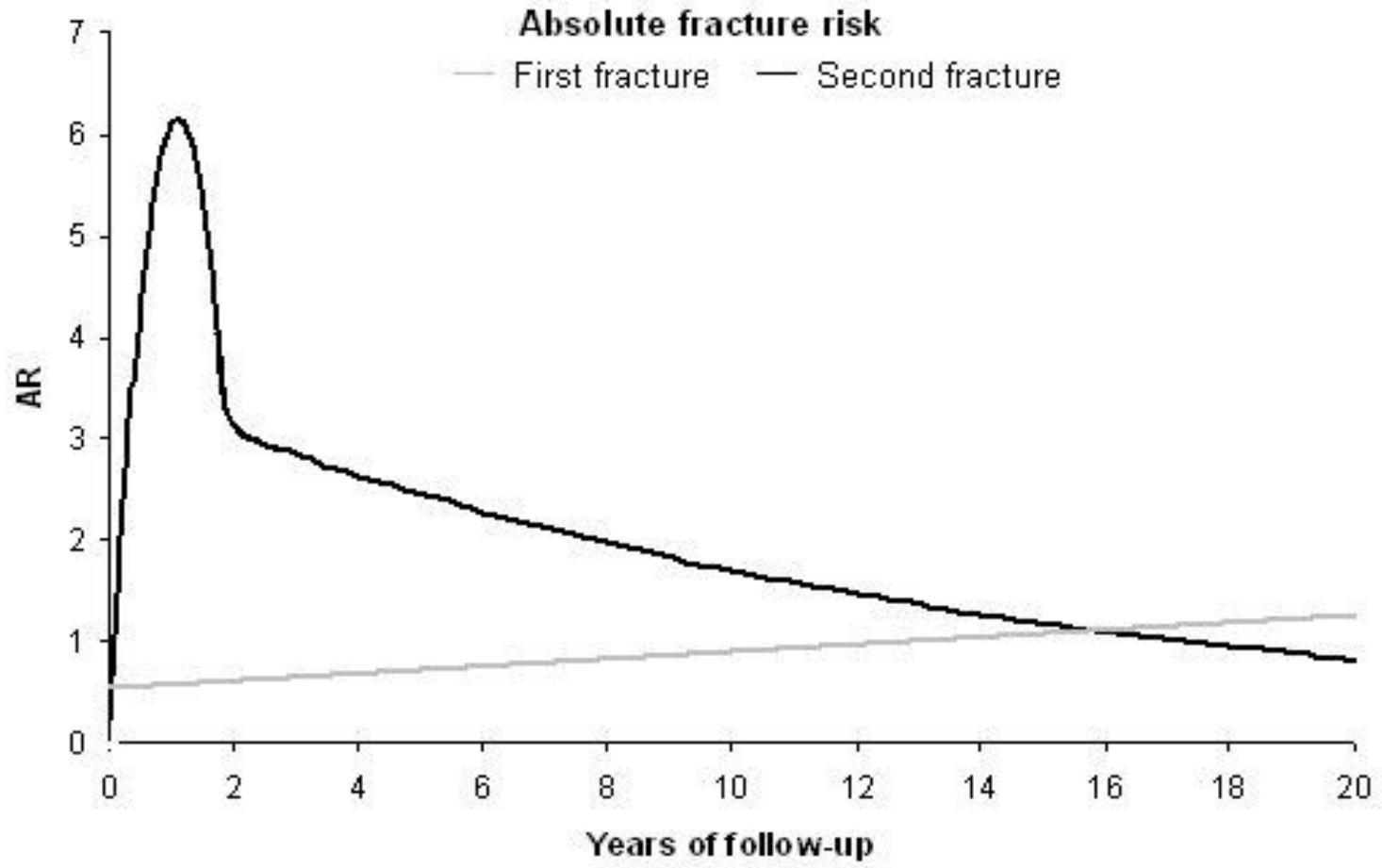
Nursing home

- 1 in 4 chance of death in the year following hip fracture[2].

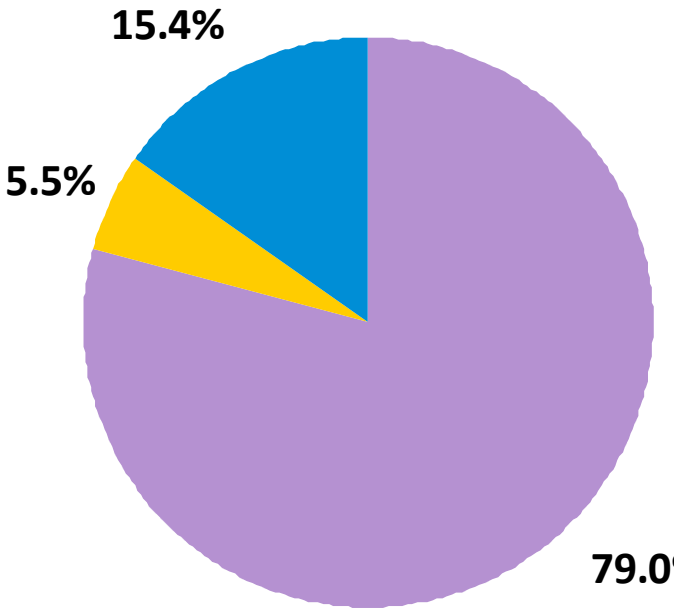
1. Hopkins RB et al. Osteoporos Int 2011 as DOI 10.100/s00198-011-1652-8
2. Ioannidis G, et al. *CMAJ* 2009;181: 265-271

Osteoporosis Canada
Ostéoporose Canada

Fracture -- Predictor of Future Fractures!



Undertreatment of Osteoporosis Post Fracture in Women[1]



This care gap is even wider **in men** and those who reside in long-term care[2,3]

A fracture is to osteoporosis what a heart attack is to cardiovascular disease. BUT... **The treatment gap is far wider post fracture than post MI**.[1,4]

1. Bessette L, et al. *Osteoporos Int* 2008; 19:79-86.
2. Papaioannou A, et al. *Osteoporos Int* 2008; 19(4):581-587.
3. Giangregorio L, *Osteoporos Int* 2009; 20(9):1471-8.
4. Austin PC, et al. *CMAJ* 2008; 179(9):901-908.

What Happened?

Patient Quotes:

- The floor was slippery
- I was clumsy
- I lost my balance
- I wasn't looking where I was going …

It was an ACCIDENT!

Patient Quotes

Sale 2015 Rheumatology International

COMMENTARY

Osteoporosis and Fractures

Missing the Bridge?

Angela M. Cheung, MD, PhD

Allan S. Detsky, MD, PhD

lung disease, early satiety, chronic pain, and low self-esteem. Even asymptomatic vertebral fractures are associated with decreased quality of life, increased hospitalization, and mortality.[4,5] Women and men who sustain a hip

Osteoporosis Canada
Ostéoporose Canada

Osteoporosis Canada

2010 clinical practice guidelines for the diagnosis and management of osteoporosis in Canada: summary

Alexandra Papaioannou MD MSc, Suzanne Morin MD MSc, Angela M. Cheung MD PhD, Stephanie Atkinson PhD, Jacques P. Brown MD, Sidney Feldman MD, David A. Hanley MD, Anthony Hodsman MD, Sophie A. Jamal MD PhD, Stephanie M. Kaiser MD, Brent Kvern MD, Kerry Siminoski MD, William D. Leslie MD MSc; for the Scientific Advisory Council of Osteoporosis Canada

FRAX Tool: On-line Calculator

Osteoporosis Canada
Ostéoporose Canada

Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: Canada Name/ID: About the risk factors

Questionnaire:

1. Age (between 40-90 years) or Date of birth
   Age: 59 Date of birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg) 55.5
4. Height (cm) 154
5. Previous fracture — No / Yes
6. Parent fractured hip — No / Yes
7. Current smoking — No / Yes
8. Glucocorticoids — No / Yes
9. Rheumatoid arthritis — No / Yes
10. Secondary osteoporosis — No / Yes
11. Alcohol 3 or more units per day — No / Yes
12. Femoral neck BMD (g/cm²)
    T-Score -2.0

Clear Calculate

BMI 23.4

The ten year probability of fracture (%)

with BMD

Major osteoporotic	7.5
Hip fracture	1.0

Weight Conversion

Pounds → Kgs Convert

Height Conversion

Inches → Cms Convert

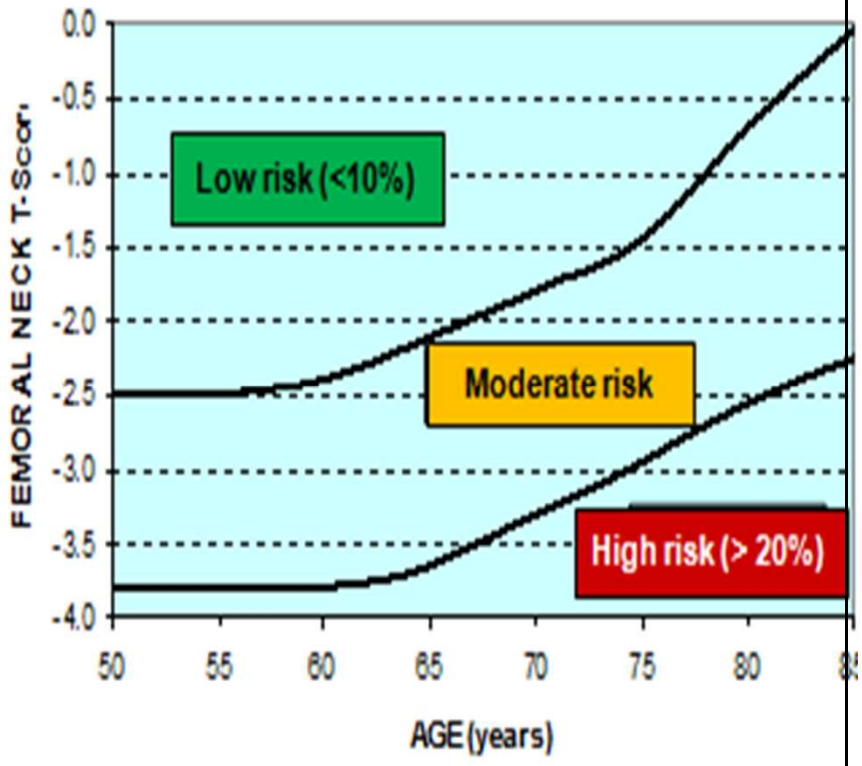
www.shef.ac.uk/FRAX.

Osteoporosis Canada
Ostéoporose Canada

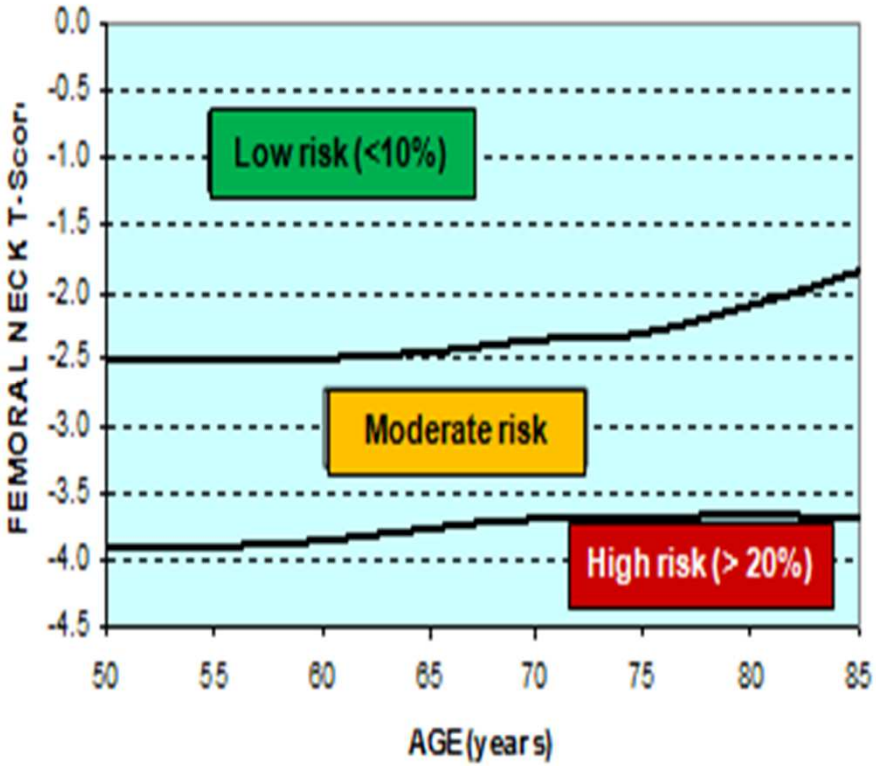
2010 CAROC tool

Assessment of Basal 10-year Fracture Risk

Women



Men



Hip Fracture = HIGH RISK (>20%)

Osteoporosis Canada
Ostéoporose Canada

Recommended Biochemical Tests

- Calcium, corrected for albumin
- Complete blood count
- Creatinine
- Alkaline phosphatase
- Thyroid stimulating hormone (TSH)
- Serum protein electrophoresis for patients with vertebral fractures
- 25-hydroxy vitamin D (25-OH-D)*

* Should be measured after 3-4 months of adequate supplementation and should not be repeated if an optimal level ≥75 nmol/L is achieved.

How can we Prevent Fractures?

- Lifestyle modifications
  - Vitamin D
  - Calcium
  - Exercise
  - Falls prevention

- Pharmacologic therapy
  - Bisphosphonates
  - Other anti-resorptives
    - Denosumab
    - Hormone therapy
    - Raloxifene
    - Calcitonin
  - Parathyroid hormone

Osteoporosis Canada
Ostéoporose Canada

Recommended Vitamin D Supplementation

Group	Recommended Vitamin D Intake (D3)
Adults <50 without osteoporosis or conditions affecting vitamin D absorption	400 – 1000 IU daily (10 mcg to 25 mcg daily)
Adults > 50 or high risk for adverse outcomes from vitamin D insufficiency (e.g., recurrent fractures or osteoporosis and comorbid conditions that affect vitamin D absorption)	800 – 2000 IU daily (20 mcg to 50 mcg daily)

Hanley DA, et al. *CMAJ* 2010; 182:E610-E618.

Recommended Calcium Intake

- From diet and supplements combined: **1200 mg daily**
  - Several different types of calcium supplements are available
- Evidence shows a benefit of calcium on reduction of fracture risk[1]
- Concerns about serious adverse effects with high-dose supplementation[2-4]

1. Tang BM, et al. *Lancet* 2007; 370(9588):657-666.
2. Bolland MJ, et al. *J Clin Endocrinol Metab* 2010; 95(3):1174-1181.
3. Bolland MJ, et al. *BMJ* 2008; 336(7638):262-266.
4 Reid IR, et al. *Osteoporos Int* 2008; 19(8):1119-1123.

Exercise and Bone Health

- Programs > 1 year including aerobic exercises and strength training have demonstrated positive effects on BMD and thoracic kyphosis but have limited evidence for fracture reduction[1]

- Moderate to vigorous exercise associated with lower hip fracture risk[2]

1. De Kam D, et al. *Osteoporos Int* 2009; 20(12):2111-25.
2. Moayyeri A. *Ann Epidemiol* 2008; 18:827-835.

Osteoporosis Canada
Ostéoporose Canada

Falls Assessment

Periodic case finding in Primary Care: Ask all patients about falls in past year

No Falls

No Intervention

Recurrent Falls

Single Fall

Gait/ balance proble ms

Check for gait/ balance problem

No Problem

Patient presents to medical facility after a fall

Fall Evaluation

Assessment
History
Medications
Vision
Gait and balance
Lower limb joints
Neurological
Cardiovascular

Multifactorial intervention (as appropriate)
Gait, balance and exercise programs
Medication modification
Postural hypotension problem
Environmental hazard modification
Cardiovascular disorder treatment

First Line Therapies with Evidence for Fracture Prevention in Postmenopausal Women

Osteoporosis Canada / Ostéoporose Canada

Based on GRADE A evidence*

Type of Fracture	Antiresorptive Therapy						Bone Formation Therapy
	Bisphosphonates			Denosumab	Raloxifene	Estrogen ** (Hormone Therapy)	Teriparatide
	Alendronate	Risedronate	Zoledronic Acid				
Vertebral	✓	✓	✓	✓	✓	✓	✓
Hip	✓	✓	✓	✓	–	✓	–
Non-Vertebral†	✓	✓	✓	✓	–	✓	✓

† In Clinical trials, non-vertebral fractures are a composite endpoint including hip, femur, pelvis, tibia, humerus, radius, and clavicle.

*For postmenopausal women, ✓ indicates first line therapies and Grade A recommendation. For men requiring treatment, alendronate, risedronate, and zoledronic acid can be used as first-line therapies for prevention of fractures (Grade D).

**Hormone therapy (estrogen) can be used as first-line therapy in women with menopausal symptoms.

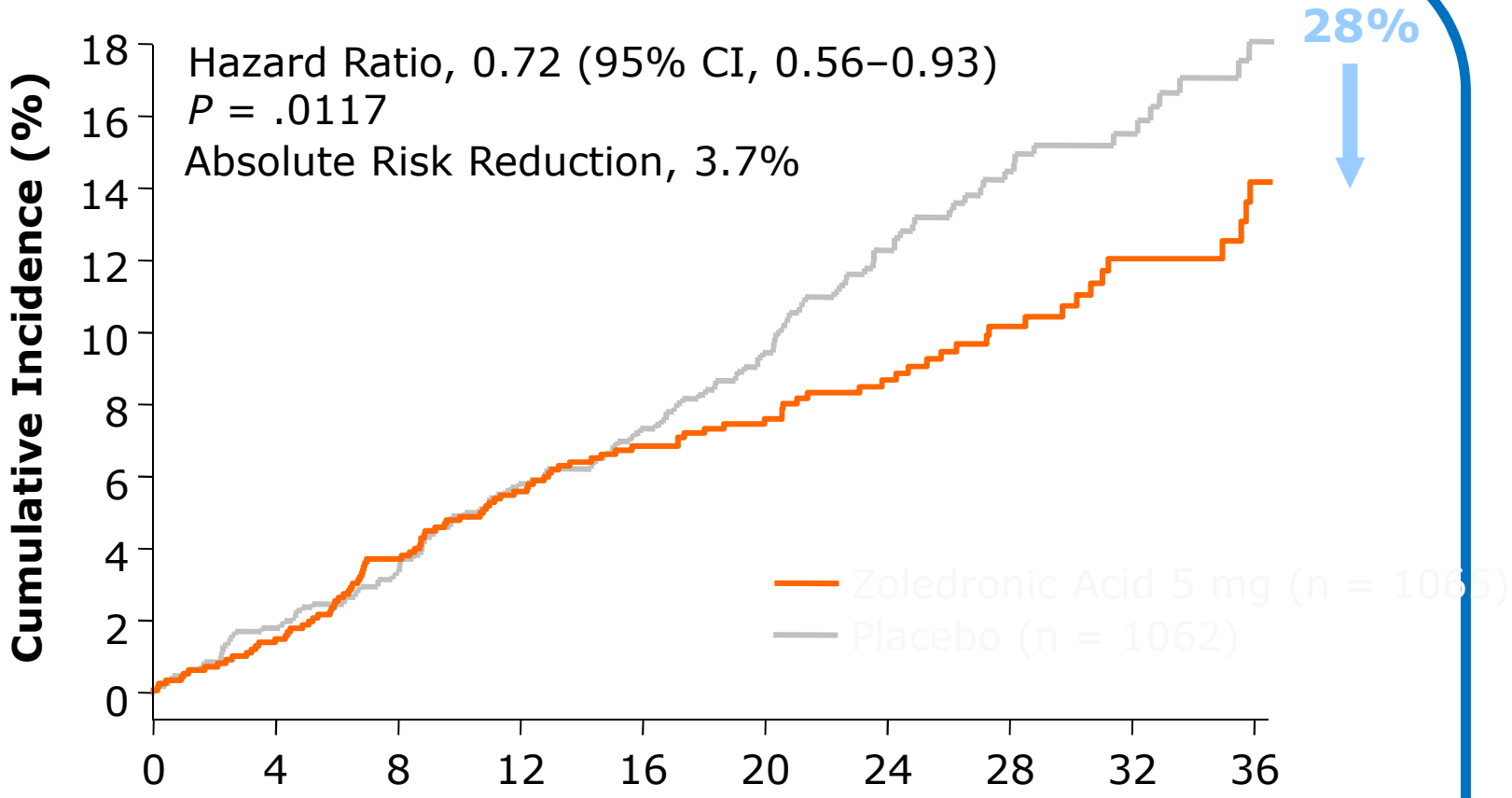
Osteoporosis Canada
Ostéoporose Canada

Highlighting newer drugs…

- Actonel DR 35mg po q week (on ODB)
- Prolia 60mg sc q 6 months (LU code)
- Aclasta 5mg iv q year over 30mins (LU code)
- Forteo 20ug sc od for 2 years (EAP)

Osteoporosis Canada
Ostéoporose Canada

Zoledronic Acid 5 mg reduced all-cause mortality



No. at Risk

Zol	1054	1029	987	943	806	674	507	348	237	144
Placebo	1057	1028	993	945	804	681	511	364	236	149

Lyles KW, *et al*. *N Engl J Med*. 2007;357:1-11.

Osteoporosis Canada
Ostéoporose Canada

Are there situations where we should not use antiresorptive therapies?

Osteoporosis Canada
Ostéoporose Canada

Three common questions:

- Fracture healing
- Kidney function
- ONJ and AFFs

Osteoporosis Canada
Ostéoporose Canada

FREEDOM Trial – fx healing

Denosumab	Placebo N = 3,876	Denosumab 60 mg Q6M N = 3,886
Nonvertebral Fractures, n	465	386
Patients With Nonvertebral Fractures, n	364	303
Delayed Healing, n	5	2
Other Complications Associated With the Fracture or Its Management		
Non-union, n	1	0
Surgical Intervention, n (%)	120 (26%)	79 (21%)
Any Complication, n/N† (%)	20/364 (5%)	5/303 (2%)‡
Most Common: Infection, n/N† (%)	4/364 (1%)	2/303 (<1%)

Renal Dysfunction

- Alendronate
- Risedronate
- Raloxifene
- Denosumab

} Reduces fractures in CKD (1-4) patients

* No CKD 5 patients in RCTs

Osteoporosis Canada
Ostéoporose Canada

Osteonecrosis of the Jaw

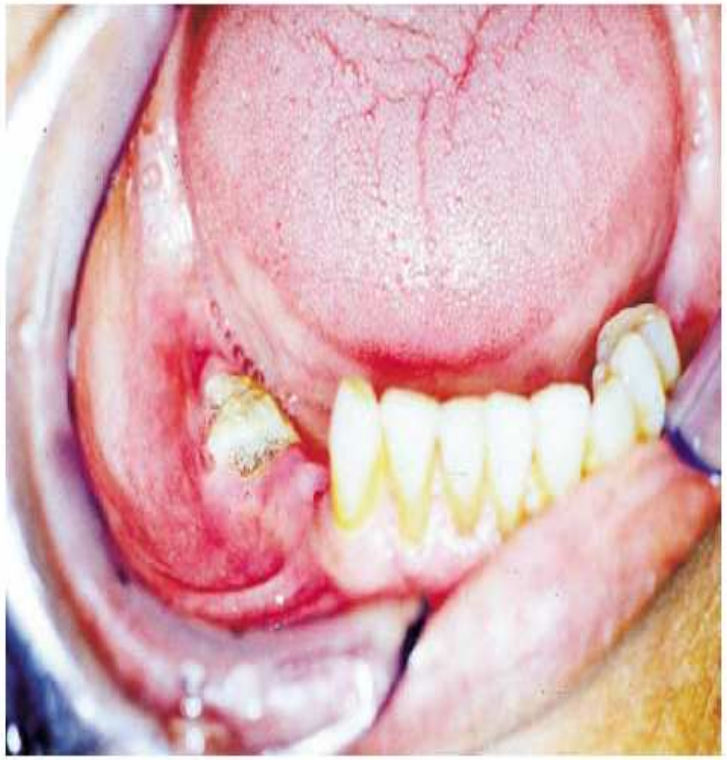


FIGURE 7. A nonhealing extraction socket such as this is a common complication when teeth are removed in patients receiving pamidronate or zoledronate therapy.

Marx et al. Bisphosphonate-Induced Exposed Bone of Jaws. J Oral Maxillofac Surg 2005.

- Exposed bone in the oral cavity for 8 weeks or longer
- Can occur spontaneously or following dental surgery
- Can be associated with antiresorptive therapy

Osteoporosis Canada
Ostéoporose Canada

Osteonecrosis of the Jaw

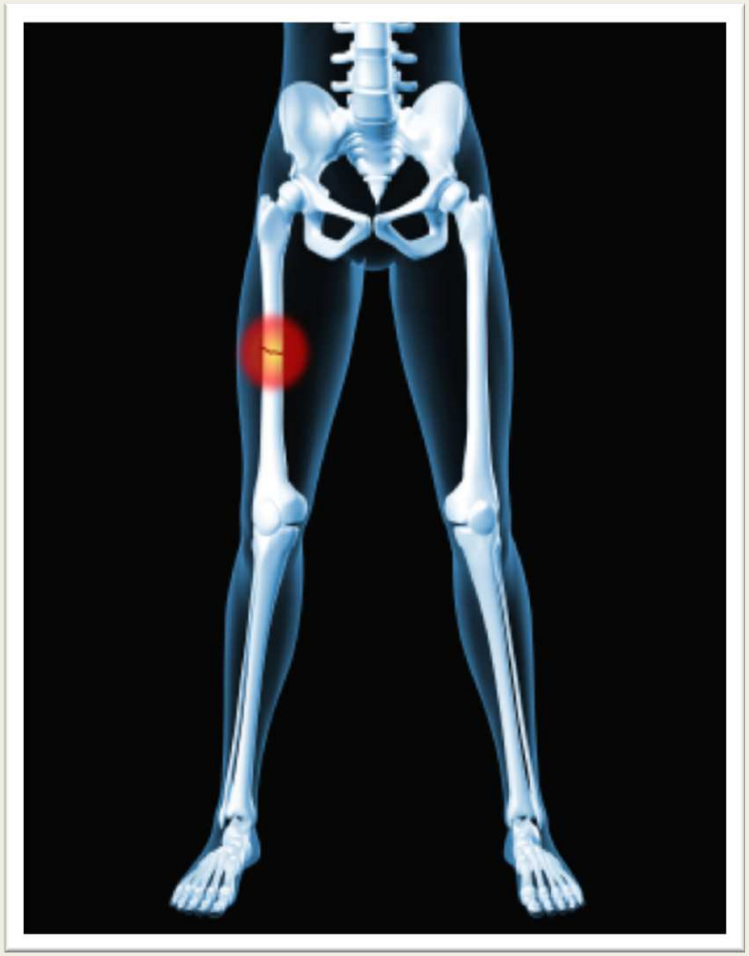
Average annualized incidence in cancer population is ~**2 per 1000**

.. osteoporosis & other metabolic bone disease population ` ~ **1 per 100 000**

A. Khan et al J Rheum 2011

Osteoporosis Canada
Ostéoporose Canada

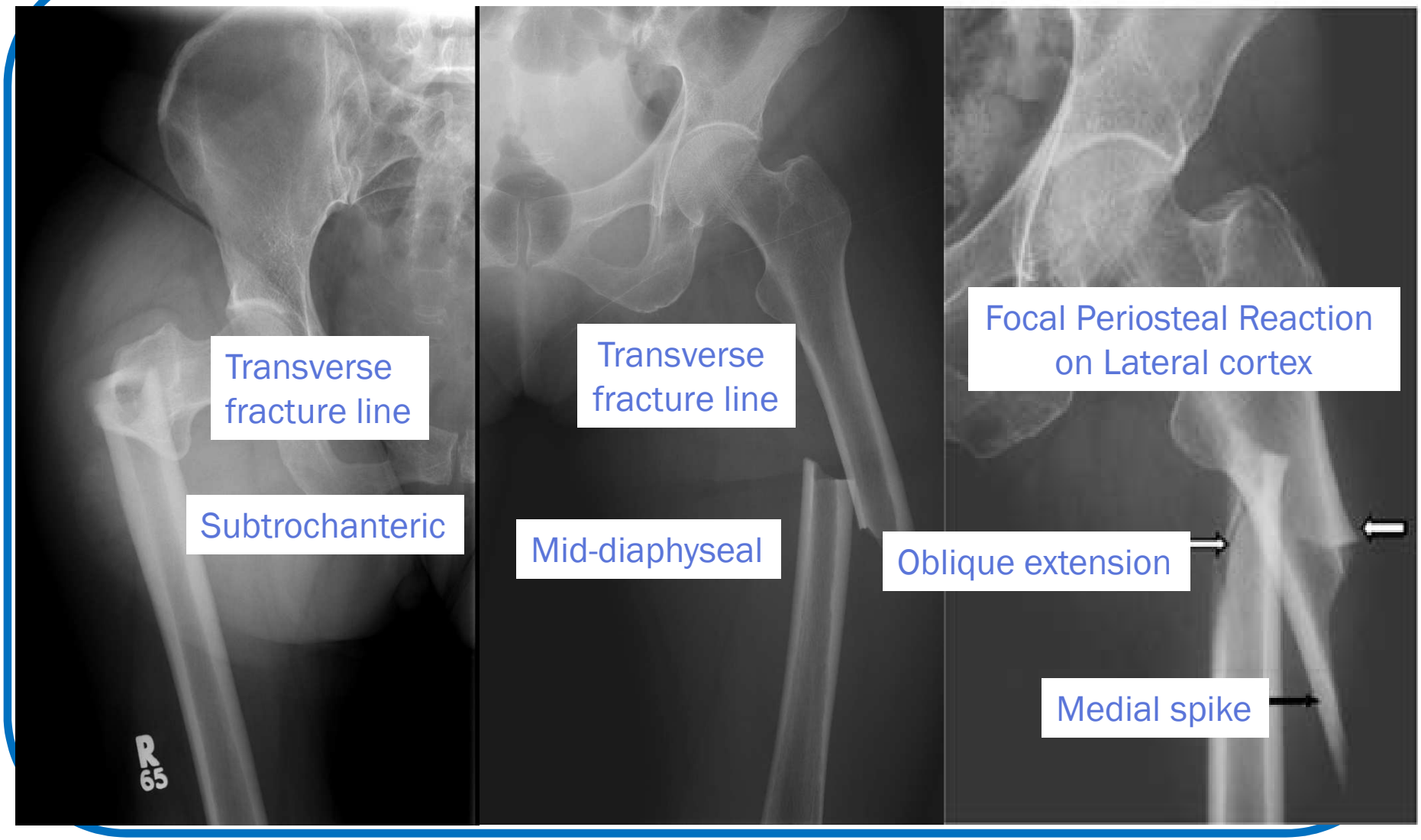
Atypical Femur Fractures



- low-trauma stress fractures
- in subtrochanteric or shaft region of the femur
- can be associated with antiresorptive therapy

Osteoporosis Canada
Ostéoporose Canada

Radiographic Images of AFFs



Incidence of Complete AFFs

Ontario CANADA Data

Bisphosphonate Use and the Risk of Subtrochanteric or Femoral Shaft Fractures in Older Women

Laura Y. Park-Wyllie, PharmD, MSc
Muhammad M. Mamdani, PharmD
Gillian A. Hawker, MD, MSc
Nadia Gunraj, MPH
Peter C. Austin, PhD
Daniel B. Whelan, MD, MSc
Peter J. Weiler, MD, MASc, P Eng
Andreas Laupacis, MD, MSc

Context Osteoporosis is associated with significant morbidity and mortality. Oral bis-

with an increased risk of subtrochanteric or femoral shaft fracture.

Design, Setting, and Patients A population-based, nested case-control study to explore the association between bisphosphonate use and fractures in a cohort of women aged 68 years or older from Ontario, Canada, who initiated therapy with an oral bisphosphonate between April 1, 2002, and March 31, 2008. Cases were those hospitalized with a subtrochanteric or femoral shaft fracture and were matched to up to 5 controls with no such fracture. Study participants were followed up until March 31, 2009.

Main Outcome Measures The primary analysis examined the association be-

JAMA, February 23, 2011—Vol 305, No. 8) 783

~1-2/1000 py after 6 - 7 years

Kaiser Permanente California Data

ORIGINAL ARTICLE

JBMR

Incidence of Atypical Nontraumatic Diaphyseal Fractures of the Femur

Richard M Dell,[1] Annette L Adams,[2] Denise F Greene,[1] Tadashi T Funahashi,[1] Stuart L Silverman,[3] Eric O Eisemon,[4] Hui Zhou,[2] Raoul J Burchette,[2] and Susan M Ott[5]

[1]Department of Orthopedics, Kaiser Permanente Southern California, Gardena, CA, USA
[2]Department of Research and Evaluation, Kaiser Permanente Southern California, Gardena, CA, USA
[3]Bone Center of Excellence at Cedars-Sinai Medical Center, West Hollywood, CA, USA
[4]Department of Orthopedic Surgery, Maimonides Medical Center, Brooklyn, NY, USA
[5]Department of Medicine, University of Washington, Seattle, WA, USA

BSTRACT

sphosphonates reduce the rate of osteoporotic fractures in clinical trials and community practice. "Atypical" nontraumatic fractures of e diaphyseal (subtrochanteric or shaft) part of the femur have been observed in patients taking bisphosphonates. We calculated the cidence of these fractures within a defined population and examined the incidence rates according to duration of bisphosphonate use. We identified all femur fractures from January 1, 2007 until December 31, 2011 in 1,835,116 patients older than 45 years who were

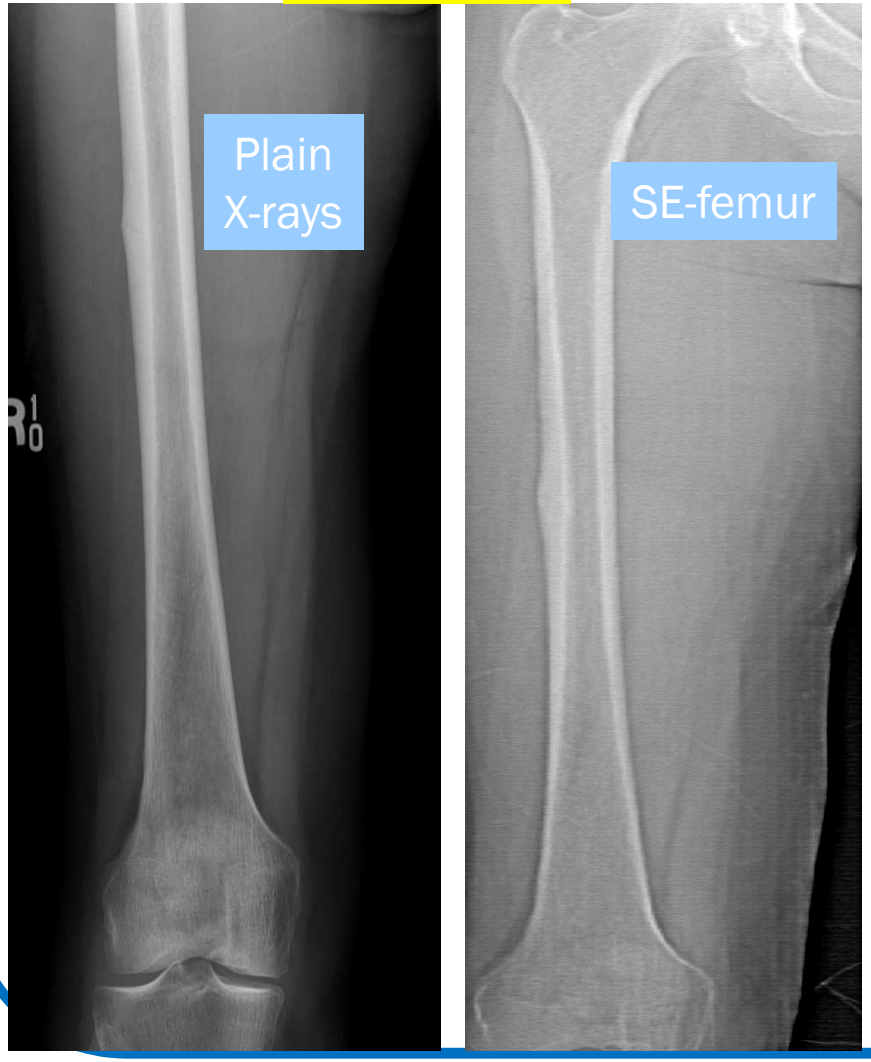
1.78/100,000/year (95% confidence interval [CI], 1.5–2.0) with exposure from 0.1 to 1.9 years, and increased to 113.1/100,000/year (95% CI, 69.3–156.8) with exposure from 8 to 9.9 years. We conclude that the incidence of atypical fractures of the femur increases with longer duration of bisphosphonate use. The rate is much lower than the expected rate of devastating hip fractures in elderly osteoporotic patients. Patients at risk for osteoporotic fractures should not be discouraged from initiating bisphosphonates, because clinical trials have documented that these medicines can substantially reduce the incidence of typical hip fractures. The increased risk of atypical fractures should be taken into consideration when continuing bisphosphonates beyond 5 years.

~1/1000 py after 8 - 9.9 years

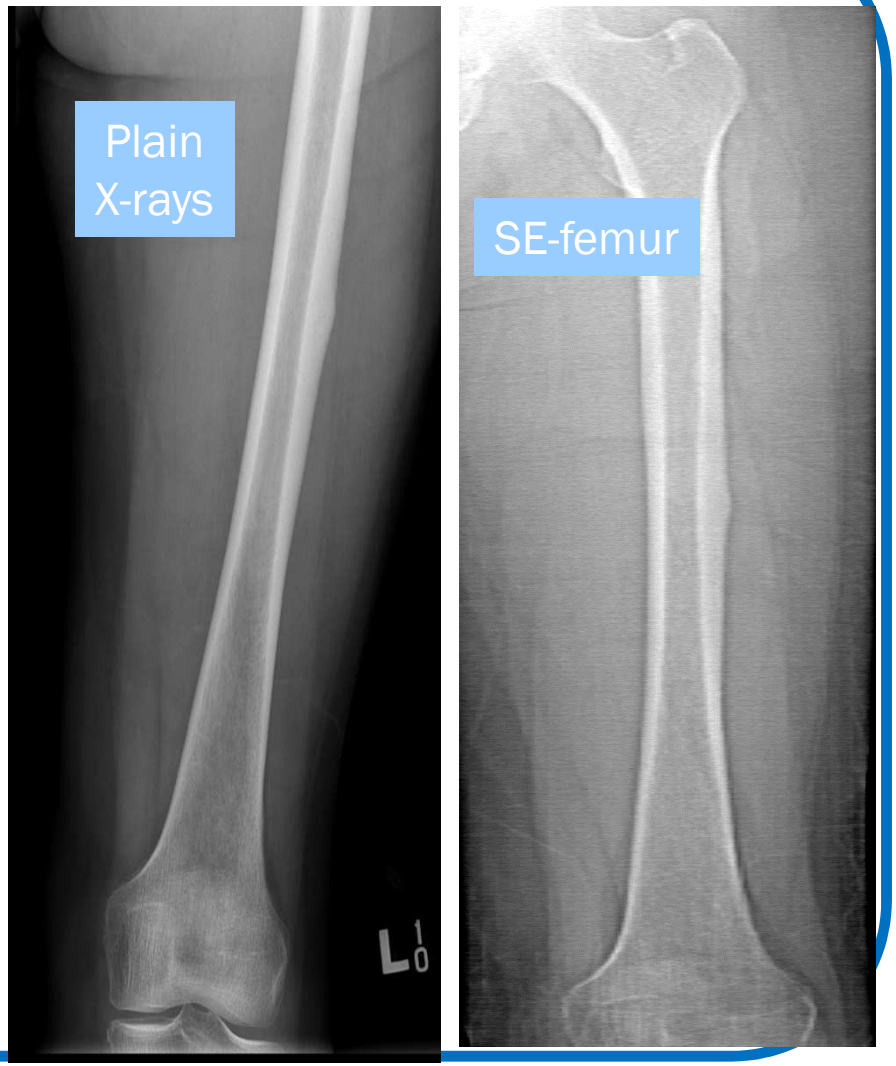
Osteoporosis Canada
Ostéoporose Canada

X-ray the other leg

Right Femur

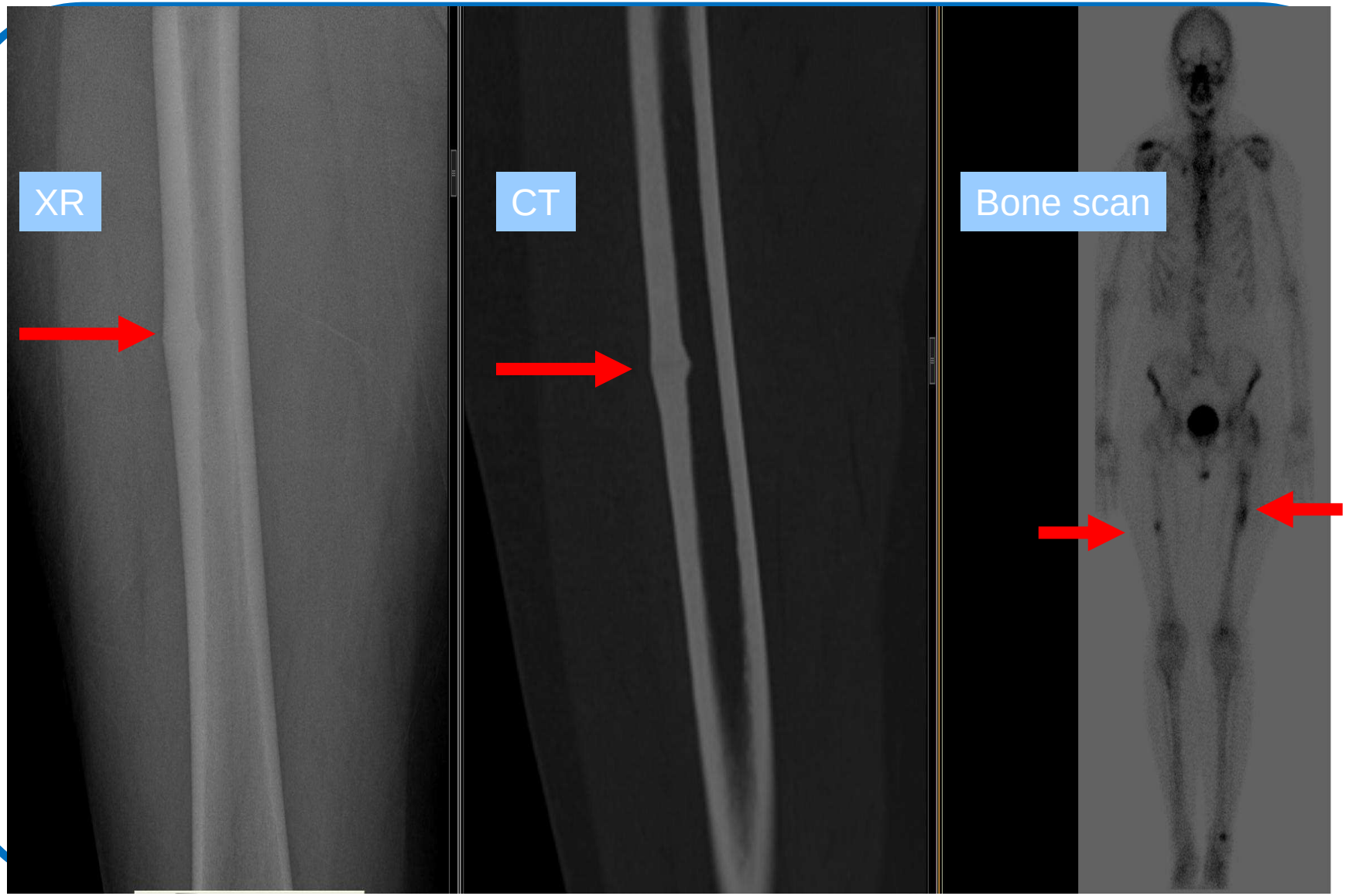


Left Femur



Osteoporosis Canada
Ostéoporose Canada

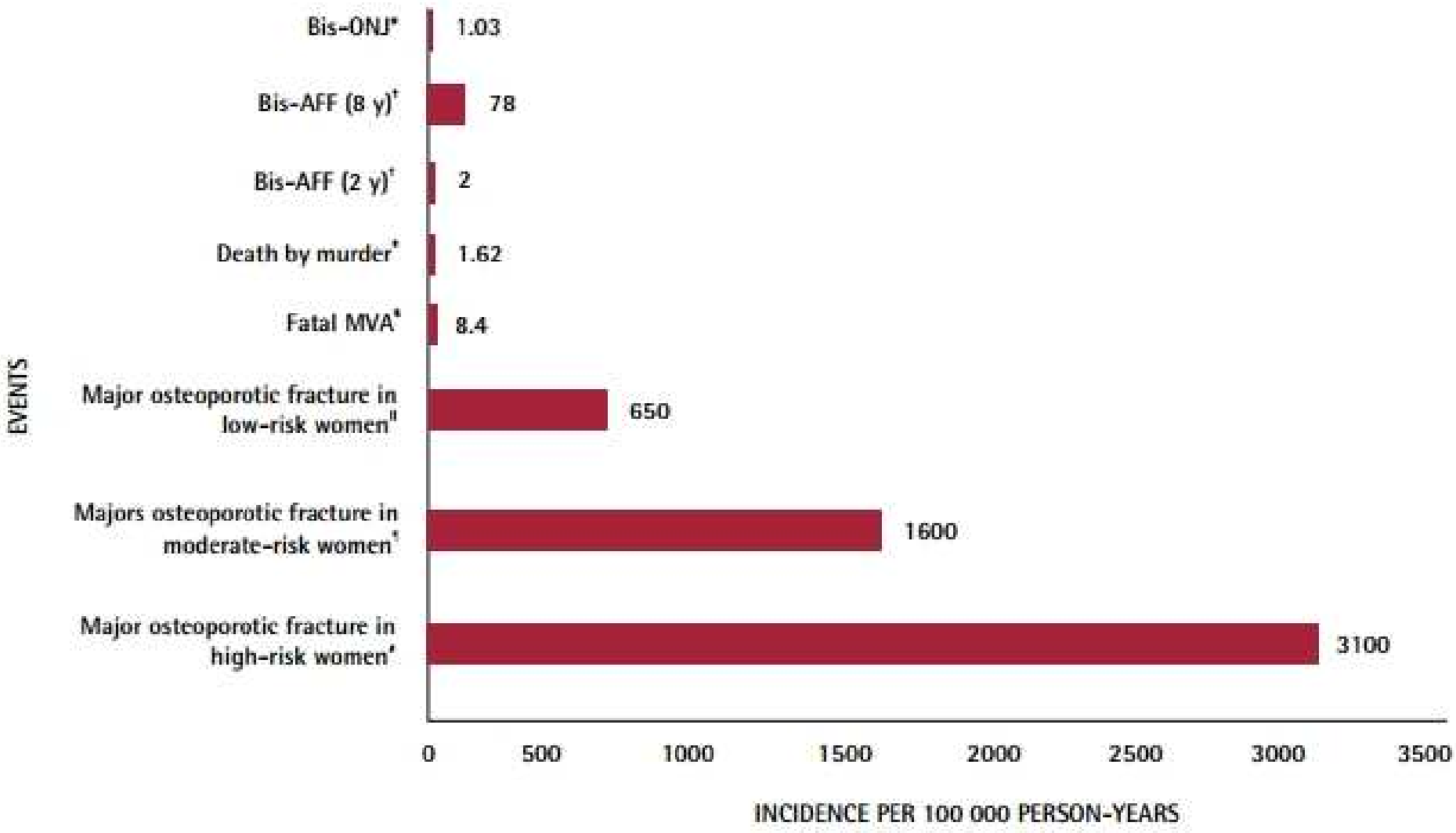
X-ray, CT, Bone Scan



Osteoporosis Canada
Ostéoporose Canada

Brown JP et al. Canadian Family Physician April 2014

Figure 1. Risks of major osteoporotic fracture and other rare events



Three Take-Home Messages

1. Hip Fractures are caused by Osteoporosis and Falls
2. Large Care Gap – we need to do better
3. There are estabilished guidelines on how to reduce mortality and fractures in patients who have had a hip fracture.

Existing Tools….

www.osteoporosis.ca

PatientOrderSets.com

Osteoporosis Canada / Ostéoporose Canada
www.osteoporosis.ca

PATIENT INFORMATION

Document allergies on organization approved form

Osteoporosis and Fragility Fracture Management Order Set	ACTION
For inpatients over age 50 with a non-traumatic (fragility) fracture	
☐ Consult _____ re: _____	
Laboratory Investigations	
Perform additional biochemical testing to rule out secondary causes of osteoporosis in selected patients, on the basis of the clinical assessment	
If not already done:	
☑ CBC, Creatinine, Calcium, Phosphate, Albumin, Alkaline Phosphatase, TSH	
☐ 25-Hydroxyvitamin D (Recommended if patient has had 3 months of adequate Vitamin D supplementation)	
☐ Serum Protein Electrophoresis (Recommended if patient has a vertebral fracture)	
Other: _____	
Diagnostics	

angela.m.cheung@gmail.com

osteoconnections.com

OsteoporosisUHN

OsteoUHN; AngelaMCheung

Thank you!

Ontario AFF line – (416)340-4843

Fax: (416)340-3215