

Patient vignettes in osteoporosis: Fracture prevention with bone formation (anabolic) therapy

This content was developed in concert with the scientific planning committee member:

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Lizzie

80-year-old woman with a history of hip fracture (naïve to anti-osteoporosis therapy)

Age	80 y	Sex	Female	Weight	52.1 kg	Height	160.2 cm
Fracture history	• Hip fracture, age 75 y; tripped on a carpet at home			Medications	Current Escitalopram 10 mg qd Perindopril 8 mg qd Rosuvastatin 10 mg qd No calcium, vitamin D, or multivitamin supplement Prior Acetaminophen/codeine/Tylenol 3, age 75–77 y No prior anti-osteoporosis therapy		
BMD T-score	Lumbar spine -2.5	Femoral neck -2.3	Total hip -2.2	Comorbidities	Hypertension, age 65 y Frailty, age 75 y Delirium, age 76 y No DM or dyslipidemia		
Fracture risk details	BMD assessment date ~5 y ago • Hip fracture history • Age 80 y • BMD \leq -2.5, ~5 y ago • Frailty and delirium; 3 falls within past year • Family history is unremarkable • Sedentary • Nonsmoker, no longer drinks alcohol			Additional notes	• Patient in LTC since age 77 y after hip fracture and delirium • Referred for a specialist assessment due to significant functional decline, increased frailty index, and significant falls history in the past year and a history of hip fracture • Daughter attended visit and worries because the patient does not eat a lot of dairy, meat, or vegetables (mostly carbs) • Patient also used to drink heavily (until age ~60 y) • Normal recent blood tests ordered at LTC: calcium (corrected for albumin), phosphate, creatinine (eGFR), alkaline phosphatase, thyroid-stimulating hormone • Low 25-hydroxyvitamin D: 35 nmol/l; high PTH: 10 pmol/l		

FRAX: 10-y fracture risk calculator based on Canadian data¹

Clinical FRAX without BMD^a

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
Age: 80 y; Date of Birth: _____

2. Sex: Male Female

3. Weight (kg): 52.1

4. Height (cm): 160.2

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/day: No Yes

12. Femoral neck BMD (g/cm²): _____

Select BMD: _____

Clear Calculate

BMI: 20.3
The ten year probability of fracture (%)

without BMD	
Major osteoporotic	33
Hip Fracture	16

Osteoporosis Canada, AACE, BHO, NAMS, and SOGC guidelines indicate that FRAX can be used without entering BMD when not available²⁻⁶; FRAX without BMD predicts a hip fracture with ~80% chance⁷

$\geq 20\%$ for MOF^{2-6,8} (i.e., hip, spine, humerus, or distal forearm fracture) or $\geq 3.0\%$ for hip fracture^{2-5,8} indicates **high** future fracture risk

FRAX with BMD^a

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
Age: 80 y; Date of Birth: _____

2. Sex: Male Female

3. Weight (kg): 52.1

4. Height (cm): 160.2

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/day: No Yes

12. Femoral neck BMD (g/cm²): T-Score: -2.3

Select BMD: _____

Clear Calculate

BMI: 20.3
The ten year probability of fracture (%)

with BMD	
Major osteoporotic	21
Hip Fracture	6.3

If you have a TBS value, click here: [Adjust with TBS](#)

Note: outdated DXA scan (5 y ago and high-risk patient)

Lizzie: Clinical management based on recent North American guidelines^{2-6,8,9}

Osteoporosis and fracture risk

- Needs treatment—at minimum high risk: hip fracture hx^{2-6,8} (also, MOF $\geq 20\%$ ^{2-6,8} and hip $\geq 3.0\%$ ^{2-4,5,8} FRAX score)
- Recommended for BF therapy—very high risk: MOF $> 30\%$ ²⁻³ FRAX score (also, hip fracture $> 4.5\%$ ²⁻³)
- Osteoporosis diagnosed 5 y ago by GP based on a hip fracture²⁻⁶



After completing BF treatment, guidelines^{2-6,8,9} and product monograph¹⁰ recommend switching to antiresorptive therapy to preserve the achieved BMD gains.



What if this patient was a man with a similar risk factor profile? Per product monograph, romosozumab is not indicated in men and teriparatide may be considered after failure/intolerance to prior therapy.^{10,11}

Management

- Indicated for **romosozumab**: osteoporosis + fracture or ≥ 2 risk factors (fracture, age ≥ 75 y, and BMD ≤ -2.5); no hx of MI or stroke and hypertension is controlled¹⁰
- Indicated for **teriparatide**: fracture hx or BMD T-score ≤ -2.5 ; no known risk factors for osteosarcoma¹¹
- DXA scan: ordered to confirm pretreatment BMD based on recent data
- Vitamin D: supplement 2000–3000 IU/d (low blood level); repeat 25-hydroxyvitamin D blood test in ~3 mo to assess if improved¹⁰
- Calcium: supplement 800–1000 mg/d
- Blood tests: reordered (prior tests ~3 mo ago) to exclude contraindications/hypocalcemia and secondary osteoporosis causes²⁻⁶
- Patient preferences: discussed treatment initiation with BF therapy (qd vs qm dosing) and follow-on antiresorptive treatment after completing BF treatment (bisphosphonates vs denosumab)

AACE, American Association of Clinical Endocrinology; BF, bone formation; BHO, Bone Health and Osteoporosis Foundation; BMD, bone mineral density; BMI, body mass index; DM, diabetes mellitus; DXA, dual-energy x-ray absorptiometry; eGFR, estimated glomerular filtration rate; FRAX, fracture risk assessment tool; GP, general practitioner; hx, history; LTC, long-term care home; MI, myocardial infarction; MOF, major osteoporotic fracture; NAMS, The North American Menopause Society; qd, daily; qm, monthly; TBS, trabecular bone score; SOGC, Society of Obstetricians and Gynecologists of Canada.

^aAdditional details for the following FRAX entries: 1. adult fracture occurring with low trauma (excluding hands, feet, and cranium); 2. biological mother/father hip fracture; 3. currently smokes tobacco; 4. current/past oral glucocorticoid use, ≥ 5 mg qd or equivalent; 5. confirmed diagnosis of rheumatoid arthritis; 6. disorders strongly associated with osteoporosis (including type 1 diabetes, osteogenesis imperfecta in adults, untreated long-standing hyperthyroidism, hypogonadism, premature menopause/ <45 y, chronic malnutrition, malabsorption, and chronic liver disease); 7. ≥ 3 units of alcohol daily; 8. enter the T-score if BMD scan is unknown and leave BMD field blank if BMD results are not available.

⁹Regulatory trials of romosozumab corrected serum 25-hydroxyvitamin D concentration ≤ 40 ng/mL by providing a loading dose of vitamin D2 of 50,000–60,000 IU within 1 week prior to starting romosozumab treatment.¹⁰

1. FRAX® Risk Assessment Tool, Canada. Accessed July 1, 2024. <https://frax.shef.ac.uk/FRAX/tool.aspx?country=19>; 2. Camacho PM, et al. *Endocr Pract*. 2020;26(Suppl 1):1-46; 3. Khan AA, et al. *J Obstet Gynaecol Can*. 2022;44(5):527-536.e5; 4. LeBoff MS, et al. *Osteoporos Int*. 2022;33:2049-2102; 5. The North American Menopause Society. *Menopause*. 2021;28:973-997; 6. Morin SN, et al. *CMAJ*. 2023;195(39):E1333-E1348; 7. Hoff M, et al. *Osteoporos Int*. 2017;28(10):2935-2944; 8. Shaback D, et al. *J Clin Endocrinol Metab*. 2020;105(3):dgaa048; 9. Qaseem A, et al. *Ann Intern Med*. 2023;178(2):224-238; 10. EVENITY® (romosozumab-aqqg). Product Monograph. Amgen Inc.; 2020; 11. Pr FORTEO® (teriparatide [DNA origin] injection). Product Monograph. Eli Lilly and Co; 2021.

This non-accredited learning activity is financially supported by Amgen Canada and is for healthcare professionals only.



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