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

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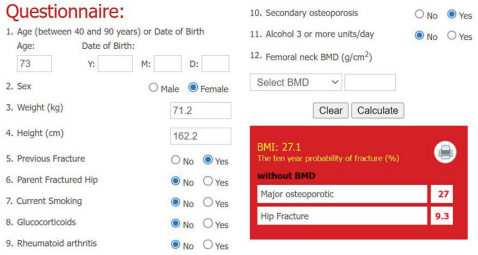
Garima

73-year-old woman with a history of multiple fractures (naive to anti-osteoporosis therapy)

Age	73 y	**Sex**	Female	**Weight**	71.2 kg	**Height**	162.2 cm
Fracture history	• Humerus fracture, age 72 y; pulled down by her son's dog when holding a leash • Wrist fracture, age 55 y; tripped in the backyard while gardening			**Medications**	**Current** ASA 81 mg Ramipril 5 mg Atorvastatin 40 mg qhs Metformin 500 mg bid Empagliflozin 10 mg qd Multivitamin but no calcium or vitamin D supplement **Prior** No prior anti-osteoporosis therapy		
BMD T-score	**Lumbar spine** −2.6	**Femoral neck** −2.5	**Total hip** −2.4	**Comorbidities**	T2D, age 58 y Dyslipidemia, 65 y AMI, age 70 y No HTN		
	BMD assessment date <6 mo ago			**Additional notes**	• Patient was referred for a specialist assessment due to low BMD on a recent test, multiple fractures (1 recent, ~1 y ago), family history of osteoporosis, and T2D • Eats mostly Indian vegetarian/vegan foods; she eats paneers once a week and does not consume milk alternatives • Normal initial blood tests ordered by GP: calcium (corrected for albumin), phosphate, creatinine (eGFR), alkaline phosphatase, thyroid-stimulating hormone • Low 25-hydroxyvitamin D: 20 nmol/l; high PTH: 15 pmol/l		
Fracture risk details	• Multiple fracture history • Type 2 diabetes • Mother had multiple fractures (lower leg, wrist, and spine fracture) • Tai chi or yoga 1–2/week; walking 1–2/week • No falls within past year • Never smoked, drinks only socially (~1/mo)						

FRAX: 10-y fracture risk calculator based on Canadian data[1]

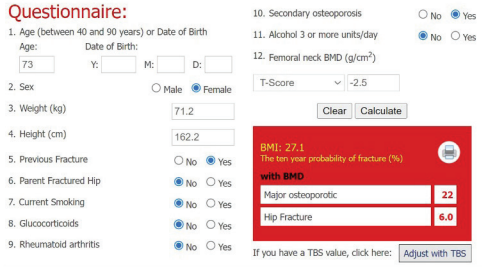
Clinical FRAX without BMD[a]



Osteoporosis Canada, AACE, BHOF, NAMS, and SOGC guidelines indicate that FRAX can be used without entering BMD when not available[2-6]; FRAX without BMD predicts a hip fracture with ~80% chance[7]

≥20% for MOF[2-6,8] (i.e., hip, spine, humerus, or distal forearm fracture) or **≥3.0%** for hip fracture[2-5,8] indicates **high** future fracture risk

FRAX with BMD[a]



Although the FRAX calculator does not include T2D under its definition of secondary osteoporosis causes,[1,a] Osteoporosis Canada 2023 guideline recommends considering both T1D and T2D as a secondary osteoporosis cause.[4]

Garima: Clinical management based on recent North American guidelines[2-6,8,9]

Osteoporosis and fracture risk

- Needs treatment—at minimum high risk: ≥2 fractures[2,3,5,6,8,9] (also, MOF ≥20%[2-6,8] and hip ≥3.0%[2-5,8] FRAX score)
- **Recommended for BF therapy—very high risk: recent fracture ≤1 y[2,3,5,9] (also, ≥2 fractures[2,3,8,9] or hip fracture >4.5% FRAX score[2,3])**
- Osteoporosis diagnosis recorded based on BMD T-score ≤−2.5[2-6]

⚠ After completing BF treatment, guidelines[2-6,8,9] 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

- Hx of MI; otherwise indicated for **romosozumab**: osteoporosis + fracture or ≥2 risk factors (≥2 fractures and BMD ≤−2.5)[10]
- Indicated for **teriparatide**: fracture hx or BMD T-score ≤−2.5; no known risk factors for osteosarcoma[11]
- DXA scan: not needed/recent BMD data available
- Vitamin D: correct with a loading dose of D2 50,000 IU qw or D3 5,000 IU qd; repeat blood tests in ~3 mo: 25-hydroxyvitamin D to assess if corrected[b] and PTH to assess if normalized with vitamin D correction; exclude celiac disease as a cause of vitamin D deficiency
- Calcium: supplement 300–600 mg/d + continue with multivitamin
- Blood tests: reordered (prior tests ~5 mo ago) to exclude contraindications/ hypocalcemia and secondary osteoporosis causes[2-6]
- Patient preferences: discussed treatment initiation with teriparatide (romosozumab not appropriate owing to MI hx) and follow-on antiresorptive treatment after completing teriparatide treatment (bisphosphonates vs denosumab)

AACE, American Association of Clinical Endocrinology; AMI, acute myocardial infarction; ASA, acetylsalicylic acid; bid, twice daily; BF, bone formation; BHOF, Bone Health and Osteoporosis Foundation; BMD, bone mineral density; BMI, body mass index; DXA, dual-energy x-ray absorptiometry; eGFR, estimated glomerular filtration rate; FRAX, fracture risk assessment tool; GP, general practitioner; HTN, hypertension; hx, history; MI, myocardial infarction; MOF, major osteoporotic fracture; NAMS, The North American Menopause Society; qd, daily; qhs, nightly at bedtime; qw, weekly; SOGC, Society of Obstetricians and Gynaecologists of Canada; TBS, trabecular bone score; T2D, type 2 diabetes.

[a]Additional details for the following FRAX entries: 5. adult fracture occurring with low trauma (excluding hands, feet, and cranium); 6. biological mother/father hip fracture; 7. currently smokes tobacco; 8. current/past oral glucocorticoid use, ≥5 mg qd or equivalent; 9. confirmed diagnosis of rheumatoid arthritis; 10. 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); 11. ≥3 units of alcohol daily; 12. enter the T-score if BMD scan is unknown and leave BMD field blank if BMD results are not available.

[b]Regulatory trials of romosozomab 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. Shoback D, et al. *J Clin Endocrinol Metab*. 2020;105(3):dgaa048; 9. Qaseem A, et al. *Ann Intern Med*. 2023;176(2):224-238; 10. EVENITY® (romosozumab-aqqg). Product Monograph. Amgen Inc.; 2020; 11. Pr FORTEO® (teriparatide (rDNA origin) injection). Product Monograph. Eli Lilly and Co; 2021.

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