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Preventing Hip Fractures in Older Adults in 2019

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The incidence of osteoporotic fracture increases exponentially throughout late life, as does the risk of their devastating consequences including functional decline, institutionalization, mortality, and even destitution.¹ Adults in their 8th and 9th decades of life are less likely to be screened and treated for osteoporosis than younger individuals. Guidelines for pharmacologic treatment suggest using 10-year fracture risk estimations, but they do not address decision-making for patients with life expectancies less than 10 years. Further, existing fracture risk calculators do not include many co-morbidities or frailty characteristics common in late life that influence risk-benefit assessment when considering pharmacologic treatment as a preventive measure for osteoporosis.

An approach to fracture prevention in older community-dwelling adults is reviewed including an estimation of fracture risk and life expectancy, shared decision making for pharmacologic interventions, and important non-pharmacologic prevention strategies.

Estimating Fracture Risk:

Many tools exist to estimate fracture risk.² Bone mineral density (BMD), assessed by dual energy x-ray absorptiometry and clinically used as T-scores is a strong predictor of future fracture, and it is included in some of these models. FRAX is the best validated and most commonly used fracture prediction model. Individuals with a 10-year estimated risk of major osteoporotic fracture between 10–20% are at moderate fracture risk, whereas individuals with an estimated risk of ≥ 20% have a high risk for fracture.²

Despite the many strengths of the FRAX tool in estimating fracture, it omits important fracture risk factors in older adults including falls, cognitive impairment, urinary incontinence, neurological conditions, and medications. When estimating fracture risk and considering pharmacologic treatment, additional geriatric assessments that are not included in most fracture prediction tools should be considered, such as tests of cognition, vision, gait and balance, and polypharmacy. Presently there is no evidence to guide how these

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assessments should be factored into the risk calculation. In the absence of evidence, a practical suggestion is that if a patient is near the threshold for pharmacologic treatment and has abnormal findings from these assessments, a clinician should consider the patient to have a higher risk for fracture than derived from the commonly used risk calculators and consider pharmacologic treatment. In the United States, pharmacologic therapy is recommended^{2,3} in individuals with 1) hip or vertebral fracture; 2) BMD T-score ≤ -2.5 ; or 3) BMD T-score between -1.0 and -2.5 AND the patient 10-year probability of hip fracture $\geq 3\%$ or 10-year probability of major osteoporotic fracture $\geq 20\%$. For example, using the FRAX model an 80 year old woman with a body mass index of 26 kg/m^2 , a BMD T-score of -2.0 , and no additional risk factors for fracture has an estimated 10-year risk of hip and major osteoporotic fracture of 4.7% and 16% . Although the hip fracture risk is over the 3% threshold for starting pharmacological treatment, many patients and clinicians may elect to monitor a patient without treatment given the relatively low major osteoporotic fracture risk. However, if this patient also had mild dementia and a recent fall, her fracture risk would be substantially higher than estimated by FRAX, and this knowledge might lower the threshold to pursue pharmacologic treatment.

Estimating Life Expectancy:

Although the current osteoporosis treatment guidelines do not explicitly address life expectancy, it is an important consideration when choosing preventive treatment. There is substantial heterogeneity in life expectancy among older adults: median life expectancy for an 80-year-old woman is approximately 10 years; however, for women in the “healthiest” quartile, life expectancy is more than 14 years, whereas for those in the “sickest” quartile, life expectancy is less than 5 years.⁴ Clinicians tend to overestimate survival, and so it is recommended to instead use standardized tools such as life tables or ePrognosis© to estimate remaining life expectancy. Clinicians should be aware that FRAX estimates for median life expectancy.

It may take more than 10-years before the benefits of cancer screening are observed. In contrast, the benefits of oral osteoporosis medications may occur at 6–12 months, and the benefits for effective fall prevention interventions might be immediate. As age increases, the number needed to treat to prevent one hip fracture declines until after the age of 80 years.⁵ Despite a shorter life expectancy, a woman at age 90 still has a substantially higher lifetime fracture risk and lower number needed to treat to prevent one hip fracture as compared with a woman aged 70 years. Therefore, in contrast to cancer and other screening and prevention services, for which the benefits of screening cease beyond some age threshold, the effectiveness of fracture prevention increases with advancing age.

Economic models suggest that it might be cost-effective to treat older women for fracture reduction who have life expectancies of as little as 2 years.⁴ If life expectancy is less than 1 year, pharmacologic osteoporosis treatment should not be provided.

Selecting an Appropriate Medication:

Oral bisphosphonates are often considered first line therapy for osteoporosis, and the number of older adults (mean age 85 years) needed to treat to prevent one hip fracture is approximately 200.⁶ While oral bisphosphonates are the most cost-effective therapy, other special considerations in choosing therapy for the oldest and frailest patients include pill burden and co-morbidities. Patients already taking multiple oral medications for other conditions may prefer annual or bi-annual formulations. Intravenous (e.g., zoledronic acid) or subcutaneous (e.g., denosumab) formulations may be preferable for those with dysphagia or poor adherence. Stage 4–5 chronic kidney disease is common with aging, and denosumab is a preferred agent for these patients. Zoledronic acid is available in generic formulations at a typical cost of <\$200 per annual infusion, whereas denosumab costs around \$2,000 annually. Limited data from post-hoc analyses of RCTs and observational studies suggest osteoporosis drugs are safe and effective in older patients.^{2,6} Monitoring patients during bisphosphonate treatment with repeat DXA scans is not necessary.⁷

Shared Decision Making:

Preventing fractures is a priority for many older adults: in a survey of 194 women (mean age 83 years), 80% reported that they would prefer death rather than have a hip fracture leading to institutionalization.⁸ Older adults are also concerned with polypharmacy, and rare but serious adverse events associated with osteoporosis treatment.³ It is important for clinicians to help patients navigate the potential risks and benefits of treatment, involving family or caregivers when the patient has or is suspected to have cognitive impairment. Decision aids for osteoporosis treatment exist, such as the [Mayo Clinic Shared Decision Making National Resource Center](#), and may facilitate treatment decisions. Shared decision making with clear descriptions of benefits and risk may have the added benefit of encouraging adherence, as osteoporosis medications are often discontinued within months.

Essential Fall Prevention Strategies:

Regardless of the decision to treat pharmacologically, all older patients should receive fall risk assessment and prevention counselling. Fall prevention starts with asking patients about falls. Patients with a fall or fear of falling should undergo gait and balance assessment.⁹ If gait is abnormal, a comprehensive assessment of falls risk factors should include testing for visual impairment, orthostatic hypotension, improper footwear, and medication review. Patients with impaired gait or balance should be referred to physical therapy for supervised exercises,^{9,10} and all patients should be encouraged to exercise regularly. Medication use is among the most common and modifiable risk factors for falls in older adults. Evidence from clinical trials supports deprescribing (i.e., discontinuing or reducing the dose of) psychoactive and probably cardiometabolic drugs as an effective strategy to prevent falls.¹⁰ Clinicians may be conflicted with the choice between wanting to reduce polypharmacy and starting osteoporosis medications to reduce fracture risk. Nonetheless, this dual approach (i.e., stopping medications that cause falls and starting a medication for osteoporosis) is appropriate in older adults with many co-morbidities who prioritize fracture prevention. The

Figure describes this recommended approach to managing medications in older adults at risk for falls and fracture.

Conclusions:

Preventing fractures in older community-dwelling adults requires careful consideration of an individual's estimated fracture risk, life expectancy, and health priorities. Clinicians must consider pharmacologic and non-pharmacologic interventions to reduce fracture burden in this vulnerable population.

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Older patient at high risk for hip and other fractures

- Prior hip or vertebral fracture
- T-score ≤ -2.5 at any site
- High FRAX 10-year fracture risk ($\geq 3\%$ for hip or $\geq 20\%$ for major fracture)
- Borderline FRAX score with prior fall or additional risk factors

MEDICATION REVIEW

Deprescribe fall-related medications

Consider discontinuing or tapering to lowest effective dose

Benzodiazepines

Antipsychotics

Antidepressants

Anticholinergics

Opiates

Sedative-hypnotics

Antihypertensives if blood pressure is below target or the patient has orthostatic hypotension

Hypoglycemics if hemoglobin $A_{1C} < 7.5$

Prescribe bone-protective medications

- Ensure vitamin D sufficiency and dietary or supplemental calcium intake ≥ 1200 mg daily
- Determine life expectancy ≥ 2 y

Standard first-line therapy

Oral bisphosphonates

Alternate first-line therapies

Condition	Medication
Chronic kidney disease stage 4-5 ^a	Denosumab
Severe osteoporosis	Romosozumab or abaloparatide
Dysphagia	Intravenous bisphosphonates or denosumab

Figure:

Managing Medications in Older Adults at Risk for Fracture

^aStage IV chronic kidney disease: creatinine clearance 15–29 mL/min; stage V chronic kidney disease: creatinine clearance < 15 mL/min or receiving dialysis.