Osteoporosis/Fracture Prevention
Clinician Guide

Introduction
This Clinician Guide was developed to assist Primary Care physicians and other clinicians in the primary prevention, screening, and treatment of low bone mass and osteoporosis. It is not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by practitioners.

Definitions
- Bone mass status is defined by T-score derived by Dual-Energy X-ray Absorptiometry (DXA) measured at total proximal femur (total hip), femoral neck, and lumbar spine:
  - Normal bone mass: ≥ -1.0
  - Low bone mass (formerly referred to as osteopenia): -1.1 to -2.4
  - Osteoporosis: ≤ -2.5
- A fragility fracture is defined as a fracture of any bone, excluding fingers, toes, face or skull, sustained from a fall at standing height or less.

Key Points
- For all adults, encourage a bone-healthy lifestyle to reduce the risk of osteoporosis. This includes regular weight-bearing and muscle-building exercise, smoking cessation, and adequate daily intake of calcium and Vitamin D
- In post-menopausal women with low bone mass (osteopenia), if either of the following risk factors are present, pharmacologic therapy should be considered:
  - A FRAX 10-year risk of hip fracture ≥ 3% or a FRAX 10-year risk of major osteoporotic fracture ≥ 20%
  - Increased risk of falling
- In men and women with osteoporosis, alendronate is preferred therapy. Other bisphosphonates (zoledronic acid, risedronate, ibandronate) may be prescribed if alendronate cannot be used.
- For women over 65 years who are not receiving prescription anti-fracture medication, rescreening interval is determined by T-score:
  - ≥ -1.4: 10 years
  - -1.5 to -1.9: 5 years
  - -2.0 to -2.4: 2 years
- Oral bisphosphonate therapy (e.g. alendronate) should not be given for greater than 10 years of continuous use.
# Prevention and Treatment of Osteoporosis

## Primary Prevention of Osteoporosis

### NORMAL BONE MASS (T SCORE ≥-1.0)

**Lifestyle choices**  
Lifestyle changes are recommended for all adults:
- Exercise – regular weight-bearing and muscle-building exercise (Consensus-based)
- Smoking cessation (Consensus-based)

**Fall prevention**  
Safety Proofing is recommended for postmenopausal women and men at risk of falling. (Consensus-based)  
**NOTE:** Home safety proofing includes removing rugs, adding grab bars, establishing adequate lighting (e.g., nightlights), and securing electrical cord placement.

Hip Protectors: The routine use of hip protectors is not recommended as an intervention for reducing the risk of hip fractures in postmenopausal women and men aged 50 or older. (Evidence-based: D)

**Supplementation**

#### Calcium and Vitamin D
- Total daily intake of calcium is recommended for all pre- or postmenopausal women and older men (1,000 mg/day for premenopausal women; 1,200 mg/day for postmenopausal women and men aged 50 or older). Many individuals require supplemental calcium therapy. (Evidence-based: B)
  
  **NOTE:** Calcium carbonate contains the most elemental calcium per dose. It should be taken with food to enhance absorption. Calcium citrate contains less elemental calcium than the carbonate salt, but it is better absorbed and may be preferred in patients with reduced gastric acid production or high gastric pH requiring long–term H2 antagonist or proton pump inhibitor therapy and in patients who have undergone bariatric surgery. It is more expensive and usually requires more tablets to be taken per day than calcium carbonate.

- Total daily intake of vitamin D (at least 1,000 IU/day), preferably vitamin D3, is recommended for all pre- or postmenopausal women and men aged 50 or older. (Consensus-based)

- Screening for vitamin D deficiency is not recommended for identifying vitamin D deficiency in adults aged 50 years or older without osteoporosis. (Consensus-based)

### LOW BONE MASS (T SCORE -1.1 TO -2.4)

**Lifestyle choices**  
Lifestyle changes are recommended for all adults:
- Exercise – regular weight-bearing and muscle-building exercise (Consensus-based)
- Smoking cessation (Consensus-based)
**Fall prevention**

- Safety Proofing is recommended for postmenopausal women and men at risk of falling. (Consensus-based)
  
  NOTE: Home safety proofing includes removing rugs, adding grab bars, establishing adequate lighting (e.g., nightlights), and securing electrical cord placement.

- Hip Protectors
  
  - The routine use of hip protectors is not recommended as an intervention for reducing the risk of hip fractures in postmenopausal women and men aged 50 or older. (Evidence-based: D)

**Supplementation**

**Calcium and Vitamin D**

- Total daily intake of calcium is recommended for all pre- or postmenopausal women and older men (1,000 mg/day for premenopausal women; 1,200 mg/day for postmenopausal women and men aged 50 or older). Many individuals require supplemental calcium therapy. (Evidence-based: B)

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- Total daily intake of vitamin D (at least 1,000 IU/day), preferably vitamin D3, is recommended for all pre- or postmenopausal women and men aged 50 or older. (Consensus-based)

- Screening for vitamin D deficiency is not recommended for identifying vitamin D deficiency in adults aged 50 years or older without osteoporosis. (Consensus-based)
Pharmacological Treatment for post-menopausal women

Consider treating women with low bone mass (and no history of prior fragility fracture) who have at least one of the following additional risk factors:

- A FRAX 10-year risk of hip fracture ≥ 3% or a FRAX 10-year risk of major osteoporotic fracture ≥ 20%.¹
- Increased risk of falling²

Preferred therapy

- Optimize non-pharmacologic therapies, including vitamin D supplementation, calcium intake and fall prevention efforts (via physical activity or therapy, ambulatory assistive devices, and reduction in sedative/hypnotic medications). (Strong recommendation)
- Consider prescribing alendronate (70 mg/week) as a first-line therapy, particularly in those with a lowest T score in the range of -2.1 to -2.4 and at least one of the following additional risk factors:
  - A FRAX 10-year risk of hip fracture ≥ 3% or a FRAX 10-year risk of major osteoporotic fracture ≥ 20%.¹
  - Increased risk of falling (Weak recommendation)

Alternative therapy³

- Consider prescribing risedronate, ibandronate, zoledronic acid or raloxifene (the latter for women with a low cardiovascular risk⁴) for women who cannot tolerate or should not take alendronate. (Weak recommendation)

Therapies to Avoid

- Do not prescribe hormone replacement therapy (estrogen or estrogen/progesterone) solely for the treatment of low bone mass. (Strong recommendation)
- Do not prescribe nasal calcitonin for the treatment of low bone mass. (Strong recommendation)

Clinical Considerations

- Calcium supplementation
  - Use calcium citrate in patients taking proton pump inhibitors (PPIs) or H₂ blockers.

¹ For women whose high FRAX score (>3% for hip fracture and >20% for major osteoporotic fracture) is due in part to long-term, daily use of corticosteroids (≥5 mg of prednisone or equivalent therapy), please refer to the recommendation for “Treatment for Men and Women Taking Corticosteroid Therapy.”

² The most common risk factors for falls include:
  - A history of falls
  - Psychoactive medications (sedatives, antipsychotics and antidepressants) anticonvulsants, or antihypertensive medications
  - A high number of medications consumed (>4), independent of medication indication
  - Strength, gait and balance impairments
  - Visual impairment
  - Age >80 years old

³ There is no recommendation for or against the use of teriparatide (PTH) or denosumab in postmenopausal women with low bone mass. Evidence is insufficient to determine benefits and harms of therapy.

⁴ Those at increased risk include postmenopausal women with known coronary artery disease, peripheral vascular disease, or cerebrovascular disease; or a combination of diabetes with 1 additional risk factor (age >65, current smoking, hypertension, hyperlipidemia), or a combination of all 4 of the listed risk factors together (Mosca 2001).
Fall risk
- Hip fracture risk increases with falling. Therefore, in this update we have added language to increase awareness of overall fall risk in the context of fracture prevention. The most common risk factors for falls include:
  - A history of falls
  - Psychoactive medications (sedatives, antipsychotics and antidepressants) anticonvulsants, or antihypertensive medications
  - A high number of medications consumed (>4), independent of medication indication.
  - Strength, gait and balance impairments.
  - Visual impairment
  - Age >80 years old

Chronic kidney disease
- Use bisphosphonates with caution in patients with chronic kidney disease and reduced glomerular filtration rate. Current drug monographs state that an estimated GFR <35 mL/min is a contraindication to bisphosphonate use.

Dental hygiene
- Educate patients starting a bisphosphonate about the importance of regular dental cleanings and good dental hygiene. For those patients who have a planned tooth extraction or dental implant surgery, consider delaying the start of bisphosphonate therapy until 3 months after completion of the dental procedure, or until maxillofacial bone healing is complete. Both of these considerations are based upon the moderate evidence for association of osteonecrosis of the jaw (ONJ) with bisphosphonate use (0.001% to 0.069% per year increased incidence over non-bisphosphonate users).

Choice of alternative therapies
- Consider significant side effects when choosing alternative therapies for patients who do not tolerate alendronate:
  - Zoledronic acid: There is strong evidence for an acute phase reaction within 3 days of zoledronic acid administration (up to 25% increased risk over placebo of any of the following symptoms: pyrexia, myalgia, headache, arthralgia, chills). A 650 mg dose of acetaminophen initiated 45 minutes before zoledronic acid infusion and continuing every 6 hours for 3 days has been shown to reduce severity of symptoms. It is common practice also to ensure the patient is well hydrated prior to infusion.
  - Raloxifene: There is strong evidence for hot flashes (2%-7% increase over placebo) and venous thromboembolic events (0.2%-0.7% increased risk) and death due to stroke (0.07% increased risk over placebo) as side effects of raloxifene.

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5 This can be assessed with the timed Get-Up-and-Go test. The test is performed by observing the time it takes a person to rise from an armchair, walk 3 meters (10 feet), turn, walk back, and sit down again. The average healthy adult older than 60 years can perform this task in less than 10 seconds.

6 Recommendations on interruption of bisphosphonate therapy can be found in the ‘discontinuation’ section of this guideline.
Treatment of Osteoporosis

T SCORE ≤-2.5 OR PRIOR FRAGILITY FRACTURE

Women (post-menopausal)

**Preferred therapy**
- Optimize non-pharmacologic therapies, including vitamin D supplementation, calcium intake and fall prevention efforts (via physical activity or therapy, ambulatory assistive devices, and reduction in sedative/hypnotic medications). (Strong recommendation)
- Prescribe alendronate (70 mg/week) as a first-line therapy for post-menopausal women with osteoporosis (T-score ≤ -2.5 or a prior fragility fracture). (Strong recommendation)

**Alternative therapy**
- Prescribe alternative bisphosphonates, including ibandronate, risedronate and zoledronic acid, for women who cannot tolerate or should not take alendronate. (Strong recommendation)

**Additional therapeutic options**
- Consult with specialty care about prescription of denosumab or teriparatide (PTH) for women who cannot tolerate or should not take bisphosphonates. (Strong recommendation)
- Consider prescribing raloxifene for women with a low cardiovascular risk who cannot tolerate or should not take bisphosphonates. (Weak recommendation)

**Therapies to Avoid**
- Do not prescribe hormone replacement therapy (estrogen or estrogen/progesterone) solely for the treatment of osteoporosis. (Strong recommendation)
- Do not prescribe nasal calcitonin for the treatment of osteoporosis. (Strong recommendation)

**Clinical Considerations**
- Calcium supplementation
  - Use calcium citrate in patients taking proton pump inhibitors (PPIs) or H2 blockers.
- Chronic kidney disease
  - Use bisphosphonates with caution in patients with chronic kidney disease and reduced glomerular filtration rate. Current drug monographs state that an estimated GFR <35 mL/min is a contraindication to bisphosphonate use.
- Dental hygiene
  - Educate patients starting a bisphosphonate about the importance of regular dental cleanings and good dental hygiene. For those patients who have a planned tooth extraction or dental implant surgery, consider delaying the start of bisphosphonate therapy until 3 months after completion of the dental procedure, or until maxillofacial bone healing is complete. Both of these

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7 A fragility fracture is defined as a fracture of any bone, excluding fingers, toes, face or skull, sustained from a fall at standing height or less.
Considerations are based upon the moderate evidence for association of osteonecrosis of the jaw (ONJ) with bisphosphonate use (0.001% to 0.069% per year increased incidence over non-bisphosphonate users).  

- **Choice of alternative therapies**
  - Consider significant side effects when choosing alternative therapies for patients who do not tolerate alendronate:
    - Zoledronic acid: There is strong evidence for an acute phase reaction within 3 days of zoledronic acid administration (up to 25% increased risk over placebo of any of the following symptoms: pyrexia, myalgia, headache, arthralgia, chills). A 650 mg dose of acetaminophen initiated 45 minutes before zoledronic acid infusion and continuing every 6 hours for 3 days has been shown to reduce severity of symptoms. It is common practice also to ensure the patient is well hydrated prior to infusion.
    - Raloxifene: There is strong evidence for hot flashes (2%-7% increase over placebo) and venous thromboembolic events (0.2%-0.7% increased risk) and death due to stroke (0.07% increased risk over placebo) as side effects of raloxifene.

### Men
- Alendronate (70 mg/week) is recommended as a first-line therapy for men aged 70 or older diagnosed with osteoporosis or with a FRAX 10-year risk of hip fracture ≥ 3%. (Consensus-based)
- Pharmacologic treatment for osteoporosis is optional in men under the age of 70 who are diagnosed with osteoporosis (T-score ≤ -2.5) but without a FRAX 10-year risk of hip fracture ≥ 3%. (Consensus-based)

### Men and Women Taking Corticosteroid Therapy
- **Bisphosphonates**
  - Alendronate (70 mg/week) or risedronate (35 mg/week) is recommended as first-line therapy for men and women who are taking oral corticosteroid medication at a dose of ≥ 5 mg/day prednisone or equivalent for a duration of 3 months or more and have a FRAX 10-year risk of hip fracture ≥ 3%. (Consensus-based)
- **Teriparatide**
  - Teriparatide (recombinant PTH) by daily injection is an anabolic agent that is an option for treating osteoporosis in glucocorticoid-treated patients not tolerant of or responsive to other agents. It should be used only after specialist evaluation. (Evidence-based: B)

### MONITORING TREATMENT
- **Bone Mineral Density Testing with DXA**
  - Routine BMD testing by DXA is not recommended for monitoring the rate of bone loss after initiation of treatment in women or men. (Consensus-based)
  - NOTE: A major determinant of fracture risk reduction with bisphosphonate therapy is continuing to take the therapy.

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8 Recommendations on interruption of bisphosphonate therapy can be found in the ‘discontinuation’ section of this guideline.
Bone Turnover Marker Testing

- There is no recommendation for or against routine bone turnover testing with biochemical markers for monitoring women and men taking antiresorptive therapy for osteoporosis. (Evidence-based: I)

DISCONTINUATION OF BISPHOSPHONATE TREATMENT

Bisphosphonate discontinuation

- Bisphosphonate therapy is generally not recommended after 10 years of continuous use. (Weak recommendation)
- There is insufficient evidence to recommend for or against discontinuation of bisphosphonates after 5 to < 10 years of therapy.

Clinical Considerations

- For patients who have taken bisphosphonates for ≥ 5 years, the decision to continue or discontinue treatment may take the following issues into account:
  - For patients at lower risk of fragility fracture, the risk of rare but serious atypical femur fractures may outweigh the relatively small additional reduction in fragility fracture risk conferred by continuing treatment. The primary factor that increases the risk for atypical femur fracture is duration of bisphosphonate use.
    - The risk of atypical femur fracture ranges from ~1 per 50,000 for < 2 years of treatment to ~1 per 1,000 for 8-10 years of treatment.
  - For patients at higher risk of fragility fracture, the benefit of reduced fragility fracture risk may outweigh the potential harms. Factors that may increase the risk of fragility fracture include the following:
    - Prior history of fragility fracture
    - Risk for falling
    - Age (increased risk with increased age, especially > 75 years)
    - Low pre- and post-treatment bone density
    - High-risk pre-treatment FRAX score
- Based on one small study (the FLEX trial), continuous use of alendronate for 10 years reduced the risk for symptomatic vertebral fracture from ~1 in 20 to ~1 in 40, compared to stopping after 5 years of treatment.
  - If bisphosphonate treatment is discontinued, there is little evidence to guide the length of discontinuation, including if and when treatment should resume.
    - The estimated half-life of bisphosphonates is measured in years and is approximately 10 years for alendronate.
    - In the FLEX trial, the relative risk for clinical vertebral fracture began to increase about 2-3 years after alendronate was discontinued.
- Patients with secondary causes of osteoporosis (e.g., rheumatoid arthritis, long-term corticosteroid use) may require additional discussion with their respective specialists.
Screening for Osteoporosis

SCREENING TESTS

**Bone Mineral Density Testing with Dual Energy X-ray Absorptiometry (DXA)**
- **Measurement Sites**
  - When BMD testing is indicated, the total proximal femur (total hip), femoral neck, and lumbar spine are recommended measurement sites for DXA to predict risk of osteoporotic fracture in women and men. (Evidence-based: B)
- **Alternative Measurement Sites**
  - DXA of the forearm (distal one-third of the radius) is an option for patients in whom hip and spine BMD cannot be measured or interpreted. (Evidence-based: B)
- **T-score Interpretation**
  - The lowest T-score from the measurements of the total hip, femoral neck, and lumbar spine (L1 to L4, composite score) is recommended to establish a diagnosis of osteoporosis (T-score ≤ -2.5) or low BMD (T-score -1.1 to -2.4). (Consensus-based)

SCREENING AGE

**Women**
- **Post-menopausal Women**
  - Age ≥ 65 years
    - A bone mineral density (BMD) test by DXA is recommended for postmenopausal women aged 65 or older who are not on drug treatment for osteoporosis. (Evidence-based: B)
  - Age < 65 years
    - For postmenopausal women under age 65, a BMD test by DXA is an option when selected risk factors are present. (Consensus-based)
- **Pre-menopausal Women**
  - Routine screening for osteoporosis with a BMD test by DXA is not recommended for premenopausal women. (Consensus-based)

**Men**
- Screening with DXA is an option for men aged 70 or older with risk factors. (Consensus-based)

SCREENING INTERVALS

**DXA Screening Intervals**
- **Post-menopausal Women**
  - For women aged 65 years or older who are not taking prescription antifracture medication (and who have had a baseline BMD test), future rescreening for low BMD with DXA is an option. (Weak recommendation)
- **Clinical Considerations**
  - Clinicians should assess the patient's willingness to initiate treatment before deciding to rescreen.
  - Clinicians should consider calculating a current FRAX score using the patient's most recent T-score to make rescreening and treatment decisions.
If DXA testing is obtained, suggested rescreening intervals based on initial T-score (lowest T-score from total hip, femoral neck, or lumbar spine) are as follows:

**TABLE 1: Initial T-Score Suggested Minimum Interval**

<table>
<thead>
<tr>
<th>Initial T-Score</th>
<th>Suggested Minimum Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ -1.4</td>
<td>10 years</td>
</tr>
<tr>
<td>-1.5 to -1.9</td>
<td>5 years</td>
</tr>
<tr>
<td>-2.0 to -2.4</td>
<td>2 years</td>
</tr>
</tbody>
</table>

**TERMINOLOGY**

<table>
<thead>
<tr>
<th>Recommendation Language</th>
<th>Strength*</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start, initiate, prescribe, treat, etc.</td>
<td>Strong affirmative</td>
<td>Provide the intervention. Most individuals should receive the intervention; only a small proportion will not want the intervention.</td>
</tr>
<tr>
<td>Consider starting, etc.</td>
<td>Weak affirmative</td>
<td>Assist each patient in making a management decision consistent with personal values and preferences. The majority of individuals in this situation will want the intervention, but many will not. Different choices will be appropriate for different patients.</td>
</tr>
<tr>
<td>Consider stopping, etc.</td>
<td>Weak negative</td>
<td>Assist each patient in making a management decision consistent with personal values and preferences. The majority of individuals in this situation will not want the intervention, but many will. Different choices will be appropriate for different patients.</td>
</tr>
<tr>
<td>Stop, do not start, etc.</td>
<td>Strong negative</td>
<td>Do not provide the intervention. Most individuals should not receive the intervention; only a small proportion will want the intervention.</td>
</tr>
</tbody>
</table>

*Refers to the extent to which one can be confident that the desirable effects of an intervention outweigh its undesirable effects.

**DISCLAIMER**

This guideline is informational only. It is not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by practitioners, considering each patient’s needs on an individual basis. Guideline recommendations apply to populations of patients. Clinical judgment is necessary to design treatment plans for individual patients.