

Implementing the NOF Guidelines in Everyday Practice

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This pocket guide, based on the National Osteoporosis Foundation's 2008 updated *Clinician's Guide to Prevention and Treatment of Osteoporosis*, is designed to serve as a quick reference tool to aid clinicians in managing patients who have or are at risk for osteoporosis. This guide focuses on risk factors for osteoporosis and the criteria used for its diagnosis; it also provides practical information for implementing the updated guidelines in everyday practice.

Table 1. Risk Factors Associated With the Development of Osteoporosis.¹

Major Risk Factors	
<ul style="list-style-type: none"> • Age – Female >65 years; Male >70 years* • Prior nontraumatic fracture occurring after age 40* 	
<ul style="list-style-type: none"> • Low estrogen levels in women and low testosterone in men • Low body weight in men and women (<127 lbs) • Smoker or history of smoking • Height loss • First-degree relative with osteoporosis • Certain diseases • Certain medications 	
Diseases Commonly Associated With Osteoporosis	Medications Commonly Associated With Osteoporosis
<ul style="list-style-type: none"> • Celiac disease • Chronic obstructive pulmonary disease/asthma • Hyperparathyroidism • Hyperthyroidism • Inflammatory bowel disease • Renal stone disease • Rheumatoid arthritis 	<ul style="list-style-type: none"> • Antiepileptics • Aromatase inhibitors • Glucocorticoids • Proton pump inhibitors • Selective serotonin reuptake inhibitors • Thiazolidinedione agents

*The presence of either of these risk factors suggests that bone mineral density (BMD) testing should occur, independent of any other risk factor.

All postmenopausal women and men ≥50 years of age should be evaluated for osteoporosis risk to determine the need for BMD testing.

The two most important risk factors associated with the development of osteoporosis are age and fracture history:

- Men >70 and women >65 years of age
- Patients with a nontraumatic fracture occurring after age 40 should undergo BMD testing

Other risk factors have been shown to increase the risk of developing osteoporosis, such as:

- Low estrogen levels in women
- Low testosterone in men
- Low body weight

Clinicians need to be aware of the secondary causes of osteoporosis, which are related to certain medications or disease states.

Table 2. Common Sources of Calcium.²

Dietary Calcium (mg)	Calcium-Enriched Food (mg)	Supplemental Calcium
Milk (285–302)	Breakfast cereals (100–1,000)	Calcium carbonate
Cheese (275–306)	Fortified orange and other fruit juices (200–600)	Calcium citrate
Yogurt (245–415)	Breads/English muffins (31)	
Sardines (270)	Drink mix ³ (40)	
Tofu (138–204)		
Salmon (205)		
Chocolate pudding made with 2% milk (153)		

Calcium is an important element in the maintenance of bone health. The recommended daily intake of calcium for adult patients is 1,200 mg per day. Dietary modification and/or the use of calcium supplements should be considered in patients who are not receiving adequate amounts of calcium. The use of supplemental calcium should be restricted to no more than 50% of a patient's total daily calcium intake.

The most common supplemental sources are calcium citrate and calcium carbonate. The carbonate form is used frequently because it is inexpensive and contains more calcium per pill than the citrate form. Calcium citrate can be taken with or without food; calcium carbonate must be taken with food. Calcium citrate is recommended in patients with gastric acidity.

For patients who are lactose intolerant, aside from the use of supplements, there are multiple nondairy sources of calcium. When a patient is severely sensitive to lactose, an over-the-counter lactase enzyme replacement may be suggested.

Table 3. Lactose-Free Sources of Calcium.²

Food	Calcium (mg)
Soy milk, fortified, 1 cup	200–300
Sardines, with edible bones, 3 oz	270
Salmon, canned with edible bones, 3 oz	205
Broccoli, raw, 1 cup	90
Orange, 1 medium	50
Pinto beans, 1/2 cup	40
Tuna, canned, 3 oz	10
Lettuce greens, 1/2 cup	10

Table 4. Calcium Intake Calculator.⁴

Product	Servings/day	Estimated calcium/serving (mg)	Calcium (mg)
Milk (8 oz)	_____	× 300 =	_____
Yogurt (8 oz)	_____	× 400 =	_____
Cheese (1 oz)	_____	× 200 =	_____
Fortified foods or juices	_____	× 80 to 1,000* =	_____
Estimated total from other foods with smaller amounts of calcium			250
Total daily calcium intake		=	_____

*Calcium content of fortified food varies. Check package label.

This calculator can be given to patients so that they can estimate their average daily calcium intake.

Table 5. Dietary Sources of Vitamin D.⁵

Food	IUs per serving*	Percent DV [†]
Cod liver oil, 1 tablespoon	1,360	340
Salmon, cooked, 3.5 ounces	360	90
Mackerel, cooked, 3.5 ounces	345	90
Tuna fish, canned in oil, 3 ounces	200	50
Sardines, canned in oil, drained, 1.75 ounces	250	70
Milk, nonfat, reduced fat, and whole, vitamin D-fortified, 1 cup	98	25
Margarine, fortified, 1 tablespoon	60	15
Ready-to-eat cereal, fortified with 10% of the DV for vitamin D, 0.75–1 cup (more heavily fortified cereals might provide more of the DV)	40	10
Egg, 1 whole (vitamin D is found in yolk)	20	6
Liver, beef, cooked, 3.5 ounces	15	4
Cheese, Swiss, 1 ounce	12	4

*International units; [†]Daily value

Vitamin D plays an important role in the absorption of calcium. Vitamin D deficiency is associated with muscle weakness and poor balance, both of which can increase the risk of falling. The recommended daily dose of vitamin D is 1,000 IU for patients 50 and older. There are a number of dietary and fortified sources of vitamin D. Examples of both sources of vitamin D are listed in the table above. Both dietary and supplemental forms of vitamin D should be considered if a patient has vitamin D deficiency.

Table 6. Vitamin D Intake Calculator.

Product	Servings/day	Estimated Vitamin D/ serving (IUs)	Vitamin D (IUs)
Cod liver oil, 1 tablespoon	_____	× 1,360 =	_____
Salmon, cooked, 3.5 ounces	_____	× 360 =	_____
Mackerel, cooked, 3.5 ounces	_____	× 345 =	_____
Tuna fish, canned in oil, 3 ounces	_____	× 200 =	_____
Sardines, canned in oil, drained, 1.75 ounces	_____	× 250 =	_____
Milk, nonfat, reduced fat, and whole, vitamin D-fortified, 1 cup	_____	× 98 =	_____
Margarine, fortified, 1 tablespoon	_____	× 60 =	_____
Ready-to-eat cereal, fortified with 10% of the DV for vitamin D, 0.75–1 cup (more heavily fortified cereals might provide more of the DV)	_____	× 40 =	_____
Egg, 1 whole (vitamin D is found in yolk)	_____	× 20 =	_____
Liver, beef, cooked, 3.5 ounces	_____	× 15 =	_____
Cheese, Swiss, 1 ounce	_____	× 12 =	_____
Total vitamin D intake		=	_____

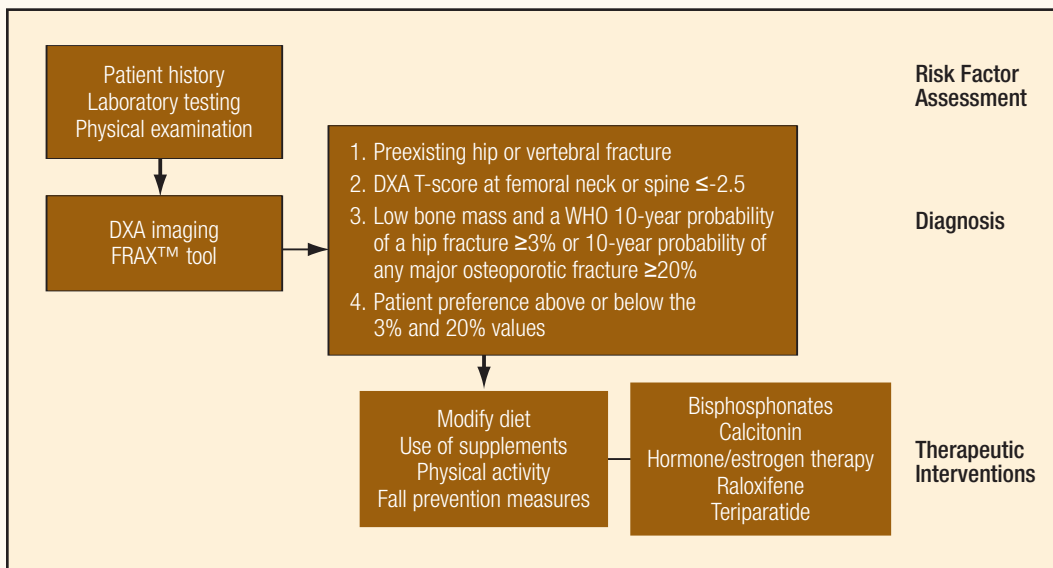
This calculator should be used to determine if a patient is receiving the proper daily intake of vitamin D.

Table 7. FDA-Approved Agents for Osteoporosis.

	Location of Antifracture Activity			Indicated Use	
	Hip	Spine	Nonvertebral	Treatment	Prevention
Antiresorptive Agents (Bisphosphonates)					
Alendronate ⁶	X	X	X	X	X
Ibandronate ⁷		X		X	
Risedronate ^{8,9}	X	X	X	X	X
Zoledronic acid ¹⁰	X	X	X	X	
Antiresorptive Agents					
Calcitonin ¹¹		X		X	
Estrogen+progesterone ¹²	X	X (all fractures)	X		X
Raloxifene ¹³		X		X	X
Anabolic Agent					
Teriparatide ¹⁴		X	X	X	

There are many treatment options for the management of osteoporosis. Treatments are divided into two major classes, antiresorptive agents (which reduce bone resorption) and anabolic agents (which build bone). Not all agents are similarly efficacious at reducing fracture risk, so it is important to know which agents are most beneficial against which types of fractures.

Figure 1. Algorithm for the management of osteoporosis.¹



Osteoporosis management is a multistep process that begins with a thorough patient history, complete physical examination, and routine laboratory tests. This is essential for risk factor evaluation for primary or secondary osteoporosis. Assessment includes:

- Dual energy x-ray absorptiometry (DXA) imaging to determine bone mineral density
- Analysis with the FRAX™ tool (<http://www.shef.ac.uk/FRAX>) to determine the 10-year probability of hip fracture and/or osteoporotic fracture*†

A T-score ≤ -2.5 at the femoral neck or spine indicates the presence of osteoporosis, and treatment should be initiated. In addition, patients who present with hip, vertebral, or nontraumatic fracture meet the criteria for osteoporosis. Pharmacologic treatment is recommended in these patients. Other recommendations to ensure the optimal maintenance of bone health should also be made:

- Dietary modification to ensure adequate calcium and vitamin D
- Appropriate exercise programs
- Fall prevention strategies

In patients with low bone mass (T-score between -1 and -2.5), the FRAX™ tool can help clinicians and patients determine the suitability of beginning therapy for osteoporosis based on assessment of the risks and benefits associated with various therapies, and the patient's individual history.

*T-score must first be converted to a T-score based on the reference standard used in FRAX™. Entering T-scores that have not been converted will alter the risk assessment and over estimate risk. The FRAX™ patch utility (available at www.nof.org/frax_patch_full.htm) is a downloadable software program that accounts for the inherent variability between densitometers and provides a more accurate assessment of fracture risk.

†**UPDATE:** The FRAX™ tool has been updated so that use of the FRAX™ patch is no longer necessary. The calculations used in the FRAX™ patch are now located in a pull down menu that is integrated into the FRAX™ tool.

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