

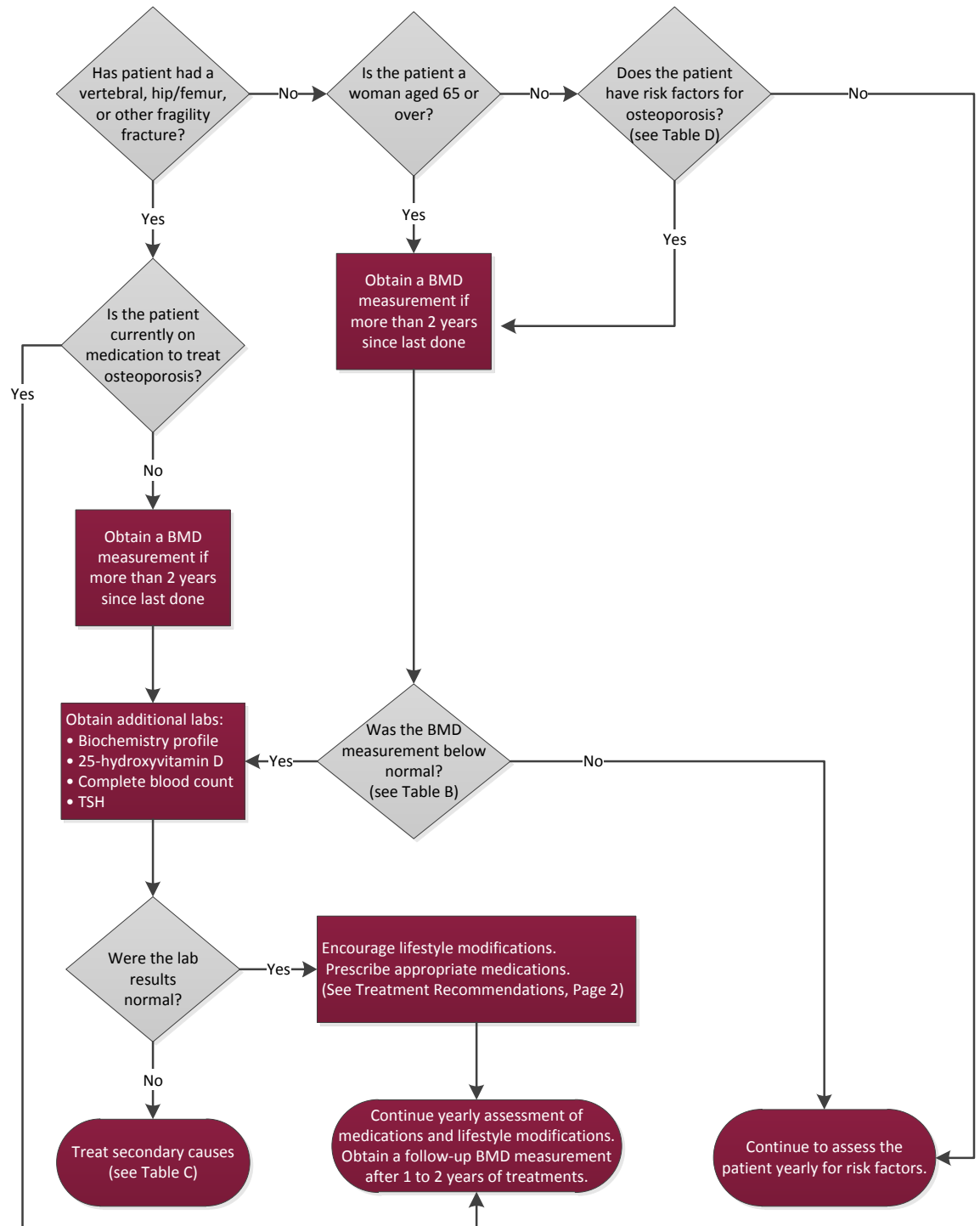
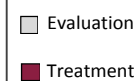
Osteoporosis Clinical Guideline

Definition: Osteoporosis is a multifactorial skeletal disease characterized by low bone mineral density with micro-architectural disruption and skeletal fragility resulting in decreased bone strength and an increased risk of fracture.

Causes: Osteoporosis is the result of an inadequate intake of calcium and vitamin D, lack of weight-bearing exercise, and/or lack of estrogen. It is also associated with hormonal disorders like hyperparathyroidism or chronic diseases that interfere with mobility. Certain medications, such as glucocorticoids, can also induce osteoporosis.

Quick Guide to Osteoporosis Care

- Diagnosis should be made by a bone minerals density (BMD) test.
- Patients should be tested and treated for secondary causes of osteoporosis (see Table C).
- Treatment includes lifestyle modification and bisphosphonates as first-line medication.
- If the patient has a fragile fracture, osteoporosis treatment is indicated even if the BMD test results are normal.
- Treatment should also continue even if follow-up BMD test results are normal after 1 to 2 years of treatment.



Treatment should begin by addressing potentially modifiable risk factors such as excess alcohol consumption, tobacco use, nutrition, and physical activity levels.

Diagnosis

A bone mineral density (BMD) test is used to diagnose Osteoporosis (see Table A).

- The result of this test is reported as a T-score. The World Health Organization (WHO) established a classification of BMD according to the standard deviation difference between a patient's BMD and that of a young adult reference population (T-score).
- A dual energy x-ray absorptiometry (DXA) gives an accurate estimate of bone mineral density.

Evaluation

The goal of the evaluation is to rule out secondary causes of low bone mass, such as hyperparathyroidism and to detect treatable causes or contributing factors of osteoporosis.

Postmenopausal women with a low BMD (T-score below -2.5) and/or a fragility fracture should have the following tests:

- Biochemistry profile (calcium, phosphorus, albumin, total protein, creatinine, liver enzymes, electrolytes)
- 25-hydroxyvitamin D
- Complete blood count
- Thyroid-stimulating hormone

Additional evaluation for women with abnormalities on the initial laboratory testing includes:

- Women with anemia and/or low vitamin D levels should be tested for celiac disease
- Serum PTH should be measured in patients with hypercalcemia, hypercalciuria, history of renal stones, or osteopenia
- Urinary cortisol excretion should be measured if Cushing's syndrome is suspected and in patients with unexplained osteoporosis and vertebral fracture.

Treatment

Lifestyle modifications should be encouraged for all adults with low bone mass (osteopenia and osteoporosis). These include:

- Dietary calcium intake of 1000 to 1200 mg daily
- Vitamin D3 intake of 800 to 1000 IU for ages 50 and over
- Regular weight-bearing exercise
- Smoking cessation
- Achievement of healthy weight (BMI 20.0 - 24.9)
- Moderation of alcohol consumption

Drug therapy is recommended for:

- History of fragility fracture of hip or spine
- BMD values consistent with osteoporosis (see Table B).

Treatment *continued...*

Medications

- First-line treatments to consider are bisphosphonates* (alendronate, risedronate, ibandronate, zoledronic acid) and denosumab.
- Selective estrogen receptor modulators (SERMs), such as raloxifene and tamoxifen, have been shown benefit for vertebral fractures, should not be used in menstruating women as they block estrogen action on the bone, leading to further bone loss.
- Parathyroid hormone (teriparatide) is often reserved for patients with severe osteoporosis with duration of therapy limited to 2 years.

***Bisphosphonates Warning:**

In bisphosphonate use rare complications can occur, such as osteonecrosis of the jaw (ONJ) or atypical femur fractures. Risk factors for developing ONJ include cancer and anticancer therapy, invasive dental procedures (dental extractions, dental implants), poorly fitting dentures, glucocorticoids, smoking, diabetes and preexisting dental disease. Patients who are being treated with bisphosphonates for osteoporosis and develop ONJ, bisphosphonates should be discontinued. Other rare complication is atypical femur fractures which evolve over time, patient typically experience onset of symptoms such as dull or aching pain in the groin or thigh. Patients who are being treated with bisphosphonates and experience an atypical fractures or stress reaction on radiographs, bisphosphonates should be discontinued and should be prescribed adequate calcium and vitamin D supplements. These patients may require orthopedic intervention depending upon the radiographs and degree of pain.

Follow Up

- An appropriate point to repeat a DXA is after one to two years of treatment and every two years thereafter.
- A repeat DXA is performed to check if the patient is responding to treatment. If DXA results are normal, continue medication.
- If there is no improvement, consider adjusting the patient's medication.
- For untreated postmenopausal women, repeat DXA testing is not useful until two to five years have passed and reinforce osteoporosis prevention .
- Consider a "bisphosphonate holiday" after 5 years of stability in moderate-risk patients and after 6-10 years in high-risk patients.
- Consider drug holiday for zoledronic acid after 3 annual doses.

Table A: Indications for BMD Testing

Consider BMD testing in the following individuals:
Women who are age 65 or older and men who are age 70 and older, regardless of clinical risk factors.
Younger postmenopausal women, women in the menopausal transition, and men who are age 50 to 69 with clinical risk factors for fracture.
Adults who have a fracture after the age of 50.
Adults with a condition (e.g., rheumatoid arthritis) or take a medication (e.g., glucocorticoids in a daily dose greater than or equal to 5 mg prednisone or equivalent of three months or more) associated with low bone mass or bone loss.
Monitor osteoporosis treatment effects

Table B: WHO Definition of Osteoporosis Based on BMD

Classification	BMD	T-Score
Normal	Within 1 SD of the mean level for a young adult reference population	At -1.0 and above
Low Bone Mass (Osteopenia)	Between 1.0 and 2.5 SD below that of the mean level for a young adult reference population	Between -1.0 and -2.5
Osteoporosis	2.5 SD or more below that of the mean level for a young adult reference population	At or below -2.5
Severe or Established Osteoporosis	2.5 SD or more below that of the mean level for a young adult reference population	At or below -2.5 with one or more fractures

Table C: Secondary Causes of Osteoporosis

Acromegaly	Epidermolysis bullosa	Leukemia
Amyloidosis	Gastrectomy	Lymphoma
Ankylosing spondylitis	Hemochromatosis	Malabsorption syndrome
Celiac disease	Hemophilia	Mastocytosis
Chronic active hepatitis	Hyperparathyroidism	Multiple myeloma
Chronic obstructive pulmonary disease	Hyperprolactinemia	Multiple sclerosis
Congenital porphyria	Hyperthyroidism	Pernicious anemia
Cushing's syndrome	Hypogonadism	Rheumatoid arthritis
Diabetes mellitus	Idiopathic scoliosis	Sarcoidosis
Eating disorders	Inflammatory bowel disease	Sickle cell anemia
Endometriosis		Thalassemia

Table D: Risk Factors for Osteoporosis

Non-Modifiable	Potentially Modifiable
Caucasian/European or Asian Ethnicity	Dietary — low body weight (< 127 lbs or BMI < 20) Inadequate calcium and/or vitamin D Excessive phosphate/protein
Increasing Age and Female	Lifestyle — lack of weight-bearing exercise, sedentary
Nulliparity	Social — current tobacco use, > 2 alcoholic drinks/day
Family History of Osteoporosis including kyphosis, previous fragility fractures, and low trauma fracture after 50	Medication — Long-term use of corticosteroids, excess thyroid hormone replacement, chronic heparin or anti-seizure medication use, chemotherapy, tamoxifen, lithium, radiation therapy

Table E: Institutes of Medicine Recommended Allowances for Calcium and Vitamin D

Age	Calcium Recommended Dietary Allowance (mg/day)	Vitamin D Recommended Dietary Allowance (intl. units/day)
9 to 18	1,300	600
19 to 50	1,000	600
51 to 70	1,200	600
71 and up	1,200	800

Table E: Conditions, Diseases, and Medications that Cause or Contribute to Osteoporosis and Fractures

Lifestyle Factors		
Alcohol abuse	Excessive thinness	Excess Vitamin A
Frequent falling	High salt intake	Immobilization
Inadequate physical activity	Low calcium intake	Smoking (active or passive)
Vitamin D insufficiency		
Genetic Diseases		
Cystic fibrosis	Ehlers-Danlos	Gaucher's disease
Hypophosphatasia	Marfan syndrome	Menkes steely hair syndrome
Osteogenesis imperfecta	Parental history of hip fracture	Porphyria
Riley-Day syndrome		
Hypogonadal states		
Androgen insensitivity	Anorexia nervosa	Athletic amenorrhea
Hyperprolactinemia	Panhypopituitarism	Premature menopause (less than 40 yrs)
Turner's & Klinefelter's syndromes		
Endocrine Disorders		
Central obesity	Cushing's syndrome	Diabetes mellitus (Types 1 & 2)
Hyperparathyroidism	Thyrotoxicosis	
Gastrointestinal Disorders		
Celiac disease	Gastric bypass	Gastrointestinal surgery
Inflammatory bowel disease	Malabsorption	Pancreatic disease
Primary biliary cirrhosis		
Hematologic Disorders		
Hemophilia	Leukemia and lymphomas	Monoclonal gammopathies
Multiple myeloma	Sickle cell disease	Systemic mastocytosis
Thalassemia		
Rheumatologic and Autoimmune Diseases		
Ankylosing spondylitis	Other rheumatic and autoimmune diseases	
Rheumatoid arthritis	Systemic lupus	
Neurological and Musculoskeletal Risk Factors		
Epilepsy	Multiple sclerosis	Muscular dystrophy
Parkinson's disease	Spinal cord injury	Stroke
Miscellaneous Conditions and Diseases		
Aids/HIV	Alcoholism	Amyloidosis
Chronic metabolic acidosis	Chronic obstructive lung disease	Congestive heart failure
Depression	End stage renal disease	Hypercalciuria
Idiopathic scoliosis	Post-transplant bone disease	Sarcoidosis
Weight loss		
Medications		
Aluminum (in antacids)	Anticoagulants (heparin)	Anticonvulsants
Aromatase inhibitors	Barbiturates	Cancer chemotherapeutic drugs
Depo-medroxyprogesterone (premenopausal contraception)	Glucocorticoids (≥ 5 mg/d prednisone or equivalent for ≥ 3 months)	GnRH (Gonadotropin releasing hormone) agonists
Lithium Cyclosporine A and tacrolimus	Methotrexate	Parental nutrition
Proton pump inhibitors	Selective serotonin reuptake inhibitors	
Tamoxifen® (premenopausal use)	Thiazolidinediones (such as Actos® and Avandia®)	Thyroid hormones (in excess)



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This clinical guideline outlines the recommendations of Mount Carmel Health Partners for this medical condition and is based upon the referenced best practices. It is not intended to serve as a substitute for professional medical judgment in the diagnosis and treatment of a particular patient. Decisions regarding care are subject to individual consideration and should be made by the patient and treating physician in concert.