

Table 23.8 Medications Used to Treat Osteoporosis and Metabolic Bone Disorders

Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
Calcium	Osteomalacia, osteoporosis, hypoparathyroidism.	1000-1500 mg/day.	Cog: 0 S: 0 A: 0 Motor: 0 D: + Com: 0 F: 0	Constipation, gas, kidney stones (rare). Antacids decrease absorption. Take at least 2 h apart from antacids, sucralfate, iron products, laxatives, and tetracycline or quinolone antibiotics like Cipro or Levaquin.
Vitamin D	Osteomalacia, osteoporosis, hypoparathyroidism.	200-800 iu/day; increase to 4000 iu/day with anticonvulsants. For vitamin D deficiency: Dose is 50,000 once/wk to month with calcium level monitoring.	Cog: 0 S: 0 A: 0 Motor: 0 D: + Com: 0 F: 0	Hypercalcemia associated with excessive dosing may cause symptoms of weakness, headache, somnolence, nausea, cardiac arrhythmia, and hypercalciuria. Must use activated form (calcitriol) in patients with renal impairment. Side effects: Excessive dosing can cause hypercalcemia.
Oral bisphosphonates: Alendronate (Fosamax) Risedronate (Actonel) Ibandronate (Boniva)	Osteoporosis, Paget's disease.	Alendronate: 5 mg/day for prevention, 10 mg/day for treatment or 70 mg/wk. Risedronate: 5 mg/day, 35 mg/wk. Ibandronate: 2.5 mg/day by mouth, 150 mg by mouth once monthly, 3 mg IV every 3 mon.	Cog: 0 S: 0 A: 0 Motor: 0 D: ++ Com: 0 F: 0	Heartburn, esophageal irritation or esophagitis, abdominal pain, diarrhea. To prevent esophageal complications, take in the morning with a full glass of water while sitting upright. Serious osteonecrosis of the jaw has been reported. Calcium supplements, antacids, food, and iron supplements interfere with intestinal absorption. Avoid use in patients with renal impairment.
Parenteral bisphosphonates: Pamidronate (Aredia) Zoledronate (Reclast, Zometa)	Osteoporosis, Paget's disease; also used in treating bone metastasis, multiple myeloma, and hypercalcemia associated with malignancy and Paget's disease.	Pamidronate: 60-90 mg IV over 2-24 h. Paget's disease: 30 mg IV daily for 3 days. Zoledronate: 5 mg IV over 15 min once yearly for osteoporosis; 4 mg IV over 15 min for treatment of hypercalcemia associated with malignancy, may retreat	Cog: 0 S: 0 A: 0 Motor: 0 D: ++ Com: 0 F: 0	Bisphosphonates given intravenously have been associated with nephrotoxicity, which increases with higher doses and rapid intravenous administration. Longer administration times decrease risk of nephrotoxicity. Avoid use in patients with renal impairment.

From L. Carl, J. Gallo, and P. Johnson, 2014, *Practical Pharmacology in Rehabilitation: Effect of Medication on Therapy* (Champaign, IL: Human Kinetics).

Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
		after 7 days if needed.		
Raloxifene (Evista)	Oral selective estrogen receptor modulator used for treatment of osteoporosis.	60 mg/day.	Cog: 0 S: 0 A: 0 Motor: + D: 0 Com: 0 F: +	Hot flashes, leg cramps, thromboembolic events. Used in postmenopausal women; also used to reduce the risk of breast cancer.
Calcitonin Intramuscular, subcutaneous injection, or intranasal spray	Osteoporosis, Paget's disease, hypercalcemia, bone metastases.	For Paget's disease: 100 units/day initially and then reduced to 50 units/day; 200 units by intranasal spray daily for osteoporosis.	Cog: 0 S: 0 A: 0 Motor: 0 D: + Com: 0 F: 0	Nasal formulation: Runny nose, nausea, hand swelling, urticaria, intestinal cramping. Injection: Discomfort at injection site. Salmon derivative. Resistance associated with antigen development can occur.
Teriparatide (Forteo)	Recombinant form of parathyroid hormone used for treatment of osteoporosis.	20 mcg by subcutaneous injection once/day.	Cog: 0 S: 0 A: 0 Motor: ++ D: ++ Com: 0 F: ++	Pain at injection site, nausea, leg cramps, headache, dizziness. Increases formation of new bone; synthetic parathyroid hormone fragment.
Cinacalcet (Sensipar)	Calcimimetic used in the treatment of secondary hyperparathyroidism in patients with chronic kidney disease on dialysis, hypercalcemia in patients with parathyroid cancer.	For hypercalcemia in kidney failure: Start at 30 mg/day by mouth and titrate up every 2-4 wk to a maximum of 180 mg/day or to normal calcium levels. For treatment of parathyroid cancer: Dosing starts at 30 mg orally twice/day and titrate up every 2-4 wk to maximum dose of 90 mg 4 times/day or maintain parathyroid hormone level between 150 and 300 pg/ml.	Cog: 0 S: 0 A: 0 Motor: + D: 0 Com: 0 F: 0	Monitor for seizures associated with rapid decreases in calcium or adynamic bone disease with parathyroid levels <100 pg/ml. CYP3A4 inhibitors such as ketoconazole (Nizoral), erythromycin, and itraconazole (Sporanox) and CYP2D6 inhibitors such as beta blockers, flecainide (Tambocor), vinblastine, and tricyclic antidepressants can increase levels and effects of cinacalcet. Phosphate binders, vitamin D, bisphosphonates, calcitonin, and glucocorticoids can interfere with the action of cinacalcet.

From L. Carl, J. Gallo, and P. Johnson, 2014, *Practical Pharmacology in Rehabilitation: Effect of Medication on Therapy* (Champaign, IL: Human Kinetics).

Cog = cognition; S = sedation; A = agitation or mania; Motor = discoordination; D = dysphagia; Com = communication; F = falls; IV = intravenously; iu = international units.

The likelihood rating scale for encountering the side effects is as follows: 0 = Almost no probability of encountering side effects. + = Little likelihood of encountering side effects. +/+ = Low probability of encountering side effects; however, probability increases with increased dosage. ++ = Medium likelihood of encountering side effects. +++ = High likelihood of encountering side effects, particularly with high doses. ++++ = Highest likelihood of encountering side effects; best to avoid in at-risk patients.