

Table 1. Exercise practice key points and definitions (1-10)

Encourage a variety of types and intensities of physical activity as in the Canadian 24-Hour Movement Guidelines (<https://csepguidelines.ca>) but **prioritize balance, functional, and resistance training \geq twice weekly.**

↑ **exercise difficulty, pace, frequency, volume (sets, reps) or resistance over time.**

For patients who wish to participate in **impact exercise**:

- only progress to moderate (e.g., running, racquet sports, skipping) or high (e.g., drop or high vertical jumps) impact exercise if appropriate for fracture risk or physical fitness level;
- safety or efficacy is uncertain in individuals at high fracture risk (*history of spine fracture or 10-year fracture risk for major osteoporotic fracture of $\geq 20\%$ calculated by FRAX or Canadian Association of Radiologists and Osteoporosis Canada tools*).

Movements that involve **rapid, repetitive, sustained, weighted, or end range of motion twisting or flexion of the spine** may need to be modified, especially in individuals with a history of spine fracture, or very low spine BMD.

Definitions

What are balance exercises?

Exercises that challenge aspects of balance, such as:

- Shifting body weight to the limits of stability;
- Reacting to things that upset your balance (e.g., catching and throwing a ball);
- Maintaining balance while moving (e.g., Tai chi, heel raises, agility training);
- Reducing base of support (e.g., standing on one foot).

What are functional exercises?

Exercises that improve ability to perform everyday tasks, or do activities for fun or fitness (e.g., chair stands for sit-to-stand ability, stair-climbing to train for hiking).

What is resistance training (or strength training, muscle strengthening exercises)?

Exercises where major muscle groups (e.g., upper and lower extremities, chest, shoulders, back) work against resistance (e.g., squats, lunges, and push-ups). Increase volume (e.g., sets, reps, weight), frequency, or difficulty to achieve **progressive overload**. Many resistance training exercises would be considered functional exercises.

Table 2. Nutrition key points (18, 19)

Recommended dietary allowances (RDA)

- Calcium*:
 - Men
 - 51-70 years: 1000 mg calcium/day
 - >70 years: 1200 mg calcium/day
 - Women
 - >50 years: 1200 mg calcium/day
 - Vitamin D:
 - Men and Women
 - ≤70 years: 600 IU vitamin D/day
 - >70 years: 800 IU vitamin D/day
- To meet the RDA, Health Canada recommends a supplement of 400 IU/day*****
- Protein:
 - Men and Women
 - >50 years: 0.8 g protein/kg body weight/day

Examples of common dietary sources

- Calcium-rich foods:
 - milk products (milk, yogurt, cheese)
 - fortified beverages (plant-based, orange juice)
 - canned salmon (with bones)
- Vitamin D-rich foods:
 - fatty fish (salmon, rainbow trout)
 - fortified foods (cow's milk, plant-based beverages)
 - eggs
- Protein-rich foods:
 - beef, pork, chicken, fish, eggs, milk products
 - legumes, beans, nuts, seeds
- **See Nutrition Resources and Tools on the OC website for additional information**
(<https://osteoporosis.ca/nutrition/>)
- **Consult with a registered dietitian when a nutritional assessment may be warranted.**

*Calcium refers to elemental calcium

**Health Canada 2022. <https://food-guide.canada.ca/en/applying-guidelines/advice-vitamin-mineral-supplementation/#vitamin-d>

Table 3. Biochemical testing for secondary causes of osteoporosis, and for potential limitations when considering specific osteoporosis pharmacotherapy (17)

- Calcium, corrected for albumin
- Phosphate
- Creatinine (eGFR)
- Alkaline phosphatase
- Thyroid-stimulating hormone
- Serum protein electrophoresis (for patients with vertebral fractures)
- 25-hydroxyvitamin D, if risk factors for insufficiency or starting potent antiresorptive therapy

Table 4. Risk factors for vitamin D insufficiency/deficiency* (11-16)

- Malabsorption syndromes (e.g. inflammatory bowel disease, celiac disease, bariatric surgery, gastrectomy)
- Reduced skin synthesis (e.g. limited sun exposure, increased skin pigmentation)
- Liver failure/cirrhosis
- Nephrotic syndrome
- Chronic kidney disease/renal failure
- Medication affecting vitamin D metabolism (e.g. anticonvulsants, glucocorticoids, antiretroviral agents)
- Parathyroid disorders (e.g. hypoparathyroidism, hyperparathyroidism)

*Vitamin D sufficiency is estimated by measuring serum 25-hydroxyvitamin D (25OHD).

The optimal serum 25-hydroxyvitamin level for bone health is uncertain, however the following definitions are widely accepted (18):

- <30 nmol/L - high risk of vitamin D deficiency
- 30 to <50 nmol/L - potential risk of inadequacy for bone health
- ≥50 nmol/L - generally considered adequate for bone and overall health in healthy individuals
- >125 nmol/L - linked to potential adverse effects

Table 5. Causes of secondary osteoporosis or that have adverse effect on bone health (15, 20-27)		
Drugs	Endocrine disorders	Gastrointestinal & Nutritional disorders
Glucocorticoid steroids Aromatase inhibitors Anticonvulsants (particularly phenytoin, phenobarbital) GnRH agonists and antagonists Androgen-deprivation agents Cancer chemotherapy Immunosuppressants (eg. cyclosporine)	Hyperparathyroidism Hyperthyroidism Hypercortisolism/Cushing’s syndrome Diabetes mellitus (Type 1 & Type 2) Prolonged premature hypogonadism Acromegaly	Inflammatory bowel disease Celiac disease Bariatric surgery Pancreatic insufficiency Other malabsorptive syndromes Primary biliary cholangitis Chronic liver disease Eating disorder Malnutrition Parenteral nutrition Vitamin D and/or calcium deficiency
Rheumatologic disorders	Genetic disorders	Other disorders
Rheumatoid arthritis Other inflammatory arthritis disorders Systemic lupus erythematosus	Osteogenesis imperfecta Hypophosphatasia Other genetic causes of osteomalacia	Multiple myeloma Other marrow-related disorders Idiopathic hypercalciuria Chronic kidney disease/renal failure Chronic obstructive pulmonary disease Organ transplantation Multiple sclerosis Parkinson’s disease Other neuromuscular disorders Prolonged immobilization Paget’s disease Acquired causes of osteomalacia

Table 6. Clinical assessment to identify who to send for imaging to rule out vertebral fractures (28-31)	
Measure	Cut off value to recommend spine imaging
Measure height	Historical height loss > 6 cm Prospective height loss > 2cm
Measure rib to pelvic distance	≤ 2 fingerbreadths
Measure occiput to wall distance	>5 cm

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