

OSTEOPOROSIS

Bottom Line 'Evidence-Informed' Recommendations for Children/Youth with Cerebral Palsy who are Non-Ambulatory and at risk for or have Osteoporosis

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DEFINITIONS

Osteoporosis: In children, the diagnosis of osteoporosis is based on two criteria: i) the presence of low Bone Mineral Density (BMD) defined as a z-score less than -2.0 on a DXA* scan, and ii) the presence of a significant fracture history (long-bone fracture of the lower extremities, vertebral compression fracture, or two or more long-bone fractures of the upper extremities).

*Dual Energy X-ray Absorptiometry (DXA) Scan: Measures bone mineral content per unit of area. In children it is important that results are compared to pediatric reference data and reported as z scores adjusted for the child's age, sex and height. Order a lateral distal femur or whole body scan.

IMPACT: WHY IS OSTEOPOROSIS IMPORTANT?

- Individuals with a physical disability such as cerebral palsy (CP) are at risk for fragility fractures (osteoporosis) secondary to osteopenia from decreased weight-bearing. Other risk factors often co-exist including poor nutrition with decreased calcium and vitamin D intake, vitamin D deficiency from decreased exposure to sunlight and medications that lower bone density (e.g. some anticonvulsants).
- Osteopenia paired with trauma (e.g. falls) can lead to painful fragility fractures. Individuals with CP who are non-ambulatory have a 20% chance of having a fragility fracture. Frequently these involve the shaft of the long-bones such as the distal femur.

Target Population: Children/youth with CP who are non-ambulatory and at risk for or have osteoporosis

Target Clinical Providers: Physicians, Therapists and Nurses caring for children/youth with non-ambulatory CP

PREVENTION STRATEGIES

Three prevention strategies are recommended:

1. **Nutrition and Calcium (Ca):** Review the child's growth charts and assess for decreasing weight velocity and/or low body mass index and if present provide nutritional counselling. Complete a dietary history to estimate Ca intake (see

section 3 for dietary Ca food reference chart) and check that intake is in the recommended range for age (700 mg elemental Ca for 1 to 3 years of age, 1000 mg for 4 to 8 years of age, and 1300 mg for 9 to 18 years of age). If dietary Ca intake is low, provide dietary counselling to increase Ca through the diet (the dietary route is preferred to avoid constipation caused by supplemental Ca).

2. **Vitamin D2/D3 (VitD) Supplementation:** Vitamin D is important for healthy bones and can be low in individuals who have poor nutritional intake or decreased exposure to sunlight. Supplement with regular VitD2/3 (800-1000 international units per day) if the individual lives in a northern climate or has decreased sun exposure as the non-hydroxylated version is very safe. If possible check 25-OH vitamin D levels at baseline and then repeat after 6 months to ensure that the individual is in the 'normal' range.

3. **Weight Bearing:** Bearing weight increases bone mineral density. Organize a physiotherapy consult to develop a weight bearing program (e.g. use of a standing frame).

TREATMENT OF FRAGILITY FRACTURES

If an individual with CP has a fragility fracture order additional investigations. These can include bloodwork (Ca, Phosphate, Parathyroid Hormone), an X-ray of the fracture site, and a DXA scan to determine bone mineral density. Ensure adequate nutrition, Ca and Vit D status. Consult with a pediatric orthopedist for fracture management.

Bisphosphonates should also be considered in children although the long-term safety on growing bones is unknown. Bisphosphonates help to build bone density by suppressing bone resorption. Consultation with a bone specialist (endocrinologist, orthopedist, physician with special interest in bone health) is recommended. In children, bisphosphonates are typically given intravenously three to four times per year rather than orally.



Flow Diagram for Evidence-Informed Clinical Practice Guideline for Children/Youth with Cerebral Palsy at risk for or have Osteoporosis

Color Legend for Level of Treatment Evidence

- Effective
- Probably or Possibly Effective
- Data Inadequate (recommendation based on expert opinion)

