Vitamin D Deficiency

FAST FACTS

400 IU/day
recommended daily allowance of Vitamin D for babies <1

600–1000 IU/daily
RDA of Vitamin D for children 1+

All cow's milk is fortified at 100 IU/8 oz. of Vitamin D.

WHEN TO REFER

Refer patients to the Division of Endocrinology who:

- Have signs of rickets despite a 25-OHD level >20ng/dL
- Continue to have 25-OHD level <20ng/dL labs despite 8–12 weeks of recommended treatment

To refer a patient, discuss a case or for more information, contact the Division of Endocrinology at 513-636-4744.

Vitamin D deficiency can be caused by a lack of dietary Vitamin D, malabsorption/metabolic issues and insufficient sunlight exposure. The deficiency can develop into rickets (a softening and weakening of bones). Rickets can cause skeletal deformity, pain in the spine, pelvis and legs, and delayed gross motor milestones. Due to its association with growth plates, rickets is only seen in babies and children. However, severe Vitamin D deficiency can occur in children of any age and cause hypocalcemic-related tetany and seizures.

ASSESSMENT

Perform a history and physical (HPE) for children at higher risk of vitamin D deficiency:

- Breast-fed infants
- Infants on less than 16 oz/day of formula
- Children with darker complexions and limited sun exposure, especially between November and May in the Cincinnati area
- Children with certain chronic conditions that cause malabsorption of nutrients, such as Crohn's and celiac disease
- Children with any dietary restrictions

Look for physical signs of rickets:

- Bowing deformities
- Delayed walking
- Poor linear growth
- Knobby deformities ("rosary beads") across the costochondral junction
- Widening of the wrists/ankles

Ask about a family history of rickets, which raises concern for a non-nutritional form of the disease.

HPE (HISTORY AND PHYSICAL EXAM) RED FLAGS

- Any physical signs of rickets
- Symptoms of hypocalcemia. Mild symptoms include muscle cramping, weakness or spasms. Severe symptoms include tetany, altered mental status and seizures.

MANAGEMENT/TREATMENT

For children at higher risk with no red flags, encourage meeting daily RDA of Vitamin D daily (either dietary or supplementation).

For infants and young children with physical signs of rickets or mild symptoms of hypocalcemia, initiate screening. Prescribe routine daily Vitamin D supplementation until results come back. Do the same for adolescents with mild symptoms of hypocalcemia (adolescents are less likely to show physical exam findings of rickets).

Screening includes:

- **Bone mineralization labs:** Renal, Phosphate, 25-hydroxyvitamin D (25-OHD), Alkaline phosphate
- **X-ray:** Rickets survey (wrists/knees)

For any patient with severe symptoms of hypocalcemia, refer to the ED.

See next page for recommended treatment.

If you would like additional copies of this tool, or would like more information, please contact the Physician Outreach and Engagement team at Cincinnati Children's.

Tool developed by Cincinnati Children's physician-hospital organization (known as Tri-State Child Health Services, Inc.) and staff in the James M. Anderson Center for Health Systems Excellence. Developed using expert consensus and informed by Best Evidence Statements, Care Practice Guidelines, and other evidence-based documents as available. For Evidence-Based Care Guidelines and references, see www.cincinnatichildrens.org/evidence.

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Patient Presents

Standard Workup

History
- Ask about a family history of rickets, which raises concern for non-nutritional form of the disease

Physical Exam
- Bowing deformities
- Delayed walking
- Poor linear growth
- Rachitic rosary
- Widening of the wrists/ankles
- Knobby deformities ("rosary beads") across the costochondral junction

HPE (HISTORY AND PHYSICAL EXAM) RED FLAGS

- Any physical signs of rickets
- Symptoms of hypocalcemia. Mild symptoms: muscle cramping, weakness or spasms. Severe symptoms: tetany, altered mental status and seizures (ED referral).

Any Red Flags?

Yes

Initiate screening and treat Vitamin D deficiency presumptively for: Infants with physical signs of rickets or mild hypocalcemia symptoms and adolescents with mild hypocalcemia symptoms

Refer to ED if severe symptoms of hypocalcemia are present.

No

Recommend daily Vitamin D supplementation

Screening

Bone mineralization labs
- Renal
- 25-hydroxyvitamin D (25-OHD)
- Phosphate
- Alkaline phosphate

X-ray
- Rickets survey (wrists/knees)

Management/Treatment

25–OHD <10 ng/ml
50,000 IU of Vitamin D for 8–12 weeks or 5,000 IU/day for 8–12 weeks

+50 mg per kilogram/day elemental calcium (usually divide by BID): TUMS 40% bioavailable

Make sure patient is receiving the RDA of calcium for age.

25–OHD between 10 and 20 ng/ml
Double the RDA for Vitamin D supplementation
- Infants: 800 IU/day
- Children: 1,200 IU/day
- Adolescents: 1,000-2,000 IU/day

Also: Ensure adequate calcium intake

25-OHD >20 ng/ml but with physical signs of rickets
Refer to the Division of Endocrinology

Recheck 25-OHD in 8–12 weeks: <20 ng/ml?

Yes

Refer to the Division of Endocrinology

No

Encourage continuation of routine Vitamin D supplementation

For urgent issues, or to speak with the specialist on call 24/7, call the Physician Priority Link® at 1-888-987-7997.