

Lown Right Care: Reducing Overuse and Underuse

Routine Vitamin D Testing: Unnecessary and Ineffective

Andy Lazris, MD, CMD, and Alan Roth, DO

Patient perspective by Helen Haskell and John James

CASE SCENARIO

A 65-year-old, health-conscious man reports that he eats organic food and exercises regularly. He often asks his family physician for blood tests to assess for “silent abnormalities.” He applies sunscreen whenever he goes outdoors, and at his wellness visit, he asks for a vitamin D test after reading that sunscreen blocks its production in the skin. He takes 1,000 IU of vitamin D₃ as part of a daily multivitamin. His 25-hydroxyvitamin D level is 11 ng per mL (27 nmol per L). Although his primary care physician informed him that levels greater than 8 ng per mL (20 nmol per L) are considered adequate for 97.5% of the population, the patient decided to increase his daily vitamin D dose to 5,000 IU and insisted on more frequent checks, every 4 months, until the levels exceed 20 ng per mL (50 nmol per L).

His physician explained that high vitamin D levels can be dangerous and that his current dose and level were more than adequate. The patient consulted another clinician who agreed to continue his preferred testing schedule. When the patient presented to his primary care physician 1 year later, he was taking 10,000 IU of vitamin D per day, and his 25-hydroxyvitamin D level was 34 ng per mL (85 nmol per L).

CLINICAL COMMENTARY

Vitamin D Testing Escalation

Over the past 10 years, vitamin D testing has increased worldwide.¹⁻⁵ Up to 75% of vitamin D testing is unnecessary, something many researchers have discussed.^{6,7} Testing is often patient-driven, promoted in the mass media based on flawed observational data, and performed for inappropriate reasons such as general fatigue.^{2,8} The number of vitamin D tests in

the United States reimbursed by Medicare Part B increased 83-fold between 2000 and 2010, with many ordered by family physicians.^{7,9} The cost of inappropriate testing is estimated at £2 million (\$2.5 million) per year and \$800 million per year in excess Medicare costs.^{2,10} These estimates do not account for downstream costs because abnormal vitamin D test results can result in a cascade of referrals, radiologic tests, and subsequent vitamin D and other laboratory tests.¹⁰

The Value of Vitamin D Supplementation

For years, observational studies suggested a strong correlation between low vitamin D levels and multiple disease states. This led to an assumption of cause and effect between vitamin D and illness and resulted in the initiation of more rigorous randomized studies to evaluate the clinical benefits of vitamin D supplementation. None of these trials were designed to assess the value of vitamin D assessment as a screening test; instead, they measured levels, gave participants supplements or placebo, and then measured outcomes. Baseline vitamin D levels varied across studies, and many studies did not stratify outcomes between patients with very low starting levels and those with higher starting levels. To complicate interpretation, many participants were taking supplements before joining the studies.

The results of these studies are summarized in the U.S. Preventive Services Task Force (USPSTF) 2015 and 2021 recommendation statements and in review articles.^{3,10-14} As one

TAKE-HOME MESSAGES FOR RIGHT CARE

In most randomized studies, vitamin D supplementation has not been shown to improve any clinical outcomes.

Although treatment with vitamin D helps resolve rickets in children and osteomalacia in adults, these conditions are rare.

Daily supplementation with 600 to 800 IU of vitamin D is sufficient to prevent vitamin D deficiency for most people.

ANDY LAZRIS, MD, CMD, is a family physician at Personal Physician Care, Columbia, Maryland.

ALAN ROTH, DO, FAAFP, FAAHPM, is a family physician at Jamaica Hospital Medical Center, Jamaica, New York.

Author disclosure: No relevant financial relationships.

Address correspondence to Andy Lazris, MD, CMD, at alazris50@gmail.com.

Lown Institute Right Care Alliance is a grassroots coalition of clinicians, patients, and community members organizing to make health care institutions accountable to communities and to put patients, not profits, at the heart of health care.

A collection of Lown Right Care published in *AFP* is available at <https://www.aafp.org/afp/rightcare>.

article noted, “In almost every trial, various doses and routes of administration did not show efficacy of vitamin D in preventing fractures, falls, cancer, cardiovascular disease, type 2 diabetes mellitus, asthma, and respiratory infections.”¹³

Most trials define deficiency as a 25-hydroxyvitamin D level less than 12 ng per mL (30 nmol per L), but there is no consensus on this cut-off. In addition, vitamin D testing is not always accurate or reproducible.^{3,11} In studies that conducted subgroup analyses on patients with very low vitamin D levels, supplementation was no more effective than in patients who began with higher vitamin D levels.^{11,15} Although vitamin D supplementation is often recommended for fracture and fall prevention in older adults, a study showed increased falls with high-dose supplementation in this population, and a recent study demonstrated no benefit for fractures in middle-aged and older people even if their baseline vitamin D levels were low.^{15,16} An interesting finding to support the lack of correlation between vitamin D levels and fracture risk is that although women who identify as African American tend to have far lower vitamin D levels than women who identify as White, they also have a lower fracture rate.³

Due to its unproven benefit, many organizations, including the USPSTF and Choosing Wisely, do not endorse measuring and supplementing vitamin D.^{3,8,10,14,17} A Cochrane review noted that some studies showed a small mortality benefit with vitamin D supplementation of 2 per 1,000 deaths averted over variable years, but the authors did not endorse testing based on uncertainty about benefits exceeding harms.¹⁸

A potential data limitation is that most studies included healthy participants with high socioeconomic status and therefore may underestimate the value of treatment.¹⁹ It has been estimated that 7% of people worldwide have vitamin D levels less than 12 mg per mL, and up to one-third of people in northern areas such as the United Kingdom may be deficient.^{1,12,13} The USPSTF and National Academy of Medicine contend that 600 to 800 IU of vitamin D daily instead of sun exposure would provide adequate vitamin D to approximately 97.5% of adults.^{3,17} Sun exposure can provide 20,000 IU of vitamin D after achieving a light-pale hue (i.e., the skin tone identified by the study authors).¹⁷

Value of Vitamin D Measurement

The theoretical value of vitamin D measurement is to identify people with potentially very low levels (such as those who have inadequate sun exposure, use sunscreen, or have darker skin) and to assess the potential for vitamin D toxicity in people who take high-dose vitamin D supplements or who use tanning beds. No data support checking vitamin D levels in any of these patients, especially because there is no consensus as to what constitutes vitamin D deficiency.¹² Because of the initial and downstream costs of vitamin D testing and clinical management for most patients would not change based on the test results, some advocate against testing and advise modest vitamin D supplementation for patients with limited sun exposure.^{2,6-9}

CONCLUSIONS

Although vitamin D helps resolve rickets in children and osteomalacia in adults, these conditions are rare.²⁰ Many of the health benefits of vitamin D supplementation suggested by the media—from preventing fractures to improving recovery from COVID-19 to averting cancer and diabetes—are not supported by current literature. There is some consensus that modest doses of supplementation (1,000 IU per day or less) could be beneficial and that very low vitamin D levels (less than 8 ng per mL) could pose some danger; however, testing does not improve outcomes in any studied population. Testing can lead to overtreatment and potentially toxic levels. Vitamin D toxicity can trigger hypercalcemia, hyperphosphatemia, parathyroid hormone suppression, and hypercalciuria with stones.³ It also introduces unnecessary expense and intervention.

Two areas that warrant further research are whether sun-derived vitamin D is more effective than supplement-derived vitamin D (therefore explaining why vitamin D levels are not predictive of outcomes after supplementation) and whether measuring vitamin D provides enough data to determine who, if anyone, would benefit from higher-dose supplementation. Until more is known, it seems prudent to advise against vitamin D testing and counsel patients with limited sun exposure to take up to 1,000 IU of vitamin D supplementation per day.

PATIENT PERSPECTIVE

The physician Sir William Osler said, “The desire to take medicine is perhaps the greatest feature which distinguishes man from animals.” Nowhere does that desire seem more pronounced than in beliefs about vitamin supplements. People are fascinated by the idea that they can control health and longevity through fine-tuning their body chemistry. Supplements may be especially appealing because of their availability and the widespread belief that even if benefits are not precisely known, the risk is nearly nonexistent.

Self-monitoring is a natural part of the widespread interest in wellness. In this context, it seems reasonable for this patient, a conscientious person, to want to ensure that a health recommendation he is following (applying sunscreen) is not interfering with another he is concerned about (maintaining adequate vitamin D levels). For a family physician, the question is how best to treat this patient in a way that meets his needs.

Highly motivated individuals want trustworthy information to make their own medical decisions. Referring this patient to the USPSTF website and articles such as this one would allow him to see for himself that the evidence is more ambiguous than he may have known and that toxicity from oversupplementation could pose a greater risk than deficiency. It can also help clarify why his physician is discouraging further testing. Until the definition of vitamin D deficiency and the benefit of supplementation are better delineated, well-informed patients are likely to see the wisdom of absorbing vitamin D the traditional way—through plenty of sunshine (but not too much)—and a daily multivitamin if desired.

RESOLUTION OF CASE

The patient's physician reiterated the risks associated with taking high-dose vitamin D supplements, including kidney stones and increased fractures, and the lack of benefits. The physician also explained that continuing frequent testing would increase the patient's anxiety and his desire to treat himself in a way that could be detrimental to his health. They agreed that the patient would decrease his supplement to 1,000 IU per day and forgo further testing.

REFERENCES

1. Crowe FL, Jolly K, MacArthur C, et al. Trends in the incidence of testing for vitamin D deficiency in primary care in the UK: a retrospective analysis of The Health Improvement Network (THIN), 2005-2015. *BMJ Open*. 2019;9(6):e028355.
2. Woodford HJ, Barrett S, Pattman S. Vitamin D: too much testing and treating? *Clin Med (Lond)*. 2018;18(3):196-200.
3. LeFevre ML. Screening for vitamin D deficiency in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2015;162(2):133-140.
4. Sattar N, Welsh P, Panarelli M, et al. Increasing requests for vitamin D measurement: costly, confusing, and without credibility. *Lancet*. 2012;379(9811):95-96.
5. Bilinski K, Boyages S. The rise and rise of vitamin D testing. *BMJ*. 2012;345:e4743.
6. Singer AG, McChesney C. Reduce unnecessary routine vitamin D testing. *Can Fam Physician*. 2023;69(9):620-622.
7. Rodd C, Sokoro A, Lix LM, et al. Increased rates of 25-hydroxy vitamin D testing: dissecting a modern epidemic. *Clin Biochem*. 2018;59:56-61.
8. McChesney C, Singer A, Duquette D, et al. Do not routinely test for vitamin D. *BMJ*. 2022;378:e070270.
9. Lin KW. Vitamin D screening and supplementation in primary care: time to curb our enthusiasm. *Am Fam Physician*. 2018;97(4):226-227.
10. Rockwell MS, Wu Y, Salamoun M, et al. Patterns of clinical care subsequent to nonindicated vitamin D testing in primary care. *J Am Board Fam Med*. 2020;33(4):569-579.
11. Amrein K, Scherkl M, Hoffmann M, et al. Vitamin D deficiency 2.0: an update on the current status worldwide. *Eur J Clin Nutr*. 2020;74(11):1498-1513.
12. Giustina A, Bouillon R, Binkley N, et al. Controversies in vitamin D: a statement from the third international conference. *JBMR Plus*. 2020;4(12):e10417.
13. Gallagher JC, Rosen CJ. Vitamin D: 100 years of discoveries, yet controversy continues [published correction appears in *Lancet Diabetes Endocrinol*. 2023;11(6):e8]. *Lancet Diabetes Endocrinol*. 2023;11(5):362-374.
14. Kahwati LC, LeBlanc E, Weber RP, et al. Screening for Vitamin D deficiency in adults: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA*. 2021;325(14):1443-1463.
15. LeBoff MS, Chou SH, Ratliff KA, et al. Supplemental vitamin D and incident fractures in midlife and older adults. *N Engl J Med*. 2022;387(4):299-309.
16. Bischoff-Ferrari HA, Dawson-Hughes B, Orav EJ, et al. Monthly high-dose vitamin D treatment for the prevention of functional decline: a randomized clinical trial. *JAMA Intern Med*. 2016;176(2):175-183.
17. LeFevre ML, LeFevre NM. Vitamin D screening and supplementation in community-dwelling adults: common questions and answers. *Am Fam Physician*. 2018;97(4):254-260.
18. Bjelakovic G, Gluud LL, Nikolova D, et al. Vitamin D supplementation for prevention of mortality in adults. *Cochrane Database Syst Rev*. 2014;(1):CD007470.
19. Brenner H, Jansen L, Saum KU, et al. Vitamin D supplementation trials aimed at reducing mortality have much higher power when focusing on people with low serum 25-hydroxyvitamin D concentrations. *J Nutr*. 2017;147(7):1325-1333.
20. Arboleya L, Braña I, Pardo E, et al. Osteomalacia in adults: a practical insight for clinicians. *J Clin Med*. 2023;12(7):2714. ■