Vitamin D

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SYNOPSIS AND RELEVANCE

Testing for vitamin D deficiency can be complicated by multiple assays with similar names. Adherence to the strategies in this module will:

1. Ensure that the correct test is selected when evaluating patients for vitamin D deficiency (25-hydroxyvitamin D).
2. Ensure that 1,25-dihydroxyvitamin D testing is performed only in a very narrowly defined set of clinical circumstances.

OBJECTIVES

1. Understand which patients are at high risk for vitamin D deficiency and should be tested.
2. Understand the utility of 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D testing.
3. Define appropriate testing procedures for vitamin D deficiency.

BACKGROUND

Vitamin D deficiency is relatively common in the United States, particularly in patients with limited sun exposure during winter months and in populations living at higher latitudes. Because of the complications associated with vitamin D deficiency, it is important to appropriately identify patients with this condition.[1-3]

There are relatively simple treatment options that are effective in most patients, including over the counter supplements and increased sun exposure. More aggressive therapies may be required in a subset of patients, such as patients with osteoporosis, chronic renal disease, and other conditions.

Two important questions regarding vitamin D testing include: (1) who should be tested? and (2) what is the appropriate test to order? Many experts agree that it is not necessary to perform broad based population screening, but rather focus testing on higher risk patients, such as patients who are obese, dark-skinned, institutionalized or hospitalized, have limited sun exposure, have medical conditions such as osteoporosis, malabsorption (including inflammatory bowel disease and celiac sprue), and patients who are taking medications that impact the metabolism of vitamin D.[2-4] Ensuring the appropriate patient selection strategy for vitamin D has been the focus of successful utilization efforts.[5]

Clinicians may be confused with assay selection due to tests with similar names or other reasons, and this is the focus of this module. The appropriate laboratory test to order when evaluating for vitamin D deficiency is 25-hydroxyvitamin D.[1,6] Because the active form of vitamin D is 1,25-dihydroxyvitamin D, ordering providers may erroneously believe that testing for this analyte provides the best estimate of vitamin D stores. In fact, 1,25-dihydroxyvitamin D serum levels are essentially unrelated to vitamin D stores. [1,2]

Another important issue regarding 25-hydroxyvitamin D testing involves the relatively large number of methods available for testing, which may impact the selection of an optimal reference range. It is important that laboratories select reference ranges appropriate for the method utilized.

INSIGHTS

Systematic approaches, including multiple electronic provider order entry strategies, can be devised and implemented to ensure that:

1. 25-hydroxyvitamin D is the test ordered when evaluating patients for vitamin D deficiency.
2. 1,25-dihydroxyvitamin D (calcitriol) has no utility in evaluating patients for vitamin D deficiency.

Many authorities agree that it is not necessary to perform broad based population screening for 25-hydroxyvitamin D, but rather focus testing on patients at high risk for vitamin D deficiency.

INTERVENTIONS

1. Review guidelines regarding the appropriate use of 25-hydroxyvitamin D, and 1,25-dihydroxyvitamin D testing with ordering providers, utilizing any number of educational efforts.
2. If information systems are amenable, consider electronic provider order strategies to ensure appropriate test selection, including but not limited to:
   - The use of “pop-up” or “soft-stop” warnings when a vitamin D test is selected that provide the appropriate clinical context for performing the test, particularly for 1, 25-dihydroxyvitamin D testing.
   - Consider “hard-stop” requirements, such as specific questions that need to be answered appropriately to successfully order 1, 25-dihydroxyvitamin D testing.
   - Consider making 25-hydroxyvitamin D appear before 1,25-dihydroxyvitamin D in the test dictionary.
   - Consider renaming 1,25-hydroxyvitamin D "calcitriol" in the test dictionary.
3. Given the narrow clinical context in which 1,25-dihydroxyvitamin D testing is appropriate, consider limiting access to selecting this test (possibly by eliminating the test as an option, and requiring a “miscellaneous” order be placed). If information system restrictions do not allow electronic interventions, consider implementing a “gate-keeping” strategy to limit inappropriate 1,25-dihydroxyvitamin D test orders.

QUESTIONS AND ANSWERS

QUESTION 1 OBJECTIVE

Understand which patients are at high risk for vitamin D deficiency, and should be tested.

QUESTION 1

Which of the following patients are NOT at high risk factor for vitamin D deficiency?

A. Institutionalized patients.
B. Obese patients.
C. Patients with idiopathic inflammatory bowel disease.
D. Light-skinned individuals.
E. Patients with manifestations of osteoporosis.

The correct answer is D. Light-skinned individuals are not generally considered at increased risk for vitamin D deficiency. In contrast, dark-skinned individuals are considered at increased risk.
A is incorrect. Institutionalized patients are at increased risk for vitamin D deficiency.
B is incorrect. Obese patients are at increased risk for vitamin D deficiency.
C is incorrect. Patients with a variety of malabsorption conditions, including idiopathic inflammatory bowel disease are at increased risk for vitamin D deficiency.
E is incorrect. Patients with osteoporosis typically have vitamin D deficiency.

REFERENCE

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QUESTION 2 OBJECTIVE

Understand the utility of 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D testing.

QUESTION 2

Testing for 25-hydroxyvitamin D is appropriate in all the following situations EXCEPT:

A. Patient taking long term phenytoin for a seizure disorder.
B. Patient who lives in a high-latitude location.
C. Patient with sarcoidosis and elevated calcium.
D. Patient hospitalized for a long period on the general medical service.

The correct answer is C. This clinical scenario represents one of the rare indications in which 1,25-dihydroxyvitamin D testing may be appropriate.
A is incorrect. Phenytoin may accelerate vitamin D metabolism, and patients on this medication are appropriate candidates for 25-hydroxyvitamin D testing.
B is incorrect. Living in a high-latitude location represents a significant risk factor for vitamin D deficiency, and therefore such patients are appropriate candidates for 25-hydroxyvitamin D testing.

D is incorrect. Long-term hospitalization represents a significant risk factor for vitamin D deficiency, and therefore such patients are appropriate candidates for 25-hydroxyvitamin D testing.

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Dawson-Hughes B. Vitamin D deficiency in adults: definition, clinical manifestations, and treatment. UpToDate® web site. Literature current June 2022. Updated June 6, 2022. Accessed July 7, 2022. https://www.uptodate.com/contents/vitamin-d-deficiency-in-adults-definition-clinical-manifestations-and-treatment?search=vitamin%20d%20deficiency&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1

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