



## Q: Does this patient need ultrasonography of the leg to evaluate for deep vein thrombosis?

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A 38-year-old woman presents to the emergency department after experiencing several days of swelling and mild discomfort in her left calf. She denies chest pain or shortness of breath. She does not recall antecedent trauma, is a nonsmoker, is healthy, and takes no medications apart from a multivitamin. She has not undergone any surgical procedure, has not been hospitalized recently, and has no history of venous thromboembolic disease. She says she started an aerobics program 1 week ago.

On examination, her left lower leg is mildly swollen, but the difference in calf circumference between the right and left legs is less than 1 cm. There is no erythema, no pitting edema, and only mild and rather diffuse tenderness of the calf. A urine pregnancy test is negative and her D-dimer level is 350 ng/mL (reference range < 500 ng/mL). Does she require ultrasonography of the left leg to evaluate for deep vein thrombosis (DVT)?

**A:** This patient does not need confirmatory ultrasonography, as her normal D-dimer level of 350 ng/mL is enough to rule out DVT. Her low probability of having DVT is further supported by her Wells score (TABLE 1), a tool that can help rule out DVT and reduce the need for further testing. DVT is unlikely if a patient's Wells score is less than 2, and this patient's score is -1. She receives 1 point for

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The views expressed in this article are those of the authors and do not necessarily reflect positions of the American College of Physicians.

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TABLE 1

### Wells score to determine pretest probability of deep vein thrombosis

Clinical characteristic	Points
Active cancer (patient receiving treatment within the previous 6 months or currently receiving palliative treatment)	1
Paralysis, paresis, or recent plaster immobilization of the lower extremities	1
Recently bedridden for 3 days or more, or major surgery within the previous 12 weeks requiring general or regional anesthesia	1
Localized tenderness along the distribution of the deep venous system	1
Entire leg swollen	1
Calf swelling at least 3 cm larger than that on the asymptomatic side (measured 10 cm below the tibial tuberosity)	1
Pitting edema confined to the symptomatic leg	1
Collateral superficial veins (nonvaricose)	1
Previously documented DVT	1
Alternative diagnosis at least as likely as DVT	-2
<b>TOTAL</b>	—
<b>Probability of DVT</b>	
Likely	≥ 2
Unlikely	< 2

FROM WELLS PS, ANDERSON DR, RODGER M ET AL. EVALUATION OF D-DIMER IN THE DIAGNOSIS OF SUSPECTED DEEP-VEIN THROMBOSIS. *N ENGL J MED*; 2003; 349:1227-1235.

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TABLE 2

**Causes of false-positive and false-negative D-dimer test results****Causes of false-positive (elevated) results**

Malignancy  
 Renal dysfunction  
 Inflammation, including infection  
 Advanced age  
 Recent surgery  
 Hospitalization  
 Pregnancy  
 Recent surgery  
 Recent trauma

**Cause of false-negative (normal) results**

Long duration of symptoms before diagnosis

swelling of her left lower leg, but injury from her recent aerobic exercise is at least as likely as DVT to account for her symptoms (−2 points).

**GUIDELINES AND CHOOSING WISELY**

Compression ultrasonography is the study most commonly used to evaluate for DVT. The diagnosis is made if either the femoral or popliteal vein is noncompressible.<sup>1</sup> In a patient with no history of DVT, the sensitivity of compression ultrasonography is 94%, and its specificity is 98%.

Several guidelines recommend using a clinical decision rule to establish the probability of venous thromboembolic disease before any additional diagnostic testing such as D-dimer measurement or ultrasonography.<sup>2-4</sup> A number of clinical decision rules exist for DVT, but the Wells score is the most studied and validated.<sup>1</sup> It incorporates the patient's risk factors, symptoms, and signs to categorize the probability of DVT as low, moderate, or high and has been further modified to classify the risk as either likely or unlikely (TABLE 1).<sup>5</sup>

Guidelines from the American College of Chest Physicians (2012), Scottish Intercollegiate Guidelines Network (2010), and American Academy of Family Physicians and American College of Physicians (2007)

recommend against performing imaging if a high-sensitivity D-dimer test is negative in a patient in whom the pretest probability of DVT is unlikely.<sup>2-4</sup> Enzyme-linked immunofluorescence assays, microplate enzyme-linked immunosorbent assays, and latex quantitative assays are considered high-sensitivity D-dimer tests, having 96%, 94%, and 93% sensitivity, respectively, in ruling out DVT.<sup>1</sup> Other D-dimer tests have lower sensitivity and cannot comfortably rule out DVT even if the results are negative.

Since D-dimer measurement is a sensitive but not specific test, it should be used only to rule out DVT—not to rule it in. Moreover, compression ultrasonography may be indicated to rule out other causes of the patient's symptoms.

The guidelines caution against D-dimer testing if the patient has a comorbid condition that can by itself raise or lower the D-dimer level, leading one to falsely conclude the patient has or does not have DVT (TABLE 2).<sup>1-4</sup> In these instances, the pretest probability of DVT may be higher than calculated by a clinical prediction rule, and compression ultrasonography may be an appropriate initial test.<sup>4</sup> Compression ultrasonography is also recommended as a confirmatory test in low-risk patients who have a positive D-dimer test or as an initial test in patients at higher risk for DVT.<sup>2-4</sup>

If a patient has a low pretest probability of DVT as defined by the Wells score and a normal high-sensitivity D-dimer measurement, then ordering imaging studies is a questionable practice according to statements by the American College of Physicians, American College of Emergency Physicians, European Society of Cardiology, American Academy of Family Physicians, and Scottish Intercollegiate Guidelines Network.

**HARMS OF ULTRASONOGRAPHY**

Although ultrasonography is generally well tolerated, it may be unnecessary. Combining a prediction rule (to assess the probability) with D-dimer testing (to rule out DVT) can significantly reduce the use of ultrasonography and the associated cost.

Wells et al<sup>5</sup> calculated that clinicians could

**In a patient with a low pretest probability, a normal D-dimer level is enough to rule out DVT, and ultrasonography is not necessary**

cut back on ultrasonographic testing by 39% by not doing it in those who had a low pre-test probability and a negative D-dimer test result.<sup>5</sup> In that patient population, fewer than 1% of patients were later found to have DVT.

Ordering compression ultrasonography as additional testing may lead to a false-positive result and to additional unnecessary testing and treatments that would inconvenience the patient, increase the risk of serious complications such as bleeding, and incur increased costs. Cost considerations should include not only the cost of the test and its interpretation,

but also the workup and treatment of false-positive results, patient time missed from work while being tested, and potential associated costs for patients who need to be evaluated in the emergency department to obtain same-day testing.


### ■ THE CLINICAL BOTTOM LINE

Our patient's Wells score indicates that DVT is unlikely. A negative D-dimer test is sufficient to rule out DVT, and further testing is unnecessary. ■

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