EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

BROWARD HEALTH Care Warriors

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Pulmonary Embolism Risk Stratification

A 34-year-old female nurse with no past medical history presented to the ED in moderate distress with sharp central chest pain radiating to her right shoulder that awoke her from sleep. She originally took a flight to the area for abdominoplasty surgery the prior week. The patient reports no operative complications and has two Jackson Pratt drains in place that have been draining approximately 50cc of fluid per day. She notes that she has been significantly immobile with decreased fluid intake since the surgery. She has associated symptoms of shortness of breath and notes the pain is exacerbated by breathing. An EKG shows normal sinus rhythm with a rate of 96 beats per minute and no ST segment abnormalities. What is the patient's Wells score and best next step in her workup?

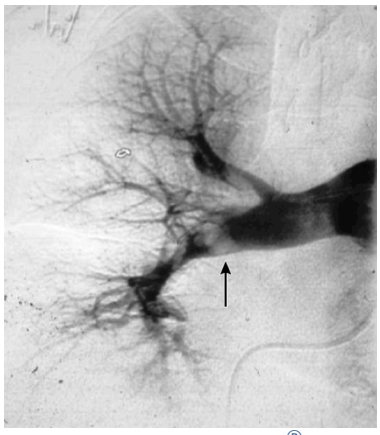
A. Wells Score = 3.0 || Order CT Angiogram, with contrast

B. Wells Score = 4.5 || Order V/Q Perfusion Scan

C. Wells Score = 4.5 || Order CT Angiogram, with contrast

D. Wells Score = 6.0 || Measure D-dimer with sensitive assay

E. Wells Score = 6.0 || Apply PERC criteria



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Pulmonary embolus. Frontal image from a selective right pulmonary artery angiogram shows a filling defect (arrow).

Table 1. The Pulmonary Embolism Rule out Criteria (PERC Rule)[2]

Age < 50 years
Heart Rate < 100 bpm
Oxyhemoglobin saturation ≥95%
No hemoptysis
No estrogen use
No prior DVT or PE
No unilateral leg swelling
No surgery/trauma requiring hospitalization within the prior 4 weeks

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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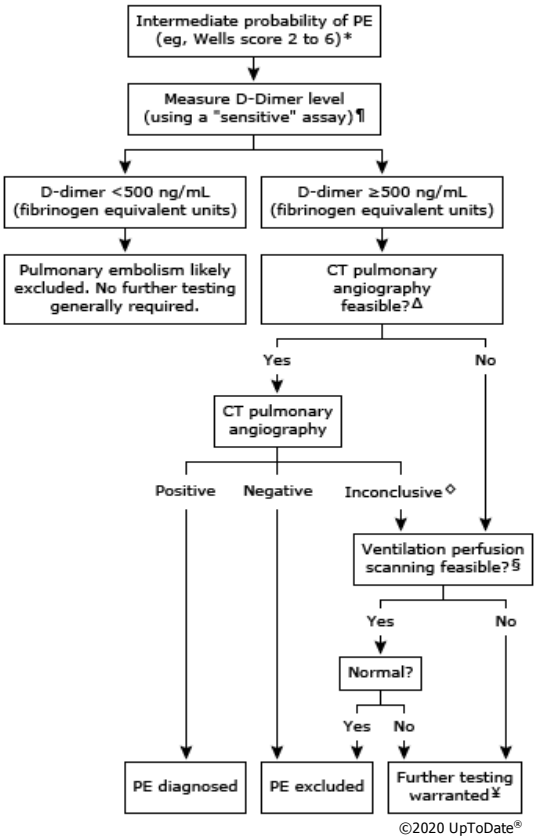
The correct answer is C.

The Wells score is used in the setting of a patient with a suspected pulmonary embolism. In this case, the patient receives a Wells score of 4.5 based on the following parameters: Pulmonary embolism (PE) was a very likely diagnosis with her presentation and history (+3.0 points) and she has recent surgical history with immobility (+1.5 points). This score indicates a moderate risk of PE since it falls in the range of 2.0 to 6.0 points. Therefore, the next best step in her workup would be to measure D-dimer levels or perform a CT angiogram. Since the Wells score is on the higher end of the intermediate risk spectrum with a notably high-normal heart rate, many experts recommend proceeding directly to CT angiogram.



Discussion

In a hemodynamically stable patient, the Wells score is utilized to stratify the risk of pulmonary embolism into high, moderate, and low risk.[1] The score is based on seven parameters with varying weights as outlined in Table 2. When a patient is identified as having a low risk of PE with a Wells score of less than 2.0, the PERC rule can be applied to determine whether to measure a D-dimer level. The PERC rule has a sensitivity of 97.4% and specificity of 21.9%.[2] For patients who fulfill all 8 criteria (Table 1), no further testing is required. In the low risk population, the PERC rule has been reported to reduce unnecessary testing by approximately 20%. If any of the PERC criteria is not fulfilled, D-dimer measurement is recommended with a threshold of ≥500 ng/mL indicating.[2]

When a patient is identified as an intermediate risk for PE with a Wells score of 2.0 to 6.0, a sensitive D-dimer assay can be used to determine the need for further imaging with CT angiography.[1] In some cases, especially if there is a high suspicion for PE, or the Wells score is >4.0, some physicians elect to proceed directly to imaging with CT angiography.[1]

When a patient is identified as a high risk for PE with a Wells score of >6.0, imaging with CT angiography is the best next step in the workup.[1]

In any case where imaging with CT angiography is inconclusive or unfeasible (ie contrast allergy or renal impairment), ventilation perfusion scanning can be performed to guide the next clinical steps.[1]

The mainstay of initial treatment for hemodynamically stable patients with a diagnosed PE is anticoagulation, while taking into account the risk of bleeding.[4] Options for initial anticoagulation include low molecular weight heparin, fondaparinux, unfractionated heparin, oral factor Xa inhibitors or direct thrombin inhibitors.[4]

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Table 2. Wells criteria and modified Wells criteria: Clinical assessment for pulmonary embolism[1]

Symptom	Score
Clinical symptoms of DVT (leg swelling, pain with palpation)	3.0
Other diagnosis less likely than pulmonary embolism	3.0
Heart rate >100	1.5
Immobilization (≥3 days) or surgery in the previous four weeks	1.5
Previous DVT/PE	1.5
Hemoptysis	1.0
Malignancy	1.0
Probability	**Score**
Traditional clinical probability assessment (Wells criteria)	
High	>6.0
Moderate	2.0 to 6.0
Low	<2.0
Simplified clinical probability assessment (Modified Wells criteria)	
PE Likely	>4.0
PE Unlikely	≤4.0

The prognosis of PE is dependent on multiple factors. In general, an untreated PE is associated with an overall mortality of up to 30% compared to 2% - 11% in those treated with anticoagulation.[3] The highest risk for adverse events occur within the first 7 days of a PE and are most commonly due to shock and recurrent PE.[3] Longer term, the five-year cumulative mortality rate was reported as 32%.[3] However, only 5% of those deaths were attributed to PE, with 64% attributed to non-cardiovascular causes such as malignancy or sepsis.[3] The Pulmonary Embolism Severity Index (PESI) and the simplified PESI (sPESI) can be used to predict all-cause mortality after PE.[3]

Take Home Points

- The first step in the workup of a patient with a suspected PE is risk stratification, which is commonly performed by utilizing the Wells criteria
- A Wells score of <2.0 indicates low risk of PE; a score of 2.0 to 6.0 indicates moderate risk of PE; a score of >6.0 indicates a high risk of PE
- A patient with a low risk of PE should be evaluated with the PERC rule to determine if a D-dimer measurement and subsequent workup is needed
- A patient with an intermediate risk of PE should have either a D-dimer measurement performed or imaging with CT angiography
- A patient with a high risk of PE should have imaging with CT angiography
- The highest risk of mortality occurs within the first 7 days of a PE and anticoagulation should be initiated immediately while considering risk of bleeding

ABOUT THE AUTHOR

This month's case was written by David Civitarese. David is a 4th year medical student from NSUCOM. He did his emergency medicine rotation at BHMC in October 2020. David plans on pursuing a career in Physical Medicine and Rehabilitation after graduation.

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