Diagnosis and Management of Pulmonary Embolism in the Hospitalized Patient

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KEYWORDS

• Pulmonary embolism (PE) • Venous thromboembolism (VTE) • Anticoagulation • thrombolysis

HOSPITAL MEDICINE CLINICS CHECKLIST

1. The first step in the evaluation of a patient with suspected pulmonary embolism (PE) is assessment of the pretest probability of PE (low, medium, high). Clinical probability tools can assist clinicians with this process.
2. Strategies that use D-dimer testing can reduce unnecessary imaging studies for select patients with low and intermediate pretest probability of PE, including hospital inpatients.
3. The most significant predictor of poor outcome in patients with acute PE is right ventricular (RV) dysfunction. Multiple imaging modalities and laboratory studies can aid in evaluation of RV status.
4. Hemodynamically stable patients should be further risk stratified using validated tools such as the Pulmonary Embolism Severity Index (PESI) and the simplified Pulmonary Embolism Severity Index (sPESI).
5. The American College of Chest Physicians 2016 guidelines recommend the use of the direct oral anticoagulant (DOAC) agents over vitamin K agonist therapy for the treatment of venous thromboembolism, including PE. Some DOACs can be used as initial therapy, but others should be preceded by a period of anticoagulation with another agent.

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6. Thrombolytic therapy is appropriate for patients with PE who are in shock and have no contraindication to thrombolysis. Thrombolysis should not be used routinely for patients with RV dysfunction without shock, but may be considered on a case-by-case basis.

BACKGROUND

Pulmonary embolism (PE) is a common condition that can result in significant morbidity and mortality. Diagnosis of PE can be challenging owing to its nonspecific signs and symptoms. Clinicians should have a high index of suspicion for PE and evaluate patients with suspected PE expeditiously and efficiently to establish a diagnosis and initiate therapy promptly while minimizing unnecessary testing.

PE is estimated to cause approximately 100,000 deaths annually in the United States[1] and 300,000 in Europe. About 75% of PE deaths are secondary to hospital-acquired PE, highlighting the importance of this topic to hospital-based physicians.[2,3] Overall, studies show a decline in the in-hospital case fatality rate from PE.[4] A large, population-based cohort study showed a dramatic decline in mortality risk ratio from PE over the past 3 decades, from 138 (95% CI, 125–153) in 1980 to 1989 to 36.08 (95% CI, 32.65–39.87) in 2000 to 2011.[5] Despite this decline mortality related to PE is still substantial, with 30-day and 1-year mortalities of 4% to 10.6% and 13% to 23% percent, respectively.[6,7]

What is the rose of clinical probability tools in the approach to the patient with suspected pulmonary embolism?

Determination of the pretest probability of PE (low, medium, or high) is the first step in the assessment of a hemodynamically stable patient for whom PE is a diagnostic consideration. Clinical probability assessment tools have been developed and validated to aid in this process. The most appropriate diagnostic strategy varies by category of clinical probability, as discussed further elsewhere in this article.

Validated clinical probability tools include the Wells score, the simplified Wells score, the revised Geneva rule, and the simplified revised Geneva rule.[8] The simplified tools require less information and are easier to use. A prospective cohort study by Douma and colleagues[9] directly compared the performance of these scoring systems, and concluded that all 4 of these tools show similar performance for exclusion of acute PE if used in combination with D-dimer value adjusted for age. In addition to these validated clinical probability tools, pretest probability estimates derived from the physician's own unstructured assessment (so-called clinical gestalt) can be used. Although clinician's gestalt has been criticized in the past, recent studies have shown that the overall accuracy of an experienced clinician's gestalt seems to be noninferior to that of validated decision tools.[10,11]

What is the recommended approach for the evaluation of a patient with suspected pulmonary embolism?

The Clinical Guidelines Committee of the American College of Physicians released Best Practice Advice for evaluation of patients with suspected PE in 2015 to assist clinicians with delivering high-value care.[8] These guidelines provide specific recommendations for diagnostic evaluation according to category of clinical risk. These