PERC Rule: Bedside Evaluation for Pulmonary Embolism In Low-Risk Patients

Summary:
The PERC rule reduced the pre-test probability below the test threshold for D-dimer evaluation in validated populations, but is limited by its low specificity.

Interpretation: This means that if the patient you are evaluating meets any of the PERC criteria, then there is a good chance the patient does not have a pulmonary embolism and does not need additional testing, but if they are PERC positive then additional testing or evaluation should be considered to aid in the work up for PE due to the concerns of false positives. This rule is most helpful when a patient is PERC negative; if PERC positive it does not help you.

The PERC rule criteria below are used to help the clinician to do a bedside assessment to determine if a patient is at "low risk" for pulmonary embolism and does not warrant additional diagnostic evaluation, including a D-dimer:

- Age < 50 yrs
- Pulse < 100 bpm
- SaO2 > 94%
- No unilateral swelling
- No hemoptysis
- No recent trauma or surgery
- No prior PE or DVT
- No hormone use.

Note: While immobility was significantly associated with risk for venous thromboembolism, it was not included in the PERC rule due to low inter-observer agreement within the study.

Application of the PERC rule to low-risk patients resulted in a sensitivity of 96% and specificity of 27%.

Note: Low-risk patients (clinical suspicion for PE and met the PERC rule criteria) had a prevalence of PE of 1.4% (95% CI, 0.5 – 3.0%)**.**

Application of the PERC rule to patients at "very-low risk" resulted in a sensitivity of 100% and specificity of 15%.

Note: Very low-risk patients (presenting with chief complaint of dyspnea or some other breathing complaint and where PE is not suspected, but met the PERC rule criteria) have a prevalence of PE of 0% (95% CI, 0 – 6.2%).

Supporting Guideline Statements:
"In patients with a low pretest probability for suspected pulmonary embolism, consider using the PERC to exclude the diagnosis based on historical and physical examination data alone. PI Level B recommendation" • Fesmire FM et al. Critical issues in the evaluation and management of adult patients presenting to the emergency department with suspected pulmonary embolism. Ann Emerg Med 57(6):628-652. PMID: 21621092

Landmark or Original Studies:	
Kline JA et al. Clinical criteria to prevent unnecessary diagnostic testing in emergency department patients with suspected pulmonary embolism. J Thromb Haemost 2004;2:1247-55. PMID: 15304025	
Study Design:	Prospective, multicenter derivation and validation study
Groups & Interventions:	n = 1427; Low-risk population (selected for D-dimer testing to rule out PE) n = 382; Very-low risk population (patients with dyspnea and PE not initially suspected)
Follow-up or Duration:	90 days
Primary Endpoint:	To develop criteria to rule-out PE at the bedside without additional testing, including the D-dimer.
Results:	Application of the PERC rule criteria in the low-risk and very-low risk populations resulted in sensitivities of 96% and 100% and specificities of 27% and 15%, respectively.
Conclusions:	The PERC rule reduced the pre-test probability below the test threshold for D-dimer evaluation in both validated populations, but is limited by its low specificity.
Comments:	This rule provides clinicians with a bedside assessment for the need to do additional evaluation for PE in low risk patients with variables that had an acceptable interobserver reproducibility. Therefore, in patients not meeting the PERC criteria should not undergo D-dimer testing.
Location(s):	10 US hospitals with geographic, socioeconomic, and physician practice diversity.
Funding:	Funding sources not reported

Supporting Studies:	
Singh B et al. Diagnostic accuracy of pulmonary embolism rule-out criteria: a systematic review and meta-analysis. Ann Emerg Med 2012;59:517-520. PMID: 22177109	
Study Design:	Systematic review and meta-analysis
Sample Size:	12 cohorts (representing 13,885 patients with 1,391 pulmonary embolism diagnosis) from 10 prospective and 2 retrospective studies from 6 countries.
Inclusion Criteria:	Studies that reported diagnostic performance of the PERC rule, reported as original research, conducted in the emergency department (ED), and no language restrictions up until August 14, 2011.
Primary Endpoint:	Use contingency tables to calculate pooled sensitivity, specificity, and likelihood ratios
Results:	Pooled results (95% Confidence Interval): Sensitivity = 97% (96% – 98%) Specificity = 23% (22% – 24%) Positive likelihood ratio = 1.24 (1.18 – 1.30) Negative likelihood ratio = 0.17 (0.13 – 0.23)
Conclusions:	In patients with a low pretest probability for pulmonary embolism, the available literature consistently shows a high sensitivity and a low specificity with the application of the PERC rule.
Limitations:	Small number of studies available. No assessment for the possibility for the presence of publication bias.
Comments:	This further supports that the use of the PERC rule in helping clinicians to decide if additional testing such as a D-dimer is useful.

Related Articles & Reviews:
Michiels JJ et al. Screening for deep vein thrombosis and pulmonary embolism in outpatients with suspected DVT or PE by the sequential use of clinical score: a sensitive quantitative D-dimer test and noninvasive diagnostic tools. Semin Vasc Med 2005;5(4):351-64. PMID: 16302156

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