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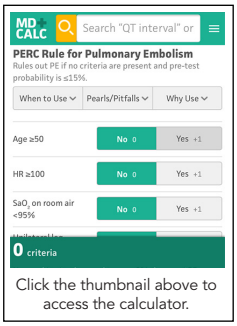

Click the thumbnail above to access the calculator.

PERC Rule for Pulmonary Embolism

Introduction: The PERC (Pulmonary Embolism Rule-out Criteria) Rule is utilized by physicians to avoid further testing for pulmonary embolism in patients deemed to be at low risk.

Points & Pearls

- The PERC (Pulmonary Embolism Rule-out Criteria) Rule is a "rule-out" tool – all variables must receive a "no" to be negative.
- The test is unidirectional. While PERC negative typically allows the clinician to avoid further testing, failing the rule does not force the clinician to order tests.
- As rule-out criteria, the PERC Rule is not meant for risk stratification.
- Physicians utilizing this rule must have a gestalt that the patient's risk of pulmonary embolism (PE) is low (the study used < 15%).
- The study was designed with a 1.8% test threshold. This took into account the risks associated with PE workup and treatment, such as computed tomography (CT) radiation, anaphylaxis from contrast, and bleeding from anticoagulation. For patients with a pretest probability below this threshold, the risk associated with starting a workup is equivalent to the chance of missing the diagnosis.

Critical Actions

There is no need to apply the PERC Rule to those patients who are not being evaluated for PE. If the patient is considered low risk, the PERC Rule may help avoid further testing. If the patient is moderate or high risk, then PERC Rule cannot be utilized.

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Consider D dimer or imaging based on risk. Consider pericardial disease in patients with pleuritic complaints, as well.

Evidence Appraisal

The original article (Kline et al) from 2004 was a prospective study with a derivation section and a validation section. There were 3148 patients from 10 sites included in the derivation. Twenty-one potential variables were included for analysis, with 8 final variables selected from among them. The validation section included 1427 low-risk and 382 very-low-risk patients from 2 sites.

In low-risk patients ,there was a sensitivity of 96% and specificity of 27%. In very-low-risk patients, there was a sensitivity of 100% and specificity of 15%. The false-negative rate at 90 days in low-risk patients was 1.4%, which is below the 1.8% testing threshold.

A second multicenter validation was done by Kline et al in 2008. This expanded upon the initial validation study and defined low pretest probability as < 15%. The study included 8138 patients from 13 sites. Some of these sites were included in the initial paper. Clinical gestalt for a pretest probability of < 15%, 15% to 40%, or > 40% was collected from the providers.

Twenty percent of the cohort was deemed low-risk (< 15%). For patients who were PERC-negative with pre-test probability < 15%, the false negative rate at 45 days was 1.0%, with a sensitivity of 97.4% and specificity of 21.9%.

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Why to Use

Emergency physicians have a low threshold for testing for PE. The PERC Rule rules out patients who are considered low-risk for PE based on clinical criteria alone. PERC-negative patients do not require utilization of the D dimer, which has a high sensitivity but low specificity. Low-risk patients who are PERC-negative avoid the risks associated with unnecessary testing and treatment for PE.

When to Use

- The PERC Rule can be applied to patients where the diagnosis of PE is being considered, but the patient is deemed low-risk.
- A patient deemed low-risk by physician's gestalt, who is also aged < 50 years, with a pulse rate < 100 beats/min, $SaO_2 \geq 95\%$, no hemoptysis, no estrogen use, no history of surgery/trauma within 4 weeks, no prior PE or DVT, and no present signs of DVT, can be safely ruled out and does not require further workup.

Next Steps

- In the setting of a low-risk patient who is not PERC-negative, the physician should consider a D dimer for further evaluation.
- If the D dimer is negative, and clinical gestalt determines a pre-test probability is < 15%, then the patient does not require further testing for PE.
- If the D dimer is positive, further testing such as a CT angiography or V/Q scan should be pursued.

Abbreviations: DVT, deep vein thrombosis; V/Q, ventilation/perfusion [ratio].

Calculator Creator

Jeffrey Kline, MD
Click here to read more about Dr. Kline.

References

Original/Primary Reference

- Kline JA, Mitchell AM, Kabrhel C, et al. Clinical criteria to prevent unnecessary diagnostic testing in emergency department patients with suspected pulmonary embolism. *J Thromb Haemost.* 2004;2(8):1247-1255.

Validation Reference

- Kline JA, Courtney DM, Kabrhel C, et al. Prospective multicenter evaluation of the pulmonary embolism rule-out criteria. *J Thromb Haemost.* 2008;6(5):772-80.

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