Abstract: P5019

Derivation and validation of a new probability score in pulmonary embolism suspicion allowing safely reduction of imaging testing: PEPS (Pulmonary Embolism Probability Score)

Authors:
P.-M. Roy\textsuperscript{1} , E. Friou\textsuperscript{1} , B. Germeau\textsuperscript{2} , T. Mounmeh\textsuperscript{1} , D. Douillet\textsuperscript{1} , J. Kline\textsuperscript{3} , M. Righini\textsuperscript{4} , G. Le Gal\textsuperscript{5} , A. Penaloza\textsuperscript{2} , \textsuperscript{1}University Hospital of Angers, Emergency Department - Angers - France, \textsuperscript{2}Cliniques Saint-Luc UCL, Emergency Department - Brussels - Belgium, \textsuperscript{3}Indiana University School of Medicine - Indianapolis - United States of America, \textsuperscript{4}Geneva University Hospitals - Geneva - Switzerland, \textsuperscript{5}University of Ottawa, Department of Medicine - Ottawa - Canada.

Topic(s):
Pulmonary Circulation, Pulmonary Embolism, Right Heart Failure – Diagnostic Methods

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Background: In pulmonary embolism (PE) suspicion, several strategies based on clinical criteria and D-dimer (Dd) measurement have been developed in order to reduce resource utilization. However, they used different clinical probability (CP) assessment methods limiting their combination.

Purpose: To develop and validate a unique probability score integrating most of previous proposals to allow safely reduction of imaging testing.

Methods: 4 CP levels were previously defined in order to obtain a false negative rate <1.9%: 1) without Dd test: very low CP (PE prevalence <1.9%), 2) with Dd <1000 μg/L: low CP (<15%), 3) with Dd <500 or age x10μg/L: moderate CP (<60%) and 4) precluding PE exclusion on Dd: high CP. We used individual data from 4 prospective cohorts of suspected PE patients in Europe and America (n=11 066) for derivation and internal validation. The variables significantly associated with PE in univariate analysis were included in a multivariate logistic regression model. Points were assigned according to the regression coefficients. The score was validated in two external independent cohorts (n=1554, n=1669).

Results: PEPS comprised 13 variables: age <50 years (−2), age 50–64 years (−1), heart rate <80 beats/min (−1), chronic lung disease (−1), chest pain and recent dyspnea (+1), syncope (+1), male sex (+1), previous venous thromboembolism (+2), medical or orthopaedic immobilization (+2), estrogenic treatment (+2), oxygen saturation <95% (+3), unilateral lower limb pain (+3) and PE is the most likely diagnosis (+ 5). The rates of false negative and avoidable imaging tests if the PEPS strategy would have been applied were 0.6% [95% CI: 0.3–1.1] and 22.7% [20.2–25.3] in the first external validation cohort, and 0.85 [0.5–1.45] and 26.6% [23.5–29.9] in the second one. Applied retrospectively, PEPS strategy compared favourably with other strategies and combinations.

Conclusions: A strategy based on the proposed score may lead to a safely substantial reduction of imaging testing. It should now be tested in an outcome interventional study.

<table>
<thead>
<tr>
<th>CP Level</th>
<th>Derivation</th>
<th>Int. validation</th>
<th>Ext. validation 1</th>
<th>Ext. validation 2</th>
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</thead>
<tbody>
<tr>
<td>Very low CP PEPS&lt;0</td>
<td>16/1445: 1.1% [0.7–1.8]</td>
<td>16/946: 1.7% [1.0–2.7]</td>
<td>3/118: 2.5% [0.7–6.8]</td>
<td>5/347: 1.4% [0.6–3.3]</td>
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<tr>
<td>High CP PEPS</td>
<td>125/179: 69.8% [62.8–76.1]</td>
<td>67/108: 62.0% [52.6–70.6]</td>
<td>69/102: 67.7% [58.1–76.2]</td>
<td>23/45: 51.1% [37.0–65.0]</td>
</tr>
</tbody>
</table>

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University Hospital of Angers, Emergency Department­Angers­France, 2 Cliniques Saint­Luc UCL, Emergency Department­Brussels­Belgium, 3 Indiana University School of Medicine­Indianapolis­United States of America, 4 Geneva University Hospitals­Geneva­Switzerland, 5 University of Ottawa, Department of Medicine­Ottawa­Canada

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A strategy based on the proposed score may lead to a safely substantial reduction of imaging testing. It should now be tested in an outcome interventional study.

| CP: Clinical probability; PEPS: Pulmonary Embolism Probability Score. | AUC | 0.84 [0.83–0.86] | 0.82 [0.80–0.84] | 0.79 [0.76–0.82] | 0.77 [0.74–0.80] |