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# Prediction Rule for Diagnosis of Pulmonary Embolism Enhanced by Lung and Venous Ultrasound: Making Confusion or Increasing Efficiency?

To the Editor:

We thank the authors for their interest in our study<sup>1</sup> and the questions raised. Our response begins from their conclusion: "... we fear that uWells' may create more noise than signal in the already murky PE milieu." We find curious that two strongly evidence-based applications of point-of-care ultrasound (POCUS) added to the clinical evaluation might create confusion rather than resolving challenging questions. Why not simply consider that the help of POCUS in ruling in or ruling out deep venous thrombosis (DVT) and pulmonary conditions may be useful when obtained at the bedside? Why not consider the intuitive difference between the clinical suspect of DVT and a definitive diagnosis obtained by visualizing the thrombus?<sup>2</sup> Why not consider the difference speculating about the probability of alternative diagnoses and the possibility of direct visualization of pulmonary conditions, including the pulmonary embolism (PE) effects on the lung parenchyma, that may be obtained with high sensitivity through lung ultrasound?<sup>3</sup> We think that the utility of POCUS, supported in its diagnostic accuracy by multiple evidences, justifies the need for our study and the validity and clinical relevance of our results. As POCUS represents one of the most promising novelties of the past decades and a tool increasingly used by clinicians, it is time to rethink the diagnostic and prognostic scores currently used in the acute setting. Accordingly, our study represents the first attempt to evaluate the diagnostic performance of an ultrasound enhanced clinical score in suspected PE.

Previous studies explored the accuracy of lung ultrasound and then multiorgan ultrasound as a diagnostic tool for PE.<sup>4-6</sup> As reported, the main aim of our study was to compare the diagnostic performance of two

prediction rules. As secondary evaluation, we also explored different diagnostic strategies to rule out PE. However, the study was not powered to give final results on this latter issue, but was only hypothesis generating. Nevertheless, the authors express their concern on the lack of statistical significance in the decrease of the failure rate when ultrasound implements the Wells/D-dimer strategy (0.8% vs. 1.9%). Even considering that the two diagnostic strategies perform similarly in terms of failure rate, we showed that lung and venous ultrasound are feasible, that the US (ultrasound)Wells score performs better than the conventional Wells and that the ultrasound-enhanced strategy may be more efficient and could reduce the use of CT pulmonary angiography.

The authors argue that our approach could be time-consuming. In our experience implementing POCUS reduces the time required for patient evaluation simply because it gives rapid responses to targeted questions such as "Is there DVT?" or "Is there an alternative pulmonary diagnosis?" Moreover we highlight that the application of the conventional Wells score often requires additional diagnostic tests in the daily practice, such as (in two-thirds of our study population) the need for a chest radiography to assign the item "Alternative diagnosis less likely than PE." In these cases the conventional Wells score cannot be immediately calculated at the bedside. We understand POCUS may represent a novelty in some institutions, but growing evidence will probably soon impose its use as a standard of care in many diagnostic applications.

Finally, the authors express their concern about the lack of consideration of the PERC rule. PERC is

supplementary to the application of the Wells score and allows to rule-out PE definitively in patients already classified at low risk.<sup>7</sup> However, the aim of our study was to compare two tools for stratifying the probability of PE, which precedes the application of the PERC rule. In our population the number of patients with low USWells score (0–1) and PERC(–) was 10% higher than with low Wells score (0–1) and PERC(–). However, less than 5% of all patients were at low risk and PERC(–) and this small sample could not support a conclusion on the role of PERC. Our feeling is that the rule could maintain its validity even when added to the USWells score. However, the integration USWells/PERC should be tested in a specifically designed study with a higher expected rate of patients at low risk than the one observed in our emergency departments.

In conclusion, the USWells score represents a novel approach that may improve the current framework of the diagnostic workup for PE. Integrating venous and lung ultrasound to the conventional Wells score may reduce uncertainty and allow a better efficiency of the stratification process.

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