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**National Institute for Health and
Care Excellence**

NICE guideline Venous thromboembolic diseases: diagnosis, management and thrombophilia testing

**Supporting document for the refresh of
recommendation 1.1.16 on the PERC rule**

NICE guideline NG158

August 2023

Guideline version FINAL



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ISBN: 978-1-4731-5297-7

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1 Pulmonary embolism rule-out criteria rule (PERC)

1.1 Objectives

To provide clarity on the PERC rule to support better understanding and implementation in clinical practice.

1.1.1 Introduction

Diagnosing pulmonary embolism (PE) is known to be a challenge because the symptoms and signs are common and not specific. The initial step for people presenting with signs and symptoms of possible PE is to assess their likelihood of having a PE. Therefore, several clinical prediction scores incorporating predisposing factors, symptoms and clinical signs have been developed to safely rule out the diagnosis of PE in a significant proportion of patients; this in turn means patients could be ruled out for further imaging or tests. One of the clinical prediction scores is the pulmonary embolism rule-out criteria (the PERC rule).

1.1.2 NICE recommendation and supporting rationale on the use of PERC

In March 2020, as part of the development of NG158: Venous thromboembolic diseases: diagnosis, management and thrombophilia testing, the guideline committee made a recommendation on the use of PERC for ruling out PE and provided a supporting rationale (see tables 1 and 2).

Table 1: PERC recommendation (2020)

Recommendation number	Recommendation text
1.1.16	If clinical suspicion of PE is low (the clinician estimates the likelihood of PE to be less than 15% based on the overall clinical impression, and other diagnoses are feasible), consider using the pulmonary embolism rule-out criteria (PERC) to help determine whether any further investigations for PE are needed. [2020]

Table 2: Supporting rationale for recommendation 1.1.16

Recommendation 1.1.16 supporting rationale

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In people with signs or symptoms of PE, but in whom clinical suspicion of PE is low (the clinician estimates the likelihood of PE to be less than 15% based on the overall clinical impression and other diagnoses are feasible), there was some evidence showing that the PERC rule can accurately eliminate PE as a possible diagnosis. The committee agreed that using the PERC rule can reduce anxiety and avoid unnecessary D-dimer testing, imaging and interim anticoagulation treatment for people with a low probability of PE and none of the PERC criteria for PE. However, the evidence was limited so the committee agreed to recommend that the PERC rule be considered as part of initial assessment. The committee noted that the studies evaluating PERC all took place in emergency departments but they could see no reason why its use should be limited to this setting or why the diagnostic accuracy of PERC would differ in other settings.

1.1.3 Healthcare Safety Investigation Branch report

In March 2022, the Healthcare Safety Investigation Branch (HSIB) published the report [Clinical decision making: diagnosis and treatment of pulmonary embolism in emergency departments](#). The report describes the findings of an investigation into the safety risk related to delayed or missed diagnosis of PE across several areas of healthcare. The investigation explored the implementation of NG158 and found that emergency department (ED) staff were familiar with the guidance, but rarely applied the decision-making scores and criteria recommended. ED staff described concerns about the guidance that limited their use of it to inform decisions. One key concern was:

- In practice determining a 'less than 15%' likelihood of PE in a patient is challenging.

The consequence of this issue is that the PERC rule can be inappropriately applied where ED staff do not understand its role and there is limited clarity around its use. The investigation also noted that even when correctly applied, there will still be a small proportion of patients who have a PE but meet the conditions of PERC.

1.1.4 NICE surveillance review

A NICE exceptional surveillance review was prompted based on the findings of the HSIB report. In the surveillance review, an impact assessment was carried out on recommendation 1.1.16. As part of this assessment, the reviewers considered the guideline committee

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discussion around the use of the PERC rule that led to the recommendation being made. This was as follows:

The PERC rule requires that clinicians categorise patients based on unstructured clinical gestalt assessment using their clinical experience and expertise, notionally into strata of low, medium and high likelihood of PE. In some studies these strata have been quantified, such as low <15%, medium 15 to 40% and high >40% (Klein et al 2008). The 15% numeric cut-off was added to the NICE guideline as a helpful guide to support gestalt assessment and as a guide to low likelihood of PE.

It was acknowledged that the experience and expertise of the person doing the scoring is an important consideration which could determine the accuracy of the scoring system.

Clinical judgement is needed to identify the subgroup of people in whom clinical suspicion of PE is low and for whom discharge is being considered.

It was concluded that the HSIB report highlights issues that stem from staff not having the knowledge and experience to follow the recommendations or senior support to help make relevant assessments, and this would appear to be the main barrier to successfully implementing the recommendation relating to the PERC rule. As a result, it was recommended that the development team work with the guideline committee to consider whether recommendation 1.1.16 could be clarified to aid implementation.

1.1.5 Methods and process

To determine if there was any evidence for the implementation of PERC, a re-run of the 2019 searches (run 4th April 2019) was conducted (see section 1.1.5.1). The search found 408 references (of which 7 were in the 2020 review that informed the recommendation). These references were screened at title and abstract level. The full texts of 9 references were ordered for closer inspection. None of these studies provided data on the implementation of the PERC tool. As there was no evidence on the implementation of PERC, a decision was made to draw upon the expertise of the committee and discuss a potential refresh of recommendation 1.1.16. A survey was shared with the committee to help facilitate the discussion around the refresh of the recommendation (see section [1.1.5.2](#)).

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The approach for reaching decisions was carried out in line with the methods and process described in [Developing NICE guidelines: the manual](#) which includes details of informal and formal consensus methods. The committee did not require formal consensus methods in their decision-making as there was no disagreement to the refresh of the recommendation.

Declarations of interest were recorded according to [NICE's conflicts of interest policy](#).

1.1.5.1 Scoping search methods

A re-run of the searches was conducted on 14th November 2022, to identify any relevant studies published since the 2019 guidance. Searches were conducted in Medline, Medline in process, Medline e publications ahead of print, Embase (via the Ovid platform), CENTRAL and the Cochrane Database of Systematic Reviews (via the Wiley platform). The search strategy is outlined in Appendix A.

1.1.5.2 Committee survey

A survey was shared with committee members to elicit views on how PERC is used in practice including barriers and enablers. The survey questions (see Appendix B – PERC survey) were prepared by the development team with the aim of generating discussion points to facilitate a structured discussion with the committee to refresh the recommendation.

The survey was distributed to 12 committee members using Microsoft Forms for 8 days in March 2023. Responses were received from 7 committee members and collated. All committee members were given the opportunity to take part in the committee discussions in the meeting and were involved in the final decision-making. The discussion points were extracted from the collated survey responses per question and presented at the committee meeting. See Appendix C – for the survey results.

1.1.6 The committee's discussion

Note that the committee discussion below is in relation to the refresh of recommendation 1.1.16 with the aim of improving implementation. The original committee discussion of the evidence underpinning recommendation 1.1.16 can be viewed in [evidence review for the use of the pulmonary embolism rule-out criteria for diagnosis of pulmonary embolism](#).

1.1.6.1 Findings of the committee survey

The committee discussed their responses to the survey relative to the findings in the HSIB report. Their responses reflected the HSIB report in that one of the barriers to using the PERC rule was interpreting the less than 15% risk of PE criteria. They discussed that clinical staff may choose not to use the PERC rule due to lack of confidence to quantify less than 15% risk of PE. However, the committee noted that some input into the HSIB report was based on anecdotal evidence and therefore is unlikely to be representative of all staff using the PERC rule. The committee described that where PERC was implemented into local pathways or guidelines, they do not include the less than 15% risk or any other way of quantifying risk. Instead, an emphasis on low risk is based on clinical gestalt informed by general medical history, physical examination, and initial investigations (e.g. ECG or chest X-ray). These initial steps will determine if PE is part of the differential diagnosis. The committee agreed that PERC is best considered where PE is part of the differential diagnosis, but other diagnoses are more likely. If there is any uncertainty about the likelihood of PE, PERC would not be used and the next stage of the diagnostic pathway is implemented. Considering these points, the committee agreed that a quantitative measure of low risk such as the suggested less than 15% risk is not needed in the recommendation wording.

1.1.6.2 Benefits and harms

The committee agreed that PERC was a useful tool in that it reduces the need for unnecessary further investigations which may cause increased anxiety to patients as well as resource expenditures. Taking into account the known challenges, the committee discussed ways to support the use and implementation of the PERC rule. They agreed that clinical gestalt was the appropriate approach to determining whether a patient is low, medium or high risk of PE but that trying to quantify this as a percentage is not particularly useful. They agreed to amend the recommendation so that the need to quantify risk was not specified. The committee did not foresee any risk in doing this as they expect it may support implementation of the PERC rule in practice.

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The committee discussed other ways to support implementation of the PERC rule. They considered who would be carrying out assessment with the PERC rule and agreed that it was experience of diagnosing PE that was important for applying clinical gestalt rather than whether a clinician was junior or senior. The committee were aware of one RCT using the PERC tool which defines clinical gestalt evaluation in this context as an unstructured impression of the treating physician as to whether the probability of PE is low, moderate or high ([PROPER trial](#), JAMA. 2018;319(6):559-566). From their experience, the committee described examples of presentations of patients that may benefit from the use of the PERC rule. For instance, chest pain is a common presentation. A clinician may consider using PERC to rule out PE from the differential diagnosis if the presenting patient was younger (under 50 years) with new onset atraumatic chest pain. This then allows for other causes of chest pain to be considered.

The committee noted that there were some online tools such as [MD Calc](#) which include examples of when to use PERC. However, they acknowledged that there may be other resources available and that some healthcare organisations have implemented the tool within their clinical systems which prompt the use of PERC where appropriate.

1.1.7.3 Other factors the committee took into account

The committee discussed the use of the PERC rule in all settings. Whilst they acknowledged that the evidence validating use of PERC is limited to the emergency setting, they reiterated that there was no real reason that the tool cannot be used in other settings outside of the hospital. There were also practical reasons to apply PERC in the community such as not sending a patient with possible signs or symptoms of PE to the emergency department, where the diagnosis is unlikely and could have been ruled out prior to the referral. The committee agreed that to support the implementation of out of hospital PERC, more evidence would be informative but expected the additional information they provided with the refreshed recommendation would help with this implementation. The committee also noted that PERC was not validated in the inpatient setting but thought its use in this setting may be less appropriate as this population will already have a higher risk of VTE.

The committee discussed the use of the PERC rule in people with COVID-19 and suspected PE. They noted that the tool is not validated in the COVID-19 population but due to the increased risk of VTE in this population, it may not be a useful tool to rule out further investigations for PE.

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1.1.7 Recommendations supported by this evidence review

This supporting document for the refresh supports recommendation 1.1.16. Other evidence supporting this recommendation can be found in the [evidence review for the use of the pulmonary embolism rule-out criteria for diagnosis of pulmonary embolism](#).

Appendices

Appendix A – Literature search strategies

To determine if there was any new evidence for the implementation of PERC, a re-run of the 2019 searches (run 4th April 2019) was conducted. The literature search strategies are outlined in full in [appendix C of the evidence review for the use of the pulmonary embolism rule-out criteria for diagnosis of pulmonary embolism](#).

Appendix B – PERC survey

PERC survey questions sent to committee members

We invite you to complete the survey questions below to help inform the committee discussion on 24 March 2023. Please fill in all questions that you feel are relevant for you.

Recommendation text

If clinical suspicion of PE is low (the clinician estimates the likelihood of PE to be less than 15% based on the overall clinical impression, and other diagnoses are feasible), consider using the pulmonary embolism rule-out criteria (PERC) to help determine whether any further investigations for PE are needed.

Questions

Experience of the PERC rule for clinicians and those with lived experience

1. What is your experience of using the PERC rule or being assessed with the PERC rule?
2. How easy or difficult was the PERC rule to use or understand? Please give examples of any barriers or facilitators you have experienced using the PERC rule.

Practical application of the PERC rule

If there are any examples from clinical practice that could help add clarity to the recommendation, please include them with your answers.

3. Who is responsible for carrying out a PERC assessment in your department?
4. How do you/your emergency department interpret the “low clinical suspicion of PE” or “less than 15% risk” criteria? Who is involved in this decision making?
5. In practice, under what circumstances would you apply the PERC rule?

Improving implementation

6. How would you amend the recommendation to add clarity and resolve the uncertainty around how to use the PERC rule?

Appendix C – Survey results

Table 3 Summary of committee survey questions and findings

Question	Summary of responses
<p>1. What is your experience of using the PERC rule or being assessed with the PERC rule?</p>	<p>Experience of using PERC</p> <p>The responses from the committee indicate that PERC is not being used in all organisations and that PE diagnosis often begins with knowledge of D-dimer result.</p> <p>Where it is used, PERC is built into local pathways or Trust guidelines with details of when it should be applied.</p> <p>Setting</p> <p>Responses from committee members indicate that PERC is being used in both the primary care and emergency department setting but one respondent mentioned their Trust restricts its use to the emergency department setting due to it only being validated in that setting.</p> <p>Experience of being assessed with PERC</p>

	<p>No members of the committee have been assessed with PERC.</p>
<p>2. How easy or difficult was the PERC rule to use or understand? Please give examples of any barriers or facilitators you have experienced using the PERC rule.</p>	<p>Ease of use</p> <p>Those that use PERC find the tool itself easy to use and that it is supported on most medical applications.</p> <p>Barriers to use of PERC</p> <p>It is challenging to estimate risk of an individual.</p> <p>Junior doctors or nurse practitioners may not be aware of the tool or may not feel confident to apply it. They may find it easier to directly request CTPA.</p>
<p>3. Who is responsible for carrying out a PERC assessment in your department?</p>	<p>Primary care/community</p> <p>Any healthcare professional consulting with a general practice patient (includes doctors, advanced nurse practitioners and advanced paramedic practitioners).</p> <p>PERC can be applied in remote consultations as long as the patient has access to a pulse oximeter.</p> <p>Emergency care</p>

	All emergency department clinical staff (advanced practitioners, junior and senior doctors).
<p>4. How do you/your emergency department interpret the “low clinical suspicion of PE” or “less than 15% risk” criteria? Who is involved in this decision making?</p>	<p>Interpretation and use of “less than 15% risk”</p> <p>Responses from the committee indicate that the need for a proportional assessment or quantified risk including the 15% risk criteria has not been implemented in their organisations due to concerns around its application.</p> <p>Practical interpretation of “low clinical suspicion”</p> <p>One organisation advises clinicians to take a history, perform an examination and undertake basic tests (CXR, ECG, NEWS2) as required. Following this assessment, PERC is only implemented where PE is as part of the differential diagnosis but considered to be unlikely based on clinical gestalt. Where the clinical staff are uncertain or think PE is likely, PERC is not used.</p> <p>Junior or trainee HCPs should only use the PERC rule under supervision.</p>
<p>5. In practice, under what circumstances would you apply the PERC rule?</p>	<p>Practical use</p>

	<p>Committee members indicated that they would only use the PERC rule when they feel confident the patient does not warrant further investigation because the symptoms are obscure and PE diagnosis is very unlikely. It is used as a final safety test.</p> <p>There was agreement that PERC should be considered where PE is considered as part of the differential diagnosis but is unlikely.</p> <p>One committee member provided an example of the criteria considered by their organisation:</p> <p>“Patients under 50 with atraumatic pleuritic chest pain or new onset SOB where PE is considered in the differential diagnosis but is felt to be unlikely after history, examination and point of care assessment”</p>
<p>6. How would you amend the recommendation to add clarity and resolve the uncertainty around how to use the PERC rule?</p>	<p>Recommendation wording</p> <p>One committee member suggested removing the “less than 15%” text from the recommendation and add it to the supporting rationale with examples of how PERC is applied in trials and how it is currently used in VTE exemplar centres. E.g. “Low clinical probability, estimated by the treating physician’s gestalt as an expectation below 15%. The physician’s gestalt evaluation consists of an unstructured impression of the treating physician as to whether the probability of PE in the patient is low, moderate, or high”</p>

	<p>Other suggestions</p> <p>Where an experienced and confident healthcare professional has decided that further investigation of PE is not warranted, they should perform and record that the PERC score is zero before discharging the patient.</p> <p>Where the implementation of PERC is difficult due to lack of knowledge of the tool, physical prompts (such as putting information on the wall) can be considered in the emergency department and wards.</p> <p>More evidence is needed on the use of PERC outside of the emergency department.</p>
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