CRD summary
The authors concluded that the individual clinical features reviewed only slightly altered the probability of acute pulmonary embolism, and had little diagnostic value in isolation. This reflected the evidence presented, but given the limitations identified regarding the synthesis of variable data and other methodological flaws in the review process, the extent to which the conclusion is reliable is unclear.

Authors' objectives
To estimate the diagnostic value of individual clinical features in determining the pre-test probability of acute pulmonary embolism.

Searching
MEDLINE, EMBASE, CINAHL, Web of Science, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials and the Database of Abstracts of Reviews of Effects (DARE) were searched from 1966 to May 2007 for relevant studies published in English, French, and Spanish. There was no search for unpublished material. The bibliographies of all retrieved articles were scanned for further articles of interest.

Study selection
Cohort studies measuring the diagnostic value of clinical features or clinical score, compared to a reference standard (pulmonary angiography, lung perfusion scanning with or without ventilation scanning, computed tomography pulmonary angiography, lower limb ultrasound, or D-dimer), were eligible for inclusion in the review. Studies measuring the risk of developing pulmonary embolism after clinical characteristics were recorded; case-control studies; and studies with less than 10 patients, were excluded.

The majority of included patients presented through an emergency department; the median prevalence of pulmonary embolism was 38% (range 9% to 55%); the median age was 57 years (range 44 to 69 years); and the proportion of males ranged from 30% to 59%. A number of clinical history and examination features were reported (the full list is available in the paper).

Two independent reviewers selected studies for inclusion, and disagreements were resolved by discussion.

Assessment of study quality
Study quality was assessed on the basis of whether the reference standard was applied independently of findings of the clinical assessment, and whether blinded outcome observers were used in the interpretation of findings.

The authors did not state how many reviewers performed the study quality assessment.

Data extraction
Positive and negative likelihood ratios with 95% confidence intervals were estimated from reported or derived data, where necessary.

It appeared that more than one reviewer performed the data extraction.

Methods of synthesis
Likelihood ratios were pooled in a random-effects meta-analysis. The $X^2$ test was used to investigate heterogeneity.
Results of the review
Eighteen studies (n=5,997 patients) were included in the review. The median sample size was 171 (range 37 to 1,100). The majority of studies reported independent application of the reference standard (except where clinical probability testing was added to the D-dimer test); most clinical assessments were blinded, but reports of blinding of the reference standard were lacking.

Although all likelihood ratios were close to the value of one (indicating marginal effect), the most prominent clinical features for diagnosing the presence of acute pulmonary embolism were: syncope, likelihood ratio (LR) 2.38 (95% confidence interval (CI):1.54 to 3.69); shock, LR 4.07 (95% CI:1.84 to 8.96); thrombophlebitis, LR 2.20 (95% CI: 0.435 to 3.29); current deep vein thrombosis, LR 2.05 (95% CI:1.12 to 3.73); leg swelling, LR 2.11 (95% CI:1.59 to 2.79); sudden dyspnoea, LR 1.83 (95% CI: 1.07 to 3.13); active cancer, LR 1.74 (95% CI: 1.17 to 2.59); surgery, LR 1.63 (95% CI:1.23 to 2.12); haemoptysis, LR 1.62 (95% CI:1.23 to 2.15); and leg pain, LR 1.60 (95% CI: 0.936 to 2.74).

Clinical features for ruling out acute pulmonary embolism were reported as the absence of sudden dyspnoea, LR 0.430 (95% CI: 0.254, 0.730); any dyspnoea, LR 0.521 (95% CI: 0.372, 0.729), and tachypnoea, LR 0.561 (95% CI: 0.404, 0.780).

Many of the analyses were carried out in the presence of statistically significant heterogeneity (p<0.001).

Authors’ conclusions
Individual clinical features only slightly altered the probability of pulmonary embolism, and therefore had little diagnostic value in isolation, or without further testing.

CRD commentary
The review question was clear, and this was supported by detailed inclusion criteria for study design, reference standard, and outcome measure. The search strategy appeared to access some relevant sources, but the applied publication and language restrictions means that relevant studies may have been missed, and that language and publication bias cannot be ruled out. The study quality assessment criteria included items relevant to studies of diagnostic tests, and the results were used to inform the review findings. Although the study selection and data extraction processes appeared to be carried out with attempts to minimise errors and biases, the review process for validity assessment was unclear. The authors acknowledged some of the reviews limitations, including potential selection bias within the included studies, and the questionable appropriateness of pooling heterogeneous data. Together with other methodological limitations identified above, this means that the reliability of the authors' conclusion is unclear.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further research is required to identify causes of heterogeneity (particularly in relation to patient characteristics) in estimating the diagnostic value of individual clinical features in acute pulmonary embolism.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.