Systematic review: diagnostic accuracy of clinical decision rules for venous thromboembolism in elderly
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CRD summary
This review found an increased prevalence of pulmonary embolism with age and strong decrease in specificity and efficiency for clinical decision rules for venous thromboembolism in older patients. These conclusions are supported by the data but should be interpreted with some caution due to the possibility of missing studies.

Authors' objectives
To assess the effect of increasing age on the diagnostic accuracy of clinical decision rules for venous thromboembolism in the elderly.

Searching
MEDLINE and EMBASE were searched from 1950 to June 2010 for full-text studies published in English. Full search strategies were reported and did not include a diagnostic filter. Reference lists were screened, key journals were handsearched and experts in the field were contacted to identify additional relevant publications.

Study selection
Studies that assessed any clinical decision rule or diagnostic algorithm or strategy for diagnosing venous thromboembolism (deep vein thrombosis (DVT) or pulmonary embolism) in patients with a clinical suspicion of venous thromboembolism were eligible for inclusion. Studies had to report at least one elderly (≥65 years) age subgroup analysis with estimates of accuracy and had to report data on sensitivity, specificity and prevalence. Studies had to use an adequate reference standard (defined as compression ultrasonography, venography, pulmonary angiography, ventilation perfusion (V/Q) lung scanning and/or uneventful follow-up).

Included studies assessed the Wells or Oudega rules for diagnosis of DVT and the Wells and/or Revised Geneva rules for diagnosis of pulmonary embolism. Studies enrolled elderly patients, but used different cut-offs to divide their population into age categories. All studies were conducted in outpatients; two studies of pulmonary embolism also included in-patients.

The authors did not state how studies were selected for inclusion.

Assessment of study quality
Two reviewers independently assessed study quality using the 14-item QUADAS criteria. Disagreements were resolved through referral to two further reviewers.

Data extraction
Two reviewers independently extracted data on sensitivity, specificity and the prevalence of DVT/pulmonary embolism. Safety was calculated as the probability of a DVT/pulmonary embolism in patients who were classed as low risk (negative) based on the clinical decision rule. Efficiency was calculated as the proportion of patients judged to be at low risk by the rule. Where necessary, authors were contacted for additional information.

Methods of synthesis
A narrative synthesis was presented. Differences between studies were discussed in the text and tables and figures were used to summarise study characteristics and results.

Results of the review
Nine studies (13,299 participants) were included: five assessed diagnosis of DVT and four assessed diagnosis of pulmonary embolism. The main limitations of the included studies were potential for differential verification bias (78%), not blinding test interpreters (78%) and not reporting intermediate results (69%).
Diagnosis of DVT (five studies, 6,560 participants): Prevalence of DVT ranged from 15% to 39%. There was no clear association with age. Sensitivity ranged from 96% to 100% (four studies). Specificity ranged from 29% to 70% (four studies) and decreased with increasing age. Safety ranged from 0% to 4% (five studies) and efficiency ranged from 21% to 40% (five studies).

Diagnosis of pulmonary embolism (four studies, 6,739 participants): Prevalence of pulmonary embolism ranged from 20% to 24%, and increased with increasing age. Sensitivity was 100% (one study) and specificity ranged from 50% to 22% (one study), decreasing with increasing age (one study). Safety was 1% (two studies). Efficiency ranged from 30% to 32% (two studies).

Authors' conclusions
This review shows an increased prevalence of pulmonary embolism with age and strong decrease in specificity and efficiency for clinical decision rules for venous thromboembolism in older patients. Although the safety to clinical decision rules for venous thromboembolism is high, these rules need to be adapted for the elderly to make them more efficient in these patients.

CRD commentary
The review addressed a clear question and inclusion criteria were defined. The authors stated that studies were required to report data on sensitivity and specificity, but some of the included studies did not report this information. The literature search was adequate for published studies. The restriction to studies published in full in English raised the possibility of language and publication biases. Appropriate steps were taken to minimise bias and errors when assessing quality and extracting data; it was unclear whether such steps were taken when selecting studies for inclusion. Study quality was formally assessed using appropriate criteria and the results were clearly presented. A narrative synthesis appeared appropriate given the small number of included studies.

The authors conclusions are supported by the data, but should be interpreted with some caution due to the possibility of missing studies and (the authors acknowledged) the small number of included studies.

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 was required to adapt clinical decision rules for diagnosis of venous thromboembolism for the elderly. Such a study was underway in the Netherlands. They also recommended that research in elderly patients should use standardised age categories of 60 to 70 years, 70 to 80 years and over 80 years.

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