Influence of age on the cost-effectiveness of diagnostic strategies for suspected pulmonary embolism

Righini M, Nendaz M, Le Gal G, Bounameaux H, Perrier A

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study assessed the cost-effectiveness of four diagnostic strategies for suspected pulmonary embolisms in patients of various ages. The authors concluded that the strategies that included the D-dimer test resulted in cost savings, which were reduced after the age of 80 years. This study had some limitations, especially in its reporting, which make it hard to assess the authors’ conclusions.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study compared the cost-effectiveness of four diagnostic strategies for suspected pulmonary embolism in six patient age groups. The patients were admitted to emergency departments with a clinical suspicion of pulmonary embolism and they were studied in six age groups ranging from under the age of 40 up to 80 years and over.

Interventions
The diagnostic tests comprised clinical probability assessment, D-dimer measurement, lower limb venous compression ultrasonography, and helical computed tomography. Four combinations of these tests were compared and each of them included helical computed tomography.

Location/setting
Switzerland/secondary out-patient care.

Methods
Analytical approach:
The authors constructed a decision analytic model (decision tree) to compare the cost-effectiveness of the four diagnostic strategies. The time horizon was three months and the authors reported that the perspective was that of the health care system.

Effectiveness data:
The effectiveness data were mainly obtained from two prospective multi-centre outcome studies and were combined by the authors. Some data were derived from peer-reviewed publications by means of a systematic literature review. The main clinical parameters included the sensitivity and specificity of the tests for each age group; mortality due to anticoagulant treatment, helical computed tomography, and angiography; and risk of major haemorrhage due to anticoagulant treatment.

Monetary benefit and utility valuations:
The utility values were obtained from published studies. The instruments and methods used to derive these utilities were not reported.

Measure of benefit:
Initially, three-month quality-adjusted expected survival was the measure of benefit. Based on predefined criteria, the therapeutic equivalence of the four strategies was demonstrated and only the costs were analysed.
Cost data:
The cost categories included the diagnostic tests, anticoagulant and coumarin treatment, in-patient and out-patient treatment, and major bleeding complications. These costs were obtained from the authors' setting and from other settings, which were the USA, Canada, and France. All costs were reported in US dollars ($) for the price year 2006.

Analysis of uncertainty:
The parameter uncertainty was investigated using one- and two-way sensitivity analyses, varying the estimates of costs, sensitivity and specificity values of the diagnostic tests, and mortality. The ranges over which the parameters were varied were reported.

Results
Based on the authors' predefined criteria, the four strategies were found to be similarly effective and only the costs were analysed.

The costs of all diagnostic strategies increased with age. Strategies that included D-dimer testing and were conducted in an out-patient setting were less costly than strategies that did not include it, across all age groups. Strategies that included compression ultrasonography were more costly than the other strategies.

The sensitivity analysis demonstrated that these results were robust.

Authors' conclusions
The authors concluded that for out-patients the strategies that included D-dimer resulted in cost savings until the age of 79 years, beyond which the savings diminished, but were not completely eliminated. Compression ultrasonography was an expensive test and added little to the effectiveness of the diagnostic strategies.

CRD commentary
Interventions:
The interventions were clearly reported.

Effectiveness/benefits:
The model parameters were mainly derived from two published studies and were augmented by other studies. The two main studies were relevant as they examined the effectiveness of the tests in relation to age, but few details of these or the other studies were provided. A systematic search of the literature was reported, but its methods and inclusion criteria were not. The utility values were obtained from published sources and the methods used to derive them were not reported. This makes it difficult to ascertain if the best available evidence was used.

Costs:
The cost categories appeared to reflect the perspective. The cost analysis was conducted for four different settings, but the costs and quantities were not reported separately, which limits the generalisability of the analysis. The price year was reported and the uncertainty around the cost estimates was investigated in a sensitivity analysis, but the results of this were not reported in enough detail.

Analysis and results:
The model structure was presented in a diagram. The details, such as the time horizon and modelling assumptions, were clearly reported. The authors reported that, based on their criteria, the diagnostic strategies were found to be almost equally effective and only the costs were analysed. The uncertainty in the model was examined through one-way and two-way sensitivity analyses around certain parameters. A probabilistic sensitivity analysis would have been a more thorough way to assess the model uncertainty. The authors acknowledged some limitations to their study.

Concluding remarks:
This study had some limitations especially in its reporting, which means it is hard to assess the authors' conclusions.

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