Spiral CT angiography for suspected pulmonary embolism: a cost-effectiveness analysis
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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.

Health technology
Spiral computed tomographic (CT) angiography and conventional pulmonary angiography.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Persons with suspected PE.

Setting
The setting was Leiden University Hospital, The Netherlands.

Dates to which data relate
Effectiveness data were collected from studies published between 1985 and 1995. The dates to which resource and cost data relate were not stated.

Source of effectiveness data
Effectiveness data were derived from a synthesis of previously completed studies.

Modelling
A decision analytic model was used to estimate costs and benefits for each diagnostic algorithm. Calculations were performed using the TreeAge software package.

Outcomes assessed in the review
Outcomes assessed in the review included the sensitivities, specificities and complications required for the model.

Study designs and other criteria for inclusion in the review
The baseline values of the variables were derived from pooled data from published literature, identified through a systematic MEDLINE search. Regarding the accuracy of spiral CT angiography, studies reporting accuracy on the embolus level were excluded. Regarding pretest probability of PE and DVT, studies reporting DVT in patients suspected of having PE were excluded. Regarding the use of US, studies were included if venographic, or negative follow-up results in cases of negative ultrasound (US) results, were used as the standard of reference.
Sources searched to identify primary studies
Primary studies were identified by searching MEDLINE (years 1985 to 1995) plus additional unspecified searches of articles listed in bibliographies.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Twenty-seven primary studies of unspecified type were used to derive the baseline values of the variables.

Methods of combining primary studies
The baseline values of the variables were based on pooled data. A decision model was used to combine the results of primary studies and to calculate final costs and benefits.

Investigation of differences between primary studies
Explanations were provided for differences in findings between studies which were relevant to the analysis in this case.

Results of the review
The results of the review were as follows:

Conditional angiography: sensitivity of 98%; specificity of 97%.
Spiral CT angiography: sensitivity of 95.5%; specificity of 97.6%.
Complications with conventional angiography: mortality 0.5%; morbidity 1%.
Complications with spiral CT angiography: mortality <0.01%; morbidity 0.22%.

Measure of benefits used in the economic analysis
The main outcome measure used in this decision analytic study was mortality at three months.

Direct costs
Costs and quantities were not reported separately. The cost analysis was performed from a hospital perspective. The costs of all diagnostic procedures were estimated by combining the costs for equipment, medical materials and personnel. Overhead costs were excluded from the analysis as were the costs of treating complications.

Currency
Costs were calculated to reflect Western European standards but were expressed in US dollars ($). The exchange rate used was not stated.

Sensitivity analysis
Threshold analyses were performed, with both mortality and marginal cost-effectiveness as primary outcome measures, for those variables where no reliable data were available in the literature, or where values may have varied with the local situation. The aim of the threshold analysis was to determine the value of those uncertain variables at which the optimal strategy becomes equally as cost-effective, or as effective overall, as another strategy. Variables varied in the threshold analysis were:

- the pretest probability of PE and coexisting DVT (deep vein thrombosis);
- the probability of mortality due to untreated PE and DVT;
- the accuracies of spiral CT angiography for detecting PE, of the D-dimer blood assay for detecting fibrinogen degradation products, and of US for detecting DVT.

**Estimated benefits used in the economic analysis**

Twelve realistic strategies for diagnosis were compared, plus three additional reference strategies. With mortality as the primary outcome parameter, the best strategy was found to be US plus spiral CT angiography, which had a per cent mortality of 0.57.

**Cost results**

The approach with the lowest average total cost per patient ($824) was found to be D-dimer assay plus spiral CT angiography.

**Synthesis of costs and benefits**

Marginal cost-effectiveness was determined by comparing the outcome of each strategy with a no-treatment strategy of zero cost. With mortality as the primary outcome measure, the best strategies all included spiral CT angiography. In this case, ultrasound followed by spiral CT angiography was found to be the dominant diagnostic strategy (cost per life saved of $20,562). When the primary outcome measure was cost per life saved, again the best strategies all included spiral CT angiography. In this case, D-dimer blood assay followed by spiral CT angiography was found to be the dominant strategy (cost per life saved of $16,493).

**Authors’ conclusions**

The use of spiral CT angiography is likely to lead to improved patient outcomes in terms of mortality and also improvements in the cost-effectiveness of the diagnosis of suspected pulmonary embolism.

**CRD COMMENTARY - Selection of comparators**

The selection of comparators was appropriate and clearly justified in this case.

**Validity of estimate of measure of benefit**

Estimates were derived from a systematic review of previously published studies. The techniques used to pool the data were not specified in the report.

**Validity of estimate of costs**

Costs included in the analysis were those incurred only by the treating institution and excluded overhead costs. There was no estimate of costs to the patient or other sectors of society.

**Other issues**

Overall the study was well designed, however, costs may not be generalisable to other institutional settings.

**Implications of the study**

Implementation of the results may lead to the more cost-effective use of diagnostic techniques for suspected pulmonary embolism.
embolism.

Source of funding
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