The cost-effectiveness of screening for latent tuberculosis infection

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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
The technology studied was the screening for latent tuberculosis infection (LTBI), and its treatment with isoniazid. Isoniazid is a common treatment for patients under 35 years of age with a positive tuberculin test.

Type of intervention
Screening and treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients suffering from LTBI.

Setting
The setting was the community. The study was carried out in Atlanta, GA, USA.

Dates to which data relate
The effectiveness data were derived from studies published from 1981 to 1997. The dates relating to resource use data were not reported. The price year was 1999.

Source of effectiveness data
The effectiveness data were derived from a review of completed studies.

Modelling
A decision model was used to estimate the outcomes of quality-adjusted life-years (QALYs) and costs for the screening versus no screening strategies. The outcomes were estimated for a hypothetical cohort of 35-year old patients with a high prevalence of LTBI, who were not at increased risk of active TB disease if infected. A Markov model was also developed to trace the health profile of this hypothetical cohort over a 20-year period.

Outcomes assessed in the review
The following model inputs were assessed in the review: the probability of fatal isoniazid-related hepatitis, the probability of active TB given LTBI, the probability of death given active TB disease, the efficacy of a complete course of isoniazid, and the efficacy of an incomplete course of isoniazid. The author made assumptions about the probability of LTBI, the probability of starting treatment, and the probability of completing treatment.
Study designs and other criteria for inclusion in the review
Different study designs were included in the review. Articles describing decision-making or cost-effectiveness analyses of the screening for and treatment of TB were selected. Studies comparing BCG vaccination with chemoprophylaxis, comparing different regimens for treating drug-resistant organisms, or examining serial testing in occupational settings were excluded.

Sources searched to identify primary studies
MEDLINE was searched from 1966 to 1999 using the keywords "decision analysis", "cost-effectiveness analysis" and "tuberculosis".

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
Approximately 20 studies were reported. The effectiveness data for the decision model were obtained from 4 of these studies.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not carried out.

Results of the review
The probability of fatal isoniazid-related hepatitis was 0.0001 (range: 0.00001 - 0.000912).

The probability of active TB given LTBI was \(0.000719\) multiplied by \(e^{-0.0569n}\), where \(n\) was the number of years following exposure (range: 0.00023 - 0.045).

The probability of death given active TB disease was 0.039 (range: 0.023 - 0.074).

The efficacy of a complete course of isoniazid was 0.68 (range: 0.5 - 0.93) whilst that for an incomplete course was 0.15 (range: 0 - 0.015).

Measure of benefits used in the economic analysis
The measures of benefits were the number of TB cases prevented and QALYs. The QALY estimates were derived from a survey of 51 TB clinicians using the Quality-of-Well-Being Scale. The QALYs were discounted using an annual rate of 3%.

Direct costs
Only direct medical costs were included in the analysis. Future costs were discounted at a rate of 3%. The quantities and costs were not analysed separately and only total costs were reported. The price year was 1999. The total costs for each strategy were estimated through the decision model.
Statistical analysis of costs
No statistical analysis was carried out.

Indirect Costs
Indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
Key parameters in the model were varied in order to investigate variation in the data. These included the risk of fatal isoniazid hepatitis, the probability of active TB given LTBI, the probability of death given active TB, the prevalence of LTBI, the efficacy of isoniazid, and the cost of treating active TB.

Estimated benefits used in the economic analysis
The screening strategy resulted in 68 TB cases, compared with 125 cases for the no screening strategy; the difference represented 57 TB cases prevented. The screening strategy also resulted in a gain of 3 QALYs per 10,000 persons screened.

Cost results
The total cost of the no screening strategy was $1,901,800 and the total cost of screening was $1,550,700. The incremental cost of screening compared with no screening was $351,100 per 10,000 persons screened.

Synthesis of costs and benefits
The costs and benefits were combined by calculating the incremental cost per active TB case prevented, and the cost per QALY gained. The author did not report any figures, but suggested that the screening strategy was likely to result in savings. The sensitivity analyses indicated that the model findings were particularly sensitive to the probability of fatal isoniazid hepatitis.

Authors’ conclusions
The decision analysis showed that the impact of screening programmes may be maximised when the population target is represented by patients with high risk of developing active TB disease, patients who have greater prevalence of LTBI, or patients who have increased treatment costs for active TB disease. The model was also able to identify the most important variables affecting the results of the study.

CRD COMMENTARY - Selection of comparators
The no screening strategy was selected as the comparator because it represented the most appropriate alternative to the main intervention. You should consider whether this is a widely used technology in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness measures adopted in the model were not based on a systematic review of the literature. In addition, the criteria for assessing the validity of the primary studies were not reported.

Validity of estimate of measure of benefit
The estimation of benefits was modelled. However, the utility values used to calculate QALYs were based on clinicians' values, when patients' values may have been more appropriate.

**Validity of estimate of costs**
The resources and costs were not reported separately. Only the total costs associated with each intervention were presented. The dates during which the resource data were collected were not stated.

**Other issues**
The issue of generalisability to other settings was not addressed. The results from several other studies were reported and discussed by the author, but these were not presented in detail.

**Implications of the study**
The author suggested that further research should consider the overall benefit for the patients and should, therefore, include patients' costs and productivity losses. The costs and benefits of new short-course treatment should also be considered in future analyses.

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