Cost-effectiveness of interferon-gamma release assay screening for latent tuberculosis infection treatment in Germany

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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.

CRD summary
The study evaluated the cost-effectiveness of the new QuantiFERON-TB Gold In-Tube (QFT-G) assay for the screening and treatment of persons who have had close contact with tuberculosis patients and who are suspected of having latent tuberculosis infection (LTBI), in Germany. The authors concluded that use of the QFT-G assay, especially following tuberculin skin test screening of close contacts at a cut-off induration size of >5 mm before LTBI treatment, was highly cost-effective in reducing the disease burden of tuberculosis. The study methodology had a few limitations, especially concerning the data used in the analysis, and for this reason the authors' conclusions should be considered with a degree of caution.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study evaluated the cost-effectiveness of the new QuantiFERON-TB Gold In-Tube (QFT-G) assay for the screening and treatment of persons who have had close contact with patients with tuberculosis (TB) and who are suspected of having latent TB infection (LTBI), in Germany.

Interventions
The four screening strategies were:

- the tuberculin skin test (TST) with an induration cut-off size >5 mm;
- the TST with an induration cut-off size >10 mm;
- the QFT-G assay; and
- the TST with a cut-off induration size of >5 mm, followed by the QFT-G assay in all TST-positive individuals.

Location/setting
Germany/secondary care.

Methods
Analytical approach:
A Markov model was used to determine the economic and clinical outcomes of each of the four screening strategies (and subsequent treatment). The time horizon of the study was 20 years. The authors stated that the study perspective had been societal.

Effectiveness data:
The effectiveness data came from published studies, with some modification of one of the studies by the authors. The authors did not report any search methods or inclusion criteria. The main clinical parameters were the sensitivity and specificity of the TST and QFT-G assay screening strategies, the positive predictive value of the TST test, the efficacy of a course of isoniazid and the annual probability of TB disease with no treatment. The sensitivity, specificity and positive predictive value of the TST were obtained by modification of an earlier study in which some of the current
authors were involved.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The primary measure of benefit was the number of life-years gained (LYG). Future health benefits were discounted at an annual rate of 3%.

Cost data:
The direct costs included the labour and resource costs of each of the screening strategies, the costs of a chest radiograph and medical consultation, and the costs of treatment. The indirect costs were those arising from the loss of productivity. Resource use and cost data were taken from a published study. The costs were expressed in US dollars ($) and the price year was 2004. Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way sensitivity analysis was conducted on the key clinical parameters used in the model. In addition, a threshold analysis was performed to determine what reduction in the total cost of treatment for TB a screening strategy must bring in order to result in cost-neutrality.

Results
The QFT-G assay-based treatment led to cost-savings of $542.9 and 0.0104 LYG (3.8 life-days gained) per LTBI case.

TST-based treatment at a 10-mm induration size cut-off gained $177.4 and 0.0056 LYG (2.0 life-days gained) per test-positive contact.

For the TST-based treatment at a 5-mm induration size cut-off, the incremental cost-effectiveness ratio fell below the willingness-to-pay threshold ($30,170 per LYG) but resulted in the unnecessary treatment of 77% of contacts, owing to false-positive TST results.

Screening first by the TST with a cut-off at >5 mm, followed by the QFT-G assay as a confirmation test and then treatment with isoniazid would produce the same number of LYG as those screened with the QFT-G assay alone. However, the total costs were slightly lower ($222,869). This screening and treatment strategy dominated the option of just screening.

The results were robust to the sensitivity analysis.

Authors' conclusions
The authors concluded that use of the QFT-G assay, especially following the TST screening of close contacts at a cut-off induration size of >5 mm before LTBI treatment, was highly cost-effective in reducing the disease burden of TB.

CRD commentary
Interventions:
The interventions were reported clearly. The inclusion and exclusion of various strategies were discussed and justified.

Effectiveness/Benefits:
The effectiveness data were derived from published sources, with data from one of the published studies being modified to obtain appropriate estimates for the authors' model. The methods of reviewing the literature were not reported, which makes it impossible to ascertain whether the best available evidence was used to inform the model, given the limited information provided by the authors. The primary outcome was the LYG, which appears to have been appropriate. You should consider if estimates of quality of life could also have been taken into account as a measure of benefit.

Costs:
The costs included would appear to reflect the authors’ stated perspective. The costs of testing and treatment were obtained from a published paper. The indirect costs also appear to have been taken from a published paper, but no details of their estimation were provided. The reporting of the cost data was generally poor, with only average or total costs being reported. Sensitivity analysis around the cost parameters was not performed, although a threshold analysis was used to determine what reduction in the total cost of TB treatment a screening strategy must bring in order to result in cost-neutrality. Future costs were appropriately discounted and the price year was reported, which enables future reflation exercises.

Results and Analysis:
The authors conducted an appropriate incremental analysis and full results were presented. The results of the sensitivity analysis were also reported in full. However, a one-way sensitivity analysis may be a limited approach to account for uncertainty in the economic model; a multi-way or even a probabilistic sensitivity analysis would have been more adequate. Given that the cost data were from the perspective of the German health care system, the unit costs were not reported and the cost parameters were not subject to sensitivity analysis, it may be difficult to generalise the results to other settings. The authors noted some minor limitations of their analysis.

Concluding remarks:
There were a few limitations to the study methodology, especially concerning the data used in the analysis, and for this reason the authors’ conclusions should be considered with a degree of caution.

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Bibliographic details

MeSH
Adult; Antitubercular Agents /therapeutic use; Carrier State /diagnosis; Cost-Benefit Analysis /statistics & numerical data; False Positive Reactions; Female; Germany; Humans; Interferon-gamma /blood; Isoniazid /therapeutic use; Male; Markov Chains; Mass Screening /economics /methods; Models, Theoretical; Sensitivity and Specificity; Tuberculin Test /economics /methods; Tuberculosis /diagnosis /drug therapy

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