Cost-effectiveness analysis of targeted and sequential screening strategies for latent tuberculosis
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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 objective was to determine the cost-effectiveness of several screening strategies for latent tuberculosis infection in US army recruits. The authors concluded that targeted testing offered the best value in the selected population, although it was still expensive compared with no testing. The methods appeared appropriate but were not well reported. The uncertainty surrounding the results makes it difficult to assess the authors’ conclusions.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study objective was to determine the cost-effectiveness of several screening strategies for latent tuberculosis infection in US army recruits.

Interventions
Eight screening strategies (universal, sequential and targeted) were compared with no screening. The screening strategies were a combination of universal versus targeted screening and sequential testing. Testing strategies included tuberculin skin testing versus interferon-gamma release assays. The interferon-gamma release assays included were T-SPOT and QFT (QuantiFERON-TB Gold In-Tube).

The eight strategies were: universal testing of all recruits with the tuberculosis skin test (usual practice for US military services); universal screening with T-SPOT; universal screening with QFT; sequential testing with tuberculosis skin test followed by T-SPOT assay; sequential testing with tuberculosis skin test followed by QFT assay; targeted testing with risk factor questionnaire followed by tuberculosis skin test; targeted testing with a risk factor questionnaire followed by T-SPOT assay; and targeted testing with risk factor questionnaire followed by QFT assay.

Location/setting
USA/primary care in a military setting.

Methods
Analytical approach:
A decision analytical Markov model was designed to combined published literature. Health outcomes were states of latent tuberculosis infection, previous active tuberculosis disease and death. A hypothetical cohort of 200,000 army recruits entered the model at age 20 years. The time horizon was 20 years. The authors stated that a societal perspective was adopted.

Effectiveness data:
The effectiveness data were derived from a non-published prospective study of 1979 recruits entering the US military at Fort Jackson, USA in 2009, and published studies. The main clinical effectiveness estimates were the sensitivity and specificity of the various tests.

Monetary benefit and utility valuations:
Not relevant.
Measure of benefit:
The benefit was measured as the number of active tuberculosis cases prevented.

Cost data:
The cost categories were: the medical costs associated with the various screening strategies, tuberculosis hospitalisation, contact investigation and adverse reaction costs; and productivity costs associated with screening and acquiring tuberculosis. Cost data were derived from cost-of-illness estimates, which were derived from the TRICARE management agency and published literature. Costs were presented in 2009 US $ and discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way and multi-way deterministic sensitivity analyses were undertaken. The chosen ranges used in the analyses were based on medical literature. Best-case and worse-case scenarios were created. The results of these analyses were presented in tables.

Results
The results showed that targeted screening strategies provided lower incremental costs per case prevented than sequential or universal screening strategies.

Compared with a no screening strategy: the risk factor questionnaire followed by tuberculosis skin test incurred an incremental cost per case prevented of $285,777; risk factor questionnaire followed by QFT assay was dominated (as it was more costly and less effective); risk factor questionnaire followed by T-Spot assay incurred an incremental cost per case prevented of $369,273; tuberculosis skin test followed by QFT assay was dominated; tuberculosis skin test followed by T-Spot assay was dominated; universal tuberculosis skin test incurred an incremental cost per case prevented of $711,363; universal QFT assay was dominated; and universal T-Spot assay incurred an incremental cost per case prevented of $3,347,268.

The one-way sensitivity analysis around estimates that compared the use of tuberculosis skin test, T-SPOT assay and QFT assay was sensitive to small to moderate changes in model assumptions. The multi-way and one-way sensitivity analyses provided very similar results.

Authors' conclusions
The authors concluded that targeted testing offered the best value in the selected population, although it was still expensive compared with no testing.

CRD commentary
Interventions:
The interventions were well described and appeared to have appropriate comparators. The usual practice in the US military and the recommended practice of the Disease Control and Prevention/American Thoracic Society were appropriately included as comparators.

Effectiveness/benefits:
The sources of effectiveness data were briefly described, so it was difficult to fully assess their quality. The use of a non-published study may have reduced the reproducibility of the study. It was unclear if a systematic review was undertaken, so all the best available evidence may not have been included. The benefit measure appeared appropriate, but the measure was quite disease specific which may reduced comparability with studies in other disease areas. The benefit measure was not discounted, which may have increased its uncertainty due to lack of benefit time-value accounting.

Costs:
The perspective was clearly stated and all the relevant categories appear to have been included. Little information was provided on the sources of the cost data, so it was difficult to assess their quality. It was unclear how resource use was estimated, which made it difficult to assess these estimates. The costs were appropriately discounted and adjusted for inflation.
Analysis and results:
The analytical approach was adequately described, with an appropriate model diagram provided. The sensitivity analysis undertaken provided a good indication of the uncertainty surrounding the various model inputs. However, it would have been useful to undertake probabilistic sensitivity analysis, which would have provided a good indication of the overall uncertainty in the model. The results of the study and the results of the sensitivity analyses were clearly reported. The authors mentioned several limitations and highlighted the uncertainty of the estimates of the cost and effectiveness inputs.

Concluding remarks:
The methods appear appropriate but were not well reported. It is difficult to assess the authors’ conclusions, particularly given the uncertainty surrounding the results.

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