Comparison of cost-effectiveness of tuberculosis screening of close contacts and foreign-born populations
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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 screening of close contacts and immigrant populations for tuberculosis (TB).

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of immigration applicants undergoing radiographic screening, already arrived immigrants requiring surveillance for inactive TB, and close contacts of active cases resident in Montreal, Canada.

Setting
The study setting was hospital. The economic study was carried out in Canada.

Dates to which data relate
The effectiveness and resource use data were collected from patient records from June 1996 to June 1997, and from studies published between 1964 and 1999. The cost data were taken from a study published in 1999. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a single study and a literature review.

Link between effectiveness and cost data
The costing was conducted retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
The study sample comprised 12,898 people who were screened before immigration, 828 people identified from the post-arrival surveillance, and 244 people identified in the close contacts group. No power calculations were reported.

Study design
This was a retrospective cohort study carried out at a single centre. The patients were followed-up until after treatment for TB.
Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. The primary health outcomes were tuberculin and microbiological test results, diagnoses, disposition, follow-up, and treatment. The authors did not compare the groups in terms of demographic or socioeconomic characteristics.

Effectiveness results
Of the 12,898 applicants screened radiographically, 5.6% were referred for further evaluation; 119 of the 200 close contacts of active TB cases were also referred for further evaluation.

In the three study cohorts, there were 3 smear-positive, 18 smear-negative or culture-positive, and 6 clinical cases of active TB detected.

The number of cases of prevalent TB disease detected and treated was 16 in the pre-immigration screening group, 4 in the post-arrival surveillance group, and 6 in the close contacts group.

The number of cases of future TB disease prevented by treatment of latent TB infection was 7.85 in the pre-immigration screening group, 1.58 in the post-arrival surveillance group, and 3.21 in the close contacts group.

Therapy was prescribed for 97% of previously untreated, tuberculin-positive close contacts of active TB cases, and for 58% of applicants with latent TB infection who appeared eligible for therapy.

Clinical conclusions
The close-contact programme had a high detection rate and demonstrated a high efficiency.

Modelling
A 20-year Markov model was used to determine the expected number of cases of active TB.

Outcomes assessed in the review
The review assessed active disease incidence, and the risk reduction from the treatment of latent TB infection.

Study designs and other criteria for inclusion in the review
Not stated.

Sources searched to identify primary studies
Not stated.

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

Methods used to judge relevance and validity, and for extracting data
Summary statistics from individual studies were used.

Number of primary studies included
At least 7 primary studies were included.
Methods of combining primary studies
The primary studies were combined narratively.

Investigation of differences between primary studies
Not stated.

Results of the review
The probability of TB infection was 0.1%, granuloma 0.2%, and fibronodular disease 0.6%.

The probabilities of infection within the last 2 years and more than 2 years earlier were 2.5 and 0.1%, respectively.

The risk reduction from treatment of latent TB infection ranged from 0% for less than 6 months and/or poor compliance, to 93% for 11 to 12 months with good compliance.

Measure of benefits used in the economic analysis
The health benefit measures were the number of cases of TB treated and prevented. The benefits were discounted.

Direct costs
It was unclear whether the direct costs had been discounted, since the timeframe was greater than one year. The quantities and costs were reported separately. The direct costs included the costs of screening tests, clinic visits, investigations, hospitalisation, drugs, administration and overheads. The quantity/cost boundary adopted was that of the hospital. The quantities and costs were estimated from the data, and were based on published reimbursement rates and fee schedules. The price year was not reported.

Statistical analysis of costs
No statistical analysis was reported.

Indirect Costs
Indirect costs were not included.

Currency
Canadian dollars (Can$). The exchange rate was Can$1.00 = US$0.67.

Sensitivity analysis
Sensitivity analyses were conducted on the number of active TB-infected cases, prescription rate, referral criteria, the future risk of active TB, and the cost per passively diagnosed case.

Estimated benefits used in the economic analysis
16 prevalent TB cases were detected and treated in the pre-immigration screening group, 4 in the post-arrival surveillance group, and 6 in the close contacts group. 7.85 cases of future TB disease were prevented by treatment of latent TB infection in the pre-immigration screening group, 1.58 in the post-arrival surveillance group, and 3.21 in the close contacts group.

Cost results
The total costs were Can$573,854 in the pre-immigration screening group, Can$246,426 in the post-arrival surveillance
group, and Can$95,120 in the close contacts group.

**Synthesis of costs and benefits**
The cost per TB infection treated was Can$491 in the pre-immigration screening group, Can$452 in the post-arrival surveillance group, and Can$507 in the close contacts group.

The cost per TB disease prevented was Can$9,123 in the pre-immigration screening group, Can$14,860 in the post-arrival surveillance group, and Can$10,427 in the close contacts group.

The incremental costs (savings) for future TB disease prevented was -Can$1,967 in the pre-immigration screening group, Can$3,770 in the post-arrival surveillance group, and -Can$663 in the close contacts group.

The applicant screening programme would have been more cost-effective if therapy for latent TB infection had been prescribed to 90% of eligible candidates.

The surveillance programme would have been more cost-effective if the prescription rate was higher, and if stricter referral criteria were applied.

The surveillance programme would have been cost-saving if the cost per passively diagnosed case had exceeded Can$40,000.

All the programmes would be more cost-effective if the future risk of active TB was higher.

**Authors' conclusions**
Close-contact investigation was highly cost-effective and resulted in net savings. The immigrant applicant screening and surveillance programmes had a significant impact but were much less cost-effective, in part because of substantial operational problems.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparators used, namely that they were alternative screening strategies for the context examined. You, as a user of the database, should decide if these health technologies are relevant to your setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a cohort study, which was appropriate for the study question. The study sample was representative of the study population. However, patient groups were not compared in terms of demographic or socioeconomic characteristics at analysis. The authors undertook a literature review to derive additional effectiveness estimates, but they did not describe their methods. Despite this limitation, the validity of the results was enhanced by sensitivity analyses to account for variability in the estimates.

**Validity of estimate of measure of benefit**
The benefits were estimated appropriately, directly from the effectiveness analysis.

**Validity of estimate of costs**
The cost analysis showed several good features: all relevant direct cost categories were included; the validity of cost results was enhanced by appropriate sensitivity analyses; and the quantities and costs were reported separately. On the other hand, a cost estimate was derived from another study, which limits the generalisability of the results; the price year was not reported, which would make reflation exercises in other settings problematic; and charges were not converted into costs, and thus, true opportunity costs were not estimated.
Other issues
The authors made appropriate comparisons of their findings with those from other studies, and addressed the issue of generalisability to other settings. The authors did not present their results selectively. The study considered immigration applicants and this was reflected in the authors' conclusions. The authors noted that the cost-effectiveness of the screening programmes may have been under-estimated because:

the costs of out-patient therapy for passively diagnosed cases of TB were under-estimated;

the testing of applicants and new arrivals for HIV was rarely performed;

the cost per passively diagnosed case did not account for possible rehospitalisation;

therapy taken for less than six months or with poor compliance was assumed to provide no benefit; and

the costs of excess spread of infection from passively diagnosed cases were under-estimated.

Implications of the study
The close-contact investigation was highly cost-effective and resulted in net savings. The programmes based on immigration applicant screening and surveillance had a significant impact, but were much less cost-effective, in part because of substantial operational problems. If these problems can be avoided, and opportunities for provision of therapy for latent TB infection are fully realised, then radiographic screening of newly-arriving immigrant populations for TB could be cost-effective. With TB on the increase in many parts of the world, the present results should be of significant interest to public health policy makers and immigration services.

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