Discussing the current situation of tuberculosis case-finding by mass miniature radiography in Japan

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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 use of mass miniature radiography (MMRY) to find cases of tuberculosis (TB) was examined. No further details of the technology were described.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adults in the general population who received periodic MMRY for TB screening either at schools, workplaces, local health institutions, or other institutions such as nursing homes and jails. No further details on the inclusion and exclusion criteria were provided.

Setting
The setting was the community. The economic study was conducted at the Japan Research Institute of Tuberculosis, Japan Anti-Tuberculosis Association (JATA), Tokyo.

Dates to which data relate

Source of effectiveness data
The effectiveness data were derived from a review of public and JATA reports on TB in Japan.

Modelling
Although the authors did not provide a description of or mention a model, it is likely that a mathematical computation package was utilised since the authors conducted and reported sensitivity analyses.

Outcomes assessed in the review
The outcomes assessed were:

the number of newly notified TB cases,
the mode of detection,
the detection rates of MMRY, and
the initial bacteriological status of pulmonary TB among the patients.

Study designs and other criteria for inclusion in the review
Public and JATA reports on TB and TB screening in Japan were included.

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
Not stated.

Number of primary studies included
Four public reports plus reports from 8 branches of JATA were used.

Methods of combining primary studies
Not relevant.

Investigation of differences between primary studies
Not relevant.

Results of the review
The number of newly notified TB cases aged over 25 years in 1998, in those who underwent screening, was 1,518 among inhabitants in local areas, 2,758 among employees of companies, and 178 among those in institutions such as nursing homes and jails.

The detection rate of MMRY was 1.6% for inhabitants, 0.6% for employees and 4.5% for people in institutions.

Based on the above two pieces of data, the estimated number of MMRY examinees in 1998 was 9,681,122 inhabitants, 44,412,238 employees, and 395,907 people in institutions. This suggested that 60.3% of the population aged over 25 years underwent MMRY annually.

The detection rate of mass screening (periodic and extra-periodic) among newly notified TB cases did not change greatly between 1987 (15%) and 1999 (16%). However, the detection rate of periodic MMRY for inhabitants declined from 4.8 to 3.4% between 1987 and 1999, while the rate for employees increased from 5.6 to 7.6%.

Overall, the detection rate of periodic MMRY was the highest among people in their 20s (27.9%). The detection rate declined with age (9.1% among those in their 60s and 5.1% for those over 70 years old).

The rate of sputum smear-positive pulmonary TB cases among those detected by periodic MMRY was 18.9%. The rate for other bacillary pulmonary TB cases was 16.2%. These rates increased with age. More specifically, 23.9% for people in their 20s, 29.6% for 30s, 38.5% for 40s, 38.4% for 50s, 40.4% for 60s, and 47.3% for those over 70 years old.
Based on the JATA report, a high correlation (r=0.97, p<0.01) was observed between TB detection rates and TB notification rates.

**Measure of benefits used in the economic analysis**
The measure of benefit was the cases of TB detected.

**Direct costs**
The direct costs included were for radiography and further examinations. The costs and the quantities were not reported separately. Discounting was not relevant due to the short period of analysis. The costs were estimated using actual data of 1996 from the 8 selected branches of JATA. The price year was not stated.

**Statistical analysis of costs**
No statistical analysis of the costs was carried out.

**Indirect Costs**
The indirect costs were not included.

**Currency**
Japanese yen (Y).

**Sensitivity analysis**
A one-way sensitivity analysis was carried out to examine the change in costs per TB case detected using MMRY. The TB notification rate was changed in the range of 5 per 100,000 people to 60 per 100,000 people.

**Estimated benefits used in the economic analysis**
The authors provided a detailed breakdown of the cases detected according to stratified age groups for men and women. The totals presented here are overall cases, 149 males and 79 females. More detailed reporting according to gender and age group is provided in the 'Synthesis of Costs and Benefits' section.

**Cost results**
The total costs were not provided, but they are accounted for in the 'Synthesis of Costs and Benefits' section.

**Synthesis of costs and benefits**
The cost per case detected was reported according to age and gender.

Overall, the cost per TB case detected by MMRY was ¥4,400,000. The cost per case detected for women (¥8,400,000) was more than three times higher than that for men (¥2,300,000).

In terms of age groups, the cost per case detected for women in their 50s was the highest (¥11,800,000), while that for men over 80 years old was the lowest (¥1,000,000).

When only bacillary TB cases were examined, the overall cost per case detected was ¥12,200,000 (¥6,000,000 for men and ¥6,200,000 for women).

From the sensitivity analysis, when the TB notification rate was 20 per 100,000 people the cost per case detected was ¥6,700,000 (95% confidence interval, CI: 4,900,000 - 9,100,000). The cost per case detected was ¥4,000,000 (95%
CI: 3,300,000 - 4,800,000) when the notification rate was 30 per 100,000 people, and Y2,400,000 (95% CI: 1,700,000 - 3,200,000) when the rate was 40 per 100,000 people.

When only bacillary TB cases were examined, the TB notification rate of 10 per 100,000 people related to a cost per case detected of Y13,200,000 (95% CI: 9,500,000 - 18,400,000). The rate of 20 per 100,000 people related to a cost per case detected of Y5,500,000 (95% CI: 2,800,000 - 11,000,000).

Authors' conclusions

Mass miniature radiography (MMRY) is not cost-effective when considering the treatment costs for a TB patient (2 months hospitalisation and 4 months outpatient treatment, calculated to be Y 900,000 in 1996), even among elderly people and in areas with tuberculosis (TB) incidence rates of less than 50 per 100,000 people. The results of this study will be useful in making decisions as to whether the use of MMRY should be continued, abolished or limited. The decision should be made on the basis of a wide range of cost-effectiveness analyses, the views of the public health service, and the willingness of people to undergo screening.

CRD COMMENTARY - Selection of comparators

The rationale for the choice of the comparator (do nothing or absence of the screening programme) was clear. It enabled the effectiveness of screening for TB using MMRY to be evaluated. You should consider if this technology and comparator are relevant to your own context.

Validity of estimate of measure of effectiveness

The effectiveness data were derived from official reports concerning TB incidence and the effectiveness of MMRY to detect cases of TB. Although the study was classified as a review, it did not undertake a search of the wider literature but focused, instead, on official statistics for the Japanese context. In this instance the more selective approach adopted is justified, as generalising the findings of the study beyond the Japanese health care system was not one of the objectives of the study. Rather, the aim was to provide information on the relative cost-effectiveness of the programme to decision-makers in Japan. A sensitivity analysis was performed on the incidence rates, to capture changes in cost-effectiveness according to variations in this parameter.

Validity of estimate of measure of benefit

The benefit measure (cases detected) was appropriate for the analysis. However, life-years gained or quality-adjusted life-years would have been useful, if feasible, in terms of comparing the value of this programme with other health care programmes.

Validity of estimate of costs

The total costs for the programme were not provided and were derived from the number of annual examinees (although it would be possible to calculate the total costs from the data provided in the paper). The costs were therefore reflected in the cost per case detected results. The costs were limited to the direct costs of detecting cases of TB only, which was within the authors' stated aims. However, the loss of earnings for those who become infected would be relevant if one were to consider a wider societal perspective in the economic analysis. The cost analysis had several limitations in that the costs and the quantities were not provided separately, and the price year was not stated. However, a sensitivity analysis on the costs was performed to address uncertainty in the data used.

Other issues

The authors compared the experiences of other countries (including England) with their results for MMRY screening for TB. The issue of generalisability was addressed only internally for the context of Japan, although the sensitivity analyses conducted on incidence rates may help in this regard. The remit of the study was to provide evidence on the continuation, or otherwise, of MMRY screening in Japan and it appears that this has been achieved.
Implications of the study
The implications of the study, in clinical and economic terms, were that MMRY is not cost-effective in any sub-population or in areas where TB incidence rates are less than 50 per 100,000 people. The results of this study are useful for making decisions as to whether the use of MMRY should be continued, abolished or limited. The authors called for further cost-effectiveness analyses, and for the views of the public health service and the willingness of people to undergo screening to be considered.

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