Cost effectiveness of DOTS and non-DOTS strategies for smear-positive pulmonary tuberculosis in Beijing
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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
Chemotherapy by directly observed treatment, short course (DOTS), as part of a tuberculosis (TB) control programme for patients with sputum smear-positive TB, was examined. The strategy consisted of treating detected cases for 7 months initially, 8 months for retreated cases, 1.5 years for patients with multidrug resistance (MDR), and 5 years for patients with chronic infection.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The hypothetical study population comprised 2,000 patients with sputum smear-positive TB, with the age-specific incidence of TB corresponding to that of Beijing (China) in 1994.

Setting
The setting was not stated, but it may have been secondary care. The study was performed in Beijing, China.

Dates to which data relate
The effectiveness data were collected from studies published between 1979 and 2000. The dates to which the cost data related were not stated. The price year was not reported.

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

Modelling
A decision tree model, combined with the burden-of-disease methodology, appears to have been used to estimate the costs and benefits of the strategies under analysis. A cohort of 2,000 patients was used. The period during which the effectiveness and costs were modelled was unclear.

Outcomes assessed in the review
The outcomes assessed in the review for both strategies (DOTS and non-DOTS) were:

the cure rates and death rates of patients treated initially;
the cure rates and death rates for patients that had to be retreated; and
the cure and death rates for patients developing MDR.

These outcomes were included as the parameters of the model. Other demographic parameters were also assessed in the review.

**Study designs and other criteria for inclusion in the review**
The authors do not appear to have considered specific study designs or other criteria for including studies in the review. The studies included were mainly epidemiological data and burden of disease studies.

**Sources searched to identify primary studies**
Not reported. The review does not appear to have been systematic.

**Criteria used to ensure the validity of primary studies**
Not reported.

**Methods used to judge relevance and validity, and for extracting data**
Not reported.

**Number of primary studies included**
At least four primary studies were included in the review.

**Methods of combining primary studies**
Not reported.

**Investigation of differences between primary studies**
Differences between the primary studies do not appear to have been investigated.

**Results of the review**
The cure rates with DOTS were 90% for initially treated patients and 80% for retreated patients. The cure rates with non-DOTS were 50% for initially treated patients, 50% for retreated patients and 30% for patients with MDR.

The death rates with DOTS were 5% for initially treated patients and 10% for retreated patients. The death rates with non-DOTS were 10% for initially treated patients, 10% for retreated patients and 20% for patients with MDR.

These estimates of effectiveness were included as parameters in the model.

**Measure of benefits used in the economic analysis**
The summary measure of benefit used was the number of DALYs saved with each of the strategies compared. The authors reported direct (i.e. directly attributed to the patients cured) and indirect DALYs (i.e. those gained by reducing transmission of infection to others) saved. They did not report the weights used to derive the DALYs, nor the published papers from where they derived this methodology. Although it was not stated, the benefits may have been discounted since the methodology for estimating the DALYs saved included time preferences, using a discount rate to adjust for it.
Direct costs
The direct costs considered in the economic analysis appear to have been those of the health service. These were the costs of diagnosis (X-rays, sputum smears and sputum cultures) and treatment (drugs). The sources of the cost data were not reported. The quantities of health resources used and the unit costs were not reported separately. Discounting was performed using a 3% discount rate, which was appropriate since the costs for some patients (i.e. those with chronic TB) were incurred during more than 2 years. The price year was not stated. The costs reported were the total costs for the cohort of 2,000 patients, according to the sub-groups of patients and age groups. The sub-groups were patients initially treated, retreated patients, patients with MDR and patients with chronic TB.

Statistical analysis of costs
No statistical analyses of the costs were reported.

Indirect Costs
No indirect costs were reported.

Currency
Chinese yuan (Yuan).

Sensitivity analysis
No sensitivity analyses of the costs were reported.

Estimated benefits used in the economic analysis
The total number of DALYs saved (for the cohort of 2,000 patients) was 35,003 with DOTS (direct DALYs 23,866; indirect DALYs 11,137) and 29,646 with non-DOTS (direct DALYs 18,536; indirect DALYs 11,110). These figures appear to be in comparison with a comparator of "no intervention". The authors did not report whether the side effects of treatment were considered when estimating the DALYs.

Cost results
The total costs for the cohort of 2,000 patients were Yuan 1,599,000 with DOTS and Yuan 13,970,000 with non-DOTS. The total cost of DOTS accounted for 11.4% of that of non-DOTS.

The costs of adverse effects do not seem to have been considered, although they may have been relevant for the interventions compared.

Synthesis of costs and benefits
The estimated costs and benefits were combined by calculating the average cost-effectiveness ratios (CERs) for each of the interventions, for the overall cohort of patients, and by age groups. No incremental analysis was performed. The CERs obtained overall were Yuan 45.7 per DALY saved with DOTS versus Yuan 471 per DALY saved with non-DOTS. When age groups were considered, the CERs obtained were:

- for patients aged 5 to 14 years, Yuan 26.7 per DALY saved with DOTS versus Yuan 273.5 per DALY saved with non-DOTS;
- for patients aged 15 to 44 years, Yuan 34.6 per DALY saved with DOTS versus Yuan 356.5 per DALY saved with non-DOTS;
- for patients aged 45 to 59 years, Yuan 60.9 per DALY saved with DOTS versus Yuan 630 per DALY saved with non-
for patients aged 60 years or older, Yuan 146.8 per DALY saved with DOTS versus Yuan 1536.4 per DALY saved with non-DOTS.

Authors’ conclusions
Chemotherapy for smear-positive tuberculosis (TB) under directly observed treatment, short course (DOTS), is cheaper and more effective than under non-DOTS. Chemotherapy under DOTS is, therefore, a good strategy for TB control.

CRD COMMENTARY - Selection of comparators
The comparator was unclear as self-administration (non-DOTS) was evaluated. It was not explained what this was or how it differed from no intervention. Also, other alternative treatments could have been considered for the treatment of TB, such as combinations of rifampin, isoniazid, pyrazinamide and ethambutol. You should decide which treatment is currently used for TB in your own setting.

Validity of estimate of measure of effectiveness
A systematic review of the literature does not appear to have been undertaken. It is difficult to comment on the validity of the estimates since little information was given on how the studies were identified, selected and assessed. There may have been relevant studies that were not included, thus the results of the study may be biased. The authors did not report the method used to derive the effectiveness estimates from the selected studies. Further, no sensitivity analyses of the effectiveness estimates were performed. This increases uncertainty about the reliability of the conclusions.

Validity of estimate of measure of benefit
A decision tree model may have been used to estimate the benefits. Although the summary measure used (DALYs) can allow the effectiveness of different interventions to be compared, it was unclear from the paper how the weights were estimated to calculate the DALYs.

Validity of estimate of costs
The perspective adopted was unclear, though it may have been that of the health service. Not all the costs relevant to this perspective appear to have been considered, as the costs of side effects of the treatment may not have been included and are relevant for the study. In addition, the indirect costs (i.e. productivity losses) were not incorporated and were relevant to the age groups studied. These would need to be included if a societal perspective was adopted. The unit costs, the sources of the costs and the price year were not reported separately. Moreover, no statistical or sensitivity analyses of the costs were performed. All these factors introduce uncertainty into the reliability of the conclusions and would make reflation exercises to other settings more difficult.

Other issues
No appropriate comparisons of the study findings with those from other studies were reported. The authors stated that their finding may be generalised to other settings if corresponding data on the age and gender-specific incidence and mortality are available. However, if these data are not similar, different results might be obtained according to the specific setting. Although it is very likely that the authors made some assumptions to estimate the benefits and costs, none of these assumptions were reported.

Implications of the study
The study presents some caveats (reported already) that should be considered when interpreting the results obtained.

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