Cost and cost-effectiveness of community-based care for tuberculosis in Cape Town, South Africa

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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 health intervention examined was clinic-based care with optional community-based observation for patients receiving treatment for tuberculosis (TB). Patients had the option of choosing to have their treatment directly observed at the clinic, or by a lay-person "treatment supporter" in the community. Under the last scenario, patients could be supervised either at the treatment supporter's house or by a colleague at their workplace. Both options were managed by a non-governmental organisation (NGO), which paid treatment supporters a financial incentive at a specified rate per patient per visit. New patients received 2 months of isoniazid (H), pyrazinamide (Z) and rifampicin (R), followed by 4 months of HR. Patients being retreated received 2 months of H, R, Z, ethambutol (E) and streptomycin (S), followed by 1 month of HRZE and 5 months of HRZ. All treatments were provided on a daily basis, five times per week.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult (15 years and older) patients receiving treatment for TB. All new smear-positive pulmonary and retreatment patients were considered. Patients with multidrug-resistant TB were excluded.

Setting
The setting was the community and primary care. The economic study was carried out in South Africa.

Dates to which data relate
The effectiveness and resource use data were gathered from January 1998 to June 1999. The price year was 1997.

Source of effectiveness data
The effectiveness evidence was derived from a single study, the design and results of which had been published elsewhere (see Other Publications of Related Interest).

Link between effectiveness and cost data
Most of the costing was carried out prospectively on a sub-sample of patients included in the effectiveness analysis.

Study sample
Power calculations, if performed, were not reported. All eligible patients registered at the study clinics from January
1998 to December 1999 were included in the study. There were 2,873 patients overall, 1,804 (64% men) in the intervention group (i.e. they could choose between clinical-based and community-based observation) and 1,069 (63% men) in the control group (clinic-based observation only). Of the intervention group, 34% were in the age class 15 to 29 years, 41% in the age class 30 to 44 years, and 25% in the age class 45 years and over. The corresponding proportions in the control group were 35% (age 15 to 29 years), 40% (age 30 to 44 years), and 25% (age 45 years and over), respectively. The number of new cases was 1,254 in the intervention group and 747 in the control group, while the numbers of retreatment cases were 550 (intervention group) and 322 (control group), respectively. It was not stated whether some patients refused to participate or were excluded from the study sample. As the economic analysis was completed 6 months earlier than the effectiveness analysis, data from a more limited number of patients were used in the current study. More specifically, 765 in the intervention group (525 new treatments, 240 retreatments) and 543 in the control group (367 new treatments and 176 retreatments). Therefore, the clinical end point rates were slightly different from those reported in the primary study.

**Study design**
This was a prospective cohort study that was carried out in two areas, Guguletu (intervention) and Nyanga (control), two black townships of the Cape Town Metropolitan Area. The length of follow-up was unclear. For each site and type of intervention, the number of patients who interrupted the treatment or were transferred was reported. These patients were not further followed up.

**Analysis of effectiveness**
The analysis of the clinical study was restricted to those patients whose complete follow-up data were available. The primary outcome measure was the success rate (cure rate). The two areas had similar demographic, economic, and development indicators.

**Effectiveness results**
With the sample of patients used in the economic analysis, the success rate was 68% in the intervention group (patients could choose between clinic-based and community-based observation) and 64% in the control group (clinic-based observation only) for new smear-positive patients. In particular, the highest success rates were achieved using a lay-person treatment supporter (80%) and in workplace-based care (81%).

The success rate was 58% in the intervention group and 52% in the control group for retreatment patients. Again, the highest success rates were achieved using a lay-person treatment supporter (73%) and in workplace-based care (75%).

**Clinical conclusions**
The effectiveness analysis showed that community-based support for the supervision of patients receiving TB treatment was effective in improving cure rates in comparison with a strategy in which supervision was available only at the clinic.

**Measure of benefits used in the economic analysis**
The summary benefit measure used was the success rate. This was derived directly from the effectiveness analysis.

**Direct costs**
Discounting was not relevant as the costs were incurred during less than 2 years. Only capital costs were discounted (annual rate of 8%). The unit costs were presented separately from the quantities of resources used for most cost items. The health services included in the economic evaluation were all components of treatment. This covered X-ray, sputum smears, sputum cultures, drug sensitivity tests, drugs, clinic visits, visits to lay-person supervisors, overall management by the NGO, and training. Joint clinic costs were allocated to TB patients on the basis of the proportion of total clinic visits for which they accounted, and then to different types of visits (diagnosis, monitoring, observation) based on the estimated staff time associated with them. Capital costs were estimated on the basis of the expected number of years of useful life (20 years). The cost/resource boundary of service providers (i.e. government health services and the NGO)
was adopted. The costs were estimated from the Cape Town City Council, the South African Institute for Medical Research, the TB Care Association, local equipment supplies, car dealers, and interviews with staff. Resource use was estimated using actual data derived from the sample of patients included in the clinical study. The price year was 1997.

**Statistical analysis of costs**

The costs were treated deterministically. Some unit costs were presented as mean values with confidence intervals.

**Indirect Costs**

Patient costs were included in the analysis because a societal perspective was adopted. The time spent to travel and receive treatment or supervision was incorporated into the analysis, using a monetary value based on the average reported hourly wage. The resource use data were estimated from a sample of 200 patients receiving treatment for TB. The source of the cost data was not reported. As in the analysis of the direct costs, the unit costs were presented separately from the quantities of resources used, the price year was 1997, and no discounting was applied.

**Currency**

US dollars ($).

**Sensitivity analysis**

Univariate sensitivity analyses were performed to investigate variability in the data. Nurse time and cost for a clinic visit were varied, as were all the effectiveness data. Confidence intervals were used whenever possible. Otherwise, the authors set ranges of variations.

**Estimated benefits used in the economic analysis**

See the 'Effectiveness Results' section.

**Cost results**

For new smear-positive patients, the estimated cost to manage a patient was $495 in the intervention group (choice between clinic-based or community-based observation) and $769 in the control group (clinic-based observation only). The corresponding costs for retreatment patients were $823 (intervention) and $1,070 (control), respectively.

Therefore, in both cases, community-based supervision was cheaper than clinic-based care alone.

**Synthesis of costs and benefits**

The average cost-effectiveness ratios were calculated to combine the costs and benefits of the two alternative treatment strategies.

For new smear-positive patients, the estimated cost per patient successfully treated was $726 in the intervention group and $1,201 in the control group. The corresponding costs for retreatment patients were $1,419 (intervention) and $2,058 (control), respectively.

An incremental analysis was not carried out. However, it would have suggested that community-based supervision was dominant because it was more effective and less costly than clinic-based care alone.

The base-case results were robust to variations in the cost and effectiveness data.

**Authors' conclusions**

Compared with current care delivered only at urban clinics, community-based care was a cost-effective strategy in the
treatment of tuberculosis (TB). Decision-makers in other urban areas in South Africa should consider the possibility of implementing community-based interventions for (re)treatment of TB. The issue of financial incentives should be further investigated, as some authorities might find the payment of financial incentives an unsuitable use of public funds.

CRD COMMENTARY - Selection of comparators
The selection of clinic-based care only as the basic comparator was appropriate as it represented the usual care approach in the authors' setting. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence came from a prospective cohort study, which was appropriate for the study question since patients were enrolled at two difference geographic areas. The authors stated that the two areas were comparable and that similar baseline characteristics were observed in the two groups of patients. However, the use of a randomised design would have reduced the potential impact of selection bias and confounding factors, which cannot be ruled out. The study sample included unselected patients and was representative of the patient population. No evidence about the appropriateness of the sample size was provided. The length of follow-up was unclear and some patients were not available for the follow-up assessment. These issues tend to limit the internal validity of the analysis. The authors stated that the number of individuals recruited for the study was high, which ensured the reliability of the results.

Validity of estimate of measure of benefit
The summary benefit measure was specific to the disease considered in the study and would be difficult to compare with the benefits of other health care interventions. The use of a more generalisable measure would have been interesting.

Validity of estimate of costs
The broadest possible perspective was adopted in the study. As such, all the relevant categories of costs were included in the analysis. Detailed information on the unit costs and quantities of resources used was provided. A breakdown of the cost items was given, which enhances the possibility of replicating the analysis. The total costs were also presented separately from the perspectives of the two providers and the patient, which represents useful information for decision-makers. The price year was provided, which will facilitate reflation exercises in other settings. The source of the unit costs was not reported. The costs were specific to the study setting, but some estimates were varied in the sensitivity analysis.

Other issues
The authors did not compare their findings with those from other studies. The issue of the generalisability of the study results to other settings was addressed, and the authors stated that some adaptation of the Guguletu model may be necessary to achieve similar economic and clinical benefits in other urban areas. Most estimates were specific to the study setting, but the use of sensitivity analysis partially enhanced the external validity of the analysis. The study referred to new TB cases and retreatment patients, and this was reflected in the authors’ conclusions.

Implications of the study
The study results suggested that community-based support represents a cost-effective option in the treatment of TB. The community-based approach could be of greatest relevance in the following scenarios or settings:

- clinics working at (or beyond) capacity;
- clinic-based care is not achieving high cure rates;
- geographical access to health facilities is poor; and
more affordable approaches are required, owing to budget constraints and/or an increase in the number of TB cases.

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**Other publications of related interest**

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