Comparative cost-effectiveness of diagnostic tests for urinary schistosomiasis and the implications for school health programmes

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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 authors compared self-reporting of blood in urine, reagent-strip testing of blood in urine, and visual examination of blood in urine against filtration of a 10 mL urine sample and microscopic examination of the filter for Schistosoma haematobium (S. haematobium) eggs, as an alternative diagnostic test for S. haematobium.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of school-aged children at risk from S. haematobium.

Setting
The setting was the community. The economic study was set in schools in the Muheza district of Tanzania.

Dates to which data relate
The effectiveness data related to a single study, details of which were published in 1997 and 2001 (see Other Publications of Related Interest). Resource use was estimated for the same period as the effectiveness data. The price year was 1995.

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

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness study.

Study sample
The sample was selected by using 15 schools (2,370 children) in the authors' setting. It was not clear how the 15 schools were selected. The authors did not discuss the power of the sample to detect statistically significant differences. All 15 schools received each of the diagnostic methods. The authors then worked out how many people would have received the treatment under three scenarios:

- urine filtration to identify high-risk schools (in which all students were treated), and treating individuals at risk if a
school was determined to be low-risk (scenario A); self-reported schistosomiasis to identify high-risk schools (in which all students were treated), and treating individuals at risk if a school was determined to be low-risk (scenario B); and self-reported schistosomiasis to identify schools at risk (in which all students were treated), and reagent strips to identify and treat individuals if a school was determined to be low-risk (scenario C).

With urine filtration, a school was determined to be high-risk if 50% or more of the students were found to be positive. With self-reporting, a school was determined to be high-risk if 30% or more of the students were found to be positive.

This method created three groups, each with different numbers of students being treated according to the ability of the test to identify individuals who were positive. There were 2,370 children altogether in the 15 centres. The initial sample was appropriate since it included school-age children at risk from S. haematobium.

**Study design**
This was a diagnostic study carried out in 15 centres, the results from the centres being combined. The authors did not report the length of follow-up or the time period during which the diagnostic tests were used. They also did not report any blinding of the participants, health care professionals or data analysts.

**Analysis of effectiveness**
The analysis was based on the outcomes of the diagnostic tests. The primary outcomes were:

- the number of individuals correctly identified as infected or uninfected (i.e. true positive and true negatives);
- the number of individuals correctly identified as a proportion of those identified using the 'gold' standard (urine filtration);
- the number of infected individuals correctly identified (i.e. true positives); and
- the number of infected individuals correctly identified as a proportion of those identified using the 'gold' standard (urine filtration).

As there was only one group of students there could be no comparability of the groups. There was no discussion of possible confounding factors.

**Effectiveness results**
The number of correctly identified individuals (as infected or uninfected) was 2,370 for urine filtration, 2,043 for reagent strips, 1,016 for visible blood, and 1,769 for self-reported schistosomiasis.

Relative to the 'gold' standard, which correctly identifies all individuals, the proportions of true positives and true negatives identified by the tests were 86% for reagent strips, 43% for visible blood, and 75% for self-reported schistosomiasis.

The number of correctly identified infected individuals was 1,612 for urine filtration, 1,423 for reagent strips, 260 for visible blood, and 1,088 for self-reported schistosomiasis.

Relative to the 'gold' standard, which correctly identifies all individuals, the proportions of true positives and true negatives identified by the tests were 88% for reagent strips, 16% for visible blood, and 67% for self-reported schistosomiasis.

**Clinical conclusions**
The authors did not draw clinical conclusions independently from the cost conclusions. They did, however, reiterate the effectiveness results demonstrating that, relative to urine filtration, reagent strips were most effective, followed closely by self-reporting. Urine examination was found to be the least effective method of diagnosis.

**Measure of benefits used in the economic analysis**
The authors did not estimate a summary measure of benefit. The study was therefore categorised as a cost-consequences analysis. The authors did, however, estimate the cost per correct diagnosis or cost per infected individual identified.

**Direct costs**
Since the costs were incurred only at the point of diagnosis, they were incurred at a single point in time and discounting was not required. For each diagnostic test the authors assumed that a mobile team was used. Both the fixed and variable costs were estimated. The fixed costs were for the personnel (parasitologist, public-health nurse and driver) and consumables (diesel, data forms). The variable costs were for personnel (microbiologist, public-health nurse) and consumables (urine pots, universal tubes, reagent strips, filter membranes, syringes and filter holders). The quantities and the costs were reported separately. The quantities were estimated using actual data from the effectiveness study. A source for the estimation of the unit costs was not provided. The price year was 1995. The authors defined three scenarios (scenarios A, B and C, see 'Study Sample' section) for diagnosis and treatment, which were costed.

**Statistical analysis of costs**
Not reported.

**Indirect Costs**
The authors did not estimate the indirect costs. However, the study involved school-aged children and if indirect costs are based on economic productivity, then they would not be relevant to this study.

**Currency**
The authors reported that the costs were converted into US dollars ($) using an appropriate exchange rate. The costs were not reported in their original currency.

**Sensitivity analysis**
Not reported.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The total cost of each diagnostic test was $2,379.36 for urine filtration, $1,027.12 for reagent strips, $564.26 for visible blood examination, and $490.26 for self-reporting.

The total costs were $3,705.98 for scenario A, $1,976.93 for scenario B, and $2,231.74 for scenario C.

**Synthesis of costs and benefits**
Although there was no summary measure of benefit, the authors estimated the cost per correct diagnosis and the cost per infected individual identified for each of the diagnostic methods. The cost per correct diagnosis was $1.00 for urine filtration, $0.50 for reagent strips, $0.56 for visible blood examination, and $0.28 for self-reporting.
The cost per infected individual identified was $1.47 for urine filtration, $0.72 for reagent strips, $2.17 for visible blood examination, and $0.45 for self-reporting.

The cost of diagnosis and treatment per infected child treated was $2.30 for scenario A, $1.33 for scenario B, and $1.43 for scenario C.

**Authors’ conclusions**
The authors concluded that, although their estimates for urine filtration are likely to be lower than is the case in practice, self-reporting was three times more cost-effective than urine filtration.

**CRD COMMENTARY - Selection of comparators**
The comparators used in the analysis were appropriate for the study question. Urine filter was justified as a comparator due to it being the ‘gold’ standard diagnostic test, against which the other three alternatives were assessed. The authors described visible blood examination, reagent strips and self-reporting as alternative diagnostic methods. It was unclear which method was most commonly used in the authors’ setting.

**Validity of estimate of measure of effectiveness**
The analysis used a diagnostic study, which was appropriate for the study question. The study sample consisted of school-aged children from 15 schools in the authors' setting. Therefore, the sample was representative of the study population. Since each of the diagnostic tests was used on all of the schools, there were effectively 4 groups of patients that were identical. There was therefore no need to assess the comparability of the groups. However, no statistical analysis was undertaken to account for potential biases in the study, for instance, user acceptability of the tests.

Although presenting useful results, in terms of the quantity of correctly and incorrectly classified individuals, the authors did not discuss the severity of the consequences of falsely classifying people. For instance, how serious is it to fail to treat an infected person? Such a discussion would have allowed a broader understanding of the results and conclusions, enabling the reader to form their own opinions when interpreting the cost-effectiveness results.

**Validity of estimate of measure of benefit**
The authors did not estimate a summary measure of benefit. The analysis was therefore classified as a cost-consequences analysis.

**Validity of estimate of costs**
All the categories of cost relevant to a health service perspective were included in the analysis, although the authors did not explicitly state that this was the perspective adopted. The authors clearly stated the costs they estimated and the assumptions underlying these estimates, although the source of the unit costs was not evident. In addition, the authors discussed the impact on their results of possible changes in the unit costs. The costs were reported separately from the quantities. The quantities were estimated from a single study. No statistical analysis of the quantities was reported.

**Other issues**
The authors made appropriate comparisons of their results with the results of other studies. These suggested that their own estimate of the relative difference in the costs was markedly lower than prior estimates. The authors provided a useful discussion of possible reasons for this difference. The issue of generalisability to other settings was not addressed. The authors may have presented some of the results selectively. For instance, the initial analysis focused on four diagnostic techniques whilst the secondary analysis, which estimated the costs of the treatment, only examined a sub-set of these techniques. The authors did not discuss the motivation for narrowing their focus. However, it would appear that they concentrated on the least costly techniques. The authors’ conclusions accurately reflect the scope of the study. No limitations to the study were presented.
Implications of the study
The authors provided a valuable discussion of the four techniques. This included strategies for identifying and treating individuals, and the acceptability to health planners of false test results. Although the authors did not give an explicit recommendation for policy, a strong case was made for using self-reporting to identify high- and low-risk schools. In this instance, all students in high-risk schools would be treated, while only those testing positive in low-risk schools would be treated. There were no suggestions for further work.

Source of funding
Funded by the Wellcome Trust and the UK Medical Research Council.

Bibliographic details

PubMedID
12080975

DOI
10.1179/000349802125000682

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Child; Cost-Benefit Analysis; Health Care Costs; Hematuria /parasitology; Humans; Parasitology /methods; Schistosomiasis haematobia /diagnosis /economics /therapy; School Health Services /economics; Self Care /economics; Tanzania

AccessionNumber
2200200806

Date bibliographic record published
31/10/2003

Date abstract record published
31/10/2003