Prereferral rectal artesunate for treatment of severe childhood malaria: a cost-effectiveness analysis
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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.

CRD summary
This study examined the cost-effectiveness of community-based artesunate treatment before referral of children with suspected severe malaria, in areas with poor access to formal health care, varying the referral compliance and treatment uptake. The authors concluded that artesunate was life-saving and cost-effective for these children in rural Africa, where there were community health workers. A conventional cost-utility framework was used, and the authors’ conclusions seem robust, but more details of the data sources would have been useful.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of community-based artesunate treatment, before referral for children with suspected severe malaria, in areas with poor access to formal health care, considering low (25%), moderate (50%), high (75%), and full (100%) compliance with referral and treatment uptake.

Interventions
The intervention was the administration of one dose of rectal artesunate, by a community health worker, to a child with suspected severe malaria, followed by referral advice for caregivers. The comparator was the uptake of treatment services available for severe malaria, which were non-oral (injected) antimalarial treatment for patients who sought care at health facilities.

Location/setting
Africa/community.

Methods
Analytical approach:
The analysis was based on a decision-tree model of a birth cohort up to five years old; the time horizon was five years. The authors stated that the study was carried out from the perspective of the provider.

Effectiveness data:
The clinical data came from selected published studies. The authors used a conservative approach to select the most appropriate clinical estimate where multiple sources were available. The efficacy of artesunate treatment was a key input of the analysis and was from a community-based, placebo-controlled clinical trial of African patients. Some assumptions were made for referral compliance and intervention uptake.

Monetary benefit and utility valuations:
Disability weights were from published sources.

Measure of benefit:
Disability-adjusted life-years (DALYs) were the summary benefit measure and they were discounted at an annual rate of 3%. The numbers of deaths averted were reported.

Cost data:
The economic analysis included the costs of artesunate treatment (acquisition and community-health worker’s time), the programme set-up and recurrent expenses, and in-patient care for malaria treatment (drugs, laboratory investigations, and hospital stay). The key unit costs and resource consumption were reported. Artesunate cost was from the manufacturer; other costs were from personal communications with experts implementing the programme in several African countries. All costs were in international dollars (INT$) and the price year was 2008.

Analysis of uncertainty:
A Monte Carlo simulation was used to assess the uncertainty in the model assumptions and results. Confidence intervals were calculated for all the model outcomes. The ranges of values for the model inputs were from published data or authors’ opinions. The results were presented for variations in the referral compliance and intervention uptake (low, moderate, high, or full).

Results
With low intervention uptake, the DALYs averted with the intervention, depending on the referral compliance, ranged from 19 (low) to 743 (full); the incremental costs ranged from INT$ 17,466 (low) to INT$ 86,316 (full); and the incremental cost per DALY averted ranged from INT$ 122 (full) to INT$ 1,173 (low).

With moderate uptake, the DALYs averted ranged from 37 to 817; the incremental costs from INT$ 16,311 to INT$ 81,250; and the incremental cost per DALY averted from INT$ 104 to INT$ 550.

With high uptake, the DALYs averted ranged from 56 to 892, incremental costs from INT$ 15,156 to INT$ 76,183, and the incremental cost per DALY averted from INT$ 89 to INT$ 342.

With full uptake, the DALYs averted ranged from 75 to 967, incremental costs from INT$ 14,001 to INT$ 71,116, and the incremental cost per DALY averted from INT$ 77 to INT$ 238.

The cost-effectiveness of artesunate increased as the uptake increased and as the referral compliance increased. At the threshold recommended by the World Health Organization, based on gross domestic product per person and calculated to be $1,546 for sub-Saharan Africa (excluding South Africa), artesunate treatment before referral was highly cost-effective. The efficacy rates were the most influential inputs, but the results were generally stable.

Authors’ conclusions
The authors concluded that artesunate before referral was life saving and cost-effective for children with suspected severe malaria in rural Africa, where there were community health workers.

CRD commentary
Interventions:
The comparators were appropriately selected to include the usual care, for several rural African areas, which was no artesunate therapy before referral and this was compared against the proposed strategy.

Effectiveness/benefits:
The methods and conduct of a literature review were not reported and relevant sources of evidence might have been omitted. The efficacy of artesunate was from a placebo-controlled randomised trial conducted in Africa and this should have had good internal validity, but the details of this trial were not provided. Other data came from African sources that were not described. This makes it impossible to objectively assess the clinical data. Ranges of values from published studies were used in the sensitivity analysis, which investigated the impact of variations in all the clinical inputs. DALYs appear to have been a valid benefit measure, given the disability caused by malaria in children. They capture the full burden of the disease on survival and disease-related sequelae; they were appropriately discounted.

Costs:
The analysis of costs was consistent with the perspective of the payer. A list of cost items was provided and details of some costs items and their resource use were given, enhancing the transparency of the analysis. The data sources were reported and most of them were of real-world implementations of the intervention. The price year was clearly presented, but discounting of costs was not reported.

Analysis and results:
An appropriate incremental approach was used to synthesise the costs and benefits of the strategies. The results were
extensively reported and clearly presented for different scenarios of uptake and compliance, which enhances the external validity of the analysis. The uncertainty was investigated and a Monte Carlo simulation provided ranges of values for the model outputs, which were generally stable. The authors highlighted the importance of high uptake and high referral compliance, in increasing the cost-effectiveness of artesunate treatment. The study was specific to areas where the access to health facilities for non-oral treatment was poor.

Concluding remarks:
A conventional cost-utility framework was used and the authors’ conclusions seem robust, but more details of the data sources would have been useful.

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