A cost-benefit analysis of intravenous immunoglobulin treatment in children with Kawasaki disease

Arj-Ong S, Lertsapcharoen P, Thisyakorn C, Chotivitayatarakorn P, Khongphathanayothin A

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 administration of intravenous immunoglobulin (IVIG; 2 g/kg) and high-dose aspirin was compared with aspirin alone (non-IVIG treatment) during the acute phase of Kawasaki disease (KD).

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The population comprised patients with KD who were treated with aspirin alone and were then followed for 10 to 21 years. Further details are published elsewhere (Kamolratanakul et al. 2001, see 'Other Publications of Related Interest' below for bibliographic details).

Setting
The setting was tertiary care. The economic study was conducted in Bangkok, Thailand.

Dates to which data relate
The effectiveness evidence and resource use data were gathered from two studies published in 1995 and 1996 (Kamolratanakul et al. 1995 and Kato et al. 1996; see 'Other Publications of Related Interest' below for bibliographic details). The cost data were taken from a cost study conducted locally between October 2000 and March 2001 (Kamolratanakul et al. 2001).

Source of effectiveness data
The estimates for the final outcomes were derived from a review of published studies.

Modelling
A model was used to estimate the costs and benefits of each strategy. The model was a simple extrapolation of observed outcomes in the study population applied to the hypothetical cohort that received treatment with IVIG. The patients were categorised into four groups according to the type and severity of CAA. The two time horizons used were a follow-up of 10 to 21 years and an average life expectancy of 60 years among the Thai population.

Outcomes assessed in the review
From the literature, the outcomes assessed for patients treated with the non-IVIG strategy were:
the percentage with normal coronary arteries;
the percentage with persistent CAA with stenosis; and
the percentage of fatal cases.

The reduction in incidence of CAA in KD patients that was attributable to IVIG was also obtained from the literature. See 'Estimates of Effectiveness and Key Assumptions' for the outcomes given for the IVIG strategy, which were derived from a model.

Study designs and other criteria for inclusion in the review
A formal review of the literature was not undertaken. A meta-analysis and a primary study of unspecified design 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
The effectiveness data were derived from 2 studies, one primary and one secondary.

Methods of combining primary studies
The effectiveness data were not pooled.

Investigation of differences between primary studies
Not stated.

Results of the review
Of those patients treated with the non-IVIG strategy:

75% had normal coronary arteries
3.9% had persistent CAA with stenosis; and
the proportion of fatal cases was 0.8%.

The reduction in incidence of CAA in KD patients that was attributable to IVIG was 4%.

Methods used to derive estimates of effectiveness
For the intervention group, the authors assumed that the proportions of coronary complications were similar to the control group.
Estimates of effectiveness and key assumptions
The model made the following assumptions for the intervention group:

the percentage of patients with normal coronary arteries was 96%;

the percentage of patients with persistent CAA with stenosis was 1%; and

the percentage of fatal cases was 0.2%.

Measure of benefits used in the economic analysis
The measures of health benefit used were the cases of CAA avoided and the deaths avoided.

Direct costs
The costs were reported separately from other model parameters. Direct costs to the hospital were included. These were the cost of investigations, medications, outpatient services, inpatient stay in a cardiology ward and in a Paediatric Intensive Care Unit, and the cost of complicated coronary artery bypass graft treatment. Transportation costs were also included, but it was unclear whether these were incurred by the patient or the hospital. The resource use data were derived using American Heart Association guidelines for the long-term treatment of KD patients. The cost data were obtained from local hospital cost data. The costs were reported but resource use was not. Discounting was not applied, even though the costs were incurred during more than 2 years. The costs were collected over a 9-year period from 1992 to 2000, but no single price year was reported. The study reported the average costs.

Statistical analysis of costs
No statistical analysis of the costs or resource use was reported.

Indirect Costs
The indirect costs were included. It was unclear whether this was appropriate as the study perspective was not stated. The indirect costs included in the study were the cost of the loss of a workday by a parent, and the productivity cost in a Thai population. The source of the cost data was not identified. Costs, but not quantities, were reported. Discounting was relevant, but was not applied. The price year was not reported.

Currency
Thailand baht (THB).

Sensitivity analysis
A sensitivity analysis was not conducted, neither was any other investigation of uncertainty in the data.

Estimated benefits used in the economic analysis
Based on the assumption of a reduction of CAA incidence from 25% to 4% with the introduction of IVIG treatment, the authors calculated that the number of KD patients without coronary complications would increase from 448 to 570.

The authors calculated that the duration of benefits was for a 10- to 21-year follow-up period.

The authors did not discuss the side effects of treatment.

Cost results
The undiscounted total costs incurred during the 10- to 21-year follow-up were THB 35,001,195 for the IVIG group.
and THB 33,451,129 for the non-IVIG group.

The authors also report the net costs at two follow-up times: 10 to 21 years, and until the average life expectancy of 60 years was reached. The net cost was defined as the cost of prevention less the cost of illness present.

For the IVIG group, the net cost was THB 25,365,215 at 10 to 21 years' follow-up and THB 29,883,833 at age 60 years.

For the non-IVIG group, the net cost was THB 33,451,129 at 10 to 21 years' follow-up and THB 75,482,803 at age 60 years.

**Synthesis of costs and benefits**

The costs and benefits were combined by calculating the incremental cost-effectiveness ratio (ICER) to avoid one case of CAA and the ICER to avoid one death.

The ICER at 10 to 21 years' follow-up, for IVIG compared with non-IVIG, was THB 13,663 per case avoided and THB 387,517 per death avoided.

The ICER at 60 years of age, for IVIG compared with non-IVIG, was -THB 590,377 per case avoided and -THB 9,003,243 per death avoided. This means that IVIG is both cost-saving and more beneficial than non-IVIG. However, from the data provided, it was unclear how the authors obtained these results.

Discounting was not applied.

**Authors' conclusions**

The treatment of all cases of Kawasaki disease (KD) in Thailand with intravenous immunoglobulin (IVIG) is likely to result in lower costs and better outcomes than a policy of not treating KD patients with IVIG.

**CRD COMMENTARY** - Selection of comparators

A justification was given for the comparator used, it represented current practice in the authors' setting. The authors reported that, owing to the high cost of IVIG, patients in developing countries with KD with CAA are commonly treated with aspirin alone. You should decide if this is representative of treatment strategies for KD in your own setting.

**Validity of estimate of measure of effectiveness**

A systematic review of the literature was not undertaken. Although this is common practice with models, it does not always ensure that the best data available are used in the model. The authors referred to only two studies and the estimates of effectiveness were not combined. The study that was used to determine the percentage of patients developing CAA was undertaken at a single centre and reported a 32% drop-out rate.

**Validity of estimate of measure of benefit**

The measures of benefit used were the cases of CAA avoided and the deaths avoided. These were derived by applying the assumed effectiveness of IVIG to the data series, and assuming that the proportions of cases of each disease severity remained the same. From the information provided it was not possible to confirm the authors' calculations. It was unclear why the sample was reported variously as 594, 596 and 613 patients, or why the percentages of patients with differing disease severity in each group did not total 100%.

**Validity of estimate of costs**

The study perspective was not stated. Consequently, it was not possible to determine whether all the relevant categories of costs were included in the analysis. The costs were reported separately from other model parameters, but the resource quantities were not specified. This will limit the ability to replicate the study in other settings. Resource use was based on a published observational study, which was carried out at a single centre, and recommendations made by
the American Heart Association. No sensitivity analysis was conducted on the model input parameters. The costs were treated deterministically and no sensitivity analysis was conducted to assess the robustness of the estimates used. Discounting was not applied, which was inappropriate given the long follow-up. Costs, rather than charges, were reported. The cost data were taken from a single study that was conducted over 9 years. However, it would appear that these were not adjusted to a single price year.

**Other issues**

The authors described the study as a cost-benefit analysis, although they considered the saving of resources as the benefit rather than employing a method such as willingness-to-pay or human capital to value the outcomes. The authors did not compare their findings with those from other studies, reporting that none were available. They also acknowledged that the cost data and assumptions around the CAA incidence limit the generalisability of the results to other settings.

**Implications of the study**

The authors stated that the use of IVIG to treat patients with KD in Thailand is cost-effective. They recommended further studies of selective treatment in a high-risk population of KD.

**Source of funding**

None stated.

**Bibliographic details**


**PubMedID**

12929987

**Other publications of related interest**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Adolescent; Adult; Child; Child, Preschool; Cost-Benefit Analysis; Follow-Up Studies; Humans; Immunoglobulins, Intravenous /economics /therapeutic use; Infant; Mucocutaneous Lymph Node Syndrome /drug therapy /economics; Time Factors

**AccessionNumber**

22003009828

**Date bibliographic record published**
30/11/2005

Date abstract record published
30/11/2005