A cost-utility analysis of treatment for acute childhood idiopathic thrombocytopenic purpura (ITP)

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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 study examined treatments for acute childhood idiopathic thrombocytopenic purpura (ITP). The strategies assessed were:

- a single dose (0.8 g/kg) of intravenous immunoglobulin G (IVIG);
- a single dose (75 microg/kg) of anti-D immune globulin;
- intravenous methylprednisolone (30 mg/kg per dose) given daily for 3 days; and
- oral prednisone (4 mg/kg per day) given for 4 days with no tapering.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of 20-kg children with acute ITP and a platelet count of less than 20,000. Children with severe, life-threatening bleeding were excluded from the model.

Setting
The study setting was inpatient care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data used to populate the model came from studies published between 1993 and 2004. The price year was 2004. The dates to which the resource use referred were not reported.

Source of effectiveness data
The clinical parameters associated with treatment were:

- the time to reach a platelet count of at least 20,000 with each of the four strategies;
- the probability of side effects with each of the four strategies;
- the probability of intracranial haemorrhage;
the probability of medication side effects; and

the probability of intracranial haemorrhage.

**Modelling**
A decision tree was used to combine the available clinical and quality of life data. The tree was graphically presented and clearly explained. A number of modelling assumptions were reported in the paper.

**Sources searched to identify primary studies**
Data on the time to reach a platelet count of at least 20,000 were collected from both randomised prospective trials and single-arm prospective studies. Data on the probability of side effects were generally obtained from various published studies. The exception was the estimate for prednisone which, owing to a paucity of data, was assumed to be similar to that reported for methylprednisolone. The probability of intracranial haemorrhage was also obtained from a published study and assumed to be the same for each strategy.

**Methods used to judge relevance and validity, and for extracting data**
The authors stated that they searched the literature for studies, but the sources searched and inclusion criteria were not reported.

**Measure of benefits used in the economic analysis**
The measure of benefit used was the quality-adjusted life-year (QALY). Quality of life weights were derived from the Health and Activity Limitation Index (Gold et al. 2001, see 'Other Publications of Related Interest' below for bibliographic details).

**Direct costs**
The costs to the institution were included in the analysis. Drug and drug infusions, hospital beds, side effects and intracranial haemorrhage costs were included. The source of the resource data does not seem to have been reported. The drug costs reflected average wholesale prices and were taken from the "2004 Red Book". The institution(s) finance department provided estimates of hospital bed costs and drug infusion costs, while the institution and 2004 Medicare reimbursement data were used to estimate the cost of an intracranial haemorrhage. The costs of side effects were estimated on the basis of common clinical scenarios. The costs and the quantities were not reported separately. The price year was 2004.

**Statistical analysis of costs**
Point estimates were used for the costs. No statistical analysis of the costs was reported.

**Indirect Costs**
The authors assumed that one parent would lose time from work to stay with their child during hospitalisation and, as such, included lost parental wages as a productivity cost. The costs were based on the average hourly wage in 2004 of an American, non-farm, production worker, and were obtained from the US Bureau of Labour Statistics.

**Currency**
US dollars ($).

**Sensitivity analysis**
A one-way sensitivity analysis was conducted on all variables to assess the effect on the cost-utility of varying baseline
estimates. This was performed using either ranges suggested in the literature or by adding and subtracting 50% from baseline estimates.

**Estimated benefits used in the economic analysis**
The total utility lost (in quality-adjusted life-days) due to hospitalisation, complications, etc. was 0.33 for prednisone, 0.496 for methylprednisolone, 0.166 for anti-D and 0.308 for IVIG. This means that anti-D was associated with the most utility.

**Cost results**
The total cost of one-time treatment for a 20-kg child was $786 with prednisone, $1,346 with methylprednisolone, $2,035 with anti-D and $2,492 with IVIG.

**Synthesis of costs and benefits**
The costs and benefits were combined by calculating the incremental cost per quality-adjusted life-day (QALD) gained. In the baseline analysis, IVIG was dominated by anti-D and methylprednisolone was dominated by prednisone. Compared with prednisone, the anti-D strategy cost $7,616 per QALD gained.

The one-way sensitivity analysis of all model parameters showed that the cost-utility of anti-D was most sensitive to patient weight, time to reach a platelet count of more than 20,000 for both prednisone and anti-D, cost of anti-D and daily cost of hospitalisation. The base-case results were not sensitive to the daily cost of lost parental wages, the cost of infusing anti-D intravenously, or the cost of prednisone.

**Authors' conclusions**
The clinical benefit of anti-D immune globulin was offset by a substantial cost increase. Prednisone is an inexpensive and effective treatment for acute idiopathic thrombocytopenic purpura (ITP).

**CRD COMMENTARY - Selection of comparators**
All the health technologies assessed in the evaluation were realistic alternatives. It was not clear which, if any, were common practice in the USA. Since the authors stated that "no published data demonstrate that drug treatment clearly decreases the incidence of haemorrhage", perhaps "no drug treatment" should also have been evaluated. As it is, the authors did not determine a cost-utility ratio for prednisone.

**Validity of estimate of measure of effectiveness**
The parameters were derived from published research. It was clear from the model inputs that some synthesis of the study results had taken place. However, no details of the methods used were provided. The authors did not report any search methods or inclusion criteria, but they did note that studies which did not report the percentage of patients with platelet counts of at least 20,000 at 24 hours and/or 48 hours were excluded. Clinical parameters were collected from both randomised prospective trials and single-arm prospective studies, which suggests that the authors tried to identify quality evidence. However, it was unclear whether they used the best available evidence.

**Validity of estimate of measure of benefit**
The estimation of health benefit (QALYs/QALYDs) was derived appropriately using a decision analytic model. The utilities were taken from the Health and Activity Limitation Index (Gold et al. 2001) and no details of the valuation method were reported. The authors reported utilities lost and quoted them as negative in the table, which means that they are read as utility gains, but they did not mean that.

**Validity of estimate of costs**
The analysis of the costs was performed from a societal perspective. Whilst it appears that all the relevant categories of
costs have been included in the analysis, some relevant costs were omitted from the analysis. In particular, the costs of laboratory studies were excluded from the analysis as they were thought to be minimal and similar across treatment strategies. Although some costs were omitted from the analysis, their omission is unlikely to have affected the authors’ conclusions. Discounting was not performed but was not necessary given the short follow-up period (48 hours or less). The authors evaluated uncertainty in the cost data jointly with the effectiveness data by estimating the impact on the incremental cost-utility ratio of varying the model parameters. The cost methods were adequately reported.

Other issues
The authors made some comparisons of their findings with those from other studies, but noted that there had been little published data on the topic. The issue of generalisability of the results to other settings was not addressed. The results of the study do not appear to have been presented selectively and the conclusions appear to be an adequate reflection of the scope of the analysis. However, as mentioned already, the authors concluded that prednisone is quite a cost-effective option, but the reader should decide if “no drug treatment” would have been a reasonable comparator.

The authors reported a number of limitations to their study. For example, the model assumed that all patients were hospitalised upon presentation, received a pharmacologic intervention, and were not discharged until the platelet count had reached 20,000 or higher. However, this is not standard practice in all institutions.

Implications of the study
High-dose prednisone appears to be the preferred option (from the health technologies examined) for the treatment of acute ITP in children. The authors made no recommendations for further research.

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None stated.

Bibliographic details

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Other publications of related interest
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MeSH
Acute Disease; Child; Costs and Cost Analysis; Decision Support Techniques; Humans; Immunoglobulins, Intravenous /economics /therapeutic use; Isoantibodies /economics /therapeutic use; Methylprednisolone /economics /therapeutic use
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