The economic impact of intermittent high-dose intravenous versus oral corticosteroid treatment of juvenile dermatomyositis

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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
High-dose, intermittent intravenous corticosteroids (IVCS) in conjunction with low-dose daily oral corticosteroids (OCS) were compared with high-dose daily OCS alone in the treatment of juvenile dermatomyositis (JDM). The high-dose IVCS was 30 mg/kg per day (maximum dose 1 g/day at onset), the low-dose OCS was 0.5 mg/kg per day at onset, and the high-dose OCS was 2 mg/kg per day at onset.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised children with JDM.

Setting
The setting was a hospital. The economic study was carried out in Chicago (IL), USA.

Dates to which data relate

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

Link between effectiveness and cost data
The cost data were collected retrospectively from the same study sample as that used in the effectiveness analysis.

Study sample
No power calculations were performed in the planning phase of the study, to assure a certain power. Patients diagnosed with JDM and treated by the same physician were considered for the effectiveness analysis.

To be included in the study, the patients had to meet the following inclusion criteria:

fulfilment of diagnostic criteria of JDM without clinical or serologic profiles suggesting an overall syndrome (such as
rheumatoid factor, myositis-specific or myositis-associated auto-antibodies); 

all hospital treatment from diagnosis to remission administered by a single physician; 

presentation to treating physician within limited timeframe to minimise heterogeneity of care practices; 

no treatment with disease-modifying medications other than hydroxychloroquine for the treatment of rashes.

From 60 patients with JDM seen at the hospital during the study period, a total of 10 patients were identified as the study sample. There were 5 patients in the OCS group and 5 patients in the IVCS-OCS group.

Study design
This was a retrospective cohort study, which was based on a single centre. The patients appear to have been followed from the time of diagnosis until remission of the disease (5.8 years maximum). No loss to follow-up was reported.

Analysis of effectiveness
The results were based on all patients included in the analysis. The primary health outcomes reported in the effectiveness analysis were the median and range of disease duration, and the number of patients in each group who were treated with hydroxychloroquine. Remission was defined as no disease activity off medications for 3 months. A disease activity score developed by one of the authors was used to state whether the groups were comparable at analysis. This score ranged from 0 to 20. It considered the intensity of skin involvement, distribution of skin disease, evidence of vasculitis, evidence of Gottron's papules, measures of muscle weakness, and general functional status. There were some differences between the patient groups in terms of gender, age and disease activity scores. In the OCS group there were 4 boys and 1 girl. The median age of onset was 4 years and the disease activity score ranged from 9 to 18 (median: 12). In the IVCS-OCS group there were 3 girls and 2 boys. The median age of onset was 3 years and the disease activity score ranged from 13 to 17 (median: 13).

Effectiveness results
The median disease duration was 3.8 years (range: 1.7 - 5.8) for OCS patients and 1.8 years (range: 1.4 - 2.1) for IVCS-OCS patients.

Four patients were treated with hydroxychloroquine in the IVCS-OCS group versus one in the OCS group.

Clinical conclusions
The disease duration was considerably shorter for patients treated with IVCS-OCS.

Measure of benefits used in the economic analysis
The summary measure of benefit considered for the economic analysis was the difference in disease-free years between the groups.

Direct costs
The direct costs considered in the economic analysis were those of the health service. These included inpatient costs, outpatient costs and home care costs. The home care costs were those associated with the room, pathology, anaesthesia, speech services, blood bank, central supply, all laboratories, nuclear medicine, radiology, magnetic resonance imaging, operating and recovery room, respiratory therapy, pharmacy, physical and occupational therapy, electrocardiography, electromyography, echocardiography, pulmonary function tests, orthotics, outside pharmacy and social work.

The resource quantities and the costs were reported separately. Hospital inpatient and outpatient data were obtained from direct billing records from 1989. For those patients cared for before 1989, the cost data were obtained from individual records and data available from 1989. The price year used was 1998, and the consumer price index was used...
to adjust the costs to 1998 present values. The authors also stated that costs for pre-1989 utilisation were appropriately adjusted for inflation, although they did not report the method used for this adjustment. Discounting was performed at a rate of 3%. This was appropriate since the costs were incurred over more than 2 years for most of the patients. The study reported the annual median costs per patient, ranges, and the total cost per group for both therapies under study (i.e. for years one to five of active disease). The cost of the flow cytometry test was analysed independently because, as the authors reported, this was not a standard test used in the treatment of JDM.

Statistical analysis of costs
The median, mean, and range of costs and resource use were reported for both inpatient and outpatient care. However, no statistical tests were performed.

Indirect Costs
No indirect costs were reported.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analyses were reported.

Estimated benefits used in the economic analysis
IVCS-OCS patients had a median of 2 more disease-free years in comparison with OCS patients. The side effects of treatment were not considered in the economic analysis. However, they seem to have been relevant since the therapies under analysis are known to cause side effects (such as increased morbidity), particularly with long-term use.

Cost results
The annual median costs per patient for OCS patients were:

$17,117 (range: 2,841 - 20,497) during year 1,
$3,147 (range: 1,389 - 4,345) during year 2,
$1,494 (range: 863 - 2,445) during year 3,
$983 (range: 160 - 2,043) during year 4, and
$863 (range: 250 - 2,270) during year 5.

The annual median costs per patient for IVCS-OCS patients were

$26,118 (range: 15,454 - 56,455) during year 1,
$8,465 (range: 4,848 - 12,225) during year 2, and
$668 (range: 180 - 2,980) during year 3.

When all the patients were considered (including those already recovered), the median cost per patient during year 3 for IVCS-OCS patients was $180.

The annual total costs per group for OCS patients were $71,540 in year 1, $14,980 in year 2, $7,547 in year 3, $5,269
in year 4, and $3,383 in year 5.

The annual total costs per group for IVCS-OCS patients were $147,187 in year 1, $41,891 in year 2, and $3,828 in year 3.

**Synthesis of costs and benefits**

An incremental cost-effectiveness ratio was calculated as the difference in costs over the difference in disease-free years when IVSC-OCS patients were compared with OCS patients. The authors commented that, considering a $40,000 per quality-adjusted life-year (QALY) benchmark for an intervention to be cost-effective, IVSC-OCS would be a cost-effective intervention if the quality of life of patients living with JDM were valued at 0.85 or less. From studies of other chronic diseases in adults, and the expected life a child with JDM would have without treatment, the authors stated that it would be reasonable to assume that the life of a non treated child with JDM could be valued at under 85% when compared with a year of perfect life.

**Authors' conclusions**

The results suggested that the combination of high-dose intermittent intravenous corticosteroids (IVCS) and oral corticosteroids (OCS) was more expensive, but it decreased the treatment period from 4-5 years to 2-3 years for patients with similar disease activity. Considering the benchmark of $40,000 per quality-adjusted life-year (QALY), the authors stated that IVCS-OCS appeared to be cost-effective.

**CRD COMMENTARY - Selection of comparators**

The two health technologies studied were stated to be currently in use in the authors' setting. None of them was stated to be the comparator. You should decide if the health technologies examined are relevant in your own setting.

**Validity of estimate of measure of effectiveness**

The analysis used a retrospective cohort study, which may have been appropriate for the study question. However, it would have been beneficial (if feasible) to carry out a randomised controlled trial in order to reduce the potential biases, such as those related to the retrospective nature of the study or the selection of patients. Only 10 patients from one centre, treated by the same physician, were included in the clinical analysis. It is therefore possible that the study sample was not representative of the study population, particularly since JDM is a heterogeneous disease, as acknowledged by the authors. The patient groups did not correspond to the same time period. For instance, the effectiveness data for OCS patients were collected between 1982 and 1991, while the effectiveness data for IVCS patients were collected between 1989 and 1994. Changes in the caregiver's treatment protocol may have occurred between these two periods. Also, since the sample size was small, no statistical analyses were performed to establish whether the patients were comparable at analysis or whether the effectiveness differences found were statistically significant.

There were some differences between the OCS and IVCS-OCS patients in terms of gender, age and disease activity scores at baseline. Further, 4 of the 5 IVCS patients were treated with hydroxychloroquine, compared with only one of the 5 OCS patients. Thus, it is unclear whether the shorter disease duration among the IVCS-OCS patients was due to the use of IVCS-OCS or to hydroxychloroquine. Hydroxychloroquine is a drug used for patients with rheumatoid arthritis whose symptoms have not improved with other treatments, and it is sometimes used in children with JDM to treat severe rashes. There is, therefore, uncertainty in the reliability of the effectiveness analysis. In addition, it would have been relevant to have considered the number of patients experiencing side effects and the kind of side effects experienced as primary health outcomes, or other primary health outcomes relating to these side effects of treatment.

**Validity of estimate of measure of benefit**

The estimation of benefits in terms of the number of disease-free years was obtained directly from the effectiveness analysis. This choice of estimate is clearly appropriate, although the authors did not provide a specific justification for their choice. The authors stated there was no information on the quality of life of children with JDM. This meant that it
was difficult to consider a different measure of benefit, such as the number of QALYs gained.

Validity of estimate of costs
All the categories of costs relevant to the health service perspective appear to have been included in the economic analysis. The costs related to one of the tests (flow cytometry) were excluded and analysed independently because, as the authors reported, this was not a standard test used in the treatment of JDM. The authors stated that the indirect costs incurred when an employed guardian had to accompany the child to outpatient care were not included, but these would have been lower for IVCS-OCS patients. These costs would be relevant if a societal perspective were adopted. The medians and ranges for the resource quantities and the costs were reported separately, and the price year was given, which would facilitate reflation exercises to other settings. No other statistical analyses were performed. Discounting was performed, which was relevant since the costs were incurred over more than two years.

Other issues
Some of the results were compared with those from other studies, but the authors did not address the issue of the generalisability of the results. It is unlikely that the results could be generalised to other settings because of the limitations of the effectiveness analysis. The authors hypothesised that there were some side effects associated with the therapies studied, but they did not evaluate them in the effectiveness analysis.

Implications of the study
The authors recommend that further research be undertaken in order to assess QALYs in children with JDM. They also highlight the need to re-evaluate the benefit of expensive tests, in order to analyse whether the benefit from more accurate information provided by these tests outweighs the costs of performing them.

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Other publications of related interest


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