A cost-effectiveness analysis of a peak flow-based asthma education and self-management plan in a high-cost population

de Asis M L, Greene R

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
Asthma education and three action plans (APs) were examined, the peak flow-based (PFB) asthma self-management plan, the symptom-based (SB) plan and no action plan (NAP). Asthma education consisted of individualised instructions given by a nurse educator, lasting an approximately one hour. The patients in the PFB-AP and SB-AP groups were given the same treatment options, but these options were initiated by peak flow measurements and symptoms, respectively. The treatments included baseline therapy with an inhaled corticosteroid, step-up level of therapy, a third level, and a fourth level. The NAP group was only reminded that the dose of corticosteroid might need to be adjusted according to suggestions in the education programmes.

Type of intervention

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult and adolescent patients with moderate to severe asthma requiring daily inhaled corticosteroids, and with a history of requiring urgent treatment for asthma at a clinic or hospital ER, or hospitalisation for asthma in the preceding 12 months.

Setting
The setting appears to have been secondary care, although this was not stated explicitly. The economic study was conducted in the USA.

Dates to which data relate
The effectiveness data were derived from a study published in 1997, while the resource use data were derived from studies published between 1995 and 1999. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a review of the literature.

Modelling
A model, involving a hypothetical cohort of 100 adult and adolescent asthma patients, was created to evaluate the cost-effectiveness and the cost-benefit of the three strategies. The type of model used was not reported. The authors stated that they had assumed that the participants in the three strategies were not significantly different in terms of age, gender, asthma severity, asthma medication use, or compliance with medications and with the self-management plans,
since the effectiveness evidence was derived from a randomised controlled trial (RCT).

**Outcomes assessed in the review**
The outcomes estimated in the review were the numbers of ER and hospitalisation visits over a 6-month period, extrapolated to a hypothetical cohort of 100 patients for each of the three strategies.

**Study designs and other criteria for inclusion in the review**
The study design criteria were not reported. It can only be stated with certainty that the one study actually used was an RCT.

**Sources searched to identify primary studies**
Not reported.

**Criteria used to ensure the validity of primary studies**
Not reported.

**Methods used to judge relevance and validity, and for extracting data**
Not reported.

**Number of primary studies included**
Only one study was used in the review to derive the effectiveness data.

**Methods of combining primary studies**
The authors stated that the only primary study used to derive data on ER and hospital use was an RCT (Cowie et al. 1997, see 'Other Publications of Related Interest' below for bibliographic details). The inclusion criteria used in the review were not explicitly reported. However, the authors stated "...after an extensive review of the literature, the Cowie study was the only randomized controlled trial... comparing a peak flow-based action plan, symptom-based action plan and no action plan...".

**Investigation of differences between primary studies**
Not stated.

**Results of the review**
The number of ER visits was 115 in the NAP group, 11 in the PFB-AP group, and 100 in the SB-AP group.

The number of hospitalisations was 25 in the NAP group, 4 in the PFB-AP group, and 13 in the SB-AP group.

**Measure of benefits used in the economic analysis**
The outcome measures were the number of ER visits averted and the number of hospitalisations averted due to asthma exacerbation over a 6-month period in the PFB-AP group and SB-AP group, compared with NAP. These were derived from the model. Discounting was not performed as the time horizon was only 6 months.

**Direct costs**
The cost/resource boundary adopted was that of the third-party payer. The health services included in the economic...
evaluation referred to the costs of the flow-meter, education programme, ER visit and hospitalisation for asthma. All of these costs were derived from the review of published studies. Discounting was not relevant because of the short timeframe of the analysis. The unit costs were reported separately from the quantities of resources used for the significant cost items. The price year was not reported.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses were conducted to investigate the uncertainty in the estimates used in the decision model. The parameters varied were the programme cost, the costs of an ER visit and hospitalisation, and the percentage decrease in asthma-related ER visits and hospitalisations. The ranges of costs were derived from the review of published studies. The authors did not report the source of the ranges used for the percentage decrease.

Estimated benefits used in the economic analysis
Compared with NAP, the number of ER visits averted over a 6-month period was 104 (1.04 per person) in the PFB-AP group and 15 (0.15 per person) in the SB-AP group.

Compared with NAP, the number of hospitalisations averted over a 6-month period was 21 (0.21 per person) in the PFB-AP group and 12 (0.12 per person) in the SB-AP group.

Cost results
The programme cost $63 per person for the PFB-AP and $35 per person for the SB-AP.

Synthesis of costs and benefits
Incremental cost-effectiveness analyses were performed to combine the costs and benefits of the three strategies. A cost-benefit ratio was also calculated, which divided the costs saved by the costs of the programme.

The PFB-AP had an incremental cost-effectiveness ratio (CER) of $60.57 per ER visit averted compared with NAP, and a CER of $31.46 compared with the SB-AP.

The SB-AP had an incremental CER of $233.33 per ER visit averted compared with NAP.

The PFB-AP had an incremental CER of $300 per hospitalisation prevented compared with NAP, and a CER of $311 compared with the SB-AP.

The SB-AP had an incremental CER of $291.66 per hospitalisation prevented compared with NAP.

The cost-benefit ratio was 13.79 for the PFB-AP compared with NAP, and 11.53 for the SB-AP compared with NAP.

The results of the sensitivity analyses showed that the programme would be cost-neutral at a programme cost of $63 per patient if the PFB-AP was successful in preventing at least 8 ER visits and 2 hospitalisations per 100 patients, given that the costs of ER visits or hospitalisation were the same as those at baseline.
Authors’ conclusions
For high-cost patients, the peak flow-based action plan (PFB-AP) was the most cost-effective alternative in reducing costs associated with ER visits and hospitalisations due to asthma exacerbation. However, the authors claimed that further refinements to this study (including measuring changes in drug use and costs and patients’ productivity losses) needed to be pursued, and these might demonstrate additional cost-savings due to PFB asthma education plans.

CRD COMMENTARY - Selection of comparators
The authors justified the choice of the comparators. All three strategies under evaluation represented common practices for patients with asthma. You should decide if these are widely used health technologies in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness was based on data derived from a review of the literature. The sources searched and other details of the methodology and conduct of the review were not given. The authors explained why only one study was chosen to derive the effectiveness data. The authors assumed that the participants in the arms of the RCT were comparable. Sensitivity analyses were performed to investigate the robustness of the study findings to variations in the model inputs derived from the literature.

Validity of estimate of measure of benefit
The number of ER visits averted and of hospitalisations averted were selected as benefit measures in the economic analysis. The Discounting was not applied as it was not necessary.

Validity of estimate of costs
The cost analysis was conducted from the perspective of the third-party payer. It appears that all the relevant categories of costs may not have been included in the study. Sources of the cost data were provided for all items included. However, items such as drug costs and productivity losses were excluded from the study, which means that the authors’ results may have been underestimated. The costs were treated deterministically in the base-case, but sensitivity analyses were conducted on the cost data. Discounting was not carried out because the costs were incurred during less than two years. The unit costs and resource quantities were not analysed separately. The price year was not reported. These factors suggest that the cost results should be treated with some caution.

Other issues
The authors made appropriate comparisons of their findings with those from other studies. They do not appear to have presented their results selectively. The issue of the generalisability of the cost and effectiveness results to other settings was addressed by the sensitivity analyses. However, the interpretation of the results may be limited by the fact that only one primary study was used to derive the effectiveness data. The study results referred to high-cost patients and this was reflected in the authors’ conclusions.

Implications of the study
The study results suggested that, for high-cost patients, a PFB asthma education and self-management plan programme is the most cost-effective alternative. The authors recommended that further studies should be conducted. These should include data on drug costs and productivity losses, and use a longer follow-up.

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None stated.

Bibliographic details
NHS Economic Evaluation Database (NHS EED)

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Other publications of related interest


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Subject indexing assigned by NLM

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