Cost-utility of a disease management program for patients with asthma
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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 present study compared a disease management programme (DMP) with usual care for patients with asthma. Care within the DMP was delivered by a collaborative practice team consisting of a pulmonologist, general practitioners (GPs) and respiratory nurse specialists (RNSs), with patient allocation being dependent on disease severity. The main differences compared with usual care were the extent to which the coordination was centralised and the position of the RNS as a liaison between primary and secondary care. The programme has been described in detail elsewhere (Steuten et al. 2006, see 'Other Publications of Related Interest' below for bibliographic details).

Type of intervention
Treatment and integrated care.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients aged 18 years and older, with a GP diagnosis of asthma. Patients with co-morbidities such as lung cancer or congestive heart failure were excluded.

Setting
The setting for the study was outpatient and inpatient care. The economic study was carried out in Maastricht, the Netherlands.

Dates to which data relate
The effectiveness, resource use and cost data used in the model came from 2002/03. Data pertaining to all-cause mortality was taken from 2006. The price year was 2004.

Source of effectiveness data
The effectiveness data included successful control, sub-optimal control, primary care-managed exacerbation, hospital-managed exacerbation, and death from all causes for both the usual care and the DMP strategies. Transition probabilities were reported. The authors provided supplementary tables with more data and details on a website.

Link between effectiveness and cost data
The costing was undertaken prospectively on the patient sample from the main clinical trial, the data from which were used to inform the model.

Modelling
A Markov model was constructed on the basis of 15-month trial follow-up data and the results extrapolated to a 5-year horizon. The structure of the model was based on one developed by Price et al. (2002, see ‘Other Publications of Related Interest’ below for bibliographic details). Five mutually exclusive health states were defined, transition probabilities were reported, and their method of calculation was explicitly described. A second-order Monte-Carlo simulation with 5,000 iterations was used to handle uncertainty in the model.

**Sources searched to identify primary studies**
The effectiveness data from which the model inputs were derived came from a clinical trial, full details of which were presented in the paper. The transition probability for all-cause mortality was derived using data from the Central Office of Statistics in the Netherlands.

**Methods used to judge relevance and validity, and for extracting data**
The aim of the model was to extrapolate the findings of a clinical trial, therefore no review took place. The use of mortality statistics was necessary to facilitate the extrapolation and the source was justified given the location of the study.

**Measure of benefits used in the economic analysis**
The authors used quality-adjusted life-years (QALYs) as a measure of benefit. The quality of life (utility) associated with disease management and usual care was measured using the EQ-5D. With the exception of the “death” state, all health states were assigned a specific utility value obtained from the underlying data set. The utilities were reported in a supplementary web table. The benefits were discounted at an annual rate of 4%.

**Direct costs**
Data collected in the 3-month pre-measurement period were used to estimate resource use within usual care. The data collected at the 1-year follow-up were used to represent resource use within the DMP. The data were seasonally adjusted. The health-related direct costs covered planned consultations with GP, RNS and pulmonologist, non-routine consultations due to an exacerbation, maintenance and emergency medication used, and hospital admissions. Overhead costs were also included. These comprised the costs of employing a medical and project coordinator, continuing education of the RNSs, an administrative support office, maintenance of the electronic patient record system used by the RNSs, telephone and travel for RNSs, and the salary of the unit leader. Training costs of RNSs were not considered because they were already employed in the health care system; learning costs were also not taken into account. The direct costs were discounted at an annual rate of 4%. Details of the direct cost data were presented in a supplementary web table.

**Statistical analysis of costs**
No statistical analysis of the quantities or costs was reported.

**Indirect Costs**
Productivity losses were measured in terms of days of sick leave. These were calculated using the age-dependent friction costs method and discounted at an annual rate of 4%. Details of the indirect cost data were presented in a supplementary web table.

**Currency**
Euros (EUR). The conversion rates were not reported.

**Sensitivity analysis**
A probabilistic sensitivity analysis (PSA), using second-order Monte-Carlo simulation with 5,000 iterations, was used to
deal with parameter uncertainty. This incorporated and appropriately described distributions of the costs, and health outcomes. Estimates were presented graphically on a cost-effectiveness plane and evaluated using net benefit analysis. A cost-effectiveness acceptability curve was also derived. Separate sub-group analyses were performed for each of the patient groups, according to assigned treatment provider (the GP, RNS or pulmonologist).

**Estimated benefits used in the economic analysis**

When considering the two strategies for the base-case (without productivity costs), the QALYs were 2.7 (± 0.2) for the usual care strategy and 3.4 (± 0.8) for the DMP. The difference between strategies was 0.69 QALYs gained for the DMP.

The measures of central tendency (i.e. mean, median) and dispersion (i.e. standard deviation, interquartile range) used were not reported.

**Cost results**

When considering the two strategies for the base-case (without productivity costs), the costs were EUR 3,302 (± 314) for the usual care strategy and EUR 2,973 (± 304) for the DMP.

When productivity costs were included, the cost of usual care was EUR 3,833 (± 410) and the cost of the DMP was EUR 3,242 (± 241).

The measures of central tendency (i.e. mean, median) and dispersion (i.e. standard deviation, interquartile range) used were not reported.

**Synthesis of costs and benefits**

The results for the base-case model (without productivity costs) showed that the DMP led to a gain in QALYs at lower costs compared with the usual care strategy. Therefore, the disease management strategy dominated usual care. If productivity costs were included, dominancy was even greater.

The results of the PSA for the base-case model were graphically presented. The probability that disease management was the more cost-effective strategy was 76% at a societal willingness-to-pay (WTP) of EUR 0 for an additional QALY, reaching 95% probability at a WTP of EUR 1,000 per additional QALY. If productivity costs were included, the results of the PSA showed that 90% of the simulations indicated dominance for the disease management strategy.

The sub-group analyses showed that for patients assigned to the RNS, the disease management strategy was associated with a 1.2 QALY gain at a higher cost of EUR 757. The expected costs and outcomes for patients assigned to the pulmonologist or the GP remained largely the same after DMP implementation.

**Authors’ conclusions**

Organising health care according to the principles of disease management for adults with asthma has a high probability of being cost-effective and is associated with a gain in quality-adjusted life-years (QALYs) at lower costs compared with usual care. The cost-savings were even higher when productivity costs were included, indicating that employers might also benefit from the programme.

**CRD COMMENTARY - Selection of comparators**

The justification for the comparator used was mainly based on the fact that the disease management programme was implemented in the authors’ setting. You should decide if the comparator represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
The authors took the data from a single within-group comparison study. As they acknowledged, no causal relationship can be demonstrated from the use of this study design. No systematic search for other similar data was reported, which could be an important limitation. An important asset of the model was that the authors analysed a DMP adapted to the organisational context of the region and the longer term implications to a locally representative patient group, making the results more locally valid.

Validity of estimate of measure of benefit
The estimation of health benefits (QALYs) was modelled using a Markov model. The methods used to estimate the utility weights from the EQ-5D were not described in the paper. A reference to a web table was provided.

Validity of estimate of costs
Given the societal perspective reported, all the relevant cost categories and their associated costs appear to have been taken into consideration. The resource use data and unit costs were not reported in the paper, but the authors referenced a website for supplemental data and details. The price year and the sources of the unit costs and resource use were adequately reported. The costs were discounted at an annual rate of 4%, which would appear appropriate as the time horizon was greater than one year. Sensitivity analyses of the costs were conducted to assess the robustness of the estimates used. Another point that was not clear was that the measures of central tendency (i.e. mean, median) and dispersion (i.e. standard deviation, interquartile range) used for the base-case were not reported.

Other issues
The authors compared their findings with those from other studies and found their results, in general, to be in agreement. The authors stated some limitations of their study. For example, measurement periods of 3 months are somewhat prone to bias caused by seasonality or coincidental variation of parameters. Also, the missing values that mainly occurred within the follow-up period, thereby selectively affecting measures of the DMP, could be another source of potential bias. Finally, a common limitation as in all Markov models was that transition probabilities were considered to be constant over time, which in reality would not be the case. The authors stated that some strengths of the model were the PSA component and the use of the QALY construct as a generic measure of effectiveness, permitting its value to be assessed in a wider health care context. The authors' conclusions would appear to be an accurate reflection of the scope of their analysis.

Implications of the study
Although the authors stated that no causal relationship can be established due to the study design, they recommended implementing DMPs on a wider scale. However, decision-makers should analyse different programmes to look for the best fit of the DMP to the organisational scheme of the location or institution where it would be set up. More research should be performed to help the decision-making process and enhance the generalisability of the results. The application of decision analytic modelling techniques will help to achieve these goals.

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Other publications of related interest
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