Cost-effectiveness of current and optimal treatment for adult 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 study examined current treatment for asthma (as documented by service use statistics for 2000 - 2001) and treatment that optimally implemented Australian evidence-based guidelines for the management of asthma in adults. It was assumed that all adults with mild persistent asthma were using regular inhaled corticosteroids, while all with moderate or severe persistent asthma were regularly using combined inhaled corticosteroids/long-acting beta-agonists.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The target population comprised all adult patients diagnosed with asthma in clinical practice.

Setting
The setting was primary and secondary care. The economic study was carried out in Australia.

Dates to which data relate
The reference year for the analysis was 2000 to 2001. Variables used to estimate effectiveness were taken from papers published between 1994 and 2003. Descriptive data on prevalence were estimated from a 2001 survey, the distribution of levels of severity were from a 2003 survey, and patterns of medication use were from a 1997 survey. The unit cost data were sourced from various government documents published between 1999 and 2004, and were adjusted to 2000/01 prices.

Source of effectiveness data
The effectiveness data were derived from a review or synthesis of published studies.

Modelling
A model was used to evaluate the cost-effectiveness of current and optimal treatment for asthma and the proportion of burden avertable by treatment. The type of model used was not reported. The time horizon was one year.

Outcomes assessed in the review
The outcomes assessed were:

the prevalence of asthma among adults;
the effectiveness of inhaled corticosteroids and long-acting beta-agonist medications, reported as the mean effect size (i.e. actual effect divided by the standard deviation, SD);

the disability weights for very mild, mild, moderate and severe asthma; and

the prevalence of asthma among adults, and its distribution according to the different severity levels.

**Study designs and other criteria for inclusion in the review**
Randomised controlled trials assessing effectiveness were used.

**Sources searched to identify primary studies**
MEDLINE was searched for primary studies.

**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**
Two randomised placebo-controlled trials were used to determine the effect size (effectiveness) of inhaled corticosteroids. Two further studies were used to determine the effect size for combined medications. An additional three papers that estimated the change in symptoms, functionality and health use were used in a method which converted effect size to disability weights.

**Methods of combining primary studies**
Three studies were combined using a method to convert the effect size due to treatment into a reduction in disability weight. The method has been reported elsewhere (Sanderson et al. 2004, see 'Other Publications of Related Interest' below for bibliographic details). There were no other details of how the primary studies were combined.

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

**Results of the review**
The prevalence of asthma among adults in 2000 - 2001 was estimated to be 10.8% (or 1,616,641 adults in Australia). Thirty-eight per cent of adults were classified as very mild, 32% as mild, 25% as moderate, and 6% as severe.

The mean effect size for inhaled corticosteroids was 0.97.

The mean effect size for combined medications was 1.33.

The conversion factor was 0.13 (such that a 1 SD change in symptoms and functionality is associated with a 0.13 unit change in disability weight).

The overall disability weight for asthma was 0.06.

The disability weight for very mild asthma was 0.03.
The disability weight for mild asthma was 0.03.

The disability weight for moderate asthma was 0.23.

The disability weight for severe asthma was 0.36.

**Methods used to derive estimates of effectiveness**
The authors made assumptions when deriving estimates of effectiveness.

**Estimates of effectiveness and key assumptions**
It was assumed that the only asthma-related medications that reduced the burden of chronic asthma were inhaled corticosteroids and long-acting beta-agonists.

The optimal treatment scenario was based on the assumption that adherence to treatment would be improved in comparison with current treatment.

**Measure of benefits used in the economic analysis**
The measure of benefit used was the years lived with disability (YLD). The YLD is the disability component of disability-adjusted life-years. YLD were calculated as the product of the prevalence and associated disability weight of a disease, where a score of 0 is "a state akin to perfect health" and a score of 1 is "a state akin to death". The YLD averted by the use of a specific medication, for each level of severity, was calculated as the number of persons at that level of severity who were using that medication multiplied by the disability weight change attributable to that medication at that level of severity. The authors also reported the percentage of burden of asthma averted with current and optimal treatment in comparison with no treatment.

**Direct costs**
The estimation of the direct costs included health service costs, such as those incurred in general practitioner (GP) and specialist consultations, hospital visits and the cost of medications over a 1-year period. The unit costs and resource use for GP and specialist consultations, hospital and emergency departments were estimated from government and state publications, and were amalgamated to provide a model of service costs under current care. The optimal treatment model employed the same unit costs as the current treatment model, while expected resource use was estimated using clinical practice guidelines, government policy and authors( assumptions. Subsidised government medical units costs were deflated to 2000/01 prices, and monthly medication use patterns were extrapolated to give yearly cost estimates. The costs and the quantities (aggregated for the population) were reported separately. Resource use was combined with unit costs and aggregated to give a total cost for both current treatment and optimal treatment. The mean cost per case treated was also estimated. Discounting was not required given the short timeframe of the analysis.

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

**Indirect Costs**
The indirect costs were not included.

**Currency**
Australian dollars (AUD).

**Sensitivity analysis**
A Monte Carlo simulation approach was used to provide 95% confidence intervals (CIs) for the total cost estimates. The authors also undertook both multivariate and univariate sensitivity analyses to identify the strongest predictors of variance around the cost-effectiveness estimates.

**Estimated benefits used in the economic analysis**
The current burden of asthma in adults was 96,998 YLD.

The total YLD averted by current treatment was 32,270 (95% CI: 20,784 to 72,964).

The baseline burden, defined as the current burden plus the burden already averted with current treatment (which was estimated to be 25% of the baseline burden), was 129,268 YLD.

For optimal treatment, the burden averted increased from 25 to 69%, or was 89,382 YLD (95% CI: 52,156 to 213,452).

**Cost results**
The total direct cost of current treatment in 2000 - 2001 was AUD 452 million (95% CI: 412 to 627). The average direct health system cost of current treatment for a patient with asthma was AUD 313.

The total direct cost of optimal treatment for a 1-year period was AUD 627 million (95% CI: 537 to 710).

The average direct health system cost of optimal treatment for a patient with asthma was AUD 434.

**Synthesis of costs and benefits**
The cost-effectiveness ratio was calculated as the direct treatment costs of that treatment regimen divided by the number of YLD averted by that regimen.

The cost-effectiveness ratio of current treatment was AUD 14,007/YLD averted (95% CI: 6,457 to 22,023). The cost-effectiveness of optimal treatment implementation improved the cost-effectiveness ratio to AUD 7,021/YLD averted (95% CI: 2,776 to 11,561).

The multivariate sensitivity analysis showed that the estimate of the conversion factor used to translate changes in functional scores to changes in disability weight scores was the most uncertain parameter, affecting the estimate of efficiency (cost per YLD averted) for both current and optimal treatment. The results appeared robust to variations in parameter values when univariate analyses were performed.

**Authors’ conclusions**
Implementation of the optimal treatment model by increasing adherence to current evidence-based guidelines for the management of asthma would be a cost-effective intervention, since it would avert more burden of asthma and would decrease disability, although at a higher cost.

**CRD COMMENTARY - Selection of comparators**
The authors chose the hypothetical situation of no treatment as the comparator. This allowed the relative cost-effectiveness of averting the burden of disease to be evaluated.

**Validity of estimate of measure of effectiveness**
The authors derived their measures of effectiveness from a review of the literature, which does not appear to have been systematic. A published method was used to convert effect size into disability weights and this would appear justified. The estimates of effectiveness were investigated in a sensitivity analysis, using methods and ranges that appear to have been appropriate.
Validity of estimate of measure of benefit
The estimation of benefits (YLD averted) was derived by combining prevalence and disability weights. This derivation method was based on the review of the medical literature and would appear appropriate. The authors justified the use of YLD because of the epidemiological perspective adopted in the study. Also, because it allows comparisons with similar studies that consider other physical and mental disorders.

Validity of estimate of costs
All the categories of cost relevant to the perspective adopted appear to have been included in the analysis. The unit costs and the resource quantities (population totals) were reported separately, which would enhance reflation exercises in other settings. Many of the assumptions employed to determine resource use were investigated in a sensitivity analysis, using ranges that would appear appropriate. No sensitivity analysis of the prices was conducted. Since all costs were deemed to be incurred during one year, discounting was not necessary. Some costs were deflated to reflect 2000/01 prices. No incremental analysis was performed, although it would have been necessary to estimate the incremental cost per YLD averted with optimal treatment in comparison with current treatment.

Other issues
The authors made some comparisons of their findings with those from other studies. They mentioned that the treatment of asthma appears to have been more cost-effective than treatments for other physical and mental disorders such as depression, anxiety or arthritis. The authors stated that the results may be generalisable to the population of patients currently diagnosed with asthma. The authors do not appear to have presented their results selectively. The study included all patients diagnosed with asthma in clinical practice, and the authors’ conclusions reflected this wide scope. The authors reported a number of limitations to their study. For example, chronic obstructive pulmonary disease and asthma are similar among older people and diagnostic transfer is common, which could substantially affect estimates of cost-effectiveness.

Implications of the study
The authors suggested that further primary research is necessary to reduce uncertainty surrounding the estimation of the conversion factor, which was used to translate changes in functional scores to changes in disability weights.

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Other publications of related interest

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