An intervention program to reduce the hospitalization cost of asthmatic patients requiring intubation

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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
Asthma management intervention programme for high risk patients, who had previously required intubation. The programme consisted of patient education, specialist care, regular outpatient visits and access to an emergency call service.

Type of intervention
Secondary prevention.

Economic study type
Although the authors have conducted the study as a cost analysis, effectiveness may be measured by the number of intubations patients required before and after the intervention. The study may therefore be treated as a cost-effectiveness analysis.

Study population
The study population consisted of patients with potentially fatal asthma, who had required intubation previously, were aged 45 years or younger, had regular follow-up visits in the study clinic for one year after initial evaluation and for whom complete medical records one year before and one year after the intervention could be obtained.

Setting
Hospital outpatient department, Chicago, Illinois.

Dates to which data relate
Price data related to 1992. Dates for all remaining data were not specified.

Source of effectiveness data
Effectiveness data was taken from a single study.

Link between effectiveness and cost data
Effectiveness and cost data were obtained from the same patient sample. The costing was obtained prospectively.

Study sample
Patients with a diagnosis of potentially fatal asthma were identified by a review of charts from the Northwestern University Medical school, covering the years 1982 to 1992. The American Thoracic Society and National Institute of Health definitions of asthma were used to justify this diagnosis. It is not known if power calculations were used to determine the sample size. Of the 21 patients originally identified as fulfilling the study criteria, 7 left the clinic within
the first year and 3 of the remaining 14 were lost to follow-up. Two of these 11 patients were unable to obtain their medical records, leaving 9 patients in the study.

**Study design**
The study is of a before-and-after design. It was not stated whether the study was single- or multi-centred. The treatment cohort was followed up for one year. Since the date of the intervention was not given, it is unclear whether the study was wholly retrospective, or partially prospective in nature.

**Analysis of effectiveness**
Given the uncertainties concerning the study design, the basis upon which the study analysis was conducted cannot be ascertained. The primary health outcomes used were the number of intubations (averted).

**Effectiveness results**
In the year before the intervention, nine intubations were required by the study group: each patient had one intubation, except for one patient who required two and one who had none. In the year following the intervention, no intubation was required by any of the patients. Confidence intervals and p-values were not supplied for primary outcomes.

**Clinical conclusions**
The intervention programme reduced the probability of respiratory arrest, and hence the consumption levels of inpatient care, for this type of asthmatic and thus improves morbidity and mortality for this patient group. The authors acknowledged that the relative efficacy of the components of the intervention programme was unclear and suggested the need for future research to clarify the issue of causality.

**Measure of benefits used in the economic analysis**
Benefits were proxied by primary health outcomes of intubations averted; this was not formally linked to health benefit.

**Direct costs**
Cost data were reported, but details of quantities were not formally specified. Resource use data consisted of inpatient days (including intensity of care), emergency visits, outpatient services (including office visits and laboratory services) and drug use data. The cost for four types of inpatient visit was proxied by the charge to the patient for standard care per day in an urban hospital in Chicago. The level of this charge was checked against that of other hospitals in Chicago by means of a telephone survey. Outpatient services and emergency visits were calculated and checked in a similar way. Emergency visits that resulted in an admission were included in inpatient costs. Drug costs were calculated from the prices charged by "a large chain of pharmacists in Chicago". Total cost of care, taken from the perspective of the hospital, was found by combining resource use data with cost data. Discount rates were not used in this analysis.

**Statistical analysis of costs**
The mean cost of care, and the standard deviation from that mean were reported for all four cost categories. A t-test and p-values were also performed. The large standard deviations, relative to the mean, would suggest that resource use data is skewed (i.e. not normally distributed). This would indicate that t-tests may overstate statistical significance.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was performed.
Estimated benefits used in the economic analysis
The incremental benefit of the intervention can be proxied by the reduction in intubations from nine in the year preceding the intervention to zero in the year following it. This reduction was not translated into direct health benefits. Discount rates were not used and a statistical analysis of benefit was not performed. Side effects of the treatments were not considered.

Cost results
The total average cost of care following the intervention was $4,914. This compares with a total average cost of care preceding the intervention of $43,066. The standard deviations on these figures were $5,030 and $25,637 respectively. This difference in cost was due to a change in the level of hospitalisation; resource use of the remaining types of care did not change. Discount rates were not applied.

Synthesis of costs and benefits
The implementation of the programme was the dominant strategy.

Authors' conclusions
The intervention programme, applied to compliant patients, resulted in a large reduction in hospitalisation and cost of care. The authors also believe that mortality was prevented. They discuss the uncertainty about the relative efficacy of component parts of the programme and advocate further research "involving larger groups of patients examined for a longer period of time" to clarify this issue. The authors also recommend further research to address the study limitations of sample size and of the absence of a formal control group.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparators used. This was that the authors wanted to assess the effect of the intervention programme on current practice, as experienced by the study group in the year prior to the intervention. You should consider whether this current practice' is a widely used health technology in your own setting.

Validity of estimate of measure of benefit
Patients are enrolled in an acute phase of disease. It is possible that benefits (measured by intubations averted) may have been overestimated due to regression towards the mean, which cannot be controlled for in this study design. Similarly, before and after studies cannot control for contemporaneous change in circumstances independent of the intervention.

Validity of estimate of costs
The cost analysis was incomplete as the costs of implementing the programme were not included. Cost data was supplied in adequate detail. Resource use data was not systematically reported. This omission made it difficult to assess the validity of the statistical analysis performed on the results. If resource use data had been supplied, giving more details of the comparator health technologies, then the extent to which the results of the study could be transferred to other settings would have been clearer. Indirect costs were not included in the analysis; given the mean age (19.6 years) of the patients, these costs are likely to have a significant positive impact on the cost-effectiveness of the intervention programme. Costs of side-effects were not considered.

Other issues
The comparator chosen, previous treatment, may not have been current practice elsewhere. This raises the question of the extent to which cost savings may be reproduced in other settings. The issue of generalisability to other settings was not addressed. Comparisons were made with other studies that evaluated the outcomes of patient education programmes, but the authors could find none that included economic evaluation. The study did not address the issue of side effects of prednisone (one of the drugs used in the intervention) and further research might be needed to ascertain the safety of using this drug in the long term.
Implications of the study
The study suggests that the intervention could yield significant cost savings. However, further research, in the areas indicated by the authors, is needed to establish the cost-effectiveness of education programmes for patients with potentially fatal asthma.

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Bibliographic details

Other publications of related interest
Detjen PF, Greenberger PA, Grammer LC, Patterson R. Malignant potentially fatal asthma: A management strategy. Allergy Proceedings 1992;13: 27-33.(This paper contains more details of the intervention programme)

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