A randomized controlled trial of a pediatric asthma outreach program

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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
An asthma outreach programme (AOP), a team-based, case-management intervention on emergency ward (EW) and hospital use for paediatric patients with asthma in a staff-model health maintenance organisation. The AOP consisted of an experienced allergy nurse, an allergy nurse practitioner, and an allergist who was available for guidance and consultation. The AOP intervention involved providing an education intervention plus long-term follow-up by an AOP nurse to ensure that patients were keeping routine paediatric appointments, taking maintenance medication, and keeping peak flow charts as requested. In addition, the AOP nurse remained a resource and counsellor for the family.

Type of intervention
Treatment and secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study looked at paediatric patients with asthma in a staff-model health maintenance organisation. Patients were recruited by reviewing hospitalisation lists for persons admitted with the diagnosis of acute asthma, with or without status asthmaticus. Patients were also referred by their primary care paediatricians on the basis of subjective impressions that these patients were at risk for asthma exacerbation. The exclusion criteria incorporated the following set of patients: patients less than 12 months of age at randomisation who had wheezing for the first time or who had the eventual diagnosis of bronchopulmonary dysplasia.

Setting
Hospital (a staff-model health maintenance organisation) and community. The economic analysis was carried out in Boston, USA.

Dates to which data relate
Not given.

Source of effectiveness data
The evidence for the final outcomes was based on a single study.

Link between effectiveness and cost data
Costing was conducted retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. In total, 57 paediatric patients were randomly assigned to either the intervention group (the full AOP intervention) (n=29) or the control group (a single education intervention) (n=28).

**Study design**
This was a randomised controlled trial, carried out in a single centre. The duration of the follow-up was 1 year after enrolment. The study had no loss to follow-up. Both those patients recruited from reviewing hospitalisation lists and referrals from primary care paediatricians were independently randomised by using a paired randomisation scheme based on a table of random numbers so that equal numbers of each type of patient would be assured in the control and AOP groups. Independent referral to the allergy or pulmonary departments was equally available to both groups. 'Before' and 'after' observation periods for each patient were of equal length (at least 1 year).

**Analysis of effectiveness**
The principle used in the analysis of effectiveness was intention-to-treat. The health outcome measures were EW visits and hospitalisation. The study groups were comparable in terms of mean EW use and hospitalisation before intervention.

**Effectiveness results**
The effectiveness results were as follows:

The control group patients experienced significant reductions in EW visits, 39% (p=0.025), and hospitalisation, 43% (compared to the period before the control intervention), possibly as a result of the baseline educational intervention received by all enrolled patients, in conjunction with regression to the mean.

The AOP group patients experienced significant reductions in EW visits, 73% (p=0.0002) and hospitalisation, 84% (p=0.0012).

When compared with the control group, the AOP group demonstrated additional significant reductions in EW visits, 57% (p<0.05) and hospitalisation, 75% (p<0.05).

**Clinical conclusions**
The control group in this study experienced a statistically significant reduction in all aspects of use, ranging between 39% and 43%. The control group effect was enhanced by the full-scale intervention in the AOP, which produced significantly better gains than the control intervention.

**Measure of benefits used in the economic analysis**
No summary benefit measure was identified in the economic analysis, and only separate clinical outcomes were reported.

**Direct costs**
Costs were not discounted due to the short time frame of the cost analysis. Resource use quantities were reported separately from the costs. Cost items were not reported separately. Cost analysis covered the actual outside-of-health-plan use costs (costs not part of the staff-model health maintenance organisation's internal costs). These costs included EW and hospital expenses (but not internal, health centre-based, urgent care or routine ambulatory care) as well as miscellaneous costs, such as ambulance, durable medical equipment, tertiary referrals and home care. The perspective adopted in the cost analysis appears to have been that of the insurer (HMO). The volumes of resources used (hospitalisations and EW visits) by each patient before and after enrolment were counted manually from a printout of the data from the claims computer. Cost data were based on the extraction of data from the claims computer, starting 2 years before the first patient was enrolled and continuing for 1 year after the last patient was enrolled. This was to
ensure that all data were available for an equal time before and after enrolment for each patient. The price year was not given.

**Statistical analysis of costs**
It was reported that statistical analysis was performed with the Wilcoxon matched-pair signed-rank test (for comparison within groups before and after intervention) and by chi-squared test (for comparisons between groups).

**Indirect Costs**
Not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Not conducted.

**Estimated benefits used in the economic analysis**
Not applicable.

**Cost results**
Total outside-plan use in dollars was reduced by 28% (p=0.003) after enrolment in the control group, with $63,450 expended before intervention (mean: $2,266; 95% CI: $1,317 - $3,214) and $42,862 after intervention (mean: $1,638; 95% CI: $3 - $3,273).

In the AOP group the total outside-plan use in dollars was reduced by 82% (p<0.0001) after enrolment, with $78,070 spent before intervention (mean: $2692; 95% CI: $1,538 - $3,846) and $13,627 after intervention (mean: $471; 95% CI: $-9- $951).

Compared with the control group, the total outside-plan use in dollars was reduced by 71%, (p<0.001) in the AOP group.

Estimates of direct savings to the health plan ranged from $7.69 to $11.67 for every dollar spent on the AOP nurse's salary, depending on assumptions.

**Synthesis of costs and benefits**
Costs and benefits were not combined since the AOP intervention was the dominant strategy.

**Authors' conclusions**
Asthma patients in a staff-model health maintenance organisation decreased their resource use between 57% and 75% by participation in an AOP as compared with a randomised control group receiving only an educational intervention. Substantial savings were achieved compared with the cost of the AOP nurse.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the choice of the comparator (a single intensive asthma education session). It was the procedure determined by the Human Subjects Committee to be available for all study patients (although it was not available to non-study patients in the study institution at the time of the study). You, as a database user, should
consider whether this is a widely used health technology in your own setting.

**Validity of estimate of measure of effectiveness**
The internal validity of the effectiveness results is likely to be high given the randomised nature of the study design, and the intention-to-treat analysis carried out. However, no power calculations were performed to justify the sample size adopted in the study. The study patients were found to be comparable in terms of mean EW use and hospitalisation before intervention. The study sample appears to have been representative of the study population (high-risk patients according to the paediatricians or because of the patients’ EW use or hospitalisation).

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. The study was therefore a cost-consequences analysis.

**Validity of estimate of costs**
Good points of the cost analysis were that resource use quantities were reported separately from the costs and adequate details of methods of cost estimation were given. However, the price year was not specified, and the perspective adopted in the cost analysis was not clearly stated. Some important cost elements such as the internal, health centre-based use patterns of the 2 groups before or after enrolment were not included in the cost analysis because it was not the authors’ intention to alter or study routine care costs. The effects of alternative procedures on indirect costs were not addressed. Statistical analyses were performed on resource use and cost data.

**Other issues**
The authors’ conclusion appears to be justified given the uncertainties in the data. The issue of generalisability to other settings or countries was not addressed. Appropriate comparisons were made with other studies, but whether the study sample was representative of the study population was not fully discussed. As acknowledged by the authors, quality of care and quality of life were not directly measured. However, it was speculated that it is likely that quality of care and quality of life were improved by reducing the frequency of EW visits or hospital admissions; each of these events represents a high-risk and high-stress situation for the patient, the family, and the health care delivery system. Furthermore, patients’ satisfaction with care was not measured directly, but it was reported that feedback clearly indicated that patient and family satisfaction with care was markedly enhanced by the AOP.

**Implications of the study**
A prospective study involving the direct measurements of quality of care, quality of life, and patient satisfaction is required.

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