Outcomes of a web-based patient education program for asthmatic children and adolescents
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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 compared two interventions for the treatment of asthmatic children. The interventions compared were a standardised patient management programme (SPMP) and an SPMP in combination with an additional Internet-based education programme (IEP). The SPMP comprised five educational sessions, each 2 hours in duration, aiming to enhance the self-management skills of the patient. Both interventions were compared with a control group (no intervention).

Type of intervention
Treatment (patient education for the improvement of self-management of the disease).

Economic study type
Cost-benefit analysis.

Study population
The study population comprised patients aged between 8 and 16 years who had a confirmed asthma diagnosis for a minimum of 1 year and had adequate knowledge of the German language. Patients who had previously taken part in an asthma programme were excluded from the study. No further inclusion or exclusion criteria were reported.

Setting
The setting was primary and secondary care (i.e. general practitioner (GP) and specialist offices, and asthma outpatient hospital services). The economic study was carried out in Germany.

Dates to which data relate
The effectiveness data were collected between July 2001 and December 2002. The cost data were derived from official sources published between 2000 and 2002. All costs were reported for the price year 2001.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
It seems that the costing has been carried out prospectively on the same sample of patients as that used in the effectiveness study.

Study sample
The study sample was not determined in the planning phase. In addition, power calculations were not conducted retrospectively. Patients who fulfilled the inclusion criteria were selected to participate in the study. It was reported that
80 patients were excluded from the study for not fulfilling the inclusion criteria. The initial sample size consisted of 358 patients (patients with a baseline visit). Of these, 85 were in the control group, 127 in the SPMP group and 146 in the SPMP+IEP group.

**Study design**
The analysis was based on a non-randomised, non-stratified multi-centre (36 centres nationwide), real life study. The patients were followed up for 1 year through visits at 6 and 12 months after enrolment. At the end of the study period, 56 patients (15.6%) had incomplete medical resource use data and 124 (34.6%) patients had dropped out of the study. Of these 124 dropouts, 6 patients were relocated, 6 patients dropped out because their caregivers took back their consent, 11 patients did not attend programmed follow-up visits, 41 patients returned mail questionnaires, and 19 dropped out of the study because the personnel in two study centres were relocated. No reasons for dropout were recorded for 41 patients.

**Analysis of effectiveness**
It was reported that although the analysis was based on intention to treat for the whole population, the results were also presented as severity-adjusted mean scores for the population per peer protocol (n=178) and for sub-groups (n=44 in the SPMP+IEP group, n=86 in the SPMP group, n=48 in the control group). The primary health outcomes used in the analysis were lung function, use of rescue medication and absenteeism from school (number of days) due to asthma. Quality of life (QoL) was also measured using a QoL questionnaire (KINDL, Berlin, Germany). This generic QoL instrument comprised 24 Likert-scale items in the dimensions of physical well-being, psychological well-being, self-esteem, family, friends and social functioning. It is suitable for self administration.

In terms of the comparability of the groups, it was reported that there were significantly more male patients in the control group than in both intervention groups. Significantly more patients in the IEP group suffered from allergies compared with the SPMP group. The proportion of patients with moderate to severe asthma did not differ statistically significantly between the three patient groups, although it was higher in the IEP group. In addition, the use of inhaled corticosteroids did not differ significantly between patient groups. Patients who dropped out used more health care resources, while among patients who were assigned to the two intervention groups, those who completed the study had significantly lower morbidity costs at baseline in comparison with those who dropped out. The authors conducted extensive statistical analyses to account for potential biases and confounding factors.

**Effectiveness results**
At the end of the study period, patients in the IEP group had significant reductions in absenteeism from school (-75%) and average daily use of rescue drugs (-77%) compared with baseline visit. The difference was statistically significant, (p<0.05).

During the study period, the number of outpatient visits (-6%) and the number of days away from school decreased significantly in the control group, (p<0.05). However, patients in the SPMP group had significantly better outcomes than the control group in terms of physician consultations (-44%), emergency treatments (-67%) and days away from school (-71%) compared with baseline.

In comparison with the IEP group, the SPMP group did not demonstrate a statistically significant reduction in the use of rescue medication.

Lung function improved significantly in all groups, (p>0.05).

QoL increased significantly in both intervention groups, (p<0.05).

Statistically significant improvements were also reported for both groups in relation to asthma-specific modules, (p<0.05).

**Clinical conclusions**
The authors concluded that the positive impact of the SPMP is fortified by the addition of IEP, as demonstrated in several outcome measures such as QoL, absenteeism from school, number of asthma-related emergencies and the use of short-acting beta-agonists.

**Measure of benefits used in the economic analysis**
The authors used monetary benefits in the economic analysis (i.e. the savings in resources through implementing SPMP and IEP programmes). These are described under the direct and indirect costs headings below.

**Direct costs**
The health service costs included in the analysis were:

GP consultation fee for first and subsequent visit (including consultation fee, therapeutic advice and spirometry),
specialist consultation fee for the first and subsequent visit (including consultation fee, therapeutic advice and bodyplethysmography),
cost of hospital day including allowances granted by official authorities,
cost of emergency department visit,
cost of ambulance transport in case of emergency,
cost of emergency physician answering an emergency call,
GP answering an emergency call,
cost of traditional patient education,
IEP additional fee, and
cost of medications.

The direct non medical costs included in the analysis were public transport per scheduled or unscheduled visit to a GP or specialist, and Internet fees (for IEP group only) within 6 months. Resources used for drugs were derived from physicians’ prescription records. The costs for traditional patient education were derived from actual data (reimbursement contracts between paymasters and providers). Further costs were derived from official sources. The costs and the quantities were not reported separately, although unit costs were reported for some cost categories. All costs were appropriately adjusted and reported for the price year 2001. Discounting was not relevant as the costs were incurred during less than 2 years.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
Productivity losses per day of caregivers' absence from work due to a child's asthma were included in the analysis. The average daily gross earning was estimated using the human-capital approach and was based on national official data. The costs and the quantities were not reported separately. Productivity losses were reported for the price year 2001.

**Currency**
Euros (EUR).
Sensitivity analysis
The authors carried out one-way sensitivity analyses to investigate the robustness of the results to variability in the data. The parameters tested were drug therapy adherence, outpatient visit costs and intervention costs. The data were analysed using statistical software (SPSS Version 10.0; Chicago IL). The method by which ranges used in the sensitivity analyses were selected was not explicitly reported.

Estimated benefits used in the economic analysis
See below for the estimated resource savings.

Cost results
The total intervention costs were reported per patient. They were estimated to be EUR 541.14 in the SPMP group and EUR 585.13 in the SPMP+IEP group.

It was reported that morbidity cost-savings due to SPMP were EUR 300.78 from a paymaster perspective and EUR 333.20 from a societal perspective. In the SPMP+IEP group, the cost-savings were EUR 461.45 from a paymaster perspective and EUR 467.05 from a societal perspective.

The adjusted benefit, estimated by accounting for potential savings or excess expenditures in each group, was EUR 299.23 from a paymaster perspective and EUR 275.90 from a societal perspective, respectively, in the SPMP+IEP group.

Synthesis of costs and benefits
The benefit-cost ratio was 0.55 from a paymaster perspective and 0.51 from a societal perspective in the SPMP group, compared with 0.79 (paymaster) and 0.70 (societal), respectively, in the SPMP+IEP group.

It was reported that the addition of IEP to the SPMP intervention resulted in incremental morbidity cost-savings of EUR 160 at an additional average cost of EUR 44 in comparison with SPMP alone. This led to a benefit-cost ratio of 3.65.

The sub-group analysis demonstrated higher benefit-cost ratios for patients with moderate persistent or severe persistent asthma (1.42 in the SMPM+IEP group and 1.07 in the SPMP group) and for patients with any emergency 6 months prior to the study entry (1.21 for the SPMP+IEP group and 1.11 in the SPMP group) compared with patients in the intention to treat population (0.42 in the SPMP+IEP group and 0.34 in the SPMP group).

The sensitivity analyses showed that the results were most sensitive to changes in drug adherence, while the benefit-cost ratio was more robust to increases in GP fees and to the IEP reimbursement level.

Authors' conclusions
The Internet-based education programme (IEP) leads to a decrease in burden of disease and to incremental morbidity cost-savings. The sub-group analysis demonstrated that cost-savings offset intervention costs for patients with moderate and severe asthma.

CRD COMMENTARY - Selection of comparators
The authors compared the two educational programmes (SPMP and SPMP+IEP) and a justification was given for the comparators used. You should decide if these represent valid health technologies in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a non-randomised study with two intervention groups and one control group. This is associated with some limitations (i.e. selection bias), given the study question. The study sample was representative of
the study population and, although the patient groups were not comparable at analysis, an appropriate statistical analysis was undertaken to take potential biases and confounding factors into account. However, power calculations were not reported to ascertain that an adequate sample size was used.

**Validity of estimate of measure of benefit**
The estimation of benefit was modelled. Although the authors reported that they used a cost-benefit model, the study was not actually a cost-benefit analysis since the savings of resources (morbidity cost-savings) were considered as benefits (outcomes). Therefore, the analysis should be defined as a cost-effectiveness analysis with the effectiveness outcomes being represented by the difference in morbidity.

**Validity of estimate of costs**
Health insurance and societal perspectives were adopted in the economic analysis. As such, it appears that all the relevant costs have been included in the analysis. However, the authors only reported summary costs, making it difficult to know which unit cost categories were included. In addition, the costs and the quantities were not reported separately. This would not enable the analysis to be easily reworked for other settings. Resource use was based on actual data and was derived from the patients’ records and self-administered questionnaires. The unit costs were derived from official sources. The costs were treated deterministically and sensitivity analyses were conducted, although the method used to select the ranges was unclear and it is not known if the ranges used were appropriate. No discounting was performed, which was appropriate given the short timeframe of the analysis. The price year was explicitly reported, which will assist any future reflation exercises.

**Other issues**
The authors compared their findings with those from other studies and found them generally to be in agreement. The issue of generalisability of the results was directly addressed. The authors do not appear to have presented their results selectively. The study enrolled patients with asthma and this was reflected in the authors’ conclusions.

The authors reported several limitations to their study. First, the lack of randomisation might have introduced selection bias. However, randomisation would have been rather difficult to implement since not all patients had access to the Internet. Second, the results were based on the population per peer protocol. This might have resulted in an overestimation of the benefits, as indicated when the results were based on intention to treat. Finally, the use of health care resources was recorded retrospectively in each of the scheduled visits, which might have introduced recall bias.

**Implications of the study**
The authors recommended implementation activities in collaboration with local and regional paymasters. However, programmes that incorporate IEP techniques will have to be subjected to economic evaluations in order to evaluate long-term cost-effectiveness from patients’ and health care providers’ perspectives. In addition, the authors suggested that future research should focus on the development of strategies that improve asthma management and patient compliance, especially among patients with high initial morbidity.

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