Long-term (3-year) economic evaluation of intensive patient education for self-management during the first year in new asthmatics

R. KAUPPINEN*, H. SINTONEN†, V. VILKKA* AND H. TUKIAINEN*

*South Karelia Central Hospital, Lappeenranta, Finland
†University of Kuopio, Department of Public Policy and Management, Kuopio, Finland and Finnish Office for Health Care Technology Assessment, Helsinki, Finland.
‡Department of Pulmonary Diseases, Kuopio University Hospital, Kuopio, Finland

Patient education and self-management programmes have proved effective in many studies with short follow-up periods. We studied the 3-year cost-effectiveness of an intensive programme of patient education and supervision for self-management.

The study consisted of 162 consecutive newly diagnosed asthmatics who were randomized either into an intervention group (IG) receiving intensive patient education and supervision for self-management at an outpatient clinic during the first year, or a control group (CG) receiving conventional education at the baseline visits only. Both groups had 2 additional years of follow-up. Lung functions and health-related quality of life (HRQOL) were measured. Extra direct and indirect costs were recorded.

At 3 years the differences in forced expiratory volume in 1 s (FEV1) and in peak expiratory flow (PEF) were significantly better in the IG being in (% predicted) respectively 5.3 (95% CI 0.6-10.0) and 4.4 (95% CI 0.1-8.7), (P<0.05). The airway responsiveness (PD15) did not differ significantly, but the improvement from baseline to 3 years was significantly greater in the IG, being 0.40 dose steps (95% CI 0.05-0.75) (P<0.05). HRQOL scores did not differ significantly. The risk for sickness day was less in the IG with a RR of 0.6 (95% CI 0.50-0.69) (P=0.000) and among patients who used the PEF meter. The compliance was similar in both groups when measured by the PEF-based self-management. There was no statistically significant difference in costs, although there was a consistent tendency for lower costs in the intensive programme.

The intensive programme was more effective in terms of FEV1, PEF and improvement in PD15 and equally effective in terms of other lung functions and HRQOL, but there was no clear difference in the costs.

Introduction

National and international asthma management guidelines usually include principles of medical treatment and additionally emphasize the importance of patient education and self-management (1-3). These activities are thought to contain the total social costs of asthma as the number of asthmatics increases (1). However, economic evaluations of patient education and self-management among asthmatics show conflicting results. Most studies have been performed in moderate and severe asthmatics with 1-year follow-up and selected outcomes and costs (4-9). In one study the follow-up time was 3 years, but only costs due to hospitalization and lost productivity were included (10). Our earlier study dealt with new asthmatics, but the follow-up time was only 1 year (11). There are no controlled long-term economic studies of the impact of intensive patient education in new asthmatics.

The aim of this study was to compare the long-term cost-effectiveness of an intensive programme of patient education and supervision for self-management in newly diagnosed asthmatics during the first treatment year with that of a conventional programme.

Materials and Methods

STUDY DESIGN

The study was carried out at South Karelia Central Hospital in Finland. Between September 1991 and February 1993, 162 consecutive new asthmatics aged 18-76
years and diagnosed according to the American Thoracic Society criteria were included in the study (12). They showed a reversible airways obstruction with an increase of at least 15% in the forced expiratory volume in 1 sec (FEV₁) or in peak expiratory flow (PEF) in response to bronchodilators. None of them had used anti-inflammatory asthma medication before. One month later they visited the attending chest physician for conventional guidance in treatment and self-management and were informed about the study.

Patients were then randomized into an intervention group (IG) or a control group (CG) using a computerized list with consecutive numbers. The duty nurse then made the next appointments according to the study plan. The IG visited the specialist clinic every third month during the first year, alternately to the respiratory nurse or attending chest physician for patient education and supervision for self-management. The CG had patient education and guidance for self-management only at their baseline and randomization. This programme was given to both patient groups during visits for diagnosis and randomization.

The IG consisted of 80 patients and the CG of 82 patients. The patients’ baseline characteristics are given in Table 1. The study plan was approved by the Hospital Ethical Committee and informed consent was obtained from all patients.

TREATMENT

All patients followed a routine treatment program consisting of higher doses of inhaled corticosteroid or nedocromil during the first 2 months, which they then decreased according to PEF monitoring. Most patients took inhaled corticosteroid from the outset, while 10 patients started with nedocromil. The patients had to buy their own drugs. The medication was prescribed for 1 year and the pharmacies supplied the medication for 3 months’ use at a time. The mean prescribed maintenance doses were 1.01 mg beclomethasone, 0.97 mg budesonide and 11 mg nedocromil in the IG, and 1.03 mg beclomethasone, 0.97 mg budesonide and 10 mg nedocromil in the CG. The inhaled bronchodilating medication was used as needed. Corticosteroid tablets were not prescribed in advance because that was not the routine practice in our clinic for new asthmatics. The patients were advised to contact their health centre if they had problems with treatment. Compliance was monitored on the basis of verbal information given by the patient. At the 1-year visit the attending chest physician checked the adequacy of maintenance asthma medication and made adjustments if needed.

THE EDUCATION PROGRAMME

The conventional patient education programme covered the use of inhaled drugs, PEF monitoring and principles of treatment. At the randomization visit, the patients were shown a video-tape on asthma and instructed in self-management by the chest physician, who explained the principles and importance of self-management and wrote the personal instructions to the diary according to the plan to be described below. This programme was administered by two respiratory nurses specially trained for that purpose. This basic education package was given to both patient groups during visits for diagnosis and randomization.

The one-to-one education for the IG patients continued during their visits to the clinic every third month, including the repetition of self-management instructions, principles of asthma treatment and use of drugs. The nurse used an average of 1.5 h per patient for education and arranging appointments. Between the 6- and 9-month visits, all IG patients participated in a 2-h education programme given by a physiotherapist and two nurses, one of whom specialized in social affairs and the other in rehabilitation. The course was attended by two or three asthmatic patients at a time.

At the 1-year follow-up visit, the attending chest physician repeated the principles of the self-management programme to all patients and revised the self-management plan as deemed necessary.

SELF-MANAGEMENT PLAN

A peak-flow meter and a diary were given to both groups for the first year. Patients were asked to monitor their PEF values whenever symptoms appeared, and for at least 2 weeks every third month, and to record the values in the diary. This plan is similar to that later adopted in the Finnish asthma programme (1).

The instructions in the diary were as follows:

- If the PEF value falls below 80–85% of the predicted or of your individual optimal value, the inhaled corticosteroid or nedocromil dosage should be doubled until the PEF level is normal and stabilized.

### Table 1. Baseline characteristics of the patients (standard deviations in parentheses)

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=80)</th>
<th>Control (n=82)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (M/F)</td>
<td>25/55</td>
<td>35/47</td>
</tr>
<tr>
<td>Mean age in years (range)</td>
<td>43-1 (18-76)</td>
<td>44-2 (19-76)</td>
</tr>
<tr>
<td>Atopy*</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td>Current smokers</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>FVC, % of predicted</td>
<td>95.1 (12.5)</td>
<td>92.5 (14.8)</td>
</tr>
<tr>
<td>FEV₁, % predicted</td>
<td>86.1 (14.0)</td>
<td>82.8 (14.8)</td>
</tr>
<tr>
<td>FEV₁/FVC</td>
<td>90.0 (10.0)</td>
<td>89.1 (9.7)</td>
</tr>
<tr>
<td>PEF</td>
<td>84.3 (11.4)</td>
<td>83.4 (13.5)</td>
</tr>
<tr>
<td>15D score</td>
<td>0.89 (0.10)</td>
<td>0.89 (0.10)</td>
</tr>
<tr>
<td>SGRQ total score</td>
<td>27.0 (14.6)</td>
<td>27.7 (13.6)</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhaled corticosteroid</td>
<td>75</td>
<td>77</td>
</tr>
<tr>
<td>Nedocromil</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

*At least one positive skin prick test reaction to common allergens.
If the PEF value falls below 70%, double the dosage and contact your doctor.

If the PEF value falls below 50%, go to an emergency department.

Use your inhaled bronchodilating drug whenever you have symptoms.

Both groups recorded the use of extra health-care services, extra medication and sickness days in the diary.

After the first year the patients were asked to buy their own PEF meter and use it whenever symptoms appeared, and to check their PEF at least once a month in the morning. They were also asked to monitor PEF for 2 weeks before the 3-year visit. The patient was defined as a complier if he or she had used the PEF meter at least once before the 3-year visit. The patient was defined as an irregular complier if he or she had used the PEF meter at least once a month, always during the symptoms and at least 6 days before the follow-up visit. Advice for symptom-based follow-up was also given, although the attending chest physician encouraged all patients to buy a PEF meter. The chest physician advised doubling the inhaled anti-inflammatory drug and regularly using bronchodilator if the patient noticed symptoms such as early morning coughing and night-time wheezing, decreased tolerance to exercise and/or an increased need for bronchodilator. The patient was advised to contact his or her general practitioner or to go to the emergency department if the increased medication did not give any relief and bronchodilator was needed more than six times a day.

OUTCOME MEASUREMENTS

Clinical measurements at baseline and at 12 and 36 months were performed at least 12 h after the latest use of bronchodilating drugs. Two flow volume spirometers, Medikro 101 and 901 (Medikro Ltd, Kuopio, Finland), were calibrated daily and the correlation of the two different spirometers was tested for agreement with a healthy person before being used to measure lung function. PEF was measured with Wright's PEF meter (Clement Clarke International Ltd., Harlow, Essex, U.K.) during the visits. The normal Finnish spirometric and Nunn's PEF values were used, adjusted for age, gender and height (14,15). The results are given as percentages of normal values. Airway responsiveness was measured by the provocative dose of histamine required to cause a 15% fall in FEV₁ (PD₁₅) (16). Changes in airway responsiveness were expressed as the mean change in dose steps of PD₁₅, which were: step 0, PD₁₅ <0-11 mg; step 1, PD₁₅ 0-11-0-4 mg; step 2, PD₁₅ 0-41-1-6 mg; and step 3, PD₁₅ >1-6 mg. At baseline the airway responsiveness and spirometric values were measured before any use of inhaled anti-inflammatory drugs.

Health-related quality of life (HRQOL) was measured by the generic 15D and disease specific St George's Respiratory Questionnaire (SGRQ). The dimensions of the 15D are moving, seeing, hearing, breathing, sleeping, eating, communicating, eliminating, working, social participation, mental functioning, pain/ache, depression, distress and perceived health. The score is on a 0-1 scale (1=full HRQOL, 0=death) (17). Among the Finnish population the average 15D score for an individual is 0·96 at 35-44 years and 0·92 at 65-74 years (18).

The SGRQ has 76 items divided into three domains, symptoms, activity and impact on daily life, from which the total score (0-100 scale) is calculated (19,20). Zero is the best possible score. The patients completed the questionnaires during their visits.

COSTS

The costing of visits to the outpatient clinic, inpatient days, and emergency visits was based on the all-inclusive (labour, capital, maintenance etc.) unit costs prevailing in South Karelia Central Hospital in 1993. Visits to primary health centres as well as the return transportation costs were valued at the mean of such costs in Finland. The cost of time used by the nurses and physiotherapist was calculated from their gross salary of £13 h⁻¹, including social security contributions. Any extra drugs used (oral corticosteroids and antibiotics) were valued at average retail prices. Also the use of regular asthma drugs, valued at the retail price, in the 2-latter follow-up years (years 2 and 3) was included, but this information was not available from the database of the Social Insurance Institution for the first treatment year.

The total patient time taken by the intervention visits and extra health-care visits plus all sickness day was recorded for the calculation of indirect costs. The total working time thus lost was valued at the rate of the average daily gross wage in Finland, including social security contributions (£89 day⁻¹).

The costs of diagnosis, the visit for randomization and the follow-up visits at 12 and 36 months were not included, since they were the same in both groups and thus do not affect the relative cost of the alternatives.

The cost-effectiveness of the intervention compared with the conventional programme was examined in the light of incremental cost-effectiveness ratios with all outcome variables. The net monetary benefit of the intervention was calculated by subtracting from the intervention cost the saving due to the intervention (cost of the conventional programme minus the extra costs of the intervention programme).

The main results are presented undiscounted. As a form of sensitivity analysis the difference between the groups in the total costs is also reported as discounted at 3 and 6%.

STATISTICAL ANALYSIS

Outcome variables are reported as mean values with a 95% confidence interval. Differences between the groups in all outcome variables at baseline and at 3 years were tested by using the Student's t-test. Differences in outcome variables between baseline and 3 years within the groups were tested with the paired t-test. Differences between distributions were tested by the chi-squared test. A P-value <0·05 was considered significant.

Results

At baseline there was no significant difference between the groups in any variable. Three IG patients did not attend
the control visits during the first year, later three moved away and two were unwilling to attend as they had become symptomless. This left 72 patients for evaluation at 3 years. Two CG patients dropped out during the first year: one died in a traffic accident and one moved away. Two other patients failed to attend at 3 years, leaving 78 patients to be evaluated in the CG.

Among the IG patients there was a significant improvement from baseline to 3 years in all clinical and other outcome variables except FVC. The same also applied to the CG, except that there was no significant change in FEV\textsubscript{1}. At 3 years the difference in % predicted between groups in FEV\textsubscript{1} was 5.3 (95% CI 0.1-10.0) and in PEF it was 4.4 (95% CI 0.1-8.7); both were significantly better in the IG (Table 2). There was no difference in the improvement of lung function between current smokers and non-smokers. Most of the smokers (n=22) were under 40 years old.

Airway responsiveness deteriorated by one dose step in two patients in the IG and in six patients in the CG during the 3-year follow-up.

The mean doses of inhaled anti-inflammatory medication used did not differ significantly between the groups at baseline or at 3 years. Apart from six patients switching from nedocromil to inhaled corticosteroid, there were no other significant changes in the mean maintenance dosages used according to the information given by the patients and the compliance was considered similar in both groups.

HRQOL scores improved significantly in both groups from baseline to 3 years, but there was no significant difference between the groups (Table 3). Neither of the HRQOL scores reached the normal level (18,19).

There was a significant difference only in a couple of cost items from 1 to 3 years. The average cost of primary care services was £5 (0-45) in the IG and £12 (0-134) in the CG (95% CI −13.4−1.3) (P<0.05) and of extra courses of antibiotics £1 (0-28) and £4 (0-69), respectively (95% CI −5.8−0.3) (P<0.05). The average cost of regular asthma drugs in years 2-3 was £476 in the IG and £595 in the CG (P=0.18). The average total 3-year extra costs (without regular asthma drugs) were £464 in the IG, of which £247 was for the intervention, compared to £477 in the CG (Table 4), suggesting a mean net saving of £12 with the intervention (95% CI −286-262; not significant). When discounted at 3% the saving was £11 and £8, respectively. With cost of regular asthma drugs included the mean net saving rose to £131; the difference was not statistically significant.

The IG patients experienced 104 sickness days and the CG patients 273 days during the 3 years, mostly during the first treatment year, at respectively 64 and 193 days. The risk ratio for sickness day was significantly less in the IG with a risk ratio (RR) of 0.6 (95% CI 0.5-0.7) (P=0.000).

### Table 2. The mean values of lung functions (as % predicted) and dose steps of histamine PD\textsubscript{15} at baseline and at 3-year follow-up in both groups (95% CI in parentheses)

<table>
<thead>
<tr>
<th></th>
<th>Intervention group</th>
<th>Control group</th>
<th>Difference between groups</th>
<th>Difference between intervention and control groups in change from baseline to 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 3 years</td>
<td>Baseline 3 years</td>
<td>Baseline 3 years</td>
<td></td>
</tr>
<tr>
<td>FVC</td>
<td>95.1 (92.2, 98.1)</td>
<td>94.8 (91.4, 98.3)</td>
<td>2.6 (−1.8, 7.0)</td>
<td>−0.35 (−4.3, 3.6)</td>
</tr>
<tr>
<td>FEV\textsubscript{1}</td>
<td>86.1 (82.8, 89.4)</td>
<td>89.2* (85.6, 92.8)</td>
<td>3.3 (0.6, 10.0)</td>
<td>1.67 (−5.7, 2.3)</td>
</tr>
<tr>
<td>FFV%</td>
<td>90.0 (87.7, 92.3)</td>
<td>85.9*** (91.3, 96.3)</td>
<td>0.9 (−2.2, 4.1)</td>
<td>1.8 (−3.5, 1.8)</td>
</tr>
<tr>
<td>PEF</td>
<td>84.3 (81.7, 87.9)</td>
<td>85.4 (88.7, 94.7)</td>
<td>4.9 (−3.1, 5.0)</td>
<td>−4.4† (−3.2, 2.4)</td>
</tr>
<tr>
<td>PD\textsubscript{15} as dose steps</td>
<td>0.54 (0.36, 0.72)</td>
<td>1.57*** (1.31, 1.82)</td>
<td>−0.04 (0.29, 0.21)</td>
<td>0.30 (0.04, 0.64)</td>
</tr>
</tbody>
</table>

Significance of the differences between baseline and 3 years: ***P<0.001, **P<0.01, *P<0.05 (paired sample t-test).

Significance of the differences between groups: †P<0.05 (Student’s t-test).
TABLE 3. The mean HRQOL scores at baseline and at 3 years in the intervention and control groups (95% CI in parentheses)

<table>
<thead>
<tr>
<th></th>
<th>Intervention group</th>
<th>Control group</th>
<th>Difference between groups</th>
<th>Difference between intervention and control groups in change from baseline to 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 3 years</td>
<td>Baseline 3 years</td>
<td>Baseline 3 years</td>
<td></td>
</tr>
<tr>
<td>15D</td>
<td>0.89 (0.87, 0.92)</td>
<td>0.92** (0.91, 0.94)</td>
<td>0.01 (0.03, 0.04)</td>
<td>-0.03 (0.02)</td>
</tr>
<tr>
<td>SGRQ total</td>
<td>27.0 15.7***</td>
<td>27.7 16.8***</td>
<td>-0.70 (0.94)</td>
<td>2.36</td>
</tr>
<tr>
<td>SGRQ symptom</td>
<td>58.2 34.5***</td>
<td>57.5 35.0***</td>
<td>0.69 (23.6)</td>
<td>3.44</td>
</tr>
<tr>
<td>SGRQ activity</td>
<td>28.1 17.0***</td>
<td>28.1 17.9***</td>
<td>-0.03 (12.5)</td>
<td>1.15</td>
</tr>
<tr>
<td>128, 19-9</td>
<td>6.1 10.9**</td>
<td>14.5 21.2</td>
<td>-6.32 (7.4)</td>
<td>1.44</td>
</tr>
</tbody>
</table>

Significance of the differences between baseline and 3 years: ***P<0.001, **P<0.01, *P<0.05 (paired sample t-tests).

The sickness days did not correlate with either lung functions or airways hyperresponsiveness in either group.

In the IG, those patients who were defined to be compliers (n=20) had 31 sickness days and non-compliers 73 days, with RR of 0.6 (95% CI 0.4-0.8) (P=0.000). In the CG, compliers (n=18) had 68 sickness days and non-compliers had 205 days, with an RR of 0.5 (95% CI 0.4-0.6) (P=0.000). The using of PEF-based self-management was not dependent on gender, smoking habit, atopy, lung function, airway responsiveness or the amount of medication used. However, the compliance was dependent on the age of the patients in the both groups. In the IG the mean age of compliers was 50 years and in the CG 51 years. Respectively the mean age of non-compliers was in the IG 40 years and in the CG 42 years. The differences were significant in both groups (P=0.02).

Thirty-one patients in the IG and 40 in the CG used only symptom-based follow-up without having bought a PEF meter. Twenty-one patients in both group had a meter without using it.

TABLE 4. The mean extra direct, indirect and total costs of asthma treatment (£) in the groups from baseline to 3 years.

The costs of visits for diagnosis, randomization and 1-year follow-up, and of regular drug therapy, are not included

<table>
<thead>
<tr>
<th></th>
<th>Intervention group mean (range)</th>
<th>Control group mean (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct costs</td>
<td>226 (140-1751)</td>
<td>160 (0-1634)</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>238 (107-1630)</td>
<td>316 (0-8011)</td>
</tr>
<tr>
<td>Total costs</td>
<td>464 (247-2939)</td>
<td>476 (0-8157)</td>
</tr>
</tbody>
</table>

*Includes intervention costs: direct £140, indirect £107; £ sterling=approx. 8 FIM.

Discussion

The findings indicate that at 3-year follow-up the intensive patient education in self-management plus supervision during the first year was significantly more effective in terms of FEV,

PEF and improvement in airway responsiveness than the conventional programme. In the IG the mean FEV

improved from 85.7 to 89.2% of the predicted value. However, at 1 year FEV

was 92.3% of predicted. The decline of FEV

after the supervision year may indicate that better results in clinical measures were due to regular supervision rather than better self-management. The improvement was greater among new asthmatics than in the study by Lahdensuo et al. on 115 asthmatics. These patients had a similar self-management programme but they had trial medication, so the difference cannot be explained in terms of compliance (21).

Among current smokers it is difficult to make a distinction between asthma and other chronic obstructive lung diseases. All smokers included in our study met the criteria of ATS for asthma (12). Most of the smokers were also under 40 years old (n=14 in the IG and n=8 in the CG). The improvements in lung functions and airways hyperresponsiveness corroborated that these smokers were real asthmatics. No significant difference between the results of smokers and non-smokers.

Apart from FEV

airway responsiveness continued improving in the IG throughout the follow-up. 29% of tested IG patients returned to the normal level of PD

1·6 mg or more, compared with 10% in the CG patients. Essen-Zandvliet et al. found that 13% returned to normal value in a 22-month follow-up study of children (n=58) treated with 0·6 mg budesonide (22). Because of the absence of long-term follow-up studies among mild asthmatics the practical implications of the achieved improvement in clinical outcomes for later morbidity and medication arrangements are unclear.
When compliance was measured by PEF-based self-management the groups did not differ from each other. The compliance was only dependent on the age of the patients. The compliers did not differ from non-compliers in the use of medication.

One important finding was that the intervention indicated a positive effect on the need for sickness days. The risk ratio for sickness days was significantly less in the IG than in the CG. Although the improvement in FEV1 and PEF was significantly greater among IG patients, no correlation could be found between these and sickness days. However, the compliers in both groups had less risk of sickness days. Therefore, not only intervention but also the use of the PEF meter for follow-up influenced the risk of sickness days. Our advice to patients was to use the PEF meter during symptomless periods at least once a month for objective monitoring of their asthma condition after the first treatment year. We also advised the patients to perform the PEF monitoring twice a day for 2 weeks before the follow-up visits. Most of the patients perceived that as too long a time and only 12 patients from both groups followed the advice. There have been many studies concerning the benefit of using a PEF meter vs. symptoms only in self-management plans, and the results have been contradictory (13,23).

Our study started before the self-management programme was recommended in Finland (1) but was essentially the same as that adopted nationally except that we did not give any rescue corticosteroid tablets to new asthmatic patients because that was not our clinical routine. On the other hand, we wanted to make sure that all exacerbations which were not treated by adjustment of inhaled anti-inflammatory medication would be recorded.

During the follow-up it was noticed that the patients could not verify exactly how often they had adjusted their inhaled anti-inflammatory medication. According to verbal information given by the patients there was no difference in the amount of drugs used during the first year. After that the costs of regular asthma drugs did not differ significantly between the groups, although they were slightly lower in the IG.

Most of our patients, even in the IG, preferred symptom-based self-management after 1 year in spite of the intensive education for PEF-based follow-up. They estimated their need for anti-inflammatory drugs according to their use of bronchodilators: the reversal in the improved FEV1 after 1 year may mean that they underestimated the need for drugs. This finding emphasizes the opinion about the importance of PEF-based self-management. The CG used more extra primary health-care services and courses of antibiotics between 1 and 3 years than the IG. This may suggest that asthma exacerbations are still partly treated as respiratory infections. They used more extra steroids, but the difference was not significant. This may also be indicative of inadequate self-management ability in the CG.

HRQOL was measured at baseline and at the 3-year control visit. When measured in this way the groups did not differ in terms of the generic 15D score or disease-specific SGRQ total, symptom, activity or impact scores. An earlier analysis of the outcome variables covered by the 15D and SGRQ indicated that HRQOL scores may measure factors largely unrelated to lung functions, but airway hyper-responsiveness may have an influence on the personal assessment of HRQOL (24). It is worth noting that the HRQOL measures do not cover the behaviour of the patients during asthma attacks or in terms of preventing attacks.

Bartter and Pratter reviewed studies of the effects of expert-based vs. generalist systems on outcomes in severe asthmatics (25). Expert involvement had a positive impact on outcomes and overall cost. Our findings in mild asthmatics are in agreement with this. To our knowledge, this is the first long-term economic evaluation (3-year follow-up) among new asthmatics without trial medication in routine clinical settings and with outcomes measured both by clinical and HRQOL indices.

Our conclusion, in an incremental cost-effectiveness framework, is that if outcome is measured by FEV1, PEF, improvement in PEF, and the need for sickness days, there is some support for deciding in favour of intensive patient education and supervision for self-management during the first treatment year; it produces a better outcome and is at least not more expensive than the conventional programme after 3-year follow-up. If outcome is measured in terms of other lung functions and HRQOL, the programmes are statistically not significant with regard to cost and effects, implying a similar outcome at a similar cost. However, there was a consistent tendency for the intensive programme to be less expensive, but considering the great variance in costs the sample sizes were not big enough to make the cost difference statistically significant.

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