

OUTCOMES

Ten-Year Follow-Up of Early Intensive Self-Management Guidance in Newly Diagnosed Patients with Asthma

RITVA SIRKKA KAUPPINEN, M.D., PH.D.,¹ VESA VILKKA, M.D., PH.D.,¹ JOUNI HEDMAN, M.D., PH.D.,^{1,*} AND
HARRI SINTONEN, PH.D, PROFESSOR (EMERITUS)²

¹*Department of Pulmonary Diseases, South Karelia Central Hospital, 53130 Lappeenranta, Finland.*

²*Department of Public Health, Hjelt Institute, University of Helsinki, Helsinki 00014, Finland.*

Objective. We assessed the 10-year effectiveness of self-management guidance in a prospective follow-up study of patients with asthma when inhaled corticosteroids were used from the beginning in the treatment. **Methods.** Consecutive newly diagnosed asthmatics ($n = 162$) were randomized: 80 to an intervention group (IG) and 82 to a control group (CG). Lung function (LF), airway hyperresponsiveness (AHR), and health-related quality of life (HRQoL) were examined at 10 years. **Results.** The advantages of intensive education with regards to LF measured by forced expiratory volume in 1 second and forced vital capacity were seen only after the first year. Later, there were no statistically significant differences in any parameters between the groups. However, during 10-year follow-up, peak expiratory flow, AHR, and HRQoL improved significantly in both groups (no differences as regards gender, smoking, or atopy). At 10 years, 68% of the IG and 75% of the CG patients still showed AHR after histamine challenge. Generic HRQoL scores in both groups equaled that of the age-standardized group a general population but only 50% in the IG and 55% in the CG had normal disease-specific HRQoL scores. According to Global Initiative for Asthma (GINA) criteria 23% of patients in the IG and 25% in the CG had asthma under control. **Conclusions.** The effectiveness of intensive self-management education could be shown only in the short term. The groups did not differ significantly in any of the parameters investigated, and showed nearly normal LF and HRQoL. AHR improved only partly and only a minority of the patients had asthma under good control according to GINA criteria. This study showed that evaluation of asthma using LF alone does not show the whole truth about asthma treatment results. HRQoL should be used in conjunction with GINA criteria, to assess asthma treatment outcomes. The value and importance of AHR for the evaluation of treatment remains obscure.

Keywords airway hyperresponsiveness, health-related quality of life, inhaled corticosteroid, long-term, lung function

INTRODUCTION

The leading goals of The Finnish National Asthma Program (1) have been early diagnosis, effective anti-inflammatory treatment from the beginning, self-management training, and regular asthma follow-up in primary healthcare. According to the Global Initiative for Asthma (GINA) (2) the goals of treatment are that the patient is both symptom-free (not more than two symptoms/week) and has good lung function. These goals are challenging, because lung function has been shown to decline in asthmatics more than in healthy persons (3,4). Treatment results among adults with regularly used inhaled corticosteroids (ICSs) have been shown to be controversial in terms of later lung function, both in short and long terms (5–8). Beasley (9) was the first to teach patients how to adjust their ICS doses according to their peak expiratory flow (PEF) measurements. However, later studies in which PEF and symptom-based self-management programs have been compared have shown controversial results (10). Self-management training programs introduced in specialist clinics have been shown to be effective in the short

term (11–14), but the long-term results are inconsistent, depending on the primary outcomes (15–16). On the other hand, when introduced in primary healthcare, such a program was not successful (17). As far as we know there are no published studies of the long-term follow-up of asthma patients educated in self-management, treated with ICS, and followed principally in primary healthcare, when effectiveness is measured by lung function, airway hyperresponsiveness (AHR), and health-related quality of life (HRQoL).

The aim of this real-life prospective investigator-driven study was to compare long-term (10 years) treatment results (primary outcomes: lung function, AHR, and HRQoL) in asthma patients who during the first treatment year had an intensive education and supervision program concerning PEF-guided self-management versus a conventional approach with PEF-guided self-management when ICS-based treatment was in use.

METHODS

Study Design

The population consisted of 162 unselected consecutive adult asthma patients newly diagnosed in 1991–1993 at the Central Hospital of South Karelia in Lappeenranta, Finland. During that time, all the patients with a suspicion of asthma were referred to a specialist clinic

*Correspondence author: Jouni Hedman, M.D., Ph.D., Department of Pulmonary Diseases, South Karelia Central Hospital, Valto Käkälän katu 1, 53130 Lappeenranta, Finland; Fax: +358 5352 5895; E-mail: jouni.hedman@pp1.inet.fi

for examinations and diagnosis. The diagnosis of asthma was based on 1987 American Thoracic Society criteria (18). Exclusion criteria were prior asthma treatment, chronic obstructive lung disease, and smoking history of more than 10 pack-years. The patients were recruited to a randomized economic evaluation study of intensive self-management education during the first treatment year (14, 15). They started treatment with a double dose of ICS or nedocromil, which was lowered to the maintenance level not later than after 2 months' treatment. All patients were responsible for buying their own medication and there was no subvention by any medical company at any time. After 1 year, all the patients were under the routine control of primary healthcare centers, except for evaluation visits at 1, 3, and 5 years. For the 10-year follow-up visit, all the patients included in the original study were invited by letter.

At every evaluation visit, they were all encouraged to continue their PEF-guided self-management plan, changing their routine treatment when needed according to their PEF measures.

The patients had given written consent to take part in the follow-up schedule. The study was approved by the Ethics Committee of the Central Hospital of South Karelia.

Study Procedure

Intervention. All patients took part in the conventional patient education program commenced at the visit for diagnosis, when they were randomized to the study. After randomization, the intervention group (IG) started the intensive education program which was continued at the visits to the clinic every third month and was given alternately by a nurse and by an attending chest physician during the first treatment year (14, 15). Between 6 and 9 months, all the IG patients participated in a 2-hour education program (14). The control group (CG) received only a conventional instruction in PEF-guided self-management at baseline. The groups had no other differences. No other education was given during the later evaluation visits.

Lung Function. Prebronchodilatory lung function was measured by flow volume spirometry using Medicro Spiromaster M922 equipment (Medicro Ltd., Kuopio, Finland). Normal Finnish spirometric values were used (19). Each patient had their own PEF meter, which they used for follow-up according to their self-management program. Nunn and Greg's (20) PEF values were used as normal values, adjusted for age and height.

Airway Hyperresponsiveness. Histamine challenges were performed to measure airway responsiveness (21). The provocative dose (PD) of histamine required to cause a 15% fall (PD₁₅) in forced expiratory volume in 1 second (FEV₁) was calculated. The results were expressed as dose steps, that is, step 0 = PD₁₅FEV₁ < 0.11 mg; step 1 = PD₁₅FEV₁ 0.11–0.4 mg; step 2 = PD₁₅FEV₁ 0.41–1.6 mg; and step 3 = PD₁₅FEV₁ > 1.6 mg. A histamine

challenge was not performed if the FEV₁ value was less than 70% of that predicted.

Health-Related Quality of Life. Health-related quality of life (HRQoL) was measured by using both a generic 15-dimensional instrument (15D) and a disease-specific questionnaire—St. George's Respiratory Questionnaire (SGRQ). The former produces a single index score on a scale of 0–1 (1 = best quality, 0 = dead), where the minimum clinically important change is about 0.03 (22). The 15D data for the general population came from the National Health 2000 Health Examination Survey, which covered a representative sample of the Finnish population aged 30 years and over (23). The sample was weighted to reflect the age distribution of the patients. The HRQoL scores of the patients were compared with those of the age-standardized general population. The mean 15D score in the age-standardized general population was 0.91 ± 0.01 (SD) (23).

The SGRQ total score is calculated from 76 items. A score of 0 indicates the best possible situation and 100 the worst. Scores lower than 10 are normal and a change of 4 units in the score corresponds to a minimum clinically important change (24).

According to advice, the patients noted in their diaries their symptoms, their use of regular medication, and the need for extra medication. The diary of each patient was monitored by the physician during the follow-up visits. At the 10-year visit, the level of asthma control was assessed by GINA guidelines (2).

Statistical Analysis

Outcome variables are reported as means and 95% confidence intervals (CIs). Differences between groups were tested by independent samples *t*-tests. Differences between baseline and the follow-up results within groups were tested with paired samples *t*-tests. Differences between distributions were tested by the chi-squared test. A *p*-value < .05 was considered significant. All analyses were carried out by using the Finnish statistical program PATO, version 4.5 (Mikrovuo Oy, Forssa, Finland).

RESULTS

Of the 162 patients who started the study, 40 dropped out during the follow-up period. Seven of them had died (none because of asthma) and 14 were known to have moved away. The others were unwilling to attend, mostly because they were symptomless. The dropouts in both groups did not differ in any baseline characteristics from those who participated (Table 1). Of the 28 smokers at baseline, and participants at the 10-year control, 18 had quit smoking during the 10 years of follow-up. There were three smokers in the IG and seven among the CG.

The patients started treatment with ICS, except for 10 (5 in each group), who used nedocromil at the beginning. With the exception of one nedocromil user,

TABLE 1.—Baseline characteristics of the subjects in the intervention group (IG) and in the control group (CG).

	Participants up to 10 years		Dropouts	
	IG	CG	IG	CG
Number of patients				
Men	18 (32%)	27 (41%)	7 (29%)	8 (50%)
Women	38 (68%)	39 (59%)	17 (71%)	8 (50%)
Atopy ^a	35 (61%)	32 (49%)	11 (45%)	7 (44%)
Current smokers	15 (21%)	13 (20%)	4 (17%)	3 (19%)
Lung function, mean (95% CI) ^b				
FVC	94.3 (90.8 – 97.7)	92.9 (89.3 – 96.9)	97.0 (92.6 – 101.3)	89.3 (80.8 – 97.9)
FEV ₁	84.9 (81.0 – 88.8)	83.6 (80.0 – 87.2)	87.2 (81.6 – 93.0)	79.1 (70.3 – 88.6)
FEV%	89.4 (87.0 – 91.8)	89.5 (87.0 – 91.9)	90.2 (84.8 – 95.6)	87.4 (82.1 – 92.7)
PEF	84.0 (80.9 – 87.1)	84.0 (80.6 – 87.4)	84.3 (79.6 – 88.9)	80.9 (73.0 – 88.2)
Histamine dose step ^c	0.52 (0.31 – 0.72)	0.58 (0.38 – 0.78)	0.59 (0.21 – 0.97)	0.46 (– 0.12 – 1.05)
HRQoL, mean (95% CI)				
SGRQ	26.0 (12.9 – 16.3)	27.0 (14.2 – 23.0)	29.9 (20.3 – 39.4)	31.3 (24.1 – 38.5)
15D	0.90 (0.88 – 0.92)	0.90 (0.87 – 0.92)	0.87 (0.81 – 0.94)	0.85 (0.79 – 0.91)
Medication				
Nedocromil (<i>n</i>)	2	4	3	1
ICS ^d (<i>n</i>)	55	61	20	14
ICS (mg), mean (95% CI)	1.22 (1.13 – 1.31)	1.20 (1.11 – 1.30)	1.23 (1.07 – 1.39)	1.39 (1.19 – 1.58)

Notes: No significant differences between groups ($p > .05$ in all characteristics). Lung function as percent of predicted.

^aAt least one positive result in the skin-prick test.

^bPrebronchodilator values; FVC, forced vital capacity; FEV₁, forced expiratory volume in 1 second; PEF, peak expiratory flow; FEV%, $100 \times \text{FEV}_1/\text{FVC}$.

^cHistamine dose steps: Step 0 = PD₁₅FEV₁ <0.11 mg; step 1 = PD₁₅FEV₁ 0.11–0.4 mg; step 2 = PD₁₅FEV₁ 0.41–1.6 mg; and step 3 = PD₁₅FEV₁ >1.6 mg.

^dInhaled corticosteroid, dose in milligrams during the first 2 months of the study (beclomethasone equivalent). HRQoL, health-related quality of life; SGRQ, St. George's Respiratory Questionnaire; 15D, generic 15-dimensional instrument.

these patients had added ICS to their medication before the first-year evaluation. None used nedocromil after the first treatment year. Fourteen patients stopped all treatments after the 5-year evaluation because they found themselves symptom-free (five in the IG and nine in the CG). Among the others, the mean doses of ICS, calculated as beclomethasone equivalent doses, decreased in the IG from an initial dose of 1.22 mg (95% CI: 1.15–1.30) to 0.44 mg (0.36–0.53) and in the CG from 1.24 (1.15–1.32) to 0.51 mg (0.51–0.60) at 10 years. The doses at 10 years were calculated according to the patients' reports.

The results of lung function tests, presented as mean percentages of predicted and as mean changes from baseline are shown in Figure 1. Statistically significant differences between the groups were not found at the 10-year control. At every control visit, both groups had significantly better PEF than at baseline, whereas forced vital capacity (FVC) changed significantly only in the IG and only during the first year of follow-up.

AHR was tested at baseline in 148 of the 162 patients (77 of them in the IG) and only 2 patients had nonhyperreactive airways (1.4%), both in the CG. After 10 years of anti-inflammatory treatment, AHR was tested in 105 of the 122 patients (49 in the IG). AHR, expressed as mean of histamine dose steps, improved significantly during the follow-up period in both groups, as shown in Table 2. After 10 years, there were 16 patients in the IG and 14 in the CG who had nonhyperreactive airways (PD₁₅FEV₁ > 1.6 mg PD histamine = 3 dose steps).

As regards hyperresponsiveness, there were no significant differences in terms of groups, gender, smoking status, or atopic versus non-atopic persons.

HRQoL was assessed at baseline in 148 of the 162 patients (71 in the IG), and at 10 years the questionnaires were filled in by 57 patients in the IG and 65 in the CG. HRQoL improved significantly during the follow-up period in both groups, as shown in Table 2.

Both the 15D and SGRQ total scores had improved in both groups in a statistically significant (paired *t*-test, $p < .001$) and clinically important manner (increase in 15D scores of ≥ 0.03 and decrease in SGRQ scores of > 4). The groups did not differ significantly from each other in either of the HRQoL scores. Mean scores in the SGRQ did not reach the normal level of <10 in either group, as shown in Table 2, and at the end of follow-up 28 patients (50%) in the IG and 35 persons (55%) in the CG had normal SGRQ scores. During follow-up, the patients' mean 15D scores in both groups were consistently better than that in the standardized general population.

Control of asthma was estimated at 10 years using 2008 GINA guidelines criteria. In the IG 13 patients had controlled asthma and 32 patients had it partly controlled. In the CG, the numbers were 16 and 31, respectively. Asthma was uncontrolled in 12 patients in the IG and in 18 patients in the CG. There were no statistically significant distribution differences between the groups (chi-square test; $p > .05$). Therefore, the groups were put together to study the correlations between asthma

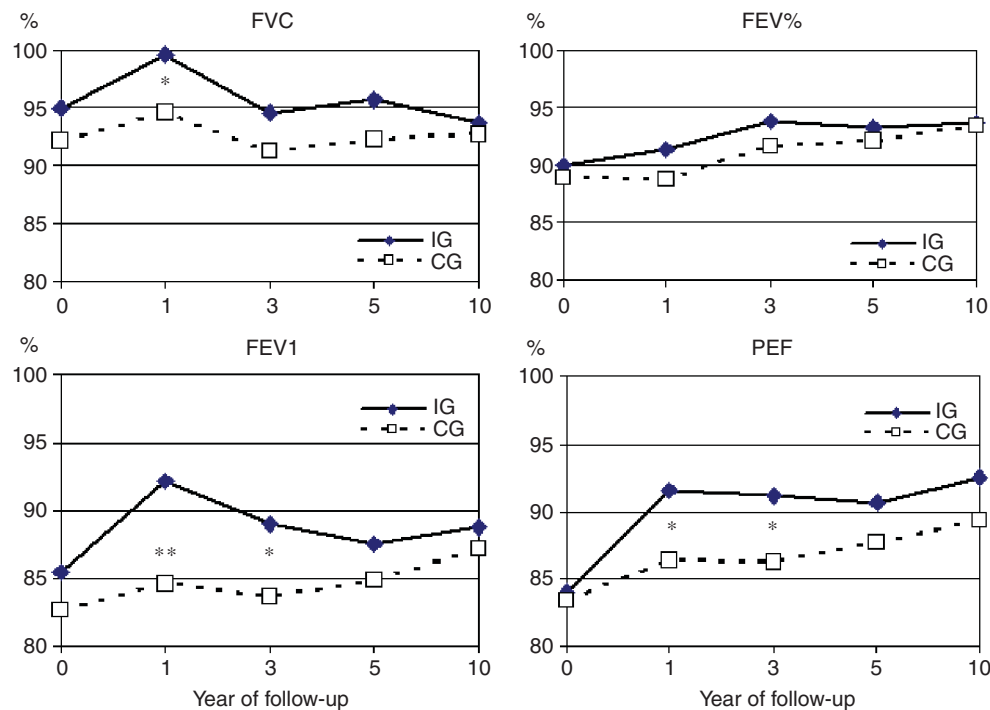


FIGURE 1.—Results of prebronchodilator lung function tests in the intervention group (IG) and in the control group (CG) during the 10-year follow-up period. Means of lung function are expressed as percent of predicted. Notes: Significance between groups, *t*-test: ***p* < .01, **p* < .05. FVC, forced vital capacity; FEV₁, forced expiratory volume in 1 second; FEV%, 100 × FEV₁/FVC; PEF, peak expiratory flow.

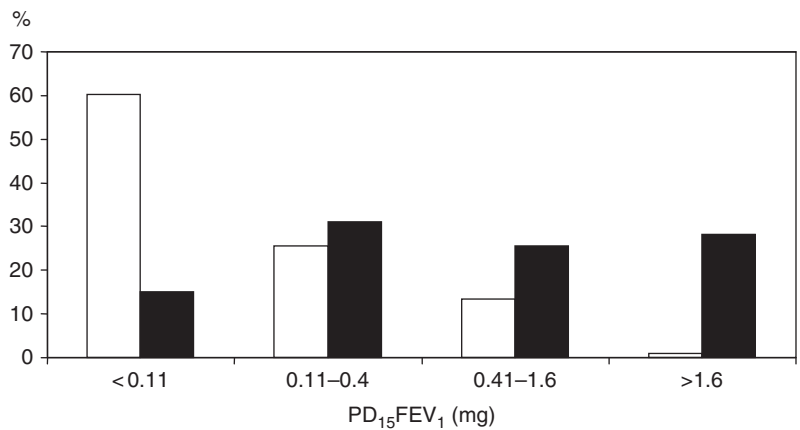


FIGURE 2.—Distribution of PD₁₅FEV₁ histamine provocation test results in asthmatics. Open bars, at the beginning (*n* = 113), solid bars at 10 years (*n* = 106).

TABLE 2.—Airway hyperresponsiveness and health-related quality of life scores in the intervention group (IG) and in the control group (CG) at baseline and after the 10-year follow-up period, expressed as mean and 95% CI.

Year of follow-up	0		10	
Groups	IG	CG	IG	CG
Number of patients	80	82	57	65
Histamine				
Dose step ^a	0.54 (0.36 – 0.72)	0.56 (0.37 – 0.74)	1.66 (1.34 – 1.98)	1.68 (1.41 – 1.94)
HRQoL				
SGRQ	27.0 (23.8 – 30.2)	27.7 (24.3 – 31.1)	11.9 (9.2 – 14.6)	13.9 (10.3 – 17.6)
15D	0.89 (0.87 – 0.91)	0.89 (0.87 – 0.91)	0.93 (0.92 – 0.95)	0.93 (0.91 – 0.95)

Notes: There were no significant differences between groups.
^aHistamine dose steps: step 0 = PD₁₅FEV₁ <0.11 mg; step 1 = PD₁₅FEV₁ 0.11–0.4 mg; step 2 = PD₁₅FEV₁ 0.4–1.6 mg; and step 3 = PD₁₅FEV₁ >1.6 mg.
 HRQoL, health-related quality of life; SGRQ, St. George's Respiratory Questionnaire; 15D, generic 15-dimensional instrument.

TABLE 3.—Means of lung function as percent of predicted, histamine hyperreactivity, and health-related quality of life scores according to GINA 2008 guidelines criteria.

	GINA groups		
	Controlled	Partly	Uncontrolled
Lung function ^a , mean (95% CI)			
FVC	97.6 (93.0 – 102.2)	95.2 (91.7 – 98.7)	84.7*** (81.2 – 88.3)
FEV ₁	94.0 (89.9 – 98.1)	89.5 (85.4 – 93.7)	78.7*** (74.5 – 82.9)
FEV%	95.8 (92.9 – 98.8)	93.1 (90.5 – 95.6)	92.3 (88.5 – 96.1)
PEF	98.7 (94.9 – 102.5)	89.4*** (85.6 – 93.1)	86.2*** (81.6 – 90.8)
Histamine, mean (95% CI)			
Dose step ^b	1.93 (1.51 – 2.35)	1.64 (1.37 – 1.91)	1.44 (0.98 – 1.90)
HRQoL			
SGRQ	5.79 (4.22 – 7.35)	13.48** (10.42 – 16.54)	18.85*** (12.88 – 24.82)
15D	0.96 (0.94 – 0.98)	0.93** (0.91 – 0.94)	0.92** (0.88 – 0.95)
ICS (mg)	0.46 (0.33 – 0.59)	0.50 (0.42 – 0.50)	0.45 (0.31 – 0.59)

Notes: Significance of difference versus controlled, t-test: *** $p < .001$, ** $p < .01$, * $p < .05$

^aPrebronchodilator values: FVC, forced vital capacity; FEV₁, forced expiratory volume in 1 second; FEV% = $100 \times \text{FEV}_1/\text{FVC}$; PEF, peak expiratory flow.

^bHistamine dose steps: step 0 = PD₁₅FEV₁ <0.11 mg; step 1 = PD₁₅FEV₁ 0.11–0.4 mg; step 2 = PD₁₅FEV₁ 0.41–1.6 mg; and step 3 = PD₁₅FEV₁ >1.6 mg. HRQoL, health-related quality of life; SGRQ, St. George's Respiratory Questionnaire; 15D, generic 15-dimensional instrument.

control level (estimated according to GINA guideline criteria) and the other measurements used. Patients with controlled versus uncontrolled asthma had significantly better forced vital capacity, FEV₁, PEF, and HRQoL. However, there were no differences between these GINA groups in AHR, FEV%, and ICS dose. Between GINA groups with controlled and partly controlled asthma, there were significant differences in PEF and HRQoL (Table 3). Patients with controlled versus uncontrolled asthma at the 10-year visit had better PEF and HRQoL at baseline (PEF 91.5% vs. 79.6% of predicted, $p = .001$; SGRQ 20.8 vs. 30.5, $p = .02$; 15D 0.93 vs. 0.88, $p = .04$) but there were no differences in spirometry, AHR, or ICS doses at baseline.

The distribution of PD₁₅FEV₁ values in asthmatics investigated at baseline, and at 10 years and presented as one group is shown in Figure 2. When AHR improved by two or more histamine dose steps ($n = 34$) FEV₁ improved on average by 0.08 L in 10 years, but it declined by 0.18 L in the others ($p < .01$).

DISCUSSION

This investigator-driven study concerns a prospective 10-year real-life follow-up of unselected consecutive patients with asthma receiving intensive versus conventional self-management education during the first treatment year and having anti-inflammatory treatment from the beginning.

The main finding was that the intensive education program compared to a conventional approach with PEF-guided self-management had no long-term positive effects when evaluated by using lung function, AHR, and HRQoL. In earlier studies, we have shown that an advantage was seen only after the first treatment year, and not later (14, 15). It is possible that the intervention did not work adequately because the type of intervention employed was not based on any specific theory of behavioral change.

The second important clinical finding was that there was no significant decrease in lung function in long term and obstruction decreased as early as during the first year (15). However, after 10 years only 27.6% of the patients had nonreactive airways in histamine provocation tests and less than one-third had asthma under control according to GINA guidelines criteria.

The third important outcome is connected with the fact that we followed the patients' HRQoL scores over 10 years. The generic 15D scores became at least as high as that in the age-standardized general population. However, not all of the patients achieved normal SGRQ total scores (both groups).

The reason that the patients were from a specialist clinic was that when the study began, at that time in Finland practically all asthma diagnoses and starts of treatment were carried out in such clinics. Hence the patients were unselected.

The study groups were created in a randomized manner from newly diagnosed unselected consecutive asthma patients. Many of the patients might have had mild or intermittent asthma, which could explain the lung function results. With the exception of 10 patients, all used regular treatment with initial high-dose ICS from baseline, adjusting their doses according to their self-management plans. Of the 10 initial nedocromil users, all but 1 had changed to treatment with ICS during the first treatment year. However, this study was not planned to show the effect of ICS. The severity of the patients' asthma was not evaluated at baseline.

All the patients paid three evaluation visits to the specialist clinic before the 10-year follow-up point (14, 15). Although they did not receive any further education, it is difficult to separate the effect of these later visits on the treatment results. This is one limitation in our study. The patients in the CG could adopt good practice later, so that they were as capable as those in the IG in following their self-management guidance. In practice, all the evaluation visits involved the same

specialist physician (RSK), who had the opportunity to motivate all the patients individually for better asthma management. Our results support the opinion of Szeffler (25) that systematic follow-up of pulmonary function and careful monitoring of measures of asthma control and treatment requirements provide a method to identify asthma progression over time in individual patients. Schatz et al. (26) achieved improved asthma outcomes by way of allergy specialist care in a population-based cross-sectional analysis.

Our lung function results are consistent with the 3-year results of ICS treatment reported by O'Byrne et al. (27) in that effective treatment at the beginning was important as regards later results. Haahtela et al. (6, 8) showed that a short (2 years) delay in treatment did not have any impairing effect on lung function.

A histamine challenge was used to test airway responsiveness. At the beginning of this study that was the only test for inflammation. Now, it is known that it is not a real marker of inflammation (28). According to our results, AHR remained in more than two-thirds of the patients in spite of 10 years of ICS treatment. The best prognosis of FEV₁ change was detected in patients whose hyperreactivity improved most. It is possible that there is a specific phenotype of asthmatics with an enhanced connection between inflammation and hyperreactivity (29). In the majority of patients, the connection might be looser. Busse (30) divided the components of airway changes in connection with AHR into two categories—variable and persistent. Previously, Sont et al. (31) concluded that by reducing AHR in conjunction with optimizing symptoms and lung function leads to more effective control of asthma while alleviating chronic airway inflammation.

Both the generic and disease-specific HRQoL scores correlated well with the level of asthma control as measured by GINA guidelines criteria. This finding is concordant with that published by O'Byrne et al. (32).

The new update of GINA guidelines was used to measure the level of asthma control at the 10-year visit. As Bousquet et al. (33) have said the guidelines were planned to be used in primary healthcare so that patients received the best possible care. Beside good lung function, one of the main goals in asthma treatment should be that patients are symptom-free. In our study, mean lung function was at a normal level but the patients still reported symptoms, and according to the GINA guidelines (2) only 24% of the patients had asthma under control, 51% had partly controlled asthma, and 25% had uncontrolled asthma. Patients with controlled versus uncontrolled asthma at the 10-year visit had better PEF and HRQoL at baseline. It might be possible that only mild asthma patients achieve good asthma control. In another study carried out in Finland, in patients with mild to moderate asthma followed in primary healthcare and treated with high doses of ICS, only half were in at least moderate control (34). In the AIRE study (35) also, more than half of the patients had symptoms, as did over 40% of the patients in a study by Gaga et al. (36). Our results corroborate

those of Haahtela et al. (8). These results indicate that practitioners' evaluations may not correspond to the real situation, as Bateman et al. (37) and Chapman et al. (38) have shown in their studies.

This study has some limitations which might have had effects on the final results. Because the severity of asthma was not defined, we do not know how many of the patients had severe asthma at baseline. The blinding of the study had some limitations, because the patients in the IG visited the clinic four times during the first treatment year and the attending physician and the nurse met them for the education. However, the other nurses, who carried out the lung function tests, and the physicians in primary healthcare were blinded. Information about the use of the drugs and follow-up of the self-management program was based only on information from the patients.

CONCLUSIONS

Our study showed that early intensive self-management education for asthma treatment had no long-term effect on the treatment results, when the patients had regular evaluation visits and had at least conventional self-management in use. However, the study showed that prognosis of these asthma patients in terms of lung function was not bad. Some patients among unselected new asthmatics were symptomless after 10 years of follow-up. Most patients (in both groups) maintained their lung function at nearly normal levels after 10 years when anti-inflammatory treatment and at least a conventional self-management program were in use. However, it can also be shown that this treatment schedule had only a mild improving effect on airway responsiveness and nearly two-thirds had persistent AHR. According to GINA guidelines criteria, two-thirds of the patients had their asthma at least partly controlled by the end of the study. Control levels showed a good correlation with HRQoL scores.

ACKNOWLEDGEMENTS

This work was carried out at South Karelia Central Hospital without any financial support.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

REFERENCES

1. Haahtela T, Laitinen LA. Asthma Program in Finland 1994–2004. Ministry of Social Affairs and Health. *Clin Exp Allergy* 1996; 26(Suppl. 1):1–24.
2. Global Strategy for Asthma Management and Prevention. Global Initiative for Asthma (GINA) 2008. Report updated 2008. Available from: <http://www.ginasthma.org/>
3. Lange P, Parner J, Vestbo J, Schnohr P, Jensen GA. 15-year follow-up study of ventilatory function in adults with asthma. *N Engl J Med* 1998; 339:1194–1200.

4. Peak JK, Woolcock AJ, Cullen K. Rate of decline of lung function in subjects with asthma. *Eur Respir Dis* 1987; 3:171–179.
5. Busse WW, Pedersen S, Pauwels RA, Tan WC, Chen YZ, Lamm CJ, O'Byrne P, START Investigators Group. The inhaled steroid treatment as regular therapy in early asthma (START) study 5-year follow-up: effectiveness of early intervention with inhaled budesonide in mild persistent asthma. *J Allergy Clin Immunol* 2008; 121:1164–1174.
6. Haahtela T, Järvinen M, Kava T, Kiviranta K, Koskinen S, Lehtonen K, Nikander K, Persson T, Selroos O, Sovijärvi A. Effects of reducing or discontinuing inhaled budesonide in patients with mild asthma. *N Engl J Med* 1994; 11:700–705.
7. Grol MH, Gerritsen J, Vonk JM, Schouten JP, Koëter GH, Rijcken B, Postma DS. Risk factors for growth and decline of lung function in asthmatic individuals up to age 42 years. A 30-year follow-up study. *Am J Respir Crit Care Med* 1999; 160:1830–1837.
8. Haahtela T, Tamminen K, Kava T, Malmberg LP, Ryttilä P, Nikander K, Persson T, Selroos O. Thirteen-year follow-up of early intervention with an inhaled corticosteroid in patients with asthma. *J Allergy Clin Immunol* 2009; 124:1180–1185.
9. Beasley R, Cusley M, Holgate ST. A self-management plan in the treatment of adult asthma. *Thorax* 1989; 44:200–204.
10. Buist AS, Vollmer WM, Wilson SR, Frazier EA, Hayward AD. A randomized clinical trial of peak flow versus symptom monitoring in older adults with asthma. *Am J Respir Crit Care Med* 2006; 174:1077–1087.
11. Ignario-Garcia JM, Gonzales-Santos P. Asthma self-management education program by home monitoring of peak respiratory flow. *Am J Respir Crit Care Med* 1995; 151:353–359.
12. Kotes H, Stout C, McConaughy K, Winder J, Creer T. Evaluation of individualized asthma self-management programs. *J Asthma* 1996; 33:113–118.
13. Lahdensuo A, Haahtela T, Herrala J, Kava T, Kiviranta K, Kuusisto P, Pekurinen M, Perämäki E, Saarelainen S, Svahn T. Randomized comparison of cost-effectiveness of guided self-management and traditional treatment of asthma in Finland. *BMJ* 1998; 316:1138–1139.
14. Kauppinen R, Sintonen H, Tukiainen H. One-year economic evaluation of intensive vs conventional patient education and supervision for self-management of new asthmatic patients. *Respir Med* 1998; 92:300–307.
15. Kauppinen R, Vilkkä V, Sintonen H, Klaukka T, Tukiainen H. Long-term economic evaluation of intensive patient education during the first treatment year in newly diagnosed adult asthma. *Respir Med* 2001; 95:56–63.
16. Powell H, Gibson PG. Options for Self-Management Education for Adults with Asthma (Review). *Cochrane Collaboration*, Issue 3. Chichester, UK: Wiley, 2009.
17. Jones A, Pill R, Adams S. Qualitative study of views of health professionals and patients on guided self management plans for asthma. *BMJ* 2000; 321:1507–1510.
18. American Thoracic Society. Standard for the diagnosis and care of patients with chronic pulmonary diseases (COPD) and asthma. *Am Rev Respir Dis* 1987; 136:225–245.
19. Viljanen AA, Halttunen PK, Kreus K-E, Viljanen BC. Spirometric studies in non-smoking, healthy adults. *Scand J Clin Lab Invest* 1982; 42(Suppl. 159):5–20.
20. Nunn AJ, Gregg I. New regression equation for predicting peak flow in adults. *BMJ* 1989; 298:1068–1070.
21. Sovijärvi A, Malmberg L, Reinikainen K, Viljanen BC. Rapid dosimetric method with controlled tidal breathing for histamine challenge. *Chest* 1993; 104:164–170.
22. Sintonen H, Pekurinen M. A fifteen-dimensional measure of life (15D) and its applications. In: Walker SP, Rosser RM, eds. *Quality of Life Assessment: Key Issues in the 1990s*. Dordrecht, the Netherlands: Kluwer, 1993:185–195.
23. Aromaa A, Koskinen S, eds. *Health and Functional Capacity in Finland. Baseline Results of the Health 2000 Health Examination Survey 2004*. Helsinki, Finland: Publications of the National Public Health Institute, 2004, B12/2004.
24. Jones PW, Quirk F, Baveystock C. The St George's Respiratory Questionnaire. *Respir Med* 1991; 85(Suppl.B):25–31.
25. Szeffler SJ. Asthma progression: can we and should we measure it? *J Allergy Clin Immunol* 2007; 121:598–600.
26. Schatz M, Zeiger RS, Mosen D, Apter AJ, Vollmer WM, Stibolt TB, Leong A, Johnson MS, Mendoza G, Cook EF. Improved asthma outcomes from allergy specialist care: a population-based cross-sectional analysis. *J Allergy Clin Immunol* 2005; 116:1307–1313.
27. O'Byrne P, Pedersen S, Busse WW, Tan WC, Chen YZ, Ohlsson SV, Ullman A, Lamm CJ, Pauwels RA, START Investigators Group. Effects of early intervention with inhaled budesonide on lung function in newly diagnosed asthma. *Chest* 2006; 129:1478–1485.
28. Crimi E, Spanevello A, Neri M, Ind PW, Rossi GA, Brusasco V. Dissociation between airway inflammation and airway hyperresponsiveness in allergic asthma. *Am J Respir Crit Care Med* 1998; 157:4–9.
29. Anderson GP. Endotyping asthma: new insight into key pathogenic mechanism in a complex, heterogeneous disease. *Lancet* 2008; 372:1107–1119.
30. Busse WW. The relationship of airway hyperresponsiveness and airway inflammation. Airway hyperresponsiveness in asthma: its measurement and clinical significance. *Chest* 2010; 132(Suppl. 2): 4S–10S.
31. Sont JK, Willems LN, Bel EH, van Krieken JH, Vandenbroucke JP, Sterk PJ. Clinical control and histopathologic outcome of asthma when using airway hyperresponsiveness as an additional guide to long-term treatment. *Am J Respir Crit Care Med* 1999; 159: 1043–1051.
32. O'Byrne PM, Reddel HK, Eriksson G, Ostlund O, Peterson S, Sears MR, Jenkins C, Humbert M, Buhl R, Harrison TW, Quirce S, Bateman ED. Measuring asthma control: a comparison of three classification system. *Eur Respir J* 2010; 36:269–276.
33. Bousquet J, Clark TJ, Hurs S, Khaltaev N, Lenfant C, O'Byrne P, Sheffer A. GINA guidelines on asthma and beyond. *Allergy* 2007; 62:102–112.
34. Hedman J, Tamminen K, Puhakka A. Onko luulo suomalaisten astman hyvästä hoitotasapainosta tiedon väärtti? (Is the belief that asthma is well controlled in Finland true?). *Suomen Lääkärilehti* 2008; 34: 2691–2696.
35. Rabe K, Vermeire P, Soriano J, Maier WC. Clinical management of asthma in 1999: the Asthma Insight in Europe (AIRE) study. *Eur Respir J* 2000; 16:802–807.
36. Gaga M, Papageorgiou N, Zervas E, Gioulekas D, Konstantopoulos S. Control of asthma under specialist care – is it achieved? *Chest* 2005; 128:78–84.
37. Bateman ED, Boushey HA, Bousquet J, Busse WW, Clark TJ, Pauwels RA, Pedersen SE, GOAL Investigators Group. Can guideline-defined asthma control be achieved? The Gaining Optimal Asthma Control Study. *Am J Respir Crit Care Med* 2004; 170:836–844.
38. Chapman KR, Boulet LP, Rea RM, Franssen E. Suboptimal asthma control: prevalence, detection and consequences in general practice. *Eur Respir J* 2008; 31:320–325.

Copyright of Journal of Asthma is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.