Effect of Patient Education on Self-Management Skills and Health Status in Patients with Asthma: A Randomized Trial

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PURPOSE: We conducted a randomized clinical trial to assess the effectiveness of a newly established education program for adults with asthma. The program was designed to improve patients' health and functional status.

SUBJECTS AND METHODS: Hospitalized patients with asthma were randomly assigned to immediate education or a 6-month waiting list. The education program consisted of three group sessions, delivered by trained educators, and focused on improving patients' self-management skills. Of 253 eligible patients, 131 agreed to participate (66 assigned to immediate education, 65 controls) and 115 (88%) completed the follow-up assessment at 6 months.

RESULTS: At follow-up, most indicators of self-management skills and health and functional status had improved significantly among educated patients, but similar improvements were also seen among controls. The trial arms differed significantly on only four variables: patients in the immediate-education group were more likely to develop confidence in their asthma treatment (odds ratio adjusted for baseline [OR] = 2.9; 95% confidence interval [CI]: 1.0 to 8.1), to improve their knowledge of correct inhalation technique (OR = 2.4; 95% CI: 1.0 to 5.7), and to improve knowledge of the peak flow reading that warrants calling a physician (OR = 3.1; 95% CI: 1.4 to 6.7), but they improved less on the Asthma Quality of Life Questionnaire "activity" score (difference: −0.4 on a 1 to 7 scale; 95% CI: −0.8 to 0.0). Use of health services during follow-up was similar in the two groups.

CONCLUSION: The education program did not enhance patients' health and functional status, despite improving a few self-management skills. These results underscore the need for controlled evaluations of education programs. **Am J Med. 2002;113:7–14.** ©2002 by Excerpta Medica, Inc.

Education directed at improving self-management skills is considered to be a cornerstone of care for patients with asthma (1). Many clinical trials have examined the effectiveness of patient education programs for adults with asthma (2–18), and a systematic review suggests that these programs generally reduce the use of health services and the number of work days missed, but do not improve lung function (19). However, the effectiveness of patient education programs varies from one study to another, presumably reflecting differences in the purpose, intensity, means, and content of the programs (20,21). Because a blanket endorsement of any education program is not supported by the literature, all new education programs should undergo rigorous evaluation. In this paper, we report the evaluation of a newly established education program for adults with asthma. The program was designed to improve patients' self-management of their disease, as well as their health and functional status.

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METHODS

Program Description

The educational intervention was based on the theoretical framework of self-regulation (22), which postulates that patients have symptomatic impairment, choose among possible solutions, apply the selected strategy, and evaluate its results. The program was based on the assumption that reinforcement mechanisms, such as providing feedback on treatment and sharing responsibility for care with patients and their families, would improve coping with asthma and increase adherence to recommended treatment. These in turn would reduce morbidity and improve health status.

We sought to promote competence in asthma self-management through the integration of knowledge, attitude, and skills. Educational strategies favored interactions between participants and educators, the use of illustrative examples, practical problem-solving exercises based on daily life situations, and limited vertical teaching.

Patients' educational needs and attitudes toward asthma and asthma medications were evaluated by a respiratory physician trained in patient education. Patients were then invited to attend three 75-minute educational group sessions, scheduled between 5 PM and 7 PM, 1 week apart. These sessions, which were conducted by two respiratory physicians and a physiotherapist who were trained in education methods, had as their purpose the design of individual self-management plans.

During the first session, patients were trained to recognize and to assess symptoms indicating worsening of asthma. Triggers (e.g., allergens, irritants, and emotional factors) identified by the patients were listed, and environmental control practices were discussed. Patients learned to use a peak flow meter and were asked to monitor peak expiratory flow rates and symptoms twice daily to establish the relations between symptoms and peak expiratory flows.

During the second session, participants received illustrated information about inflammation and bronchospasm, and the purpose of asthma medications. Patients were asked to classify their drugs between long-term preventive and quick-relief medications, and they were trained in the correct use of their inhaled therapies using placebo devices.

The third session started with the distribution of an individualized two-page self-management plan that participants were taught to use. Depending on changes in symptoms and peak expiratory flows, the following actions were advised: (a) if there were no symptoms and the peak flow was >80% of the patient's predetermined best (predicted) value, the patient continued regular treatment, set according to asthma severity, in agreement with guidelines (23); (b) if there were mild symptoms or the peak flow fell to 60% to 80% of the predicted value, the patient doubled the inhaled steroid dose; (c) if there were moderate symptoms or the peak flow fell to 40% to 60% of the predicted value, the patient began an oral dose of prednisone (40 mg/d) and contacted his or her physician by telephone as soon as possible; and (d) if there were severe symptoms or the peak flow fell below 40% of the predicted value, the patient immediately called an emergency telephone number.

At any stage, inhaled salbutamol or terbutaline were advocated as rescue medication. Problem-solving exercises taught participants to anticipate problems and to use their self-management plan whenever asthma attacks or risky situations occurred (e.g., flu symptoms, cough and wheezing after physical effort, invitation to a party attended by people who smoke; preparation for travel). Patients were also trained in proper breathing and relaxation techniques. At the end of the last session, copies of self-management plans were sent to the patients' physicians.

Evaluation Design

We conducted a randomized trial of immediate versus delayed patient education (starting after hospital discharge versus after follow-up assessment). The study was approved by the hospital research ethics committee.

Between January 1996 and June 1998, we approached all adult patients hospitalized for asthma at the Geneva University Hospital, seen in the emergency ward, or who received asthma medications while hospitalized for another reason. The diagnosis of asthma was confirmed by a pulmonary physician. Exclusion criteria included inability to understand French, residence outside the canton of Geneva, inability to fill out questionnaires, and asthma that was so unstable that enrollment was deemed unsuitable by the patient's health care team. Of 311 patients approached, 253 were confirmed as eligible, and 131 (52%) agreed to participate (Figure). The consent statement informed patients that patient education was recommended, but how it should be best implemented was unclear. All participants underwent a baseline evaluation and received minimal education about asthma and asthma treatment, as dictated by ethical considerations. Random assignment was performed immediately thereafter, based on a computer-generated list of random numbers placed in sealed, consecutively numbered envelopes. The group allocation was done in blocks of 20 patients. Patients allocated to immediate education received appointments for the next educational program, whereas those allocated to delayed education were scheduled after their follow-up assessment at 6 months.

The primary outcome variable was improvement in health and functional status, measured by validated French translations of the Short Form 36-Item (SF-36) health survey (24) and the Asthma Quality of Life Questionnaire (25). Additional outcomes included number of work days missed because of asthma; smoking status; whether asthma caused physical limitations, sleep problems, emotional problems, social difficulties, or difficulties with work; perceived threat from asthma; level of confidence in treatment and perceived effectiveness of treatment; division of responsibility for asthma treatment between patient and physician; number of physician visits, emergency room visits, and hospitalizations; and regular use of steroids and beta-agonists.

Five criteria were used to judge each patient's proficiency in using the spray inhaler: canister shaken properly, breathed out before inhaling, trigger pushed properly, inhalation adequate, and inhaled medication held in long enough. Seven criteria were used for peak flow monitor use: correct initial posture, cursor in down position, tight grip on device, device horizontal, inspiration performed properly, mouth closed when breathing out, and expiration performed properly. Three questions exam-

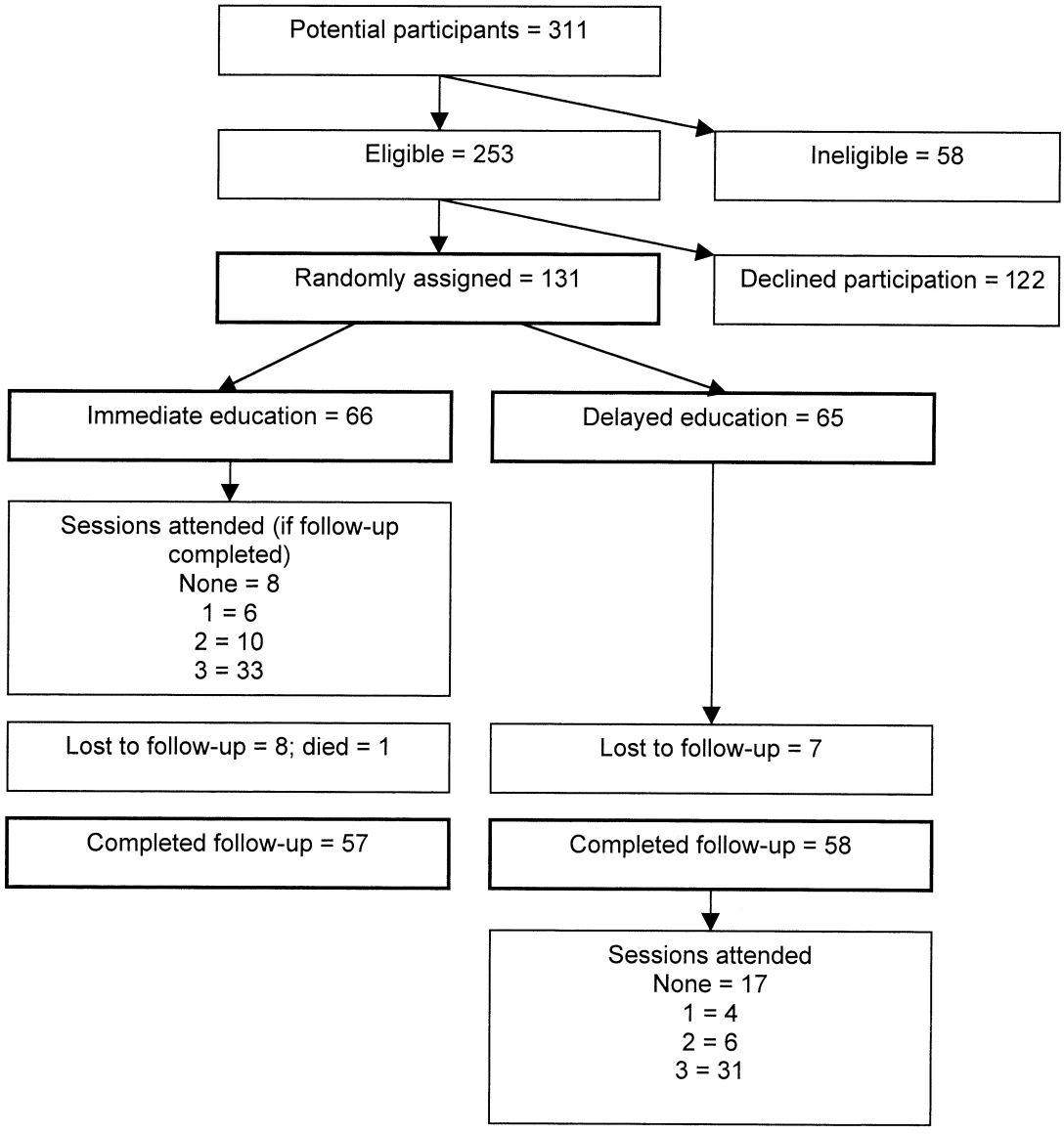

Figure. Flow chart of patient recruitment and follow-up.

ined whether patients knew what to do during an asthma attack: call physician, measure peak expiratory flow, and use inhaler. Peak expiratory flow measurements were obtained using Mini-Wright, Astra, or Glaxo monitors. The predicted value was read from charts of normal values by age, sex, and height (23).

At baseline, patients were classified based on the severity of the asthma attack that motivated the admission (stage 1: Pa_{O_2} 75 to 95 mm Hg, Pa_{CO_2} <36 mm Hg; stage 2: Pa_{O_2} <75 mm Hg, Pa_{CO_2} <36 mm Hg; stage 3: Pa_{O_2} <75 mm Hg, Pa_{CO_2} 36 to 44 mm Hg; stage 4: Pa_{O_2} <75 mm Hg, Pa_{CO_2} >44 mm Hg) (23).

The planned sample size was 128 patients, to detect a difference of 0.5 standard deviations in change scores, with $\alpha = 0.05$ (two sided) and a power of 80%. All comparisons were performed on an intention-to-treat basis. A comparison of baseline characteristics was used to determine the effectiveness of randomization into the immediate- and delayed-education treatment groups. To assess the effects of the program on continuous outcome variables, we computed paired before-after differences and compared mean changes in the two groups. For dichotomous outcomes, we used adjusted odds ratios, using a logistic regression model, adjusting for the baseline

Table 1. Baseline Characteristics of Participants in a Randomized Trial of a New Education Program for Adults with Asthma, Geneva, Switzerland, 1996 to 1998*

Characteristic	Immediate Education (n = 66)	Control Group (n = 65)
	Number (%)	
Female sex	41 (62)	38 (59)
Age (years)		
<30	12 (18)	19 (29)
30–44	22 (33)	18 (28)
45–59	19 (29)	18 (28)
60+	13 (20)	10 (15)
Swiss nationality	36 (55)	38 (59)
University education	18 (27)	16 (25)
Duration of asthma (years)		
<2	11 (17)	12 (19)
2–10	20 (31)	16 (25)
>10	34 (52)	35 (56)
Hospitalized for asthma	52 (79)	48 (74)
Severity of asthma attack		
Stage 1	3 (5)	7 (11)
Stage 2	10 (15)	8 (12)
Stage 3	20 (30)	16 (25)
Stage 4	13 (20)	8 (12)
Unknown or not applicable	20 (30)	26 (40)
First asthma attack	5 (8)	8 (15)
Prior education for asthma	18 (27)	20 (31)
Other respiratory problem (in addition to asthma)	44 (67)	36 (57)
Specialist physician for asthma	30 (46)	26 (40)
Smoking		
Current	21 (32)	23 (35)
Former	21 (32)	13 (20)

* There were no significant differences between the two groups.

measurement of the particular outcome of interest (e.g., use of correct inhalation technique). We also computed within-group before-after differences using the McNemar test. *P* values <0.05 (two sided) were considered statistically significant.

RESULTS

Only about half of eligible patients agreed to participate (Figure). Most participants had asthma for more than 10 years and had been hospitalized before enrollment (Table 1). About 30% reported having received asthma education previously. At baseline, the two treatment groups had similar characteristics (Table 1).

In the immediate-education group, only 35 patients (53%) attended all three scheduled sessions, 11 patients (17%) attended two sessions, 6 patients (9%) attended one session, and 14 patients (21%) attended none of the sessions.

Of the 131 patients who underwent random allocation, 115 (88%) were reassessed at 6 months. One patient in the immediate-education group had died, and 15 patients could not be located or declined participation. Among patients who were assessed at 6 months, attendance of the education sessions was similar in the immediate education group and in controls (Figure).

Overall Effects of the Education Program

We examined before-after differences for 40 outcome variables (Tables 2 to 4), of which 26 improved significantly between baseline and follow-up in the immediate-education group and 19 variables improved significantly in the control group. Only four improvements differed significantly between the two study arms, and three of these favored the education group. Disregarding statistical significance, changes favored the education group for 27 variables, and the control group for the remaining 13.

Effects on Self-Management of Asthma

Of the nine measurements of self-management (Table 2 and 3), patients in the immediate-education group had significantly greater improvements in their inhalation technique (proportion with at least 80% correct actions) and in the knowledge of the peak flow reading that requires calling a physician. The proportion taking regularly inhaled steroids increased significantly, but an equivalent change was also seen among controls. Patients in the immediate-education group improved their identification of actions to be taken in case of a severe and sudden asthma attack, their peak flow reading skills, frequency of use of peak flow readings, and their inhalation technique, but the between-group differences were not significant (Table 3).

Effects on Attitudes Toward Asthma and Treatment

We measured five aspects of attitude. Patients' confidence in their asthma treatment increased significantly in the immediate-intervention group and less so in the control group (Table 2). Other results did not differ by treatment group; at follow-up, more patients thought that their treatment was beneficial, the same proportion thought that the responsibility for treatment rested with the patient, and fewer thought that asthma was a serious threat to their health.

Effects on Health and Functional Status

There were no meaningful differences in the number of problems caused by asthma (Table 2). In both groups, fewer patients missed work or study because of asthma at follow-up (Table 2), but the average number of days that were missed increased (Table 3). Improvements between baseline and follow-up were seen for most health status scales in both groups (Table 4). The "activity" score of the Asthma Quality of Life Questionnaire improved signifi-

Table 2. Effects of Asthma Education Program on Self-Management, Attitudes, Functional Outcomes, and Use of Health Care, by Randomized Assignment to Immediate Education or a Waiting List*

Outcome	Immediate Education (n = 57)			Control Group (n = 58)			Between-Group Difference†	
	Baseline	Follow-up	*P* Value	Baseline	Follow-up	*P* Value	Odds Ratio (95% Confidence Interval)	*P* Value
	Number (%)			Number (%)				
Self-management								
Correct inhalation technique (>80% correct actions for spray, powder, or inhaler)	10 (20)	27 (48)	0.007	16 (34)	14 (25)	0.80	2.4 (1.0–5.7)	0.048
Knows peak flow reading that requires calling physician	11 (19)	36 (63)	<0.001	9 (16)	21 (36)	0.02	3.1 (1.4–6.7)	0.004
Usual treatment includes inhaled steroids	24 (42)	38 (67)	0.001	24 (41)	40 (69)	0.002	0.9 (0.4–2.0)	0.77
Usual treatment includes beta-agonists	50 (88)	55 (97)	0.18	48 (83)	55 (95)	0.04	1.4 (0.2–8.7)	0.74
Current smoker	19 (33)	17 (30)	0.69	20 (35)	14 (24)	0.15	1.7 (0.6–5.2)	0.32
Attitudes								
Confidence in treatment‡	26 (49)	47 (86)	0.001	29 (60)	39 (68)	0.33	2.9 (1.0–8.1)	0.047
Perceived benefit of current treatment§	17 (33)	31 (56)	0.021	17 (35)	27 (47)	0.04	1.4 (0.6–3.2)	0.38
Patient fully or mostly responsible for treatment	25 (46)	29 (54)	0.79	22 (43)	32 (55)	0.31	0.9 (0.4–1.9)	0.69
Asthma is a serious threat to you	30 (57)	19 (37)	0.05	32 (62)	27 (51)	0.33	0.6 (0.3–1.4)	0.23
Fears steroid treatment	22 (39)	20 (36)	0.63	21 (38)	23 (40)	1.00	0.7 (0.3–1.7)	0.49
Functional outcomes								
Missed work because of asthma	14 (25)	8 (14)	0.18	14 (25)	11 (21)	0.51	0.6 (0.2–1.9)	0.43
Asthma caused physical limitations‖	30 (53)	27 (48)	0.65	29 (51)	29 (50)	1.00	0.9 (0.4–2.0)	0.87
Asthma caused sleep problems‖	20 (35)	12 (21)	0.12	22 (39)	10 (17)	0.02	1.4 (0.5–3.6)	0.51
Asthma caused emotional problems‖	15 (26)	15 (27)	1.00	26 (46)	21 (36)	0.21	0.9 (0.4–2.2)	0.84
Asthma caused social difficulties‖	13 (23)	13 (23)	1.00	19 (33)	16 (28)	0.66	0.8 (0.3–1.9)	0.65
Asthma caused difficulties with work or other activities‖	19 (34)	11 (20)	0.12	23 (40)	19 (33)	0.36	0.6 (0.2–1.4)	0.23
Use of health care in past 6 months								
Hospitalized for asthma	40 (70)	4 (7)	0.001	29 (50)	6 (10)	0.001	0.6 (0.2–2.5)	0.52
Emergency visit for asthma	44 (77)	7 (12)	0.001	42 (72)	8 (14)	0.001	0.8 (0.3–2.5)	0.76

* Data exclude missing values (e.g., patients without inhaled treatment were not tested on inhaler technique). Within-group (baseline/follow-up) *P* values based on the McNemar test.
† Between-group comparison at follow-up adjusted for baseline.
‡ "Full, a lot" versus "average, little, none."
§ "Really worth it" versus "rather beneficial, hardly beneficial, useless."
‖ "Moderate amount, quite a bit, a lot" versus "a little, none."

cantly less in the immediate-education group than among controls.

The average peak flow reading almost doubled between baseline and follow-up in both groups (Table 3). A similar trend was observed for the peak flow reading as percentage of predicted value.

No differences were found between the two groups in their use of services during follow-up; hospitalizations and emergency room visits decreased (Table 2), and the number of physician office visits increased in both groups (Table 3).

DISCUSSION

Patients hospitalized with asthma benefited only moderately from the education program that we evaluated. Although most patient outcomes improved significantly

Table 3. Effects of Asthma Education Program on Self-Management, Pulmonary Function, and Use of Health Care, by Randomized Assignment to Immediate Education or a Waiting List

Outcome	Immediate Education (n = 57)			Control Group (n = 58)			Between-Group Comparison*		
	Baseline	Follow-up	*P* Value	Baseline	Follow-up	*P* Value	Difference (95% Confidence Interval)		*P* Value
	Mean ± SD			Mean ± SD					
Self-management									
What to do in case of severe and sudden asthma attack (correct actions out of 3)	1.5 ± 0.6	1.7 ± 0.7	0.08	1.2 ± 0.7	1.3 ± 0.6	0.33	0.1	(−0.2 to 0.5)	0.36
Peak flow reading technique (correct actions out of 7)	6.1 ± 1.1	6.6 ± 0.7	0.01	6.1 ± 1.3	6.4 ± 0.8	0.11	0.2	(−0.3 to 0.7)	0.35
Inhalation technique (percentage of correct actions out of 5, averaged over spray, powder, and inhaler)	73 ± 18	84 ± 17	<0.001	75 ± 25	79 ± 15	0.24	7	(−2 to 17)	0.14
Peak flow readings in past 6 months (per month)	9 ± 20	16 ± 26	0.002	5 ± 15	15 ± 25	<0.001	−3	(−13 to 7)	0.57
Pulmonary function									
Peak expiratory flow (L/min)	235 ± 118	424 ± 116	<0.001	245 ± 109	442 ± 104	0.07	−8	(−58 to 42)	0.74
Peak flow as a percentage of theoretical	66 ± 21	83 ± 16	<0.001	71 ± 17	81 ± 17	0.001	7	(−1 to 14)	0.09
Functional outcome									
Number of work days missed because of asthma	1.5 ± 4.6	3.8 ± 19.4	0.34	3.4 ± 10.8	5.1 ± 20.5	0.30	0.5	(−5.3 to 6.4)	0.85
Use of health care									
Number of physician visits for asthma in past 6 months	1.5 ± 1.8	2.7 ± 2.5	<0.001	2.2 ± 3.4	3.5 ± 4.5	0.06	0.0	(−1.4 to 1.5)	0.95
Number of drugs in usual treatment	2.3 ± 1.2	2.9 ± 1.4	0.001	2.0 ± 1.3	2.7 ± 1.3	0.001	−0.1	(−0.6 to 0.4)	0.65

* Between-group differences in changes from baseline to follow-up.

between baseline and follow-up among patients in the immediate-education group, similar improvements also occurred among those on the waiting list. Only a handful of variables differed significantly between the two groups. Hence, few favorable outcomes could be attributed to the education program. Had we applied a correction for multiple testing, a practice that we do not believe is useful (26), none of the between-group comparisons would have been statistically significant.

Nevertheless, the educated patients improved significantly more than did patients on the waiting list in several areas, namely confidence in their treatment, inhalation technique, and knowledge of the peak flow meter reading that requires calling a physician. These variables capture the overall goal of improved self-management of asthma and may be related to better health outcomes in the future. These findings are also reassuring with regards to the effectiveness of the education program, as these improvements mirror concepts and skills that were emphasized during the training sessions.

Regarding the main outcomes of health and functional status, 12 of the 13 scales did not differ significantly between groups, and the Asthma Quality of Life Questionnaire "activity" score improved less among patients in the immediate-education arm. The latter result suggests that patient education may have increased reports of activity limitations due to greater awareness of the disease. Whether this reflects a true change in behavior caused by the program, or information bias, is uncertain.

Several previous reports have also found substantial before-after improvements among patients in control groups (16,19,27). There are several potential explanations for this observation. The minimum education offered to patients on the waiting list may have been too thorough, making the benefit of the subsequent education program more difficult to detect. Indeed, for ethical

Table 4. Effects of Asthma Education Program on Health Status, by Randomized Assignment to Immediate Education or a Waiting List*

Scale	Immediate Education (n = 57)			Control Group (n = 58)			Between-Group Comparison†	
	Baseline	Follow-up	*P* Value	Baseline	Follow-up	*P* Value	Difference (95% Confidence Interval)	*P* Value
	Mean ± SD			Mean ± SD				
SF-36								
Physical functioning	71 ± 25	76 ± 22	0.04	69 ± 26	74 ± 24	0.05	0	(−6 to 7)	0.89
Role-physical	50 ± 40	75 ± 38	0.001	43 ± 39	71 ± 38	<0.001	−4	(−19 to 12)	0.65
Bodily pain	62 ± 32	74 ± 30	0.02	63 ± 30	71 ± 30	0.09	3	(−10 to 16)	0.67
General health	61 ± 24	62 ± 20	0.75	63 ± 22	65 ± 22	0.38	−1	(−8 to 6)	0.70
Vitality	42 ± 20	49 ± 17	0.01	44 ± 17	51 ± 20	0.02	−1	(−9 to 7)	0.85
Social functioning	60 ± 27	77 ± 26	<0.001	65 ± 26	73 ± 28	0.06	8	(−3 to 20)	0.16
Role-emotional	55 ± 44	78 ± 36	0.001	50 ± 40	68 ± 38	0.005	4	(−13 to 22)	0.64
Mental health	59 ± 19	67 ± 16	<0.001	59 ± 22	63 ± 19	0.09	4	(−2 to 11)	0.17
Asthma Quality of Life Questionnaire								
Symptoms	4.2 ± 1.2	5.5 ± 1.2	0.001	4.0 ± 1.3	5.5 ± 1.2	0.001	−0.3	(−0.8 to 0.3)	0.32
Activity	4.5 ± 1.0	4.7 ± 1.0	0.02	4.1 ± 1.2	4.7 ± 1.2	0.001	−0.4	(−0.8 to 0.0)	0.03
Emotions	4.6 ± 1.3	5.7 ± 1.2	0.001	4.2 ± 1.5	5.5 ± 1.3	0.001	−0.2	(−0.7 to 0.4)	0.60
Environment	4.8 ± 1.4	5.4 ± 1.2	0.001	4.3 ± 1.3	5.3 ± 1.4	0.001	−0.3	(−0. 8 to 0.1)	0.17
Overall	4.4 ± 1.0	5.3 ± 1.0	0.001	4.1 ± 1.2	5.2 ± 1.1	0.001	−0.3	(−0.7 to 0.0)	0.09

* Higher scores denote better function.
† Between-group differences in changes from baseline to follow-up.
SF-36 = 36-item short form.

reasons, the respiratory therapist in charge of recruitment corrected inappropriate patient beliefs and practices. Furthermore, enrollment in the trial may have prompted control patients to improve their management of asthma. Alternatively, both groups may have improved in part because the baseline assessment took place when they were ill.

Several other factors may have reduced the benefit of our education program. Low participation rates and less-than-perfect attendance may have limited patient education to those who needed it the least. Our outcome variables and the length of follow-up may have failed to capture program benefits, particularly on the use of health services and on health status. Finally, the sample may have been too small to detect lesser effects.

Despite these concerns, our education program was less effective than we had hoped. There is little empirical evidence about which educational objectives, methods, aids, content, and amount of interaction achieve the best results among patients with asthma, and we may have selected an incomplete package of ingredients. In retrospect, our intervention may have been too limited in time, lacking any reinforcement beyond the 3-week training period. We also did not involve the patients' community physicians in the educational process. Finally, our program may have required a greater degree of autonomy than patients were willing to assume (28).

Our results also confirm the need for randomized trials to evaluate new patient education programs. Had we performed a before-after evaluation (29–31), we would have concluded mistakenly that the program had a beneficial effect. Nonrandomized designs may be tempting when a new program is started. The promoters of the program must often convince health care payers that patient education is effective and that not to offer it would be unethical; to then argue that more funds are needed for a randomized trial of program effectiveness is a self-defeating proposition. We have no easy solution for this dilemma.

An additional concern is the low rate of participation in the trial. Only half of eligible patients agreed to participate, and among those who did, only slightly more than half attended all educational sessions. Although this may have been due in part to the constraints of an experimental study, many patients with asthma may be reluctant to engage in education (21). Indeed, we previously reported that participation in this program was associated with university education, a more severe asthma attack at enrollment, lower confidence in one's asthma treatment, and better self-management skills, such as knowledge of what to do in case of an asthma attack, using a peak flow meter, and inhaler technique (32).

Our results suggest that although three educational sessions for patients with asthma may have improved some of the patients' self-management skills, they did not improve patients' health and functional status. These findings argue against the uncritical endorsement of all patient education programs for adults with asthma.

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