Two-year evaluation of an educational program for adult outpatients with asthma*

Avaliação de dois anos de um programa educacional para pacientes ambulatoriais adultos com asma

Luciene Angelini, Priscila Games Robles-Ribeiro, Regina Maria de Carvalho-Pinto, Marcos Ribeiro, Alberto Cukier, Rafael Stelmach

Abstract

Objective: To evaluate the understanding of asthma and the clinical improvement in patients with moderate or severe persistent asthma prior to and after their participation in an educational program presented during the routine outpatient visits. **Methods:** This was a prospective pilot study involving 164 patients over a two-year period. The educational program, presented to small groups on outpatient visit days, consisted of lectures divided into three parts: pathophysiology; environmental control; and treatment, including training in the inhalation technique. The program was evaluated using standardized questionnaires on clinical improvement and understanding of the disease. **Results:** By the end of the first year, 120 patients had completed three visits, and 51 of those patients were revaluated at the end of the second year. The mean age of the patients was 44 years, 70% were female, and 43% had up to eight years of schooling. The educational intervention significantly increased the understanding of the disease ($p < 0.001$), and allowed greater clinical improvement ($p < 0.05$) with a decrease in the use of oral corticosteroids, fewer visits to the emergency room and fewer days missed from work or school. **Conclusions:** The educational program offered during the routine outpatient visits of adult patients with asthma at our clinic resulted in a progressive long-term increase in knowledge, as well as in clinical improvement.

Keywords: Asthma; Adult; Patient education as topic.

Resumo

Objetivo: Avaliar o conhecimento da doença e a melhora clínica de portadores de asma persistente moderada e grave antes e após a sua participação em um programa de educação realizado durante as visitas ambulatoriais de rotina. **Métodos:** Trata-se de um estudo piloto, prospectivo que envolveu 164 pacientes durante um período de dois anos. O programa de educação, oferecido para pequenos grupos nos dias de consulta, consistiu de aulas expositivas divididas em três módulos: fisiopatologia, controle ambiental e tratamento, incluindo o treinamento da técnica inalatória. Para a avaliação do programa, foram utilizados questionários padronizados sobre a melhora clínica e conhecimento da doença. **Resultados:** Em um ano, 120 pacientes completaram três visitas, e 51 pacientes foram reavaliados em dois anos. A média de idade dos pacientes foi de 44 anos, 70% eram do sexo feminino, e 43% tinham até oito anos de educação formal. A intervenção educacional aumentou o conhecimento da doença de forma significativa ($p < 0,001$) e possibilitou melhora clinica ($p < 0,05$) com a diminuição do uso de corticosteroide oral, redução de visitas ao serviço de emergência e menor número de faltas ao trabalho ou escola. **Conclusões:** O programa de educação expositivo oferecido durante a rotina de atendimento ambulatorial de adultos asmáticos de nosso serviço mostrou um crescente e progressivo aprendizado em longo prazo. Paralelamente, promoveu melhora clínica.

Descritores: Asma; Adulto; Educação de pacientes como assunto.

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Introduction

Health education is considered essential in controlling asthma[1] because it disseminates knowledge, increases the ability to identify triggering/aggravating factors and improves treatment adherence.[2,3]

Although the guidelines for the treatment of asthma include the implementation of educational and management programs to improve the quality of asthma treatment,[4,5] the impact of such programs on long-term clinical control of asthma in adult patients remains unclear.[6] Control goals are not always achieved, and the absence of standardization regarding the minimum requisites for these programs causes disagreement among authors attempting to validate the best educational model.[3] Factors related to program structure, adherence measures, outcomes and patient characteristics have been described as being responsible for the conflicting results of different studies.[7,8]

Programs that include education, self-monitoring, regular evaluations and management using written action plans are effective in reducing the following: the number of visits to the emergency room; the number of hospitalizations by two thirds; the number of unscheduled medical visits; the number of days missed from work; and the number of nighttime awakenings. To date, structured programs have resulted in better outcomes, greater clinical impact and apparently greater benefit when aimed at patients with moderate or severe asthma, especially those with high comorbidity rates.[3,9]

Structured programs are presented to small groups, over long periods, by trained educators using verbal, written, visual or aural resources to impart knowledge.[10] They also include training in management based on self-monitoring and on an individualized, written action plan, combined with regular medical appointments.[11,12]

The effectiveness of educational programs depends on environmental and social aspects. In general, the lack of infrastructure, principally of human resources, and the difficulty in monitoring patients are obstacles to the presentation of sequential educational programs for long periods of time. Patient participation in asthma education programs is low, which makes it difficult to implement such programs on a large scale, as well as reducing their effectiveness.[8,13] Patients are almost 12 times less likely to participate in educational programs due to major structural obstacles such as lack of time, lack of financial resources, living far from the health care facility and the need for frequent returns to the facility.[13]

It is necessary to adjust educational programs to the reality of health care facilities and to ensure that patients have access to such programs so that they can succeed. Therefore, the present study was based on the hypothesis that an educational program presented during routine outpatient visits would allow clinical improvement of patients with moderate or severe persistent asthma.

The principal objective of the present study was to evaluate the understanding of concepts related to the pathophysiology, environmental control and treatment of asthma before and after an unstructured educational program presented during routine outpatient visits. In addition, the success of the program was measured by the clinical improvement of patients.

Methods

We conducted a prospective study at the asthma outpatient clinic of a tertiary university hospital. The study was approved by the local research ethics committee. This was a pilot study aimed at implementing a multidisciplinary facility for the treatment of asthma patients. The following inclusion criteria were applied: having been diagnosed with moderate or severe persistent asthma according to the criteria adopted in the 2002 Global Initiative for Asthma guidelines[14]; being under outpatient follow-up treatment for a minimum of 2 years; and being under regular pharmacological treatment (with an inhaled corticosteroid and a long-acting bronchodilator) for a minimum of 3 months. All of the patients who participated in the study did so voluntarily and gave written informed consent. The educational program was applied during medical visits scheduled according to the outpatient clinic routine or according to clinical instability.

The educational program consisted of lectures, with visual aids (posters), presented to groups of 7 to 10 patients. The program was divided into two 1-h lectures presented before and after medical visits, totaling 2 h of duration. The first 1-h lecture, presented to patients prior to the medical visit, covered the pathophysi-

ology of asthma and environmental control, focusing on conceptual information regarding asthma and its triggering factors, respectively. The second 1-h lecture, presented to patients after the medical visit, provided information regarding pharmacological treatment, including training in the inhalation technique.

The patients were evaluated using a standardized questionnaire, administered before and after their participation in the program. The questionnaire comprised the following items: four qualitative questions regarding the pathophysiology of asthma (yes/no); five questions regarding environmental control, divided into three qualitative questions (yes/no), a checklist composed of 15 triggering/irritating factors and an analogue scale from 0 to 100; and five questions regarding the treatment of asthma, divided into four quantitative questions (yes/no) and two checklists of the inhalation technique, with and without a spacer. The questionnaires were self-administered, except when administered to patients who were illiterate. Clinical improvement was based on the month prior to the medical visit and was evaluated according to the number of days on which oral corticosteroids were used, the number of visits to the emergency room and the number of days on which patients were unable to perform activities of daily living, work activities or leisure activities due to asthma. The

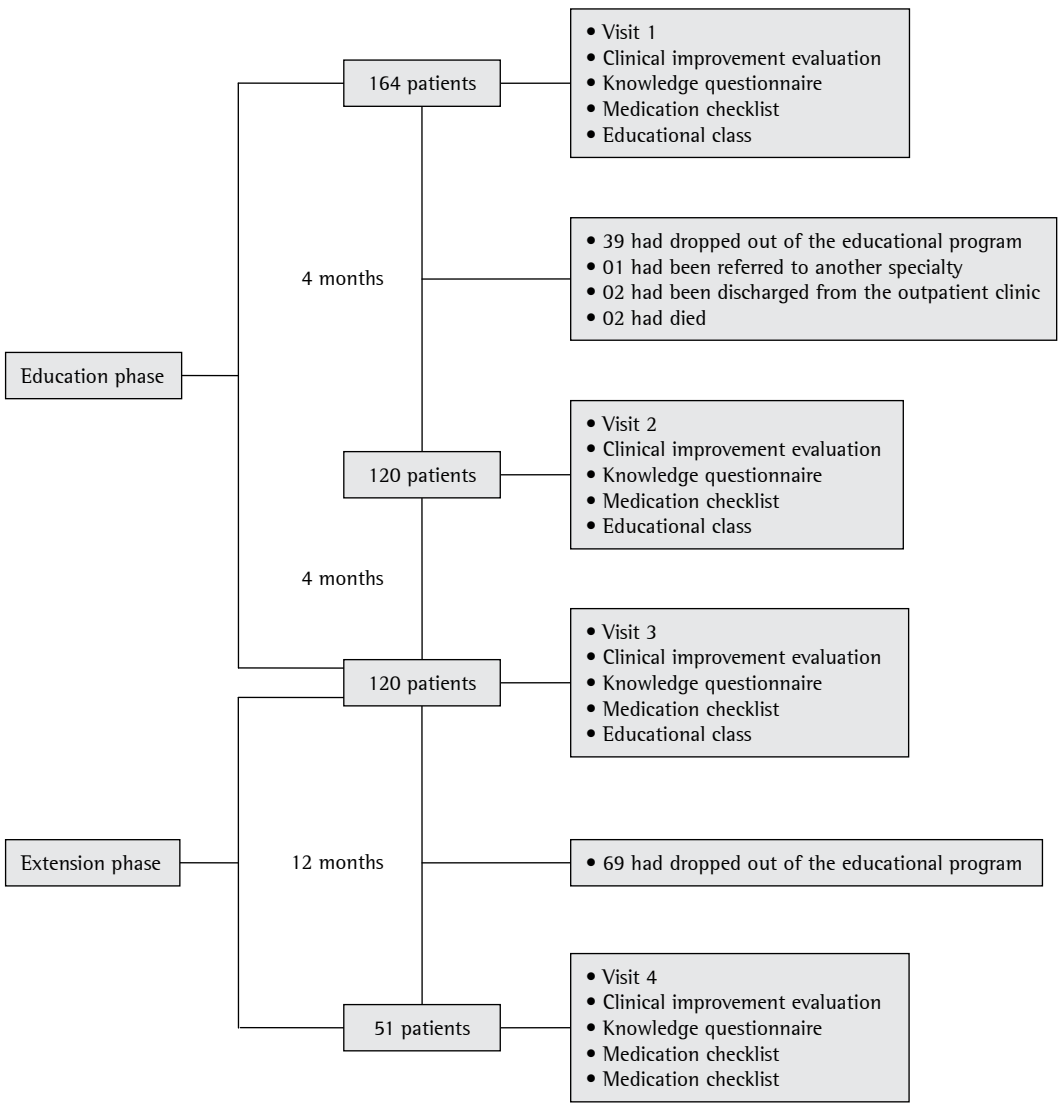

Figure 1 - Algorithm.

Table 1 - Demographic data of the patients who participated in the educational program, divided according to the phases of the program.

Variables	Study sample	Education phase only	Education phase + Extension phase
	(n = 120)	(n = 69)	(n = 51)
Gender, F/M	84/36	48/21	36/15
Age, years (mean ± SD)	44 ± 16	43 ± 16	46 ± 16
Years of schooling, %			
None	1	1	0
≤ 4 years	29	19	3
≤ 8 years	43	48	40
≤ 11 years	22	20	1
≥ 12 years	6	8	2

structure of the educational program and of the clinical improvement evaluation, as well as the questionnaire for evaluation (Appendix 1), was developed by a multidisciplinary team composed of pulmonologists, allergists, general clinicians and respiratory physiotherapists, the last being responsible for administering the questionnaire.

After visit 1 (V1), patients returned for two more medical appointments (V2 and V3), being submitted to the same procedure and evaluated using the same questionnaire. This period corresponded to the first phase of the study, designated the education phase.

At V3, patients were temporarily discharged from the educational program, and routine outpatient follow-up treatment continued. After a period of approximately 12 months, patients were summoned for reevaluation (visit 4; V4) and participated in the educational program a final time. This follow-up phase was designated the extension phase.

Throughout the experimental period, including the extension phase, pharmacological treatment was adjusted by the attending physician according to the degree of clinical improvement of asthma patients.

The data contained in the questionnaires completed during each of the four visits were submitted to ANOVA with repeated measures and expressed as mean proportion of correct answers, presented as complementary probabilities.[15] The data related to the evaluation of clinical improvement were submitted to ANOVA with multiple comparisons and are presented as means and standard deviations.[16] Values of $p < 0.05$ were considered significant.

Results

A total of 164 patients, corresponding to approximately 15% of all patients registered at the asthma outpatient clinic, were selected over a period of 24 months (Figure 1). Of those 164 patients, 39 (23.8%) did not return to the educational program, 1 (2.6%) was referred to another medical specialty, 2 (5.1%) were discharged from the outpatient clinic and 2 (5.1%) died in the early stages of the present study. Therefore, a total of 120 patients (73.1%) participated in the education phase (3 visits), and 51 of those patients (31.1% of the initial sample) also returned for reevaluation in the

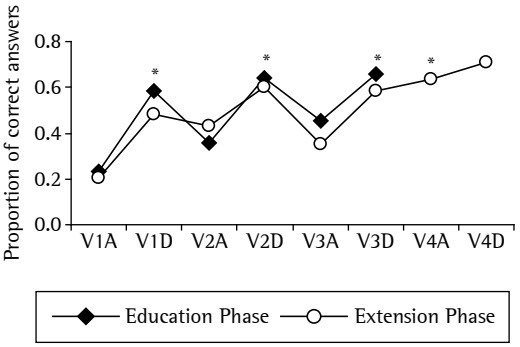

Figure 2 - Degree of knowledge of patients (proportion of correct answers) throughout the study at two distinct moments: in the education phase (n = 120), during three visits (V1, V2 and V3), and in the extension phase (n = 51), after a period of 12 months for reevaluation (having attended all four visits). Complementary probability. EP: educational program; V1: Visit 1; V2: Visit 2; V3: Visit 3; V4: Visit 4; pre: before the EP; and post: after the EP.

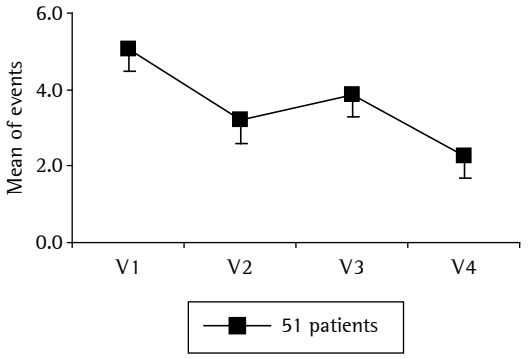

Figure 3 - Clinical improvement of patients throughout the study (n = 51). Mean of number of days using oral corticosteroids + number of visits to the emergency room + number of days missed from activities of daily living/work/leisure due to asthma. V1: Visit 1; V2: Visit 2; V3: Visit 3; and V4: Visit 4.

extension phase, completing the four visits that constituted the program. Of the 120 patients who attended at least the three initial visits, 84 (70.0%) were female and 36 (30.0%) were male. The mean age was 44 years (range, 14-82). There were no significant differences in gender, age or level of education between the patients who completed the educational program (Table 1). Approximately half of the patients (52; 43.3%) had only 8 years of schooling or less. During the education phase, the interval between visits was 4 months, whereas it was approximately 12 months in the extension phase (between V3 and V4).

Figure 2 shows the results of the questionnaire administered at the various time points in both phases of the study. As previously stated, 120 patients completed all three education phase visits. We found that, despite having been in outpatient follow-up treatment for a number of years, these patients had little knowledge of asthma prior to the presentation of the educational program (V1). From the pre-V1 evaluation to the post-V1 evaluation, the mean proportion of correct answers increased significantly, from 0.23 to 0.58 ($p < 0.001$).

After 4 months (in the pre-V2 evaluation), the mean proportion of correct answers had decreased to 0.36. However, in relation to the value obtained at the end of V1, this difference was not statistically significant. Nevertheless, in the post-V2 evaluation, the mean proportion of correct answers again increased (to 0.64). After another 4 months (in the pre-V3 evaluation), the mean proportion of correct answers again decreased (to 0.45), although this decrease was not statistically significant in relation to the value obtained at the end of V2. However, in the post-V3 evaluation, the mean proportion of correct answers was 0.66, a value similar to those obtained at the end of V1 and V2. Comparing the post-V1 evaluation with the post-V3 evaluation in terms of the mean proportion of correct answers, the increase was statistically significant for all three topics covered by the program ($p < 0.001$). For all visits, the proportion of correct answers was higher after the presentation of the educational program, and the non-significant decrease in the proportion of correct answers before the presentation of the program at V2 and V3 suggests progressive consolidation of the knowledge acquired in the process.

Figure 2 also shows the results of the questionnaire regarding the knowledge of 51 patients who were reevaluated in the extension phase (V4). The results show that the knowledge acquired by this group at each visit was similar to that acquired by the group as a whole (the 120 patients), and no significant difference was observed between the subgroup and the group as a whole regarding the variables analyzed. Therefore, the proportion of correct answers increased significantly between V1 and V4, from 0.48 to 0.36 ($p < 0.001$), indicating that patients retained the knowledge acquired after a period of 12 months, and that the entire group behaved in the same manner in the long term.

Figure 3 shows the results regarding clinical improvement of the 51 patients. The mean number of adverse events (visits to the emergency room, use of oral corticosteroids and days missed from work or school, or a combination of the two), based on the analysis of the month preceding each visit, decreased significantly between V1 and V2 (5.06 ± 0.44 *vs.* 3.19 ± 0.34; $p < 0.05$). This number remained stable between V2 and V3 but showed yet another significant reduction between V3 and V4 (from 3.86 ± 0.39 to 2.27 ± 0.47; $p < 0.05$).

Discussion

The present study demonstrated that an educational program, consisting of lectures presented to patients during medical appointments scheduled at a tertiary hospital, significantly increased the understanding of

asthma and promoted clinical improvement in a population of patients with moderate or severe asthma. The program was presented to small groups using verbal, visual and aural resources and, through "remedial classes" over a period of approximately 2 years, allowed patients to consolidate the knowledge acquired. The individual mastery in identifying signs and symptoms of the worsening of asthma, gained from participating in the educational program, benefitted patients, reducing the number of visits to the emergency room, the use of oral corticosteroids and the number of days missed from work, school or leisure due to asthma.

Health education programs can be brief (presented at a specific point in time) or extended.[17] Short-term programs aim at evaluating immediate knowledge, based on the instructions given and on an informal evaluation of the learning process, without reinforcement or medical follow-up.[17] The patients who participated in the present study retained the information received on the day of intervention; they did not, however, retain it until the following appointment. The patients apparently had difficulty in assimilating all of the information in a short period of time. The repetition of the interventions, even months apart, yielded the expected results, which were similar to those found in another study conducted in Brazil.[18] One group of authors[19] reported that a long-term educational program presented to patients in an outpatient clinic had a positive impact on morbidity due to asthma. This effect might be due to various factors, such as the acquisition of knowledge, the understanding of the pharmacological treatment and the greater amount of attention the medical team devoted to the patients.[7,20] The presentation of the educational program during routine outpatient visits influenced the decision-making process regarding the disease, resulting in greater treatment adherence and therefore in clinical improvement.

It is of note that the program presented to our patients differed from what is traditionally defined as a structured program, in that self-monitoring and self-management of pharmacological treatment were not performed. According to some authors,[21] structured educational programs encourage patients to assume greater responsibility for disease management, resulting in increased treatment adherence and decreased morbidity due to asthma. Self-monitoring (by means of symptom diaries or PEF measurement) and self-management of treatment generate controversy. One review[22] showed that sequential treatment adjustment by the attending physician is equally effective. The absence of these components from the structure of the program presented in the present study did not, however, prevent patients from gaining a deeper understanding of asthma or from presenting clinical improvement, as has been observed in randomized controlled studies. Other authors[23] investigated patients with moderate asthma who participated in three distinct types of educational intervention (verbal information provided to patients individually; written information; and asthma classes) and reported that the patients who attended asthma classes showed a better understanding of the disease; in addition, improvement of symptoms was similar in all groups. However, a study involving 127 adult asthma patients who participated in a structured program (compared with 111 patients who did not) showed a significant reduction in the number of days on which asthma symptoms manifested, as well as in the use of oral corticosteroids, among those who participated in the program.[24]

The two largest systematic reviews of educational interventions for self-management of asthma among children, adolescents and adults conducted in recent years[25,26] made it clear that educational programs that are more complex and individualized are more effective in reducing morbidity due to asthma.

The present study has limitations, among which is the lack of a control group. There is no doubt that this reduced the power of the present study. However, because it was a long-term pilot study (as specified previously), involving a large number of patients, we opted to include only volunteers, thus minimizing the progressive loss of patients. The strategy was partially successful, since 73% of the patients selected completed the first phase and 42% completed the extension phase. Other limitations of the present study include the methods of evaluation of clinical improvement and the use of a questionnaire designed specifically for this study to evaluate knowledge and appropriate technique for using the medication. In addition, no instruments were used to evaluate psychological aspects,[12] health-

related quality of life,[27] cognitive aspects,[28] or psychosocial behavior.[29]

Apparently, there is no consensus regarding the best instrument for evaluating educational programs, since such programs are designed according to specific methodological principles, and the results obtained do not present parameters according to which it can be affirmed that the conceptual objectives were achieved.[8] Different models of intervention have been described, based on the study population and its characteristics, respecting socioeconomic and cultural differences.[3] In the present study, the educational program and the questionnaire used to evaluate it were developed after an extensive discussion with the multidisciplinary team that treats the patients. The adjustments to the environmental control section of the lectures, for instance, aimed at specifying triggering factors and local irritants. Likewise, the adaptation of the language to the same standard language used when talking to patients during visits was considered central to the success of the educational intervention performed. As has been established in the literature, good results are obtained through adequate communication among educators, physicians, patients and their families.[30] It has been reported that the following are some of the most common measures of the degree of clinical control[3]: the doses of maintenance medication, relief medication and oral corticosteroids; the need for emergency room treatment; the number of hospitalizations; school and work absenteeism; and the symptom diary data. Although neither a symptom diary nor serial evaluation of PEF was used in the present study, the educational program reported herein correlated with a reduction in the limitation of activities of daily living (days missed from work, school or leisure), with a decrease in the use of oral corticosteroids and with fewer visits to the emergency room. One group of authors[10] demonstrated that visits to the emergency room and the use of oral corticosteroids translate to additional expenditures for medication, as well as being related to an increase in the number of hospitalizations and, consequently, to an increase in mortality. Factors related to the understanding of the information received and doubts regarding the benefit of the educational program affect the behavior of patients more significantly than does their level of education.[13]

The educational program is central to the management of asthma and should be presented to all patients. However, it seems to be more beneficial for severe asthma patients or for patients with asthma-related comorbidities.[1] It is necessary to simplify and perfect the types of program and their objectives, as well as to evaluate their outcomes more accurately.[7] The real impact of the educational program on the evolution of patients remains to be seen. However, it is safe to assume that the program will increase knowledge and change patient attitudes toward the disease. The educational program offered during the routine outpatient visits of adult patients with asthma at our clinic resulted in a progressive long-term increase in knowledge of the pathophysiology of asthma, environmental control and long-term treatment of the disease. In addition, the program resulted in clinical improvement in these patients. The results of the present study might contribute to a better understanding of the topic and could further attempts to adjust asthma education programs to the local reality, which is an important goal.

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Appendix 1 - Questionnaire for the evaluation of clinical improvement and of the degree of knowledge.

Evaluation of clinical improvement

How many times did you have to go to the emergency room because of asthma in the last month?

0 ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) more than 4 ( )

How many days did you have to take oral corticosteroids, e.g., prednisone (Meticorten®), in the last month?

0 ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) more than 4 ( )

How many times were you unable to go to work, to go to school or to perform household activities because of asthma in the last month?

0 ( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) more than 4 ( )

Questionnaire for the evaluation of knowledge prior to the medical appointment

Pathophysiology and environmental control

What do you think is the problem with your lungs?

Asthma ( ) Bronchitis ( ) Both ( )

What is asthma, in your opinion?

( ) I don't know
( ) It is a contagious disease
( ) It is a disease you might catch if you come into contact with a cat
( ) It is inflammation of the bronchial tubes
( ) It is an infection of the bronchial tubes

What is bronchospasm? Is it when you're wheezing or when you feel chest tightness?

( ) I don't know
( ) Closing of the airway in the bronchial tubes
( ) Obstruction of the lungs
( ) Dirt in the lungs
( ) Infection of the lungs

Do you think anyone can die from asthma?

Yes ( ) No ( )

Put a checkmark next to the factors that might cause someone to have an asthma attack

cigarette smoke ( ) cleaning products ( ) animal hair ( )
perfume/strong odors ( ) dust or pollution ( ) change in the weather ( )
mold/mildew ( ) foods ( ) pregnancy ( )
emotion/anger/sadness ( ) menstruation ( ) laughter ( )
the flu/a cold ( ) physical exertion ( ) medicine ( )

Make a mark above the line below indicating how important it is to take care of the place you live so that you won't have any more asthma attacks (as if you were to attribute a score from 0 to 10 by marking the line with a short line).

0 _____ 10

Questionnaire for the evaluation of knowledge after the medical appointment

Treatment and the inhalation technique

What are bronchodilators used for in asthma?

( ) I don't know
( ) It is a medication to open the bronchial tubes
( ) It is a medication that reduces inflammation
( ) It is a medication that accelerates the heart

What are corticosteroids used for in asthma?

( ) I don't know
( ) It is a medication that stops the attack
( ) It is a medication used in order to treat inflammation
( ) It is a medication that causes swelling

Do you think that corticosteroids

( ) are addictive?
( ) can damage your heart?
( ) should be used at the beginning of an asthma attack?
( ) should be used in order to prevent an asthma attack?

Appendix 1 - Continued...

Do you know how to use your spray or dry powder medication?
Yes ( ) No ( )
CHECK THE USE OF MEDICATION (patients are asked to demonstrate how they commonly use two doses of medication using placebo devices; the educator observes the demonstration and checks what the patient has done, following the list below).
With a spacer ( )
Removes the cap from the pump ( )
Attaches the spacer ( )
Shakes the pump ( )
Exhales all air before placing the pump in the mouth ( )
Sprays one jet from the pump ( )
Slowly inhales the medication with the mouth open ( )
Holds breath after inhaling the medication ( )
Counts to 10 and then exhales ( )
Waits 1 min before spraying another jet ( )
Without a spacer ( )
Removes the cap from the pump ( )
Shakes the pump ( )
Leaves some space between the pump and the mouth ( )
Exhales all air before placing the pump in the mouth ( )
Sprays one jet from the pump ( )
Slowly inhales the medication with the mouth open ( )
Holds breath after inhaling the medication ( )
Counts to 10 and then exhales ( )
Waits 1 min before spraying another jet ( )