

1-1-2002

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### Recommended Citation

DEMİRALAY, REZAN (2002) "Comparison of the Effects of Three Forms of Individualized Education on Asthma Knowledge in Asthmatic Patients," *Turkish Journal of Medical Sciences*: Vol. 32: No. 1, Article 12. Available at: <https://journals.tubitak.gov.tr/medical/vol32/iss1/12>

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## Comparison of the Effects of Three Forms of Individualized Education on Asthma Knowledge in Asthmatic Patients

Received: December 04, 2000

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**Abstract:** This study was carried out to compare the effects of three forms of individualized education (verbal, written, and verbal-written) on asthma knowledge in asthmatic patients. For this purpose, a randomized double blind controlled study was conducted with 62 adults with asthma followed-up at the outpatient clinic of Chest Diseases and Tuberculosis of the Faculty of Medicine of Süleyman Demirel University. Patients were randomized to the verbal (n:20), written (n:20), and verbal-written (n:22) education groups. Knowledge of asthma was measured at the baseline and 2 months after education. Before education, knowledge of asthma was low in the three education groups. The ratio of non-compliance with the treatment was 51.6%. Twenty-nine (46.8%) patients had perfect inhaler skill. Forty-one (66.1%) patients used their drug regimes in non-compliance with the

Consensus Report. Eleven (17.7%) patients were in strict compliance with the treatment and used their drug regimes in accordance with the Consensus Report. Twenty-seven (43.5%) patients were in strict compliance with the treatment and at the same time used inhaled corticosteroids. Two months after education, the mean change in knowledge score was highest in the verbal-written education group. Before and after education, the mean knowledge score was correlated with education level. The results of this study suggest that asthmatic patients did not have sufficient information about their disease, and additional information about asthma increased their asthma knowledge, and that verbal-written information had a greater impact on patients' knowledge of asthma.

**Key Words:** Asthma, knowledge, patient education.

### Introduction

Asthma, as a major public health problem, has received increasing attention in recent years. People of all ages worldwide are affected by this chronic airway disorder that can be severe and sometimes fatal (1).

Despite the ever-increasing knowledge about the pathophysiologic condition of asthma and the development of more specific and effective drugs, the prevalence, morbidity, mortality, and social and economic costs of asthma are increasing at an alarming rate (2). In many countries, an increase in the rate of emergency room visits and hospitalizations, as well as loss of school days and/or work days due to asthma, has shown the difficulty in providing adequate control of the disease (3).

The major factors contributing to asthma morbidity and mortality are underdiagnosis and inappropriate treatment, and a significant number of asthma deaths can be prevented if management is comprehensive and ongoing. The International Consensus Report on Diagnosis and

Management of Asthma considers patient education to be one of the essential components for the successful treatment of asthma and emphasizes the role of patient education in achieving improved asthma care outcomes (4).

The present study aimed to determine the knowledge about asthma, previously reported compliance with the treatment, ability to use inhalation devices, treatment compliance in accordance with the Consensus Report, whether any sociodemographic or disease profile characteristics correlated with these factors, and the effects of the three forms of individualized education (verbal, written, and verbal-written) on asthma knowledge in a group of asthmatic patients.

### Materials and Methods

This study was conducted with asthmatic patients followed-up at the outpatient clinic of Chest Diseases and Tuberculosis of the Faculty of Medicine of Süleyman Demirel University. Between January and August 2000, a

total of 65 patients (52 female, 13 male, ages 21-63 years) with asthma confirmed by history and airflow obstruction according to the criteria of the Consensus Report (4) were eligible to participate in the study. None of the patients had taken part in an asthma education program before this study. All subjects were reviewed individually and in an organized way.

Data belonging to independent variables of the enrolled asthmatic patients were collected at the baseline as part of a randomized clinical trial, and recorded in a form developed specifically for this study. The section of independent variables were divided into two categories as a) sociodemographic characteristics: including age, sex, and education level. b) disease profile characteristics: including duration and severity of asthma, family asthma history, drug regimens, previously reported compliance with the treatment, inhaler type and skill, and admissions to emergency departments and hospitals due to asthma in the past year.

The severity of asthma was categorized according to patients' clinical features. The subjects were classified as mild, moderate, and severe asthmatics, in accordance with the Consensus Report, and placed into the highest severity class in which they had features (4).

Previously reported compliance with the treatment was monitored on the basis of verbal information given by the patient.

Patients were then requested to demonstrate their usual inhaler skill twice. Proficiency in the use of the inhaler was assessed with a checklist containing the steps for different types of inhaler adapted from the Consensus Report (4). In subjects whose skills were inadequate, correct procedure was demonstrated and their inhaler skill was rechecked.

Knowledge of asthma was measured with a verbally administered questionnaire based on the Consensus Report (4). The asthma knowledge questionnaire was composed of 17 close-ended questions, presenting yes/no/I don't know options (Table 1). The questionnaire contained questions about asthma aetiology, pathophysiology, symptomatology, precipitants, medications and prognosis. Answers were graded from 0 (false answer/no answer) to 1 (true answer). Correct answers were counted and the knowledge score was determined as the total number of correct answers. The questionnaire was applied to all the subjects at the baseline interview and 2 months after education.

Table 1. Asthma knowledge questionnaire.

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1.	Is asthma an inflammatory disease of the airways?
2.	Is asthma a contagious disease?
3.	Is asthma a hereditary disease?
4.	Does asthma inflammation cause constriction in the airways?
5.	Are there symptoms such as coughing, wheezing, dyspnea, or chest tightness in asthmatic patients?
6.	Do aspirin, some rheumatism drugs, and some antihypertensive drugs cause asthma symptoms?
7.	Is asthma a disease that cannot be treated and which continues throughout one's life?
8.	Could asthma be completely controlled with continuous and regular treatment and can the patient continue a normal life?
9.	Should asthmatic patients use the prophylactic treatment regularly even if they feel well?
10.	If an asthmatic patient does not use the treatment regularly, do asthma attacks threaten life?
11.	Are inhaled medications the most effective delivery method for the treatment of asthma?
12.	Do inhaled drugs reach the airways directly?
13.	Do the effects of inhaled drugs disappear quickly and enter the circulation system in very small amounts?
14.	Are there any harmful side effects of inhaled medications?
15.	Do inhaled medications cause addiction?
16.	Can asthmatic patients do sports?
17.	Can asthmatic patients become pregnant?

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After completion of the baseline interview, in a double blind fashion, patients were randomized to one of the three education groups via the closed envelope technique: 1) the verbal education group were given only verbal information, 2) the written education group were given only a written asthma information sheet (Appendix 1), and 3) the verbal and written education group were given both verbal information and a written asthma information sheet. Patients were unaware of being involved in a study.

The format of the information sheet could not be independently assessed because of the unavailability of an educational psychologist.

The educational component of the study was individually administered to all the subjects. At the end of the education, patients' treatment regimes were organized for each patient. The interview lasted approximately 45 minutes.

The asthma knowledge questionnaire was applied again to the subjects in telephone interviews 2 months after education.

Statistical analyses were conducted by the SPSS statistical package (SPSS 9.0 for Windows, Chicago, IL). The results were expressed as mean values  $\pm$  standard deviation (SD). Differences between the groups in quantitative variables were assessed by using the Kruskal-Wallis test. Comparisons of the nominal and ordinal categorical data from the groups were made by the Chi-Squared test and significance was assessed using the Pearson X<sup>2</sup> statistic. The Chi-Squared test was used to compare the differences for each question between the groups at the baseline and 2 months after education. The Kruskal-Wallis test was used to compare the mean scores between the groups at the baseline and 2 months after education, and the mean changes in the knowledge scores among the groups after education. Differences in the mean scores between the baseline and 2 months after education within the groups were tested with the Wilcoxon test. The Mann-Whitney U test was used to determine differences between the groups in outcome variables. The association of continuous/ordinal independent variables, such as education level and duration of disease, with outcome scores were analysed using the correlation analysis. Subsequently, variables with significant associations ( $p \leq 0.05$ ) were entered into the regression analysis. All statistical tests were two-tailed and a  $p$  value less than 0.05 was assumed to be significant.

## Results

Three of the 65 patients initially enrolled in the study (2 from the written education group and 1 from the verbal-written education group) were excluded because they did not read the asthma information sheet. As a result, the study was limited to the 62 patients (20 subjects in the verbal education group, 20 in the written education group, and 22 in the verbal-written education group) who completed the protocol.

The main characteristics of patients receiving verbal, written, and verbal-written asthma education are given in Table 2. It was found that there were no differences between the groups in sociodemographic and disease profile characteristics. However, the number of subjects who had college or university education in the verbal education group was higher than those of the other groups.

The results related to the comparison of correct responses to each question among the groups before and after education are given in Table 3. Before education, it can be seen that patients in the verbal education group had a significantly higher response rate for the question related to the control of asthma with the treatment than those of the other groups ( $p=0.033$ ).

It was found that the questions most often answered correctly for each group were related to the pathophysiology of asthma, the symptoms of asthma, the cause of inadequate treatment of an asthma attack and the role of inheritance in asthma.

It was found that the questions least often answered correctly for each group were related to the effects and side effects of inhaled medications, and whether inhaled medications cause addiction.

After education, it was found that there were significant increases in the response rates to all the questions for each group. Questions having increases at the highest ratios for each group were related to the definition of asthma, the effects of inhaled medications and the most adequate delivery method for medications.

Before and after education, the mean scores obtained from the asthma knowledge questionnaire for each group and mean changes in the knowledge scores are given in Table 4. Before education, it was found that there were no statistically significant differences in the mean knowledge scores between the groups ( $p=0.065$ ). But the baseline mean knowledge score of the verbal

Table 2. The main characteristics of patients receiving verbal, written, and verbal-written education.

Characteristics	Verbal education	Written education	Verbal-written education	p value
Sample size	20	20	22	
Mean age in years	43.8 ±10.8	42.8±10.8	43.6±13.6	0.938
Sex (female)	14(70.0%)	17(85.0%)	18(81.8%)	0.468
Educational level				0.537
Literate	3(15.0%)	1(5.0%)	4(18.2%)	
Completed primary school	8(40.0%)	12(60.0%)	11(50.0%)	
Completed junior high school	- (0.0%)	1(5.0%)	1(4.5%)	
Completed high school	4(20.0%)	5(25.0%)	4(18.2%)	
Completed college or university	5(25.0%)	1(5.0%)	2(9.1%)	
Mean duration of asthma (year)	9.7± 8.1	9.6±10.2	7.1±7.1	0.364
Severity of asthma				0.988
Mild	6(30.0%)	7(35.0%)	6(27.3%)	
Moderate	4(20.0%)	4(20.0%)	5(27.7%)	
Severe	10(50.0%)	9(45.0%)	11(50.0%)	
Family asthma history	11(55.0%)	11(55.0%)	13(59.1%)	0.953
Previously reported drug compliance	12(60.0%)	7(35.0%)	11(50.0%)	0.378
Correct inhaler use	11(55.0%)	10(50.0%)	8(36.4%)	0.453
Hospital admissions in the past year	3(15.0%)	3(15.0%)	5(22.7%)	0.748
Emergency department visits in the past year	5(25.0%)	4(20.0%)	5(27.7%)	0.931
Adequate drug regimens	6(30.0%)	7(35.0%)	8(36.4%)	0.902

Table 3. The results related to the comparison of correct responses to each question among the groups before and after education.

Question number	Before education				After education			
	Verbal education	Written education	Verbal-written education	p value	Verbal education	Written education	Verbal-written education	p value
	n(%)	n(%)	n(%)		n(%)	n(%)	n(%)	value
1	6(30.0)	5(25.0)	4(18.2)	0.668	16(80.0)	17(85.0)	19(86.4)	0.843
2	8(40.0)	6(30.0)	6(27.3)	0.655	12(60.0)	14(70.0)	14(63.6)	0.799
3	10(50.0)	10(50.0)	9(40.9)	0.79	16(80.0)	14(70.0)	15(68.2)	0.659
4	13(65.0)	9(45.0)	8(36.4)	0.167	19(95.0)	19(95.0)	21(95.5)	0.997
5	20(100.0)	20(100.0)	21(95.6)	0.397	20(100.0)	20(100.0)	22(100.0)	
6	8(40.0)	3(15.0)	3(13.6)	0.077	14(70.0)	9(45.0)	13(59.1)	0.275
7	4(20.0)	2(10.0)	3(13.6)	0.661	10(50.0)	10(50.0)	16(72.7)	0.222
8	12(60.0)	4(20.0)	8(36.4)	0.033	18(90.0)	20(100.0)	21(95.5)	0.337
9	10(50.0)	8(40.0)	9(40.9)	0.777	18(90.0)	19(95.0)	22(100.0)	0.32
10	14(70.0)	9(45.0)	11(50.0)	0.241	20(100.0)	18(90.0)	21(95.5)	0.337
11	6(30.0)	8(40.0)	5(22.7)	0.478	18(90.0)	20(100.0)	22(100.0)	0.114
12	12(60.0)	6(30.0)	11(50.0)	0.153	19(95.0)	19(95.0)	20(90.9)	0.821
13	5(25.0)	1(5.0)	1(4.5)	0.063	15(75.0)	17(85.0)	15(68.2)	0.443
14	3(15.0)	3(15.0)	2(9.1)	0.802	11(55.0)	13(65.0)	16(72.7)	0.486
15	1(5.0)	3(15.0)	2(9.1)	0.561	12(60.0)	12(60.0)	18(81.8)	0.213
16	12(60.0)	5(25.0)	9(40.9)	0.08	14(70.0)	14(70.0)	22(100.0)	0.017
17	11(55.0)	5(25.0)	7(31.8)	0.119	17(85.0)	15(75.0)	21(95.5)	0.171

Table 4. Before and after education, the mean knowledge scores obtained from the asthma knowledge questionnaire for each group and mean changes in the knowledge scores.

Groups	Before education		After education		Mean change (%)	p value
	Mean score (%)	Range	Mean score (%)	Range		
Verbal	7.7±3.6(45.3)	2-14	13.4±2.9(78.8)	6-17	5.8±3.5( 33.5)	0
Written	5.1±2.6(30.0)	1-9	13.4±1.7(78.8)	6-16	8.4±3.1(48.8)	0
Verbal-written	5.4±3.6(31.8)	1-14	14.5±2.0(85.3)	8-17	9.1±4.0(53.5)	0
P value	0.065		0.123		0.013	

education group was significantly higher than those of the written and the verbal-written education groups ( $p=0.037$  and  $p=0.048$ , respectively). After education, it was found that there were no statistically significant differences in the knowledge scores among the groups ( $p=0.123$ ). But the mean knowledge score of the verbal-written education group was significantly higher than that of the written education group ( $p=0.019$ ). After education, there were no differences in the mean knowledge scores between the verbal education group and the written education group. After education, there were statistically significant differences in the mean changes in the knowledge scores among the groups ( $p=0.013$ ). The mean change in the knowledge score was significantly higher in the verbal-written education group than that of the verbal education group ( $p=0.010$ ). The mean change in the knowledge score of the written education group was significantly higher than the verbal education group ( $p=0.016$ ). After education, mean knowledge scores increased significantly in each group compared to the baseline scores ( $p=0.000$ ).

It was found that the mean knowledge score was directly correlated with education level before education ( $r=0.422$ ,  $p=0.001$ ) and after education ( $r=0.290$ ,  $p=0.022$ ), and before education, previously reported compliance with the treatment ( $r=0.387$ ,  $p=0.002$ ), not with the duration of asthma, asthma severity, correct inhaler skill, family asthma history, or admissions to emergency departments or hospitals in the past year.

Only 30 (48.4%) of asthmatic patients claimed to use their medications as prescribed. Compliance with the treatment was not associated with the duration of asthma, age, sex, education level, correct inhaler use, asthma severity, family asthma history, or admissions to emergency departments or hospitals in the past year. The most common reason given for non-compliance was giving up the treatment after feeling well (75.0%).

When the drug regimes of each subject were carefully reviewed, it was found that 14 mild asthmatics, 9 moderate asthmatics, and 18 severe asthmatics used drug regimes that were inappropriate when compared to the Consensus Report. Only 11 (17.7%) of the patients were in strict compliance with the treatment and used their drug regimes in accordance with the Consensus Report. It was found that 48 (77.4%) of the patients (14 mild, 12 moderate, and 22 severe asthmatics) used inhaled corticosteroids. Only 27 (43.5%) of the patients were in strict compliance with the treatment and also used inhaled corticosteroids. Only 21 (28.8%) of the patients were able to recognize their medications' name.

The result suggests that 29 (46.8%) asthmatic patients had perfect inhaler skill. The most common mistakes were in breathing out before pressing the inhaler, in holding the breath for 10 seconds and in waiting 1 minute between puffs. It was found that correct inhaler use had statistically significant relation with sex (male,  $p=0.014$ ), but not with device type, education level, knowledge score, asthma severity, duration of asthma, family asthma history, or admissions to emergency departments or hospitals in the past year.

During the administration of the questionnaire by telephone interviews, almost all the patients said they were pleased with the education and had used the medications regularly. They also wanted to be telephoned more frequently to be reminded of their treatment.

## Discussion

Asthma education is considered to be an essential component of the asthma treatment and is necessary to help patients gain motivation, skill and confidence in controlling their asthma (1).

In this study, prior to education, it was found that asthmatic patients had a lack of knowledge about the dis-



ease and an overall knowledge of the disease was found to be adequate in only 35.6% of patients. The mean knowledge score in the verbal education group was significantly higher than in the other groups. However, the number of subjects who had college or university education in the verbal education group was higher than those of the other groups.

After individualized education, it was found that although knowledge of asthma increased in the three education groups, the mean change in the knowledge score was significantly higher in the verbal-written education group. The mean change in the knowledge score of the written education group was significantly higher than that of the verbal education group. Verbal asthma information can be absorbed easily by a patient, though it is often forgotten or misunderstood. Verbal-written information about asthma can be easily obtained by the patient providing a better understanding of asthma and can be far more effective than a monologue delivered by an educator (5,6). Hilton et al. demonstrated that an education program based on written information only was not able to change self-management ability or asthma morbidity in trained asthmatics with respect to an untrained control group (7).

The results of this study support the results previously reported by controlled studies; namely, that educational programmes can increase patients' knowledge of asthma (8,9,10).

It is worth noting that patients responded to questions about asthma according to their personal experiences. Akkaya et al. reported that patients treated for the first time had a lower knowledge score than patients who had been receiving treatment for a long time at the clinic. Two months after education, knowledge scores in both groups were similar (11).

The results of this study can be generalized for other outpatient clinic settings as the patients were unaware of being in a research study. Had they been aware, they may have listened more and/or read the asthma information sheet carefully. In other words, they may have proved to have better knowledge than the knowledge they showed in this study. In addition, the asthma questionnaire was verbally applied to patients during the interview because of the high incidence of illiteracy among the patients. It should be remembered that, less literate patients may not necessarily be less knowledgeable, even though they are worse at reading and understanding the questions.

In this study, before and after education, it was found that the mean knowledge score was associated with education level, not with asthma severity, duration of asthma, family asthma history, or admissions to emergency departments or hospitals in the past year. In a previously reported study, asthmatic patients with low literacy levels had poorer knowledge of asthma than those with adequate literacy (12). Other studies suggested that many patients admitted to emergency departments with asthma complications had little knowledge about asthma (13,14). On the other hand, other studies suggested that patients with severe asthma benefited more from education than those with mild asthma (10). In this study, many of the patients had a long history of asthma and severe asthma and it might have been expected that they had reasonable knowledge of the complaint. However, their asthma knowledge scores were lower before education and after education, and mean knowledge score did not increase in line with the duration and severity of asthma.

In addition, it was found that only 48.4% of asthmatic patients claimed to use their drugs as prescribed. The treatment non-compliance ratios were similar to those of other studies (15,16). Studies of adults and children have shown non-compliance rates of around 50 percent with the taking of regular preventive therapies (4,17). The correct extent of patient non-compliance is difficult to measure. In this study, compliance was monitored on the basis of verbal information given by the patient. In this respect, the actual extent of non-compliance could be greater than that recorded.

In the present study, half of the patients had severe asthma and they were in non-compliance with the treatment. Strict compliance with the treatment is of special importance for such patients with difficultly controlled forms of the disease (17). In spite of this, 24 of the 32 noncompliers (75%) had a tendency to stop their treatment when they felt better. The intermittent nature of asthma is a cause of non-compliance.

Patient non-compliance with the treatment is a significant factor in morbidity and mortality of asthma sufferers. A commonly used approach for improving patient compliance with the treatment is asthma education. Patient knowledge is an essential component of good self-management, but it is insufficient to assure high levels of compliance. Educational interventions have shown that patient knowledge has a limited effect upon patient

behaviour and morbidity markers such as rates of hospitalization, emergency room use, or school absence (18,19).

The patient-doctor relationship can serve to remove barriers to treatment compliance. When such a relationship is established, information provided by the doctor is more likely to be heard, remembered, and put into action. A study involving frequent telephone contact with asthmatic children and their parents resulted in a 79% reduction in emergency room visits in the year after enrollment (20). In a study of outpatient clinic settings, it was found that telephone information was more apt to enhance the functional status of patients with osteoarthritis compared to those contacted only at the clinic, while clinic intervention was detrimental (21). In this study, 2 months after education, the questionnaire was applied to patients by telephone interviews. All the patients said that they were pleased by the education and had used the medications regularly, and they also wanted to be contacted by telephone frequently.

In this study, it was found that the large majority of asthmatic patients used drug regimens that were not in compliance with the Consensus Report. Only 11 (17.7%) of the patients were in strict compliance with the treatment and used their drugs in accordance with the Consensus Report. This result is consistent with the findings of other studies (13). Although 77.4% of the patients used inhaled corticosteroids, only 27 (43.5%) of the patients were in strict compliance with the treatment and also used inhaled corticosteroids.

Also, half (53.2%) of the patients did not have perfect inhaler skill. The most common mistakes observed were in breathing out before pressing the inhaler and when holding breath for 10 seconds and in waiting 1 minute between puffs. The findings support the works of others (13).

It was observed that correct inhaler use was associated with sex (male,  $p=0.014$ ), but not with education level, knowledge score, asthma severity, duration of asthma, family asthma history, device type, or admissions to emergency departments or hospitals in the past year. Other studies suggested that poorer knowledge and incorrect inhaler use resulted in the high use of health-care services (12).

The results of several studies have shown that education can have a large impact on the percentage of patients who use an inhaler correctly. The study by Goodmann et al. indicated that women may have a greater need for education on inhaler technique because of their less effective use of the inhaler. They suggested that this problem with inhaler technique might explain why women experience more severe asthma symptoms than men (22).

In conclusion, it was found that asthmatic patients did not have sufficient information about their disease and the correct use of their inhaler device, and were not in compliance with the treatment and did not use drug regimes in accordance with the Consensus Report. In addition, the results of this study indicated that additional information about asthma increased their asthma knowledge and verbal-written education had a greater impact on patients' knowledge of asthma. It is necessary to build up a good relationship between patients and doctors to improve patients' understanding of their conditions and its treatment, to increase their motivations and confidences that their conditions can be controlled with treatment and to increase their adherence to treatment regimes.

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## APPENDIX

### Appendix 1. Asthma information sheet.

Asthma is an inflammatory disease of the airways. Asthma is not a disease that is spread by contagion. In the occurrence of this inflammation of the airways, factors related to inheritance and the environment are equally responsible. This inflammation causes constriction in the airways. Thus, symptoms such as coughing, wheezing, dyspnea, and chest tightness in asthmatic patients appear. Some factors (infection, exercise, cigarettes, allergens, aspirin, some antihypertensive drugs and some rheumatism drugs) can facilitate the bringing on of asthma symptoms.

Asthma is not a disease which cannot be treated or continue throughout one's life. However, it is a chronic disease that requires long-term treatment. If asthma is treated regularly and continuously, it could be completely

controlled and the patient can continue a normal life. For this, asthmatic patients must use the prophylactic treatment regularly even if they feel well. If an asthmatic patient does not use the treatment regularly, asthma attacks can threaten life.

Medications for asthma can be administered in different ways, including inhaled, oral (ingested), and parenteral (intramuscular or intravenous) ones. However, the most effectual treatment is inhaled. Inhaled drugs reach the airways directly. The effects of inhaled drugs disappear quickly and enter the circulation system in very small amounts. There are no harmful side effects from inhaled medications and these medications do not cause addiction.

Asthmatic patients must not avoid exercising.

Asthmatic patients can become pregnant.