

Comparison of the Effects of Individualized Education in Three Forms on Inhaled Corticosteroids in Asthmatic Patients

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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 knowledge of inhaled corticosteroids in asthmatic patients. To this end, a randomized double blind controlled study was conducted with 60 adult asthmatics followed-up at the outpatient clinic of Chest Diseases and Tuberculosis in the Faculty of Medicine of Süleyman Demirel University in Isparta, Turkey. Knowledge of inhaled corticosteroids was tested at baseline and 2 months after an educational intervention.

Prior to the educational intervention, knowledge of inhaled corticosteroids was low in all three education groups. The ratio of compliance with the treatment was 50.0%. Only 30 (50.0%) patients had perfect inhaler skills. Thirty-eight (63.3%) patients used their drug regimens in non-compliance with the Consensus Report. Eleven (18.3%) patients were in strict

compliance with the treatment and used their drug regimens in accordance with the Consensus Report. Twenty-seven (45.0%) patients were in strict compliance with the treatment and at the same time used inhaled corticosteroids. Two months after the educational intervention, the change in knowledge score was highest in the verbal-written education group.

From the results of this study it can be concluded that asthmatic patients do not have sufficient information about inhaled corticosteroids, that additional information can increase their knowledge, and that the verbal-written information has a greater impact on patients' knowledge of inhaled corticosteroids than verbal or written information alone.

Turkish Respiratory Journal, 2003;4(3):101-107

Key words: asthma, inhaled corticosteroids, knowledge, patient education

Introduction

Asthma because of its increasing morbidity and mortality rates is a disease that has received increasing attention in recent years (1,2). At present, the goal of asthma treatment is to control airway inflammation even when patients are free of symptoms. For this reason, the use of maintenance anti-inflammatory therapy has been endorsed by the Consensus Report (3).

Poor understanding of asthma and the roles of asthma medications may lead not only to insufficient intake of some drugs such as bronchial anti-inflammatory agents, but also to overuse of others, such as Beta₂-adrenoreceptor agonists. Although inhaled corticosteroids play a central role in the safe and efficacious control of asthma, compliance with these medications is often poor (4,5). Patient education is considered as one of the best ways to improve compliance (6). It appears that educational interventions may influence the ability of patients to cope with asthma episodes, but may be less successful

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Table 1. Knowledge questionnaire for inhaled corticosteroids

1. Is a chronic inflammation of the airways associated with occurrence of asthma?
2. Are inhaled corticosteroids the most effective anti-inflammatory medication for the treatment of inflammation of the airways in asthmatic patients?
3. Do inhaled corticosteroids reduce symptoms in asthmatic patients?
4. Do inhaled corticosteroids improve lung functions in asthmatic patients?
5. Do inhaled corticosteroids reduce frequency of exacerbations and mortality of asthma?
6. Do inhaled corticosteroids prevent irreversible destruction of the airways?
7. Must asthmatic patients use inhaled corticosteroids continuously and regularly even if they feel well and have no symptoms of asthma?
8. Are there any harmful side effects of inhaled corticosteroids and are they safe at recommended doses?
9. Are oropharyngeal candidiasis and dysphonia the most common side effects of inhaled corticosteroids?
10. May the side effects of inhaled corticosteroids be prevented by rinsing the oropharynx with water after inhalation?
11. Must you call your doctor if the side effects of inhaled corticosteroids appear?
12. Do inhaled corticosteroids cause osteoporosis, obesity and hirsutism?
13. Do inhaled corticosteroids cause arterial hypertension, diabetes and cataracts?
14. What side effects of inhaled corticosteroids do you know?

in facilitating compliance with long-term preventive medication regimes (7,8). Patient education should include the mode of action of therapeutic agents, how to use them, and their potential side effects (9).

The present study aimed to determine, in a group of asthmatic patients, their basic knowledge about inhaled corticosteroids, 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 knowledge of inhaled corticosteroids.

Material and Method

The 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 64 patients (51 female, 13 male, ages 21-67 years) with asthma confirmed by history and airflow obstruction according to the criteria of the Consensus Report (3) were eligible to participate in the study. None of the patients had taken part in an asthma education program before. All subjects were reviewed individually in accordance with a structured design.

Baseline data on independent variables were collected 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, and b) disease profile characteristics including duration and severity of asthma, family asthma history, drug regimens, previously reported compliance with the treatment, side effects of 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 the patient's 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 (3).

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 inhalers, adapted from the Consensus Report (3). In subjects whose skills were inadequate, the correct procedure was demonstrated and their inhaler skills were rechecked.

Knowledge of inhaled corticosteroids was measured with a verbally administered questionnaire based on the Consensus Report (3). The knowledge questionnaire of inhaled corticosteroids was composed of 13 close-ended questions, presenting yes/no/I do not know options, and one open ended question (Table 1). The questions were on various aspects of inhaled corticosteroid therapy, particularly related to the perceived modes of action and side effects of those agents. 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 given to all the subjects at the baseline interview and 2 months after the educational session.

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

Table 2. Characteristics of the education groups (verbal, written, and verbal-written)

	Verbal education	Written education	Verbal-written education	p value
Sample size (n)	22	18	20	
Mean age (years)	42.1±10.7	43.2±12.2	44.9±12.9	0.743
Sex (female) n (%)	18 (81.8)	11 (61.1)	18 (90.0)	0.086
Educational level				0.626
Literate n (%)	4 (18.2)	2 (11.1)	2 (10.0)	
Primary school n (%)	9 (40.9)	9 (50.0)	12 (60.0)	
Junior high school n (%)	1 (4.5)	1 (5.6)	-	(0.0)
High school n (%)	6 (27.3)	5 (27.8)	2 (10.0)	
College or university n (%)	2 (9.1)	1 (5.6)	4 (20.0)	
Mean duration of asthma (years)	11.5± 9.9	8.5±11.0	6.8±6.9	0.102
Severity of asthma				0.614
Mild n (%)	6 (27.3)	6 (33.3)	5 (25.0)	
Moderate n (%)	7 (31.8)	3 (16.7)	3 (15.0)	
Severe n (%)	9 (40.9)	9 (50.0)	12 (60.0)	
Family asthma history n (%)	14 (63.6)	8 (44.4)	12 (60.0)	0.445
Reported drug compliance n (%)	12 (54.5)	7 (38.9)	11 (55.0)	0.530
Correct inhaler use n (%)	12 (54.5)	8 (44.4)	10 (50.0)	0.817
Hospitalization in past year n (%)	3 (13.6)	2 (11.1)	4 (20.0)	0.727
Emergency department visits in the past year n (%)	5(27.7)	3 (16.7)	7 (35.0)	0.408
Adequate drug regimens	7 (31.8)	7 (38.9)	8 (40.0)	0.837
Inhaled corticosteroid use	18 (81.8)	14 (77.7)	13 (65.0)	0.430

The format of the information sheet could not be independently assessed because of the unavailability of a psychologist specialized in educational methods.

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

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

Statistical analyses were conducted by the SPSS statistical package (SPSS 9.0 for Windows, Chicago, IL). The results were expressed as mean values ± 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 χ^2 test and significance was assessed using the Pearson χ^2 statistical method. χ^2 test was used to compare the differences for each question between the groups at baseline and 2 months after education. The Kruskal-Wallis test was used to compare the mean scores between the groups at baseline and 2 months after education, and

the mean changes in the knowledge scores among the groups after the educational intervention. 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

Four of the 64 patients initially enrolled in the study (3 from the written education group and 1 from the verbal-written education group) were excluded because they did not read the inhaled corticosteroids information sheet. As a result, the study was limited to the 60 patients (22 subjects in the verbal education group, 18 in the written education group, and 20 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. There were no differences between the groups in sociodemographic and disease profile characteristics.

Table 3. Correct answers to each question in the three educational groups

Question number	Baseline				After education			
	Verbal education n (%)	Written education n(%)	Verbal-written education n(%)	p value	Verbal education n(%)	Written education n(%)	Verbal-written education n(%)	p value
1	8(36.4)	4(22.2)	1 (5.0)	0.048	19(86.4)	13(72.2)	10(50.0)	0.036
2	10(45.5)	3(16.7)	1 (5.0)	0.004	19(86.4)	17(94.4)	20(100.0)	0.204
3	11(50.0)	3(16.7)	4 (20.0)	0.036	21(95.5)	15(83.3)	20(100.0)	0.106
4	5(27.7)	4(22.2)	2 (10.0)	0.498	17(77.3)	17(94.4)	19(95.0)	0.127
5	6(27.3)	2(11.1)	2 (10.0)	0.244	16(72.7)	17(94.4)	20(100.0)	0,071
6	4(18.2)	1(5.6)	1 (5.0)	0.274	16(72.7)	15(83.3)	14(70.0)	0.608
7	10(45.5)	6(33.3)	0 (0.0)	0.003	21(95.5)	16(88.9)	20(100.0)	0.290
8	4(18.2)	3(16.7)	1 (5.0)	0.402	19(86.4)	14(77.8)	19(95.0)	0.296
9	4(18.2)	3(16.7)	6 (30.0)	0.538	18(81.8)	14(77.8)	20(100.0)	0.093
10	15(68.2)	12(66.7)	14 (70.0)	0.976	21(95.5)	16(88.9)	20(100.0)	0.290
11	22(100.0)	17(94.4)	20 (100.0)	0.305	22(100.0)	18(100.0)	20(100.0)	
12	1(4.5)	0(0.0)	0(0.0)	0.415	7(31.8)	7(38.9)	16(80.0)	0.004
13	3(13.6)	0(0.0)	1(5.0)	0.213	5(22.7)	10(55.6)	13(65.0)	0.015

The results related to the comparison of correct responses to each question among the 3 groups before and after the educational intervention are given in Table 3. At baseline, patients in the verbal education group had significantly higher response rates for most questions, especially those related to the pathophysiology of asthma, the most effective medication of inflammation of the airways, whether inhaled corticosteroids reduce asthmatic patients.

It is noteworthy that the question most often answered correctly by each group was related to the prevention of side effects of inhaled corticosteroids.

The questions least often answered correctly for each group were related to the effects and side effects of inhaled corticosteroids.

After the educational intervention, significant increases in response rates to all questions and particularly those related to the most common side effects and to the safety of inhaled corticosteroids, were noted in each group. However, accurate response rates to questions related to the systemic side effects of inhaled corticosteroids were low.

After the educational intervention, 26 patients (7 subjects in the verbal, 5 in the written and 14 in the verbal-written education group) listed accurately the side effects of inhaled corticosteroids in an open-ended question, while before the education no patient did.

Mean scores obtained from the knowledge questionnaire of inhaled corticosteroids at baseline and after the education and mean changes in the knowledge scores are given in Table 4. Before education, there were statistically significant differences in the mean knowledge scores between the

groups ($p=0.012$). The baseline mean knowledge score of the verbal education group was significantly higher than that of the verbal-written education group ($p=0.005$). After education, it was found that there were statistically significant differences in the knowledge scores among the groups ($p=0.051$). The mean knowledge score of the verbal-written education group was significantly higher than that of the verbal education group ($p=0.013$) while no differences in mean knowledge scores existed. The educational intervention also led to statistically significant differences in mean changes in the knowledge scores among the groups ($p=0.000$). The mean change in the knowledge score was significantly higher in the verbal-written education group than that of the verbal education group ($p=0.000$). 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 educational level at baseline ($r=0.303$, $p=0.019$) and also after the educational intervention ($r=0.292$, $p=0.023$). At baseline, educational level was also correlated with previously reported compliance with the treatment ($r=0.370$, $p=0.004$), correct inhaler skill ($r=0.311$, $p=0.016$), but not with the duration of asthma, asthma severity, sex, family asthma history, or admissions to emergency departments or hospitals in the past year.

Only 30 (50.0%) of asthmatic patients stated that they used their medications as prescribed. Compliance with the treatment was associated with knowledge score before education ($p=0.005$), but not with educational level, sex, duration of asthma, age, correct inhaler use, asthma severity, family asthma history, or admissions to emergency departments or hospitals in the past year. The most common reason for non-compliance was giving up the treatment after

Table 4. Knowledge on inhaled corticosteroids for each educational group at baseline and after education (results given as mean scores±SD, mean changes in scores ± and percentage of correct answers)

Groups	Baseline		After education		Mean change (%)	p value
	Mean score (%)	Range	Mean score (%)	Range		
Verbal	4.6±2.5(33.1)	-	10.0±2.3(76.2)	6-17	5.5±2.8(43.1)	0.000
Written	3.2±2.0(23.8)	-	10.8±2.4(78.5)	6-16	7.6±2.7(54.7)	0.000
Verbal-written	2.7±1.8(20.8)	-	11.7±1.1(88.5)	8-17	9.0±2.0(67.7)	0.000
p value	0.012	-	0.051		0.000	

feeling well (63.3%). Before the educational intervention, only 8 patients knew that their inhalers contained corticosteroids and 18 patients referred to side effects of their treatment. These were not related to compliance ($p=0.647$ and $p=0.199$ respectively).

When the drug regimen of each subject was carefully reviewed, it was found that 11 mild asthmatics, 9 moderate asthmatics, and 18 severe asthmatics used drug regimes that were inappropriate when compared to the Consensus Report. Only 11 (18.3%) of the patients were in strict compliance with the treatment and applied their drugs in accordance with the Consensus Report. It was found that 45 (75.0%) of the patients (12 mild, 12 moderate, and 21 severe asthmatics) used inhaled corticosteroids. Only 27 (45.0%) of the patients (4 mild, 8 moderate, and 15 severe asthmatics) were in strict compliance with the treatment and also used inhaled corticosteroids. Only 20 (33.3%) of the patients were able to recognize the name of their medication.

The results have shown that 30 (50.0%) of the asthmatic patients in this group had perfect inhaler skills. 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 relations with sex (male, $p=0.028$) and knowledge score before education ($r=0.311$, $p=0.016$) but not with educational level, 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 patients said that they were pleased with the education and had used the medications regularly. They also wanted to be contacted by telephone more frequently to be reminded of their treatment.

Discussion

One of the recognized main risk factors that contribute to morbidity and mortality of asthma is medication misuse. Medication misuse occurs when insufficient information or misinformation exists. It may be corrected by providing a clear verbal and written explanation of recommended

dosages, expected effects, possible toxic effects, and known interactions (10). The patient education aims at managing asthma effectively. A patient who has no knowledge of the preventive effects of certain antiasthmatic drugs does not understand the need for chronic drug intake and therefore does

not use these drugs when he feels well (11).

In this study, baseline data indicate that asthmatic patients had a lack of knowledge about the usefulness and safety of inhaled corticosteroids and an adequate overall knowledge level was found in only 26.9% of patients. It is worth noting that the answers given by the patients to questions about inhaled corticosteroids were based on their own personal experiences.

After individualized education, it was found that although knowledge on inhaled corticosteroids increased in all three education groups, the mean change in the knowledge score was significantly higher in the verbal-written education group. Also, the mean change in the knowledge score of the written education group was significantly higher than that of the verbal education group. Verbal information can be absorbed easily by a patient, but it is also often misunderstood or easily forgotten. Verbal-written information can be easily absorbed and better understood by the patient and can be far more effective than a monologue delivered by an educator (11-13).

In this study, it was found that the educational level of the patient was an important determinant of mean knowledge score and of compliance. One previous report also drew attention to the relation between literacy level and understanding of asthma and its management (14). Other studies suggested that many patients admitted to emergency departments with asthma complications had little knowledge about asthma (15,16). Some studies suggest that patients with severe asthma benefited more from education than those with mild asthma (17).

In this present study, many of the patients had a long history of asthma and many were classified as severe asthma. However, their knowledge scores of inhaled corticosteroids were low at baseline and after the educational intervention, mean knowledge scores did not increase in line with the duration and severity of asthma. In addition, it was found that only 50.0% of asthmatic patients claimed to use their drugs as prescribed. The treatment non-compliance ratios were similar to those of other studies (18-20). The correct extent of patient non-compliance is difficult to measure. In

this study, compliance was determined on the basis of verbal information given by the patient. Thus, the actual extent of non-compliance could be greater than recorded.

In the present study, despite the fact that half of the patients had severe asthma, disease severity was not related to compliance with the treatment. Strict compliance with the treatment is of special importance for patients with forms of the disease which are difficult to control (21). It has been hypothesized that when patients become more symptomatic, compliance with treatment improves (22). Nineteen of the 30 non-compliers (63.3%) in our group had a tendency to stop their treatment when they felt better. The intermittent nature of asthma prevents some individuals from considering themselves as being asthmatic between episodes and this results in poor compliance with the preventive regimes (7). Mann et al found that compliance with inhaled corticosteroids did not change with asthma severity, so compliance is not a symptom-dependent behaviour (18).

That many patients neglect to use inhaled corticosteroids with fear of side effects is a widely held belief. A cortisone image which involves overemphasizing the threatening aspects of cortisone often underlies non-compliant illness behaviour (4,18). In this study, only 8 patients knew their inhalers involved corticosteroids and there was no correlation between awareness of corticosteroid and compliance. This finding supports the view advanced by Dompeling et al that the specific nature of the drug is less important than expected and that compliance is a patient-dependent and not a drug-dependent issue (18).

In management of asthma, the initial need is often knowledge, followed by time to gain experience with the illness in order to increase self-awareness and self-confidence, and also acquisition of an ability to cooperate with the health-care provider. Successful long-term asthma management requires enhanced communication and close cooperation between patient and doctor. Dissatisfaction with care is associated with decreased medication compliance (20). One study suggested that patients who were satisfied with the physicians' level of warmth, concern, and communication were three times more willing to comply than those who were dissatisfied (23). 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 our study, 2 months after the educational intervention, the questionnaire was applied to patients by telephone interviews. All patients said that they were pleased with the education they had received and had used the medications regularly, and they also wanted to be contacted by telephone frequently.

Taylor et al reported that 62% of asthmatic patients were undertreated by Consensus guidelines. In another report, it

was found that only 50% of the patients used some forms of steroid therapy and some did not understand its proper use. In this same report it is stated that while 72.0% of patients with severe asthma had a steroid inhaler, only 54.0% of those patients used it daily (24). In agreement with these reports, 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 (18.3%) of the patients were in strict compliance with the standard treatment and used their drugs in accordance with the Consensus Report. Although 75% of our patients used inhaled corticosteroids, only 27 (45.0%) were in strict compliance with the treatment.

In a previous study, a significant increase in use of inhaled corticosteroids following an education period of 6 months was reported and the increased use of regularly inhaled corticosteroids was found as the main cause of improvement in asthma morbidity in the educational group (25). In this same study, the reduction of morbidity was also found to be related to development of good patient-doctor relationships leading to better education. An understanding of the long-term nature of asthma by the patients may by itself influence their adherence to preventive medication.

Also in our study, half of the patients did not have perfect inhaler skills. 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 experiences reported by others (15).

It was observed that correct inhaler use was associated with baseline knowledge score and gender (male, $p=0.028$). Studies suggest that poor knowledge and incorrect inhaler use result in a high use of health-care services (14). The results of several studies have shown that education can have a large impact on the proportion of patients who use inhalers correctly. The study by Goodmann et al indicates that women may have a greater need for education on inhaler techniques because of their less effective use of the inhalers (26). These authors suggest that this problem with inhaler technique might explain why women experience more severe asthma symptoms than men.

In conclusion, the results of this study show that our asthmatic patients did not have sufficient information about inhaled corticosteroids and the correct use of their inhaler device, and that many were not in compliance with the drug regimen recommended in the Consensus Report. In addition, the results indicate that additional information about inhaled corticosteroids increased their knowledge and that verbal-written education had a greater impact on patients' knowledge of inhaled corticosteroids. Because anti-inflammatory agents interrupt the development of bronchial

inflammation and prevent asthma symptoms, more needs to be done to educate patients about the importance of adhering to inhaled anti-inflammatory corticosteroids.

References

1. Bartter T, Pratter MR. Asthma: Better outcome at lower cost? The role of the expert in the care system. *Chest* 1996; 110:1589-96.
2. Akkaya E, Yılmaz A, Baran A, et al. The importance of asthma education in patients with asthma. *Eur Respir J* 1996; 9(suppl): 355.
3. Expert Panel Report 2. Guidelines for the diagnosis and management of asthma. National Institutes of Health, National Heart, Lung, and Blood Institute. Publication no: 97-4051. July 1997
4. Boulet LP. Perception of the role and potential side effects of inhaled corticosteroids among asthmatic patients. *Chest* 1998; 113: 587-92.
5. Coutts JAP, Gibson NA, Paton JY. Measuring compliance with inhaled medication in asthma. *Arch Dis Child* 1992; 67: 332-3.
6. Oğuzlügen IK, Türkteş H. Bronşiyal astımda hasta eğitiminin hastalığın prognozu, solunum fonksiyonları ve yaşam kalitesine etkisi. *Tüberküloz ve Toraks* 2001; 49: 421-30.
7. Bennett P, Rowe A, Katz D. Reported adherence with preventive asthma medication: A test of protection mativation theory. *Psychol Health Med* 1998; 3: 347-55.
8. Abdulwadud O, Abramson M, Forbes A, et al. Evaluation of a randomised controlled trial of adult asthma education in a hospital setting. *Thorax* 1999; 54: 493-500.
9. Global initiative for asthma. Global strategy for asthma management and prevention. NHLBI/WHO workshop report. National Institutes of Health, National Heart, Lung, and Blood Institute. Publication no: 95-3659. January 1995
10. Hindi-Alexander MC. Asthma education programs: Their role in asthma morbidity and mortality. *J Allergy Clin Immunol* 1987; 80: 492-4.
11. Worth H. Patient education in asthmatic adults. *Lung* 1990; 168(suppl): 463-8.
12. Gibbs S, Waters WE, George CF. The benefits of prescription information leaflets. *Br J Clin Pharmacol* 1989; 27: 723-39.
13. Hilton S, Sibbald B, Anderson HR, et al. Controlled evaluation of the effects of patient education on asthma morbidity in general practice. *Lancet* 1986; 1: 26-9.
14. Willams MV, Baker DW, Honig EG, et al. Inadequate literacy is a barrier to asthma knowledge and self-care. *Chest* 1998; 114: 1008-15.
15. McD Taylor D, Auble TE, Calhoun WJ, et al. Current outpatient management of asthma shows poor compliance with international consensus guidelines. *Chest* 1999; 116: 1638-45.
16. Hanania NA, David-Wang A, Kesten S, et al. Factors associated with emergency department dependence of patients with asthma. *Chest* 1997; 111: 290-95.
17. Yoon R, Mckenzie DK, Bauman A, et al. Controlled trial evaluation of an asthma education programme for adults. *Thorax* 1993; 48: 1110-16.
18. Bosley CM, Parry DT, Cochrane GM. Patient compliance with inhaled medication: Does combining beta-agonists with corticosteroids improve compliance? *Eur Respir J* 1994; 7: 504-9.
19. Teterssell MJ. Asthma patients' knowledge in relation to compliance with drug therapy. *J Adv Nurs* 1993; 8: 103-13.
20. Milgrom H, Bender B. Nonadherence with the asthma regimen. *Pediatr Asthma Allergy Immunol* 1997; 11: 3-8.
21. Pretet S, Perdrizet S, Poisson N, et al. Treatment compliance and self-medication in asthma in France. *Eur Respir J* 1989; 2: 303-7.
22. Apter AJ, Reisine ST, Affleck G, et al. Adherence with twice-daily dosing of inhaled steroids:socioeconomic and health-belief differences. *Am J Respir Crit Care Med* 1998; 157: 1810-17.
23. Kelloway JS, Wyatt RA, Adlis SA. Comparison of patients' compliance with prescribed oral and inhaled asthma medications. *Arch Intern Med* 1994; 154: 1349-52.
24. Paponick J. Asthma. We need to do better(letter). *Chest* 1999; 116: 1509-10.
25. De Oliveira MA, Faresin SM, Bruno VF, et al. Evaluation of an educational programme for socially deprived asthma patients. *Eur Respir J* 1999; 14: 908-14.
26. Cochrane MG, Bala MV, Downs KE, et al. Inhaled corticosteroids for asthma therapy. Patient compliance, devices, and inhalation technique. *Chest* 2000; 117: 542-50.

Appendix 1

Inhaled corticosteroids information sheet.

Occurrence of asthma is associated with a chronic inflammation of the airways. For this reason, asthma is a disease which requires long-term prophylactic treatment. Inhaled corticosteroids are currently the most effective medications available for the treatment of airway inflammation in asthmatic patients.

Inhaled corticosteroids;

- reduce symptoms
- improve lung function
- reduce frequency of exacerbations and hospital admissions
- reduce deaths related to asthma
- prevent irreversible destruction of the airways in asthmatic patients

To see these effects of inhaled corticosteroids, asthmatic patients must use inhaled corticosteroids continuously and regularly even if they feel well and have no symptoms of asthma.

Inhaled corticosteroids are safe and do not have any harmful side effects at dosages recommended by your doctor. The most common side effects of these medications are oropharyngeal candidiasis and dysphonia. These side effects may be reduced to a minimum by using spacer devices and rinsing the oropharynx with water after inhalation. If these side effects appear, you can call your doctor and take preventive measures.

Inhaled corticosteroids do not cause osteoporosis, obesity, hirsutism, arterial hypertension, diabetes and cataracts.