**RESPIRATORY MEDICINE**

# Health beliefs and compliance with inhaled corticosteroids by asthmatic patients in primary care practices

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The aim of this study was to determine factors associated with regular use of inhaled corticosteroids (ICS) by asthmatic patients in primary care practices. A cross-sectional survey was carried out over 12 family practices in the Philadelphia greater Metropolitan area. A total of 394 patients aged 18–49 years, who received medical care for asthma from their primary care physician and had been prescribed ICS between 1 January 1995 and 31 December 1996, were included.

The study measured self-reported demographics, experience with asthma, use of and attitudes about ICS, and health beliefs in six domains.

Only 38% of patients reported using ICS at least twice a day almost every day. The most frequently cited reasons for inconsistent or non-use of ICS were related to a belief that ICS were unnecessary during asymptomatic periods and to a general concern about side-effects. By logistic regression, factors associated with regular use of ICS were two patient health beliefs, namely the health belief of 'Active' participation in clinical decision-making with their physician (OR = 4·6, 95% CI 2·8, 7·5), and the health belief that asthma was a 'Serious' health problem (OR = 2·3, 95% CI 1·4, 3·7), and hospitalization for asthma within the previous 12 months (OR = 2·3, 95% CI 1·6, 4·6).

Patients were more likely to report regular use of ICS if they saw themselves as active participants in their treatment planning and conceptualized asthma as a potentially serious illness. These results support the themes of patient education and shared decision-making between patients and physicians that are promoted by the Asthma Guidelines from the National Heart, Lung and Blood Institute (NHLBI).

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## Introduction

The asthma guidelines issued by the National Heart Lung and Blood Institute (NHLBI) focus on four themes: 1. use of objective measures of lung function; 2. environmental controls; 3. comprehensive pharmacological therapy for both long-term control and management of exacerbations; and 4. patient education that fosters a partnership with clinicians (1). The section on drug therapy emphasizes the use of anti-inflammatory or 'controller' medications, particularly inhaled corticosteroids (ICS), for patients with persistent asthma. Poor patient compliance with controller medications would be expected to increase the hospitalization rate for asthmatic patients dramatically (2).

However, although nearly two-thirds of all medical visits for the management of asthma are to primary care physicians (3), little is known about primary-care patients' understanding of and compliance with prescribed treatment regimens.

We report data from a survey of 394 asthmatics who were prescribed ICS and treated by primary-care practitioners in the Philadelphia area. The survey explored relationships among patients' demographics, attitudes toward and patterns of use of ICS and their health beliefs.

## Methods

### PRIMARY CARE PRACTICE NETWORK

The TriState Primary Care Research Network is a network of family practice sites in the Philadelphia area. The network includes residency programs as well as private practices in the TriState (Southeastern Pennsylvania, Southern New Jersey and Northern Delaware) area. Six private solo and group practices (11 physicians) and six practices affiliated with residency programs (169 physicians) participated in this study.

## PATIENT SELECTION

Patients were eligible for inclusion in this study if they:

1. were active patients in one of the participating practices (at least one office visit in the previous 2 years, 1 January 1995 to 31 December 1996);
2. were between the ages of 18 and 49 inclusive as of December 1996;
3. had a billing diagnosis of asthma (ICD-9 493.x, NOS) (4); and
4. had been prescribed ICS in the past 2 years by their physician.

The participating sites used their office billing systems to generate a list of patients who met the first three inclusion criteria. The ambulatory medical records ('paper charts') for all these patients were reviewed by a research assistant to determine if ICS had been prescribed. The final list of eligible patients included only those patients for whom ICS were prescribed or continued according to the physician note for any office visit between January 1995 and December 1996.

## SURVEY

The survey contained sections for the respondents' demographics and general health, experience with asthma, frequency of use of and attitudes to ICS and health beliefs. Patients' self-reported frequency of use of ICS was queried in four categories, from 'never' to 'at least twice a day almost every day'.

If their ICS use was other than at least twice a day almost every day, they were asked to indicate the reasons. Patients checked as many reasons as were applicable from a list of 16, which included perceived ineffectiveness of ICS, inconvenience of multiple inhalers, and concerns about side-effects and costs (see Appendix for a list of the reasons used). The last section of the survey measured patients' health beliefs. Key constructs in the health belief model (5) include motivation, perceived benefits of complying with a specific treatment recommendation, perceived seriousness of the condition and risks of treatment. Asthma, hypertension and diabetes are three chronic conditions for which health beliefs have been studied (6–10). We used previously published scales (6,8,9,11) as sources for 15 of the health belief items. Four others were newly constructed for this investigation. Responses to each question used a five-point Likert scale of agreement.

Before the survey was mailed, patients received a post-card announcing the study and requesting their cooperation. The subsequent mailing included the survey instrument, cover letter, return envelope and $5.00 incentive to complete the survey. A second mailing was sent to those patients who did not respond.

## ANALYSIS

Items in the Health Belief section of the survey were scored so that a higher score indicated more agreement. The principal components methods was used to extract the health belief factors (12). This method uses the correlation matrix of scores on the health belief items to form internally consistent clusters. Clusters are then rotated to obtain an interpretable pattern of factor loadings – the correlation of the factor and the item. We used the popular Varimax technique, where the number of rotated factors were those with eigenvalues greater than 1·0 (13). We inspected the factor loadings and assigned the items to factors with which they were most highly correlated, such that each item was assigned to only one factor. The names of the factors were derived from the sources of the health belief items and from the rotated factor pattern. All items and factors are listed in the Appendix.

Stepwise logistic regression was used to model associations between frequency of use of ICS and other factors. Frequency of use of ICS was dichotomized as 'at least twice a day almost every day' versus all other responses. Independent variables were gender (male/female), race (African–American/other), education (high school graduate or above/less than high school), living alone (yes/no), married (yes/no), ER admission for asthma in the past 12 months (yes/no), hospitalized for asthma in the past 12 months (yes/no), missed work or school for asthma in the past 12 months (yes/no), self-reported health status (excellent or very good/good, fair or poor), and scores on the health belief scales. Scores on the health belief scales were categorized as either below the median or equal to or above the median score. All analyses were done using the PC version 6.11 of the Statistical Analysis System (SAS) at a Type I error rate of 0·05.

## INSTITUTIONAL APPROVAL

The study procedures were approved by the appropriate Institutional Review Boards at the participating institutions.

## Results

Of the 694 surveys mailed, 44 were not delivered because of address problems. Of the remaining 650 forms, 435 (67%) were returned. Forty-one of these were excluded from analysis because they were from patients who indicated they either did not have asthma or were not in the eligible age range. All data analysis was done on the remaining 394 forms.

## DEMOGRAPHICS

The demographics of the group are shown in Table 1. Eleven per cent rated their general health as excellent; 32% rated it very good, 34% good, 21% fair and 3% poor.

## MORBIDITY RELATED TO ASTHMA

Nearly half the patients had had at least one hospitalization for asthma in their life (Table 2). Fewer had been admitted

TABLE 1. Demographics of respondents (n=394)

| | |
|---|---|
| Median age (years) | 36 |
| Gender (%) | |
| Female | 75 |
| Male | 25 |
| Race (%) | |
| African–American | 51 |
| White | 40 |
| Hispanic | 4 |
| Asian | 3 |
| Other | 3 |
| Marital Status (%) | |
| Single, never married | 47 |
| Married | 39 |
| Divorced | 11 |
| Other | 3 |
| Educational level (%) | |
| Graduate school | 18 |
| College graduate | 20 |
| Some college | 28 |
| High school graduate | 22 |
| Other | 12 |

to a hospital (14%) or treated in an emergency room (29%) in the previous year but 50% had missed work or school in that period. A majority of patients had experienced nocturnal symptoms and asthma attacks in the previous 4 weeks: 86% of patients reported at least some breathing symptoms between asthma attacks.

## PATTERNS OF ICS USE

Sixty-two per cent of patients reported less than regular, twice-daily use of ICS (Table 3). Only five reasons for inconsistent use were selected by more than 10% of these respondents (Table 4). The most common reason was 'I use it only when I need it'.

## HEALTH BELIEFS

Table 5 shows the psychometric statistics and a sample item for each Health Belief subscale. The item with the highest factor loading within the rotated factor pattern and the percentage agreement are shown.

## LOGISTIC REGRESSION ANALYSIS

Using the stepwise procedure to model self-reported compliance with ICS, only three variables emerged as independent predictors: having been hospitalized for asthma in the past 12 months, and the 'Serious' and 'Active' health belief subscores. Table 6 shows the odds ratios and 95% CI for each of the three variables in the regression analysis. The Hosmer–Lemeshow goodness-of-fit test value was 8·5 ($df=5$; $P=0·13$).

TABLE 2. Self reported morbidity related to asthma (n=394)

| | |
|---|---|
| Ever hospitalized for asthma (%) | 45 |
| In past 12 months (%) | |
| Treated in emergency room for asthma | 29 |
| Hospitalized for asthma | 14 |
| Missed work or school because of asthma | 50 |
| Nocturnal symptoms in past 4 weeks (%) | |
| 0 | 37 |
| 1 night | 13 |
| 2–4 nights | 32 |
| 5–7 nights | 9 |
| ≥8 nights | 9 |
| 'Asthma attacks'* in past 4 weeks | |
| 0 | 38 |
| <1 per week | 30 |
| 1–2 per week | 20 |
| ≥3 per week | 12 |
| Breathing between 'asthma attacks' | |
| No problems | 14 |
| Symptoms some days | 48 |
| Symptoms most days, inhaler required | 31 |
| Symptoms most of the time | 7 |

*Defined as a 'sudden worsening of your asthma'.

TABLE 3. Percentage of respondents reporting use of steroid inhaler by option

| Option | %* |
| --- | --- |
| I use it at least twice a day almost every day | 38 |
| Some days I use it at least twice, but on other days I don't use it at all | 36 |
| I used to use it, but now I don't | 22 |
| I never used it | 4 |

*Based on 386 respondents; eight patients left this item blank.

TABLE 4. Five most frequently selected reasons for not using ICS (% of total selecting item)

| Reason | % |
| --- | --- |
| I use it only when I need it | 62 |
| I don't like using medicine unless I feel sick | 33 |
| I don't want to use steroids | 27 |
| I feel fine | 22 |
| I don't like the side-effects | 18 |

Based on 247 respondents that did not report using ICS at least twice a day almost every day; respondents were allowed to select multiple items.

## Discussion

Only 38% of the patients in our survey reported using ICS at least twice a day almost every day, the response category in our survey that most closely reflects the recommended level of use for patients with persistent asthma (1). Other studies also suggest that patient compliance with inhaled controller medications is poor in general (14–16) and significantly lower than compliance with oral theophylline (17). In light of the chronic inflammatory airway disease in asthma, understanding the inconsistent use or non-use of prescribed ICS presents a major clinical challenge.

The reasons respondents selected most frequently for not using ICS almost every day suggest that many patients with asthma conceptualize the disease as periods of wellness interspersed with exacerbations of the disease, a model for which inconsistent use of chronic medication is not surprising. Such a model is particularly troubling for the patients in this study, however, given their self-reported morbidity related to asthma.

Patients hospitalized in the past 12 months for asthma or patients with the health belief that asthma was 'Serious' were 2·3 times more likely to use their medication every day than those who did not have these attributes, independent of other factors. The issue for physicians is how to convince patients that preventive therapy is needed without having to wait for the patient to experience a crisis (7). While hospitalization may represent a 'teachable moment' (18,19) for asthmatic patients, it is imprudent to focus medication compliance programs only on the subset of patients who have been hospitalized in a given year.

Additional attention needs to be paid to the role of active decision-making on the part of patients in selecting the therapeutic approach for managing the disease. In our survey, patients reporting an 'Active' health belief exemplified by shared decisions about treatment had 4·5 times the likelihood of using their controller medication every day as those who did not have this health belief. The importance of informed decision-making and of a partnership between patients and providers in medical decision-making is increasingly being discussed in the medical literature (20–24). A recent study in which the process of primary care decision-making during office visits was audiotaped found that physicians frequently described the nature of their decisions, less frequently discussed the risks and benefits, and rarely assessed the patient's understanding of the decision (25). Patient preferences were elicited in only 19% of the decisions.

While the concept of partnership and shared decision-making is fundamental to the practice of primary care medicine, the primary care setting may be a difficult one in which to incorporate this approach to care. Because the agenda for most primary care visits is set by the patient, discussions about asthma-related issues may lose out to competing priorities. Although some have advocated referral of selected asthmatic patients to specialists (26,27), the practical implications and acceptability of this strategy have not been assessed.

Although the importance of shared decision-making in the management of asthma cannot be denied, our study does not show a causal relationship between an 'Active' health belief and compliance. It may be that both the attribute and the behaviour are the result of some other patient characteristic. In addition, it is not clear that all patients are interested in active decision-making. While patients who are more active decision-makers may force this model of care on their providers, it may be difficult for patients not inclined to this approach to be coached in how to be active decision-makers.

The strength of the relationship that we observed between active decision-making by patients and compliance with ICS is limited by the self-reported data. Since the survey was mailed to the patients' homes and responses were confidential, we believe there was less chance that patients would feel compelled to report compliance with their medication than if the questions had been asked in an office interview. Other methods such as weighing canisters (14) or counting prescription refills (15) would provide

TABLE 5. Health belief subscales, psychometric statistics and sample items

| Subscale | Items | Alpha* | Loading† | Item with highest loading | %‡ |
|---|---|---|---|---|---|
| Active | 4 | 0·88 | 0·72 | My physician and I decide together about treatment for my asthma | 66 |
| Barriers | 4 | 0·89 | 0·75 | No matter what you do, if you are going to get sick, you will get sick | 28 |
| Benefits | 2 | 0·80 | 0·80 | I believe it is possible to be completely free of asthma symptoms | 42 |
| Frustration | 3 | 0·89 | 0·79 | I need more training in how to use my asthma medicine | 14 |
| Motivation | 3 | 0·95 | 0·82 | I think about my health a lot | 73 |
| Serious | 3 | 0·90 | 0·71 | My asthma is no problem as long as I feel all right | 53 |
| Total | 19 | 0·71 | | | |

*Estimates of Cronbach's Alpha for a 19-item scale, using the Spearman–Brown equation.
†From rotated factor pattern, using Varimax method.
‡Percentage Agree or Strongly agree.

TABLE 6. Patient factors associated with regular use of ICS (by logistic regression)

| Variable | Odds ratio | 95% confidence interval |
|---|---|---|
| 'Active' health belief | 4·6 | 2·8–7·5 |
| 'Serious' health belief | 2·3 | 1·4–3·7 |
| Hospitalization | 2·3 | 1·6–4·6 |

See text for description of model used.

more objective measures of compliance; however, it would be difficult to match the health beliefs of individuals with these data in a population study. The cross-sectional design also limited our ability to assess whether regular use of ICS was appropriate for all patients in this study. Although all respondents had a diagnosis of asthma, there was no evidence beyond a prescription for ICS that any patient's disease severity met criteria for persistent asthma. Furthermore, the instructions that physicians gave to their patients about how to take ICS were not available. It is possible that some of the patients had only intermittent asthma and were, in fact, instructed by their doctors to take medications sporadically. Even patients with mild, persistent asthma may not have been instructed to take their ICS medication daily since the need for this is challenged by some authorities (28,29). This uncertainty may also contribute to the inconsistent use of ICS reported by patients. Nonetheless, the associations we observed between compliance and patients' health beliefs suggest that improvements in asthma care may be dependent upon better communication between patients and providers, and upon a more active role of patients in selecting the type of medication used to control asthma.

## Acknowledgements

## References

1. Expert Panel Report 2. *Guidelines for the Diagnosis and Management of Asthma.* National Heart Lung and Blood Institute, April 1997, (NIH Publication No. 97-4051).
2. Donahue JG, Weiss ST, Livingston JM, Goetsch MA, Greineder DK, Platt R. Inhaled steroids and the risk of hospitalization for asthma. *JAMA* 1997; **277:** 887–891.
3. Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. *N Engl J Med* 1992; **326:** 862–866.
4. American Medical Association. *International Classification of Diseases: 9th Revision Clinical Modification.* Chicago, IL: American Medical Association, 1997.
5. Kirscht JP, Haefner DP, Kegeles SS, Rosenstock, IM. A national study of health beliefs. *J Health Hum Behav* 1966; **7:** 248–254.
6. Becker MH, Radius SM, Rosenstock IM, *et al.* Compliance with a medical regimen for asthma: a test of the Health Belief Model. *Publ Health Rep* 1978; **93:** 268–277.
7. Jones PK, Jones SL, Katz J. Improving compliance for asthmatic patients visiting the emergency department

using a health belief model intervention. *J Asthma* 1987; **24:** 199–206.

8. Hurley AC. The Health Belief Model: evaluation of a diabetes scale. *Diabetes Educator* 1990; **16:** 44–48.

9. Schwab T, Meyer J, Merrell R. Measuring attitudes and health beliefs among Mexican Americans with diabetes. *Diabetes Educator* 1995; **20:** 221–227.

10. Wilson SR. Patient and physician behavior models related to asthma care. *Med Care* 1993; **31:** MS49–MS60.

11. Bates AS, Fitzgerald J, Wolinsky FD. Reliability and validity of an instrument to measure maternal health beliefs. *Med Care* 1994; **32:** 832–846.

12. Hotelling H. Analysis of a complex of statistical variables into principal components. *J Educ Psychol* 1933; **24:** 417–441.

13. Kaiser HF. The varimax criterion for analytic rotation in factor analysis. *Psychometrika* 1958; **23:** 187–200.

14. Rand CS, Wise RA, Nides M, *et al.* Metered-dose inhaler adherence in a clinical trial *Am Rev Respir Dis* 1992; **146:** 1559–1564.

15. Yeung M, O'Connor SA, Parry DT, Cochrane GM. Compliance with prescribed drug therapy in asthma. *Respir Med* 1994; **88:** 31–35.

16. Dekker FW, Dielemann FE, Kaptein AA, Mulder JD. Compliance with pulmonary medication in general practice. *Eur Respir J* 1993; **6:** 886–890.

17. Kelloway JS, Wyatt RA, Adlis SA. Comparison of patients' compliance with prescribed oral and inhaled asthma medication. *Arch Intern Med* 1994; **154:** 1340–1352.

18. Stevens VJ, Severson H, Lichtenstein E, Little SJ, Leben J. Making the most of a teachable moment: a smokeless-tobacco cessation intervention in the dental office. *Am J Public Health* 1995; **85:** 231–235.

19. Leist JC, Kristofco RE. The changing paradigm for continuing medical education impact of information on the teachable moment. *Bull Med Libr Assoc* 1990; **78:** 173–179.

20. Ubel P. Informed consent: from bodily invasion to the seemingly mundane. *Arch Intern Med* 1996; **156:** 1262–1263.

21. Kasper JF, Mulley AG, Wennberg JE. Developing shared decision-making programs to improve the quality of health care. *Qual Rev Bull* 1992; **18:** 183–90.

22. Faden R. Disclosure of information to patients in medical care. *Med Care* 1981; **19:** 718–733.

23. Sulmasy DP, Lehmann LS, Levine DM, Faden RR. Patient's perception of the quality of informed consent for common medical procedure. *J Clin Ethics* 1994; **5:** 189–194.

24. Patel AM, Axen DM, Bartling SL, Guarderas JC. Practical considerations for managing asthma in adult. *Mayo Clin Proc* 1997; **72:** 749–756.

25. Braddock CH, Fihn SD, Levinson W, Jonsen AR, Pearlman RA. How doctors and patients discuss routine clinical decisions: informed decision-making in the outpatient setting. *J Gen Intern Med* 1997; **12:** 339–345.

26. Bartter T, Pratter MR. Asthma: better outcomes at lower costs? The role of the expert care system. *Chest* 1996; **110:** 1589–1596.

27. Zeiger RS, Heller S, Mellon MH, *et al.* Facilitated referral to asthma specialist reduces relapses in asthma emergency room visits. *J Allergy Clin Immunol* 1991; **87:** 1160–1168.

28. Haahtela T, Jarvinen M, Kava T, *et al.* Effects of reducing or discontinuing inhaled budesonide in patients with mild asthma. *N Engl J Med* 1994; **331:** 700–705.

29. Drazen JM, Israel E. Treating mild asthma – when are inhaled steroids indicated? *N Engl J Med* 1994; **331:** 737–739.

# Appendix

The health belief items to which the patients responded are shown below, by subscale:

## ACTIVE

I feel better when I listen to my physician's advice.
I feel I will always need to take medicine to control my asthma.
My physician and I decide together about my treatment for asthma.
I am satisfied with the treatment I am currently receiving for my asthma.

## BARRIERS

Good health is a matter of good luck.
No matter what I do I cannot control my asthma.
No matter what you do, if you are going to get sick, you will get sick.
It is God's will that I have asthma.

## BENEFITS

Medicine can help but not cure asthma.
I believe it is possible to be completely free of asthma symptoms.

## FRUSTRATION

I cannot understand everything I have been told about asthma.
Taking medicine to control asthma interferes with my daily activities.
I need more training in how to use my asthma medicine.

## MOTIVATION

I think about my health a lot.
Whenever I get sick, it concerns me a lot.
My health is the most important consideration in my life.

## SERIOUS

My asthma is no problem to me as long as I feel all right.
My asthma will cause me to be sick a lot.
It is very difficult for me to take care of my asthma.

The item concerning reasons why patients might not use ICS as prescribed is reproduced below.

If you do not use your steroid inhaler almost every day, can you tell us why? (**choose as many as apply to you**)

☐ I don't need another inhaler.
☐ It's too complicated to use two or more inhalers.
☐ I don't want to use steroids.
☐ It's too difficult to carry two or more inhalers.
☐ It doesn't help me feel better.
☐ It was inconvenient.
☐ I'm too lazy.
☐ I don't like the side-effects.

☐ It costs too much.
☐ It ran out and I never had it refilled.
☐ I use it only when I need it.
☐ I'm not sure which inhaler to use.
☐ I feel fine.
☐ I don't like using medicine unless I feel sick.
☐ I feel the same whether I use the inhaler or not.
☐ It's hard for me to use the inhaler.