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ORIGINAL ARTICLE

Management of Asthma Among Community-Based Primary Care Physicians

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Background. Despite significant improvements in asthma treatment and the dissemination of national and international guidelines for asthma management, there are ongoing concerns that suboptimal care is being provided for patients with asthma. **Objective.** To determine the current practice patterns of asthma care among primary care physicians. **Design.** A cross-sectional study. **Setting.** Province of Alberta, Canada (population: 3 million people). **Participants.** Patients, 5 years of age or older, who had a physician's diagnosis of asthma, and had at least two visits for asthma between 1996 and 2001. **Measurement and Results.** Charts of 3072 distinct patients (from 45 unique primary care physicians) were reviewed. Previous emergency department visits or hospitalizations were experienced by 20% of the sample. A total of 25% of patients had documented evidence that they had performed spirometry. More than half of the patients had no documented evidence that they had received any form of asthma education; only 2% of the charts indicated that patients received a written action plan. Two thirds of the patients were prescribed an inhaled steroid within 6 months of the last clinic visit. **Conclusions.** Our study indicates a gap in the provision of asthma education, written action plans, and spirometric testing for patients diagnosed with asthma among primary care physicians.

Keywords asthma, family medicine, community-based research, primary care research

INTRODUCTION

Asthma is a major health concern in Canada and elsewhere (1–6). Despite many advances in the understanding and treatment of asthma over the past 20 years, it remains the leading cause of physician visits, emergency admissions, hospitalizations, and missed school days among children in Canada (1, 7–10). Asthma is estimated to cost \$504 to \$548 million per annum in Canada (1990 dollar figures) (11). In the United States, the total indirect and direct costs related to asthma are over \$10 billion (12). Alarming, this represents a twofold rise in expenditures from 1987 until 1994 (12, 13).

To address the growing health burdens of asthma, numerous expert guidelines from various organizations have been widely promulgated to foster “evidence-based” practice and to reduce the large variations in care (14). Despite these efforts, several studies indicate that physicians may not be fully adhering to the asthma guidelines. One study indicates that less than 50% of asthmatic patients were prescribed medications, consistent with recommendations from a national consensus guidelines (15). In a

study of 1022 consecutive patients visiting the emergency room of two Edmonton hospitals for asthma exacerbation, only 52% were prescribed inhaled steroids (16). Similar findings have been reported in other jurisdictions (17–19). Importantly, nonadherence to the guidelines has been associated with increased asthma morbidity and costs (19–22).

A major limitation of these and other studies was that they concentrated largely on prescription patterns; little attention was paid to use of diagnostic tests or patient education, which are the cornerstones of asthma management (14, 23). To address these gaps in knowledge and to assess the potential gaps in asthma care, we conducted a large community-based initiative, aimed at understanding current asthma practice patterns among primary care physicians across Alberta.

METHODS

Alberta Strategy to Help Manage Asthma (ASTHMA)

The Alberta Strategy to Help Manage Asthma (ASTHMA) is a 4-year, three-phase project aimed at improving the care and outcomes of individuals with asthma in the province. The study is guided by the ASTHMA Executive Committee, which is composed of representatives from several key stakeholder groups including academia, government, and industry. The project was divided into three distinct phases of assessment, intervention, and evaluation. The goal of the first phase of the study was to assess the current patterns of asthma care in Alberta through chart reviews of patients in the offices of primary care physicians.

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Recruitment of Primary Care Physicians from the Community

Ethical approval for this study was obtained from both the Health Research Ethics Board of the University of Alberta and the Conjoint Health Research Ethics Board of the University of Calgary. On behalf of ASTHMA, the Alberta Family Practice Research Network (AFPRN) mailed out postcards to all primary care physicians (both members and nonmembers of AFPRN) in Alberta ($n = 2572$ physicians). The explicit expectation from all participating physicians was that they would allow ASTHMA full access to charts of their patients with asthma, provide space for a trained medical analyst (to perform data abstractions), and answer all questions concerning their practice. Positive responders to the postcards were contacted directly by a member of ASTHMA to confirm the physicians' intention of participating in the project and to arrange a face-to-face meeting with them and their office staff. Informed consent was obtained from those willing to participate. For physicians practicing in remote rural areas, an ASTHMA representative contacted each physician by phone to provide the study overview and expectations and to address concerns. A package containing all of the relevant study material and a consent form was then couriered to these physicians.

This resulted in the recruitment of 136 (5%) primary care physicians who agreed to participate. Of these, one third were randomly selected for detailed chart review conducted by certified health records analysts. Practices were drawn from the urban areas of Edmonton and Calgary, as well as from rural areas to ensure a representative sample. Participating physicians provided consent to Alberta Health

and Wellness, which based on billing data, generated a list of names of patients who were treated for asthma (International Classification of Diseases, 9th Revision, Clinical Modification code 493.xx) during the study period of 1996–2001 for each individual practice. The list was then sent in a confidential manner to each individual physician. Trained certified health record analysts reviewed the medical records of eligible patients using standardized data collection forms. Patients included were those 5 years of age or older with a physician's diagnosis of asthma and those who had at least two visits for asthma since 1996. Information was collected for the 10 most recent visits for asthma from 1996 to 2001.

Abstracted Information

The data abstracted from the patients' medical records included demographics (including concomitant illnesses), emergency room visits (ER) and hospitalizations for asthma, diagnostic tests (spirometry, peak flow, or complete lung function) performed for asthma, asthma triggers and symptoms, referral to specialists, referral to education center for asthma, and asthma medications.

Statistical Analysis

Patients with a previous ER visit/hospitalization for asthma were compared with those without documentation of an ER visit or hospitalization for asthma. Medication use was documented as current use or nonuse. We defined current use if a prescription was written within the last 6 months of the final visit. Continuous variables were compared by using a t-test, and dichotomous variables

TABLE 1.—Baseline characteristics of the study patients.

	No. overall (%)	No. without ER/hospital event (ever) (%)	No. with ER/hospital event (ever) (%)	<i>p</i>
<i>Patients in study</i>	3072 (100)	2467 (80)	605 (20)	
Age in years (average)	33 ± 20			
Age 5–17	903 (29)	681 (28)	222 (37)	< 0.0001
Age 18 +	2169 (71)	1786 (72)	383 (63)	
Females	1650 (54)	1338 (54)	312 (52)	NS
Smokers	755 (25)	614 (25)	141 (23)	NS
<i>Comorbidities</i>				
COPD	188 (6)	142 (6)	46 (8)	0.09
CAD	69 (2)	18 (2)	51 (3)	NS
Hypertension	238 (8)	191 (7)	47 (8)	NS
CHF	50 (2)	37 (1)	13 (2)	NS
Thyroid	88 (3)	73 (3)	15 (2)	NS
DM	98 (3)	76 (3)	22 (4)	NS
Peptic ulcer	39 (1)	31 (1)	8 (1)	NS
GERD	160 (5)	121 (5)	39 (6)	NS
Arthritis	170 (5)	134 (5)	36 (6)	NS
Depression	406 (13)	325 (13)	81 (13)	NS
Cancer	58 (2)	46 (2)	12 (2)	NS
Other*	168 (5)	126 (5)	42 (7)	0.08
<i>Asthma physician visits (since 1996)</i>				
Mean asthma visits	6.6 ± 6.4	5.8 ± 4.8	9.8 ± 10.0	< 0.0001
Patients with 1–3 visits to PCP since 1996	1086 (35)	972 (40)	114 (19)	< 0.0001
Patients with >4 visits to PCP since 1996	1986 (65)	1495 (61)	491 (81)	

ER: emergency room; COPD: chronic obstructive pulmonary disease; CAD: coronary artery disease; CHF: congestive heart failure; DM: diabetes mellitus; PCP: primary care physician; GERD: gastroesophageal reflux disease; NS: not significant.

*Other: other psychiatric diseases, kidney, liver, or peripheral vascular diseases.

TABLE 2.—Pulmonary tests and education in primary care.

	No. overall (%)	No. without ER/hospital event (ever) (%)	No. with ER/hospital event (ever) (%)	<i>p</i>
Pulmonary function tests (other than peak flow)	759 (25)	559 (23)	200 (33)	< 0.0001
Airway hyperresponsiveness test	30 (1)	25 (1)	5 (0.8)	NS
Peak flow monitoring	1411 (46)	1059 (43)	352 (58)	< 0.0001
No tests documented*	1048 (34)	934 (38)	114 (19)	< 0.0001
Chest x-ray	808 (26)	566 (23)	242 (40)	< 0.0001
Education				
Environmental factors	677 (22)	464 (19)	213 (35)	< 0.0001
Inhaler use	612 (20)	439 (18)	173 (29)	< 0.0001
Home PEF	310 (10)	189 (8)	121 (20)	< 0.0001
Smoking cessation	397 (13)	313 (13)	84 (14)	NS
Written action plan	51 (2)	25 (1)	26 (4)	< 0.0001
No education documented	1687 (55)	1448 (59)	239 (40)	< 0.0001

PEF: peak expiratory flow; ER: emergency room; NS: not significant.

*No documentation of pulmonary function tests, peak flow monitoring, or airway hyperresponsiveness tests performed.

were compared by using a chi-squared test with appropriate degrees of freedom.

To determine the independent relationship between various patient and physician characteristics, lung function measurement, patient education, and inhaled corticosteroid use, we constructed a multiple logistic regression model that sequentially added patient level, physician level, and regional characteristics. This allowed us to adjust for the hierarchical nature of the data (patients nested within individual physician practices, which were nested within regional characteristics). The regional variable was dichotomized into urban and rural areas. In the final model, we included age, gender, comorbidities, area of residence, smoking status of patients, the number of asthma visits since 1996, emergency room visits or hospitalizations for asthma since 1996, and presence of symptoms or documentation of asthma triggers as covariates. Statistical significance was defined as $p < 0.05$ for all analyses. We used SAS statistical software version 8.1 (SAS Institute Inc., Cary, NC) for the statistical analyses.

RESULTS

The medical records of 3072 patients were reviewed (Table 1). Values are presented as mean \pm standard deviation (SD). The average age of the patients was 33 (± 20 years), with 29% between the ages of 5 and 17 and 71% aged 18 and above. Fifty-four percent of patients were female, and 25% were current smokers. There were 605

patients (20%) who had been previously hospitalized or had visited an emergency department for asthma as noted in their chart.

The number of comorbidities was relatively few; the most frequent were depression (13%), followed by hypertension (8%), chronic obstructive pulmonary disease (6%), and arthritis (6%). There were no differences in comorbidities between those with an ER/hospital event versus those without. The average number of physician visits for asthma since 1996 was 7 (± 6.4). Overall, 65% of patients had more than four visits to their family physician for asthma since 1996. Patients with an ER/hospital event had more physician visits (9.8 ± 9.9) compared to those without (5.8 ± 4.8 ; $p = 0.001$). Only 22.4% of patients visited their primary care physician within 1 week of an ER/hospital event, and 48.9% within 90 days.

Diagnostic and monitoring tests for asthma were performed relatively infrequently (Table 2). A total of 25% of patients had documentation of any pulmonary function test, and 34% of patients had no pulmonary function tests documented at all. Forty-six percent of patients had documented ever using peak flow monitoring. Patients with an ER/hospital event were more likely to have pulmonary function tests performed (33%) compared to those without (23%; $p = 0.001$). A total of 55% of patients had no education for asthma documented, and 2% of patients received a written action plan. Those who did receive education received it on environmental factor

TABLE 3.—Medication use within the past 6 months.

	No. overall (%)	No. without ER/hospital event (ever) (%)	No. with ER/hospital event (ever) (%)	<i>p</i>
Short-acting β_2	2457 (80)	1973 (80)	484 (80)	NS
Inhaled steroids	2101 (68)	1646 (67)	455 (75)	< 0.0001
Oral steroids	346 (11)	249 (10)	97 (16)	< 0.0001
Theophylline	92 (3)	65 (3)	27 (4)	< 0.02
Long-acting β_2	253 (8)	175 (7)	78 (13)	< 0.0001
Leukotriene antagonists	211 (7)	150 (6)	61 (10)	< 0.0005
Antibiotics	482 (16)	391 (16)	91 (15)	NS
Other*	340 (11)	230 (9)	110 (18)	< 0.0001
No medications documented	140 (5)	112 (4)	28 (5)	NS

NS: not significant; ER: emergency room.

*Other: ipratropium, ketotifen, nedocromil, combinations.

TABLE 4.—Predictors of asthma education, use of spirometry, and inhaled corticosteroids.

	Use of spirometry odds ratios (95% CI)	Patient education odds ratios (95% CI)	Use of inhaled steroids odds ratios (95% CI)
Age (≤ 17)*	2.71 (2.13, 3.46)	0.67 (0.56, 0.80)	NS
Gender (female)	NS	NS	NS
Comorbidities (none)	2.07 (1.72, 2.49)	NS	NS
Region of residence (urban)	NS	NS	NS
Smoker (no)	NS	3.85 (3.15, 4.71)	NS
Asthma visits (≤ 4 since 1996)	1.62 (1.36, 1.94)	1.77 (1.51, 2.08)	1.78 (1.52, 2.08)
ER/hospital event (none ever)	1.63 (1.33, 2.01)	1.80 (1.48, 2.20)	1.33 (1.08, 1.63)
Symptoms (none documented)	NS	2.20 (1.51, 3.22)	1.64 (1.23, 2.18)
Triggers (none documented)	1.44 (1.19, 1.74)	4.26 (3.56, 5.10)	NS

ER: emergency room; NS: not significant.

*The reference group is shown in brackets.

control (22%), inhaler use (20%), and smoking cessation (13%). Patients with an ER/hospital event were more likely to have at least some education documented.

Patients were most commonly referred to an allergist (16%), followed by respirologists (8%), and by asthma teaching clinics (6%). Sixty-three percent of patients had no documentation of any referrals. Patients with an ER/hospital event were more likely to be referred to a specialist or asthma teaching clinic; however, the absolute numbers were low. The most commonly documented trigger of asthma symptoms was that of allergens (35%), followed by respiratory infection (28%), and nonallergic irritants (13%). Thirty-five percent of patients had no documentation of any triggers. The most common symptoms of asthma documented were cough (76%), followed by wheeze (70%), dyspnea (37%), and chest tightness (27%). Seven percent of patients had no documentation of any symptoms. Patients with an ER/hospital event tended to have more symptoms documented than those without.

Medication use is shown in Table 3. As a group, the most commonly used asthma medications were short-acting β_2 -agonists (80%), followed by inhaled steroids (68%), oral corticosteroids (11%), long-acting β_2 -agonists (8%), leukotriene modifiers (7%), and antibiotics (16%). Five percent of patients had no medications for asthma documented.

Factors significantly associated with receipt of patient education were those less than 18 years of age, smokers, those with a previous ER or hospital visit for their asthma, and those with four or more clinic visits (Table 4). The latter two factors were also significantly associated with the use of inhaled corticosteroids. Use of spirometry was more common in adults and in those with comorbidities.

DISCUSSION

Our study findings indicate a gap in the provision of asthma education, written action plans, and spirometry testing for asthmatic patients in the community. Indeed, only 2% of asthmatic participants were provided with a written action plan as documented by their physician. Only 25% had spirometry testing ever ordered by a physician. Even among those with one or more visits to the emergency department or hospitalization (suggesting moderate-to-severe asthma) only 4% received written action plans and

33% had spirometry testing. These data suggest that in community practice, notwithstanding recommendations from expert panels, usual asthma care does not include the use of written action plans and other forms of asthma education or spirometry.

The reason for the underuse of asthma education and spirometry testing could not be ascertained in our study. However, because primary care physicians generally lack manpower resources and do not have on-site spirometers, there may be significant logistical barriers within primary care settings for the provision of nonpharmaceutical therapy of asthma. Because asthma is predominantly a self-managed condition, this represents an important gap in the management of this disease. Because we could not judge the quality of asthma education when it was documented, this may even be an underestimate of the need for asthma education. The Canadian asthma guidelines strongly recommend provision of a written action plan for patients' self-management of their asthma according to peak flow and symptoms (14).

As expected, most patients were prescribed a short-acting β_2 -agonist for symptomatic relief. The cornerstone of asthma pharmacotherapy is the use of inhaled steroids to address the inflammatory component of this disease (14). Overall, two thirds of the patients were prescribed an inhaled corticosteroid. In those patients with a previous ER/hospital event, only 75% of patients were prescribed an inhaled corticosteroid. Although the optimal proportion of patients who should be receiving inhaled corticosteroids is not known, this rate may be low especially in the ER/hospital group. The design of the present study does not allow for assessment of other important parameters of medication use such as medication adherence (with short-acting β_2 -agonist and inhaled steroids) and proper inhaler technique.

This study has several potential limitations. First, as a retrospective medical record review, we are limited by the accuracy and completeness of chart documentation. Second, there is also potential for physician volunteer bias. We sought to obtain a representative cross section of primary care physicians and their patients with asthma. Using this sampling process, physicians more interested in asthma care are more likely to volunteer to have their charts or patterns of practice reviewed. If that were the case, our results might represent an overestimate of the general level of asthma care.

CONCLUSIONS

In this review of more than 3000 patients and 45 primary care physician practices, we identified a number of potential gaps in asthma management. These include limited follow-up of patients following acute exacerbations, low use of pulmonary function testing, poor documentation of asthma triggers, lack of patient education on collaborative asthma self-management, and potential underprescription of anti-inflammatory medications. Future research should include practice-based studies aimed at assessing the barriers to optimal care and developing interventions that would improve access to essential components of asthma care including patient education and objective testing with spirometry.

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