

## Self-Reported Physician Practices for Children With Asthma: Are National Guidelines Followed?

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**Abstract. Objective.** To determine self-reported adherence to national asthma guidelines for children by primary care physicians in managed care; and, to analyze sources of variation in these practices by physician specialty and managed care practice type.

**Design.** A survey of 671 primary care physicians (pediatricians and family physicians) practicing in 3 geographically diverse managed care organizations (MCO). Domains of interest included asthma diagnosis, pharmacotherapy, patient education and follow-up, and indications for specialty referral. Item formats included self-reports of usual practice and responses to case vignettes.

**Results.** A total of 429 (64%) physicians returned surveys, 22 of whom did not meet criteria for inclusion in the analysis. Most respondents had both heard of (91%) and read (72%) the National Asthma Education and Prevention Program (NAEPP) guidelines. For diagnosis, 75% reported routine use of office peak flow measurement, but only 21% used spirometry routinely. Family physicians were more likely than pediatricians to use spirometry in diagnosis (odds ratio [OR] = 5.9), and less likely to recommend daily peak flow measurement (OR = .3). The median reported frequency of providing written care plans was only 50%. Though inhaled corticosteroids were deemed very safe or safe by 93%, almost half had specific concerns regarding at least 1 side effect, most commonly growth delay. Primary care physicians' criteria for referral to an asthma specialist differed from those of the NAEPP panel in choosing to manage more severe patients without asthma specialist input. Family physicians were more likely than pediatricians to refer a child after a single hospitalization, 2 to 3 emergency department visits, after 2 exacerbations, or if the child was <3 years old and required daily medications. Responses to vignettes showed generally appropriate initial use of antiinflammatory agents, but reluctance to increase the dose in response to continued symptoms, and less frequent follow-up than recommended by the NAEPP.

**Conclusion.** Most physicians for children report having read and adopted NAEPP guideline recommendations for asthma treatment, including generally ap-

propriate use of medications. Opportunities for improvement exist in specific areas such as the use of written care plans, optimizing antiinflammatory dosing, and providing routine follow-up. Although physicians show evidence of awareness of national guidelines and knowledge consistent with much of their content, additional work is required to promote the use of self-management tools in practice. *Pediatrics* 2000;106:886–896; *asthma, primary care physicians, managed care organizations, practice guidelines.*

ABBREVIATIONS. NAEPP, National Asthma Education and Prevention Program; MCO, managed care organization; PORT, Patient Outcomes Research Team; RPHS, Rush-Prudential Health System; GHC, Group Health Cooperative of Puget Sound; HPHC, Harvard Pilgrim Health Care; ED, emergency department; RAST, radioallergosorbent testing; OR, odds ratio; CI, 95% confidence interval.

Care for childhood asthma has been the subject of widely distributed guidelines developed based on available evidence and expert consensus by the National Asthma Education and Prevention Program (NAEPP).<sup>1</sup> Childhood asthma has been an appropriate target for care improvement for several reasons. First, it is a common condition with increasing prevalence,<sup>2,3</sup> causing substantial morbidity for children<sup>4</sup> and costs for society.<sup>5,6</sup> Second, there has been a major shift in our understanding of the pathogenesis of asthma as a chronic inflammatory condition, with resultant changes in recommended therapy.<sup>7,8</sup> The NAEPP attempted, through its guideline in 1991<sup>9</sup> and revision in 1997,<sup>1</sup> to organize diagnosis and treatment into a straightforward stepwise approach that encourages treatment with antiinflammatory agents for all patients with persistent asthma. In addition, the guidelines stress approaches to promote partnerships with patients that include providing written action plans and other tools for self-management. The NAEPP used a structured process to arrive at recommendations based on evidence when available, and consensus of experts when evidence was insufficient.<sup>1</sup>

Managed care organizations (MCOs) have particularly embraced the use of clinical guidelines for asthma as one way to reduce unwanted variation, improve clinical outcomes, and reduce costs.<sup>10</sup> Many organizations have accepted the NAEPP's core recommendations as representing best prac-

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tice for this condition, although some have modified guidelines based on local practice norms.<sup>11</sup> Despite the dissemination efforts of the NAEPP and local efforts by many MCOs, it is unclear what impact the guidelines have had on actual practice. In adolescents and adults in one California health maintenance organization, antiinflammatory use was low even among asthmatics with severe current symptoms.<sup>12,13</sup>

There is evidence that dissemination of guidelines alone has minimal impact on physician behavior.<sup>14,15</sup> Although changes in understanding of a condition or treatment do not always result in changes in behaviors such as drug prescribing, the former is a prerequisite for actual practice change. One way to assess changes in knowledge is to survey physicians about their usual practices. Although responses to surveys may not always correlate with actual practice behaviors,<sup>16</sup> they may be a good reflection of whether the first step in the behavior change process has been successful.

We surveyed primary care physicians associated with 3 MCOs in 3 cities. Our goals were to assess the current state of physician understanding of asthma care for children according to the NAEPP guidelines, and to assess potential sources of variation in self-reported patterns of care including physician specialty and type of managed care delivery system (staff or network model). Specifically, we assessed use of tests for the diagnosis of asthma, views of the safety of inhaled corticosteroids, and perceived indications for specialty referral. Using brief case vignettes we compared physician self-reported practices to those recommended in the guidelines.

## METHODS

As part of the Pediatric Asthma Care PORT (Patient Outcomes Research Team), a multi-center trial of strategies for asthma care improvement,<sup>17</sup> we surveyed physicians in MCOs regarding their current asthma care practices. The 3 participating organizations included Rush-Prudential Health System (RPHS), Chicago, Illinois; Group Health Cooperative of Puget Sound (GHC), Seattle, Washington; and Harvard Pilgrim Health Care (HPHC), Boston, Massachusetts).

The survey focused on the domains of diagnosis, pharmacotherapy, patient education and follow-up, and indications for specialty referral. Items included explicit reports of usual practice and responses to brief case vignettes. The survey instrument was based in part on a previous asthma survey of Chicago-area physicians<sup>18</sup> and modified by the study team. Three case vignettes (see the Appendix) were developed to represent children with a range of asthma severity, and pretested at each of the sites. After each case, clinicians were asked 4 to 7 questions regarding severity classification, diagnostic testing maneuvers and medication changes, appropriateness of specialty referral, and recommended follow-up frequency. A panel consisting of 4 generalist physicians and 4 allergists collaborating in the PORT rated all vignette responses as acceptable or unacceptable according to the NAEPP guidelines. For items on which there was initial disagreement, a modified Delphi approach was used in which responses of the entire panel were shared with each member. Three of the original 19 items were excluded from analysis: 2 were excluded before analysis to achieve rough balance in the number of items in each subscore, and 1 because a consensus on acceptable responses could not be reached. Acceptable responses were summed across vignettes and divided by the total number of possible acceptable responses to form 1 total score and 5 subscores in the following categories: severity

classification, evaluation and monitoring, pharmacotherapy, specialty referral, and follow-up.

The sample included all physicians providing primary care to children (pediatricians and family physicians at RPHS and GHC and pediatricians at HPHC). Because of the large number of family physicians at GHC, in that health plan we surveyed pediatricians and a randomly selected sample (18%) of family physicians. Surveys were mailed in the spring of 1998, with at least 2 reminders (by fax, e-mail, or mail) sent to each nonrespondent. Surveys were returned from March to August, 1998. Responses were excluded from analysis if the physician reported  $\leq 25\%$  of their time or  $< 8$  hours per week in clinical practice, or a specialty other than pediatrics or family medicine. All analyses were performed using SAS (Version 6.12, SAS Institute, Cary, NC). We report overall responses for items of interest, as well as differences in responses according to physician specialty (family medicine versus pediatrics) and managed care type (staff or large group model versus nonstaff model). Associations with categorical variables were tested for significance using the  $\chi^2$  test or the  $\chi^2$  test for trend; the Wilcoxon rank sum test was used to compare nonparametric continuous variables. Finally, multivariate logistic regression models were used to assess the impact of predictor variables of interest controlling for possible confounders. All final models included site, MCO type, and physician years in practice. Gender was excluded from final models because it was not associated with outcome variables of interest. The study was approved by the human subjects committee at each of the sites.

## RESULTS

Of the 722 surveys mailed, 51 were returned as undeliverable. Of the remaining 671, 429 were returned for an overall response rate of 64%. The response rates in the 3 MCOs were 65%, 64%, and 64%. Of the 429 surveys completed, an additional 22 respondents were excluded from analysis, 13 because they reported  $< 25\%$  of their time spent in clinical practice, and 9 because they listed a primary specialty other than family medicine or pediatrics. The final number of completed, eligible surveys for analysis was 407. Because no item had missing responses for  $> 5\%$  of respondents, we have omitted the number missing for each item from data tables.

Respondents reported a mean of 20.6 years since medical school graduation and engaged in a median of 35 clinical hours each week. Almost all respondents (91%) had heard of the NAEPP guidelines; 72% reported having read them. Of this group, respondents were equally divided among those reporting them very useful and somewhat useful;  $< 1\%$  found them not useful.

Table 1 presents overall responses from the 3 sites for the domains of diagnosis and monitoring. For initial work-up, a majority reported frequently using office peak flow measurement and roughly half reported recommending daily home peak flow monitoring. Only 21% reported using spirometry always or most of the time. Chest radiograph use was relatively common, while use of sinus radiographs was not. Response to  $\beta$ -agonist medications was reportedly assessed always or most of the time. When asked about follow-up visits, almost all providers (85%–99%) reported obtaining key elements of clinical history, but fewer (72%) routinely obtained office peak flow measurements and only 8.3% routinely used spirometry. Only 33% reported routinely observing patients' inhaler technique. When asked to identify the percent of pa-

**TABLE 1.** Diagnosis and Management

Item	% Always/ Most of the Time	% Some of the Time	% Rarely or Never
In new diagnosis of asthma (5–17 y), use of			
Spirometry	20.6	20.6	58.9
Chest radiograph	27.4	40.8	31.8
Sinus radiograph	3.8	45.5	50.8
Skin or radioallergosorbent testing	4.0	36.9	59.1
Office measurement of peak flow*	75.4	15.6	8.9
Trial of daily peak flow monitoring	49.1	37.2	13.7
Trial of $\beta$ -agonists	95.3	4.7	0
In routine follow-up, monitoring of			
Frequency of wheeze/cough*	96.5	3.0	.5
Frequency of disturbed sleep†	84.4	13.2	2.5
Frequency of $\beta$ -agonist use*	99.2	.8	0
Loss of days from work/school*	86.5	12.3	1.3
Direct observation of inhaler technique*	33.2	43.9	22.9
Office peak flow measurement	72.3	21.4	6.2
Spirometry	8.3	19.9	71.8
Percent receiving spacer device	Median response = 90% (interquartile range = 50–100)†		
Percent receiving written treatment plan	Median response = 50% (interquartile range = 10–90)†		

\* Recommended by NAEPP guidelines for virtually all asthma patients.

† Interquartile range is the range between the 25th percentile and 75th percentile of response to this item.

tients for whom they recommend spacer devices, the median response was 90% (interquartile range = 50%–100%). The use of written treatment plans was less common with a median response indicating use in 50% (interquartile range = 10%–90%) of children.

Twenty-six percent of respondents rated inhaled corticosteroids very safe, and 66% rated them safe. However, substantial fractions (Table 2) reported at least moderate concern for their effect on linear growth (21.7%), oral thrush (18.8%), adrenal suppression (18.6%), and disseminated varicella (18.4%). A smaller number were concerned about cataracts (14.6%), bone density problems (11.6%) or avascular necrosis of the femoral head (11.4%). Forty-seven percent were at least moderately concerned about 1 or more of these side effects.

Table 3 identifies criteria for which primary care physicians report they would usually refer a child with asthma for specialty care. Seven of these indications are explicitly listed in the NAEPP guidelines as criteria for referral or for consideration of referral. Consistent with the guideline's criteria, the vast majority of physicians (93% or more) would

**TABLE 2.** Concerns Regarding Inhaled Corticosteroids in Children

Potential Concern	Percent at Least Moderately Concerned*
Growth delay	21.7
Oral thrush	18.8
Adrenal suppression effects (besides growth)	18.6
Risk of disseminated varicella	18.4
Cataracts	14.6
Bone density problems	11.6
Avascular necrosis of the femoral head	11.4
Percent reporting 1 or more concerns	46.9

\* Includes respondents reporting very concerned or moderately concerned, but not a little concerned, not concerned, or unsure.

refer a patient who had a life-threatening asthma event, was not responding to treatment, had severe persistent asthma, or had atypical asthma. However, only 40% would refer a patient who had 2 exacerbations requiring oral steroids, which is also a listed indication for referral in the NAEPP guidelines. We queried physicians about 2 indications for which the guideline recommends that clinicians consider referral. Among these, 72% would refer a child <3 years old requiring daily medication, and 52% would refer all patients with moderate persistent disease. Thirteen percent of those responding usually refer asthma patients in the mild persistent category. Of indications not specifically mentioned in the guidelines, 89% and 49%

**TABLE 3.** Perceived Indications for Specialty Referral

Possible Indication	Percent Reporting Yes*
Listed indications for recommended referral in the NAEPP guidelines	
All patients with severe persistent asthma	98.8
Poor response to therapy after 3 to 6 months	97.0
A life threatening asthma episode	96.5
Signs or symptoms that are "atypical"	93.0
Two exacerbations requiring oral steroids	40.1
Listed indications to consider referral in the NAEPP guidelines	
A child $\leq$ 3 y requiring daily medication	72.3
All patients with moderate persistent asthma	51.5
Indications not specifically mentioned	
Two or 3 hospitalizations in 1 year	89.3
Two or 3 ED visits in 1 year	49.3
A single hospitalization	23.4
All patients with mild persistent asthma	12.9
A single ED visit	3.0

\* Percent reporting that each event would "usually lead you to recommend a consultation visit with an asthma specialist (allergist/pulmonologist)."

would refer patients with multiple hospitalizations or emergency department (ED) visits respectively. Only 23% would refer for a single hospitalization, and only 3% for a single ED visit.

The mean score of acceptable answers to the 16 vignette items (total score) was 74%  $\pm$  11%, and approximated a normal distribution. The means for each of 5 subscores are given in Table 4, and range from 63% (severity classification) to 85% (pharmacotherapy). We further analyzed responses to determine if unacceptable responses were clustered in individual items, and whether they showed a particular pattern (eg, reluctance to use inhaled steroids). Within severity classification, the patient described as having mild persistent asthma was identified as moderate persistent by 34% of respondents, while the severe persistent patient was labeled moderate persistent by 41%. Of the evaluation and monitoring items, 60% suggested daily peak flow monitoring for the mild persistent case, while the panel suggested peak flow monitoring intermittently or with symptoms. Conversely, for the child described with severe asthma, the expert panel recommended spirometry, while 30% of respondents chose to use a hand-held peak flow meter only. The medication items were answered acceptably by 73% to 95% of respondents. The most frequent unacceptable response (by 20% of respondents) was maintaining the most severe patient (with continuing symptoms) on the same dose of inhaled corticosteroids. For the follow-up care items, the unacceptable responses were almost all in the direction of less follow-up than recommended by the NAEPP guidelines. Unacceptable responses for specialty referral items included overreferring the mild persistent patient and underreferring the most severe.

Our analysis of the influence of physician specialty and practice setting included all of the domains surveyed. Figure 1 characterizes the association of physician specialty with reports of use of selected diagnostic tests. Crude analysis (represented by horizontal bars) showed that family medicine physicians were more likely to use several diagnostic maneuvers such as office peak flow (96% vs 68%;  $P < .001$ ), spirometry (40% vs 12%;  $P < .001$ ), chest radiographs (38% vs 24%;  $P < .01$ ), sinus radiographs (10% vs 1%;  $P < .001$ ), and skin or radioallergosorbent testing (RAST; 8% vs 3%;  $P = .03$ ). Pediatricians were more likely to report using daily peak flow monitoring in the diagnosis

(54% vs 36%;  $P < .01$ ). After control for study site, managed care type, and years in practice, family physicians were more likely to use spirometry in the diagnosis of asthma (odds ratio [OR] = 5.9; 95% confidence interval [CI]: 2.4, 14.6), and 4 times less likely to use daily peak flow measurement (OR = 0.3; CI: .1, .5).

Substantial differences by respondent specialty were also apparent in the reports of indications for specialty referral (Fig 2). For indications for which 90% or more of physicians would usually refer, such as poor response to treatment or a life-threatening event, there were no differences by physician specialty. However, family medicine physicians were more likely to refer a patient with 2 to 3 ED visits (78% vs 40%;  $P < .001$ ), a single hospitalization (49% vs 14%;  $P < .001$ ), 2 exacerbations requiring treatment with oral steroids (68% vs 30%;  $P < .001$ ), or a child <3 years old requiring daily medication (95% vs 64%;  $P < .001$ ). After control for study site, managed care type, and years in practice, family medicine physicians remained more likely to refer a child after a single hospitalization (OR = 2.8; CI: 1.3, 6.3), after 2 to 3 ED visits (OR = 5.1; CI: 2.5, 10.5), after 2 exacerbations requiring treatment with oral steroids (OR = 2.9; CI: 1.4, 6.0), and for children <3 years old requiring daily medications (OR = 7.8; CI: 2.7, 23.1). There were no significant differences in the total score on vignette items by physician specialty. The only subscore that differed between pediatricians and family physicians was that for specialty referral.

We found less striking differences in diagnosis and referral patterns according to the type of delivery system in which physicians practiced. In crude analyses, physicians in staff/large group model MCOs reported more frequent use of office peak flow measurement (93% vs 60%;  $P < .001$ ), spirometry (27% vs 15%;  $P < .01$ ), sinus films (7.8% vs 0%;  $P < .001$ ), and skin testing (6.3% vs 1.9%;  $P < .05$ ). After controlling for potential confounders, only differences in office peak flow use (OR = 4.6; CI: 2.1, 10.3) and daily peak flow use (OR = 2.4; CI: 1.3, 4.3) were significant. Staff/large group model physicians in our sample were more likely to refer patients for specialty care who had 2 or more exacerbations requiring oral steroids (53% vs 29%;  $P < .001$ ), 2 or 3 ED visits (62% vs 37%;  $P < .001$ ), 1 hospitalization (36% vs 12%;  $P < .001$ ), or who were <3 years old and required daily medication (81% vs 64%;  $P < .001$ ). However, none of these effects remained significant after control for study site, physician specialty, and years in practice. We found no differences by managed care type on the vignette total score or on any of the subscores.

## DISCUSSION

Asthma is the most common chronic condition in childhood, responsible for substantial morbidity including 200 000 hospitalizations and 10.1 million school days missed,<sup>4,19,20</sup> as well as an estimated \$1.3 billion in direct and indirect costs.<sup>5</sup> It is not surprising then, that treatment for asthma has been the subject of both national consensus guide-

TABLE 4. Responses to Case Vignettes

	Number of Items Scored	Mean Percent (Standard Deviation) of Items Answered Correctly
Severity classification	3	63 (21)
Evaluation and monitoring	4	70 (18)
Pharmacotherapy	3	85 (20)
Follow-up	4	74 (26)
Specialty referral	2	75 (28)
Total score	16	74 (11)

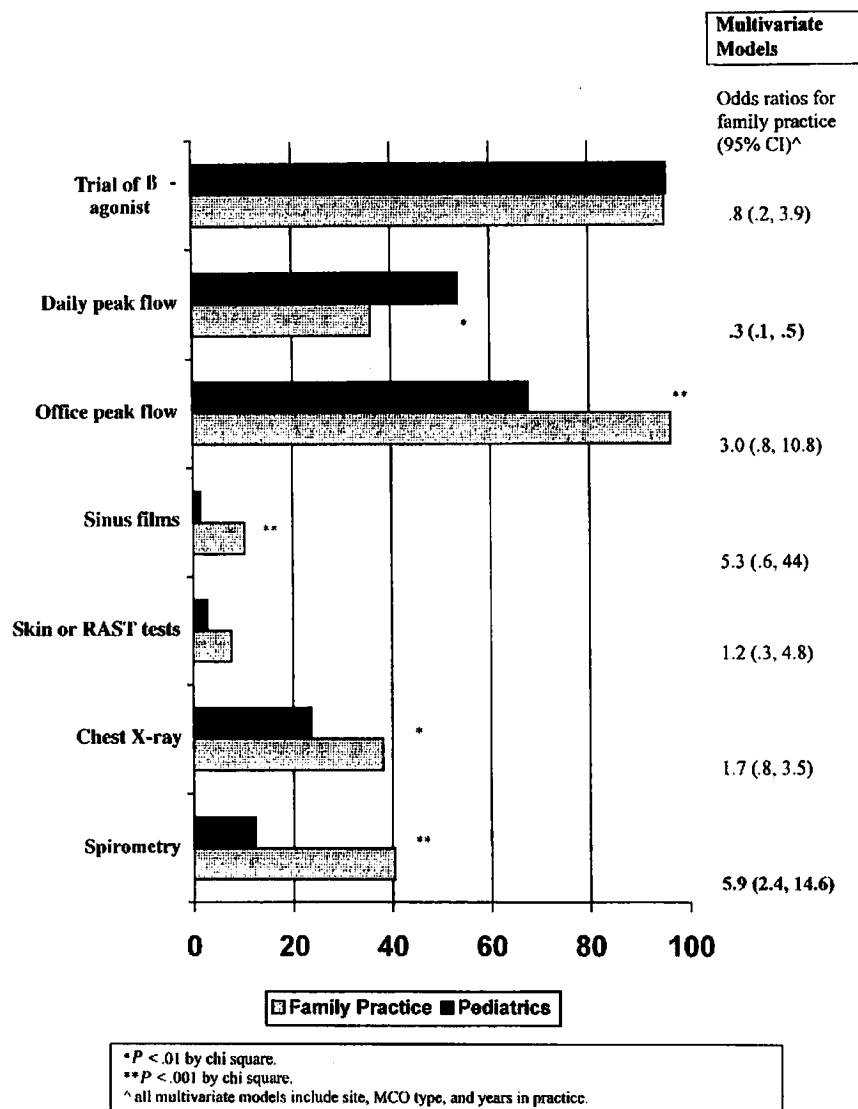


Fig 1. Diagnostic testing by physician specialty (pediatrician vs family physician).

lines<sup>1</sup> and local care improvement efforts by many MCOs and others over the last several years.<sup>10,21</sup> Given the attention paid to this condition, we believe that analysis of self-reported physician treatment patterns is important. Our data show that self-reported practice among these physicians tracks closely with the guidelines in some areas but is fairly discrepant in others. For example, we were impressed with the widespread reported use of office-based peak flow monitoring and daily monitoring for some patients, which was a major area of focus for both the 1991 and 1997 editions of the NAEPP document.<sup>1,9</sup> The mean proportion of correct responses to medication questions in case vignettes was 85%, reflecting substantial understanding of the role of antiinflammatory agents in asthma treatment. However, another key recommendation, that all children with asthma receive a written action plan, is reportedly followed for only half of patients.

A recent survey of Massachusetts pediatricians

focused on criteria for the initial diagnosis of asthma.<sup>22</sup> These authors report widespread use of diagnostic criteria that are consistent with the NAEPP guidelines, but variation in those thought necessary for diagnosis, and in the combinations of criteria used. Rates of objective measurement of lung function (such as spirometry) were low compared with guideline recommendations, and consistent with the results presented here. A Chicago-area survey of primary care physicians<sup>18</sup> showed reported rates of spirometry of 55% and chest radiograph of 54% in the new diagnosis of asthma, but this included physicians caring for both adults and children. In summary, these surveys consistently show reports of underuse of objective measurement of lung function (especially spirometry) compared with national guidelines.

The level of concern we found regarding use of inhaled corticosteroids in children (93% believing they were very safe or safe) was similar to that reported by Chicago-area physicians for individu-

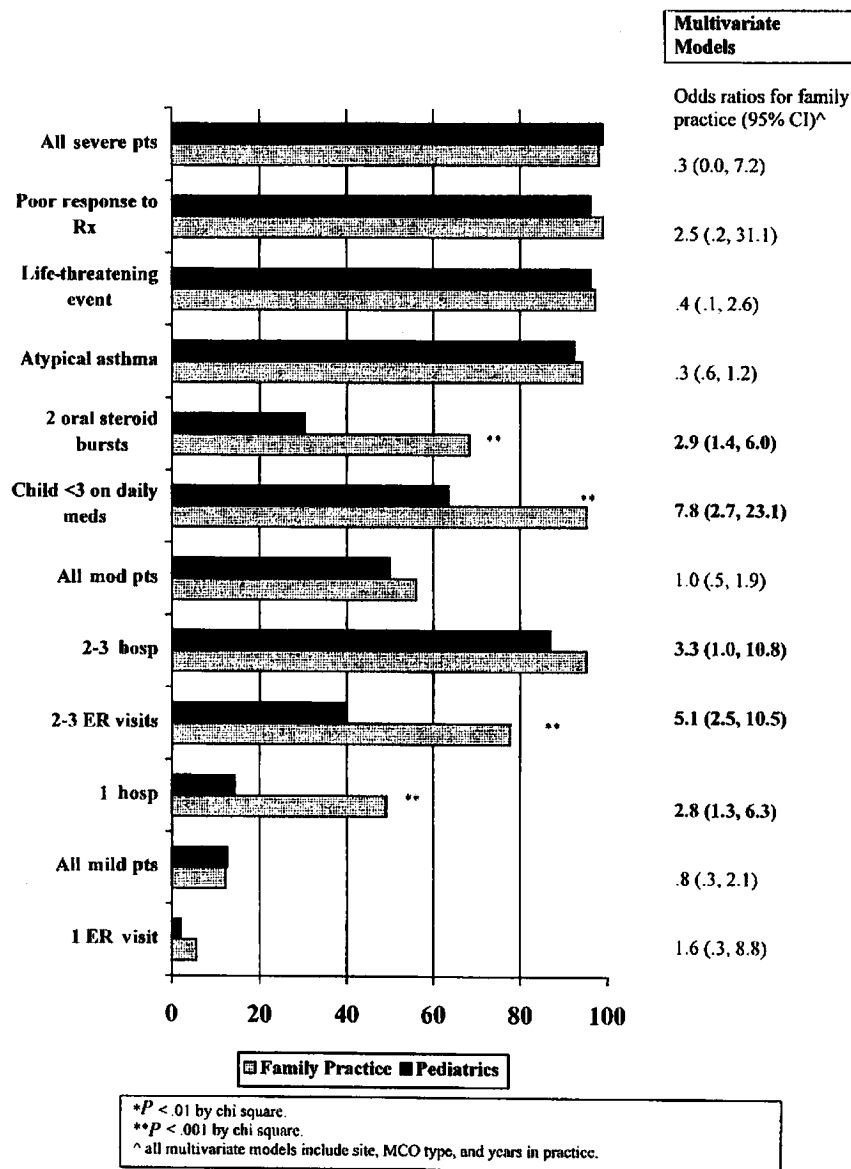


Fig 2. Indications for specialty referral by physician specialty (pediatrician vs family physician).

als >5 years old.<sup>18</sup> These data suggest that although concerns regarding the potential side effects are present, they are not so widespread or intense as to preclude their use. However, the current survey found that a substantial fraction of physicians expressed specific concerns about corticosteroid use when queried. Both surveys antedated the change in labeling of inhaled corticosteroids by the Food and Drug Administration that highlighted concerns of their possible effects on linear growth in children.<sup>23</sup> Growth delay was the most common concern expressed by physicians in our sample.

No data were available to guide the NAEPP panel in recommending specific indications for specialty referral. Rather, a consensus process was used that largely reflected the opinions of asthma specialists and generalist physicians with a specific interest in asthma care. Our data suggest many of the indications for referral recommended by the panel are

consistent with the current views of primary care physicians. Life-threatening asthma, severe asthma, or asthma not responding to therapy were considered by all to be indications for referral. However, the primary care physicians we surveyed are less likely to refer patients with moderate persistent asthma, 2 exacerbations requiring oral steroids, a single hospitalization, or several ED visits. This suggests they are more comfortable than the NAEPP panel with management of children with evidence of substantial asthma morbidity in primary care settings. Results of a survey of asthma specialists about appropriate criteria for referral<sup>24</sup> were more consistent with the views expressed by the NAEPP, suggesting a difference in referral threshold for asthma between generalists and specialists.

We found differences between pediatricians and family medicine physicians in referral practices that are particularly interesting. Family physicians

report that they are more likely to refer some patients for specialty care that pediatricians would continue to care for without assistance. We do not presume to suggest which group of physicians has more appropriate referral patterns, but merely point out the difference. Other differences by specialty included a higher likelihood of diagnostic testing by family physicians, including greater use of spirometry and skin or RAST. Previous work comparing family practice to general internal medicine residents showed no significant differences in diagnostic services or specialty referrals.<sup>25</sup> It is possible that the differences we found reflect practice patterns used by physicians treating adults with asthma that spill over into the pediatric practice of those treating both adults and children.

The 16 vignette items, while based on only 3 case vignettes, provide a window into the ways in which primary care practice continues to differ from guideline recommendations. The responses suggest a tendency to diagnose moderate asthma when the symptoms are more consistent with either higher or lower severity. Peak flow monitoring is seen as a useful adjunct to management, but spirometry is rarely used, even when indicated. Respondents would appropriately prescribe anti-inflammatory medications in many scenarios, but would hesitate to increase the dose, even when asthma symptoms are quite disabling. Finally, a substantial number of primary care providers would not have recommended the frequency of routine follow-up that the NAEPP guidelines suggest. This suggests that while physicians have integrated (at least into their knowledge base) the need for chronic anti-inflammatory medications, they have not embraced other aspects of guideline-recommended care such as the use of written treatment plans and routine follow-up visits.

Cabana et al<sup>26</sup> have recently provided a useful framework for barriers to physician adherence to guidelines that includes lack of awareness, familiarity, agreement, self-efficacy, and outcome expectancy, as well as inertia of previous practice and external barriers. Our data suggest that awareness of NAEPP guidelines is high, but some of the remaining barriers may prevent their full adoption. There is also extensive literature on the degree to which the self-reported behavior of physicians reflects their actual practice.<sup>16,27</sup> Studies show that response to a written instrument is an imperfect

reflection of actual practice,<sup>16</sup> but may help us understand the level of knowledge of appropriate practice by providers. The responses to survey items are likely to overestimate the extent to which usual practice adheres to guideline recommendations. If, even in a survey, physicians do not report use of a recommended treatment we can assume that its use in actual practice is very uncommon. Vignettes, of the sort used here, may help put questions in a clinical context making respondents less likely to report what they believe to be the correct answer.

The physicians we surveyed are all affiliated with at least 1 MCO. Some are salaried employees of a staff or large group model organization, while others are in private practice settings that are part of the networks of several managed care delivery systems. We did not find dramatic differences in care patterns based on the type of managed care system, but did not have the number of systems to compare that would be necessary to settle this question. Comparisons to results of surveys of all Massachusetts pediatricians<sup>22</sup> and Chicago-area physicians<sup>18</sup> suggest that physicians in MCOs report similar practices to other primary care physicians, but we have no information on practice patterns of survey nonresponders. Finally, the possibility that unmeasured confounders may be responsible for the differences by physician specialty cannot be ruled out. For example, additional studies should address the possibility of geographic variation that has been observed in other medical care practices.<sup>28</sup>

#### CONCLUSION

In summary, we believe that among physicians in these organizations there is substantial understanding of the basic tenets of the NAEPP guidelines and little stated reluctance to use inhaled corticosteroids in their pediatric patients. However, we see opportunities for improvement in specific areas such as the use of written treatment plans and scheduling routine follow-up care. We believe that the national asthma guidelines developed and promulgated by the NAEPP have been successful in the necessary step of sensitizing and educating practicing physicians. Other techniques to achieve guideline adherence may be necessary to translate these changes in understanding into changes in actual practice.

## ASTHMA CASES

**Directions:** Please read the following case scenarios. For each question, please select your most likely response.

14. A 7 year old boy presents as a new patient to your practice. He uses an albuterol inhaler before vigorous sports, and when he has wheezing or episodes of coughing. Currently he is using this inhaler for relief of symptoms roughly 3 times per week during the daytime, and once each week when he awakens from sleep with coughing. He has had 1 exacerbation in the past, (8 months ago), which required a 5 day course of oral steroids. He has never been hospitalized. On exam, he has no audible wheezing.
- 14a. How would you classify the severity of this child's asthma?
- Intermittent
  - Mild persistent
  - Moderate persistent
  - Severe persistent
  - Don't Know
- 14b. Would you routinely use peak flow measurement or spirometry to further evaluate this child?  
(Please choose **ONE** response only)
- No, not at this time.
  - Yes, using a hand-held peak flow meter only.
  - Yes, using spirometry:
    - performed in my office
    - performed elsewhere
  - Yes, using both spirometry and peak flow.
- 14c. How would you recommend that the family monitor this child's asthma at home?
- Monitor symptoms only.
  - Peak flow meter intermittently or with symptoms.
  - Daily peak flow monitoring.
- 14d. What medications, if any, will you prescribe at this time? (Check all that apply)
- Continue albuterol by inhaler on an "as needed" basis.
  - Albuterol by inhaler t.i.d.
  - Cromolyn sodium by inhaler on an "as needed" basis.
  - Daily cromolyn sodium by inhaler b.i.d. or t.i.d.
  - Inhaled steroids on an "as needed" basis.
  - Daily inhaled steroids.
- 14e. Once this patient is in good control on a stable medication regimen, how often will you see him for routine re-evaluation?
- As needed, and as part of yearly health supervision visits.
  - Every six months.
  - Every 3-4 months.
  - More frequently than every 3 months.

15. A 3 year old boy presents with a history of several episodes of wheezing in the past, beginning at 6 months of age. One has been serious enough to require hospitalization. His asthma seems to be triggered by viral upper respiratory infections. He was given a nebulizer for home use with which he uses albuterol on an "as needed" basis. His mother reports that he has had 2-3 episodes of wheezing and coughing in the past month, for which she has used the nebulizer. She reports no nighttime symptoms.

15a. How would you classify the severity of this child's asthma?

- Intermittent
- Mild persistent
- Moderate persistent
- Severe persistent
- Don't Know

15b. What medications, if any, would you prescribe at this time? (*Check all that apply*)

- Continue albuterol on an "as needed" basis.
- Albuterol t.i.d.
- Cromolyn sodium by nebulizer on an "as needed" basis.
- Cromolyn sodium by nebulizer b.i.d. or t.i.d.
- Inhaled steroids on an "as needed" basis
- Daily inhaled steroids with an inhaler, spacer and mask.

15c. Once this patient is in good control on a stable medication regimen, how often will you see him for routine re-evaluation?

- Only as needed, and as part of yearly health supervision visits.
- Every six months.
- Every 3-4 months.
- More frequently than every 3 months.

15d. Would you routinely refer this patient to an asthma specialist for further testing or treatment?

- Yes
- No
- Not sure

16. A 12 year old girl presents as a new patient to your practice with a long history of asthma. Over the past four months she has had symptoms of some wheezing nearly every day. She awakens almost nightly with cough. She has missed 5 days of school in the past 3 months, and says she is unable to do as well in sports as she would like. In the past 6 months, she has had two exacerbations requiring short courses of oral steroids. She is currently on a regimen of metered dose inhalers which includes albuterol 2 puffs t.i.d. and beclomethasone 2 puffs t.i.d. with some mild improvement. There are no smokers in the house, and you have been unable to identify any specific triggers.

16a. How would you classify the severity of this child's asthma?

- Intermittent
- Mild persistent
- Moderate persistent
- Severe persistent
- Don't Know

- 16b. Would you routinely perform any tests of lung function to further evaluate this child?
- No, not at this time.
  - Yes, using a hand-held peak flow meter only.
  - Yes, using spirometry:
    - performed in my office
    - performed elsewhere
  - Yes, using both spirometry and peak flow.
- 16c. How would you recommend that the family monitor this child's asthma at home?
- Would recommend family monitor symptoms only.
  - Would recommend peak flow meter intermittently or with symptoms.
  - Would recommend daily peak flow monitoring.
- 16d. What medications, if any, would you prescribe at this time? *(Please check all that apply)*
- Continue albuterol on an "as needed" basis.
  - Albuterol t.i.d.
  - Cromolyn sodium by inhaler on an "as needed" basis.
  - Cromolyn sodium by inhaler b.i.d. or t.i.d.
  - Oral theophylline.
  - Continue current dose of daily inhaled steroids.
  - An increased dose of daily inhaled steroids.
  - Oral steroids every other day.
  - Daily salmeterol by inhaler.
  - Daily zafirlukast (Accolade).
  - Daily zileuton (Zyflo).
- 16e. Once this patient is in good control on a stable medication regimen, how often will you see her for routine re-evaluation?
- Only as needed, and as part of yearly health supervision visits.
  - Every six months.
  - Every 3-4 months.
  - More frequently than every 3 months.
- 16f. Would you routinely refer this patient to an asthma specialist for further testing or treatment?
- Yes
  - No
  - Not sure
- 16g. Assume that your change in treatment regimen decreases this child's asthma symptoms to once each week or less. How long would you have her continue this regimen before a trial of a reduction in therapy (either change in dose or elimination of a medication)?
- 2-4 weeks
  - 1-2 months
  - 3-4 months
  - 4-6 months
  - 6-12 months
  - > 12 months

#### REFERENCES

1. National Asthma Education and Prevention Program. *Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma*. Bethesda, MD: National Institutes of Health; 1997. Publ. No. 97-4051
2. Weitzman M, Gortmaker SL, Sobol AM, Perrin JM. Recent trends in the prevalence and severity of childhood asthma. *JAMA*. 1992;268:2673-2677
3. Mannino DM, Homa DM, Pertowski CA, et al. Surveillance for asthma—United States, 1960-1995. *MMWR Morb Mortal Wkly Rep*. 1998; 47(SS-1):1-27
4. Taylor WR, Newacheck PW. Impact of childhood asthma on health. *Pediatrics*. 1992;90:657-662
5. Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. *N Engl J Med*. 1992;326:862-866
6. Ireys HT, Anderson GF, Shaffer TJ, Neff JM. Expenditures for care of children with chronic illnesses enrolled in the Washington State Medicaid program, fiscal year 1993. *Pediatrics*. 1997;100:197-204
7. Barnes PJ. A new approach to the treatment of asthma. *N Engl J Med*. 1989;321:1517-1527
8. McFadden ER, Gilbert IA. Asthma. *N Engl J Med*. 1992;327:1928-1935
9. National Asthma Education Program. *Guidelines for the Diagnosis and Management of Asthma*. Bethesda, MD: US Department of Health and Human Services; 1991

10. Lozano P, Lieu TA. Asthma in managed care. *Pediatr Ann*. 1999;28:74-80
11. Picken HA, Greenfield S, Teres D, Hirway PS, Landis JN. Effect of local standards on the implementation of national guidelines for asthma. *J Gen Intern Med*. 1998;13:659-663
12. Jatulis DE, Meng YY, Elashoff RM, et al. Preventive pharmacologic therapy among asthmatics: five years after publications of guidelines. *Ann Allergy Asthma Immunol*. 1998;81:82-88
13. Legoretta AP, Christian-Herman J, O'Connor RD, Hasan MM, Evans R, Leung KM. Compliance with national asthma management guidelines and specialty care. *Arch Intern Med*. 1998;158:457-464
14. Lomas J, Anderson GM, Domnick-Pierre K, Vayda E, Enkin MW, Hannah WJ. Do practice guidelines guide practice? *N Engl J Med*. 1989;321:1306-1311
15. Davis DA, Thomson MA, Oxman AD, Haynes B. Changing physician performance: a systematic review of the effect of continuing medical education strategies. *JAMA*. 1995;274:700-705
16. Jones TV, Gerrity MS, Earp JA. Written case simulations: do they predict physicians' behavior? *J Clin Epidemiol*. 1990;8:805-815
17. Finkelstein JA, Lozano P, Shulruff R, Fagan J, Weiss KB. The Pediatric Asthma Care PORT: design of a trial of guideline implementation. Presented at the ACCP Conference; March 28, 1998; Leesburg, VA. Abstract
18. Grant EN, Moy JN, Li TV, Turner-Roan K, Daugherty SR, Weiss KB. Asthma care practices, perceptions and beliefs of Chicago-area primary care physicians. *Chest*. 1999;116:145S-154S
19. Halfon N, Newacheck PW. Trends in the hospitalization for acute childhood asthma, 1970-84. *Am J Public Health*. 1986;76:1308-1311
20. Halfon N, Newacheck PW. Characterizing the social impact of asthma in childhood. In: Weiss KB, Buist AS, Sullivan SD, eds. *Social and Economic Impacts of Asthma*. New York, NY: Marcel Dekker; 1998
21. O'Brien K. P. Managed care and the treatment of asthma. *J Asthma*. 1995;32:325-334
22. Werk LN, Steinbach S, Adams WG, Bauchner H. Beliefs about diagnosing asthma in young children. *Pediatrics*. 2000;105:585-590
23. Food and Drug Administration. Class labeling for intranasal and orally inhaled corticosteroid regarding the potential for growth suppression in children. Available at: <http://www.fda.gov/cder/news/cs-label.htm>. Accessed November 10, 1998
24. Moy JN, Grant EN, Turner-Roan K, Li T, Weiss KB. Asthma care practices, perceptions, and beliefs of Chicago-area asthma specialists. *Chest*. 1999;116:154S-162S
25. Bertakis KD, Helms LJ, Azari R, Callahan EJ, Robbins JA, Miller J. Differences between family physicians' and general internists' medical charges. *Med Care*. 1999;37:78-82
26. Cabana MD, Rand CS, Powe NR, et al. Why don't physicians follow clinical practice guidelines? *JAMA*. 1999;282:1458-1465
27. Adams AS, Soumerai SB, Lomas J, Ross-Degnan D. Evidence of self-report bias in assessing adherence to guidelines. *Int J Quality Health Care*. 1999;11:187-192
28. Wennberg J, Gittelsohn AM. Variations in medical care among small areas. *Sci Am*. 1982;246:120-134