**Reasons for Pediatrician Nonadherence to Asthma Guidelines**

Michael D. Cabana, MD, MPH; Cynthia S. Rand, PhD; Oren J. Becher, MD; Haya R. Rubin, MD, PhD

**Background:** The 1997 National Heart, Lung, and Blood Institute (NHLBI) asthma guidelines include recommendations on how to improve the quality of care for asthma.

**Objective:** To identify barriers to physician adherence to the NHLBI guidelines.

**Design:** Cross-sectional survey.

**Participants:** A national random sample of 829 primary care pediatricians.

**Main Outcome Measures:** Self-reported adherence to 4 components of the NHLBI guidelines (steroid prescription, instructing peak flow meter use, screening and counseling patients with asthma for smoking, and screening and counseling parents for smoking). We also collected information on physician demographics, practice characteristics, and possible barriers to adherence. We defined adherence as following a guideline component more than 90% of the time.

**Results:** The response rate was 55% (456/829). Most of the responding pediatricians were aware of the guidelines (88%) and reported having access to a copy of the guidelines (81%). Self-reported rates of adherence were between 39% and 53% for the guideline components. After controlling for demographics and other barriers, we found that nonadherence was associated with specific barriers for each guideline component: for corticosteroid prescription, lack of agreement (odds ratio [OR], 6.8; 95% confidence interval [CI], 3.2-14.4); for peak flow meter use, lack of self-efficacy (OR, 3.4; 95% CI, 1.9-6.1) and lack of outcome expectancy (OR, 4.7; 95% CI, 2.5-8.9); and for screening and counseling of patients and parents for smoking, lack of self-efficacy (OR, 3.8; 95% CI, 1.7-6.2 and OR, 2.8; 95% CI, 1.3-5.9, respectively).

**Conclusions:** Although pediatricians in this sample were aware of the NHLBI guidelines, a variety of barriers precluded their successful use. To improve NHLBI guideline adherence, tailored interventions that address the barriers characteristic of a given guideline component need to be implemented.

*Arch Pediatr Adolesc Med. 2001;155:1057-1062*
SUBJECTS AND METHODS

SUBJECTS

We randomly selected 1000 general pediatrics from the American Medical Association Masterfile of physicians in the United States, which includes all allopathic and most osteopathic physicians regardless of membership with the American Medical Association. We excluded pediatrics in training, pediatricians who spent greater than 30% of their professional time outside of clinical practice (ie, administration, research), and pediatric specialists.

Between March and May 1999, we sent a cover letter, an 8-page questionnaire, and a prepaid return envelope to each subject. Nonrespondents received up to 3 reminder surveys. Physicians who did not respond after 3 attempts were contacted by telephone to confirm that they had received the survey. We did not offer an honorarium for participation. The study was approved by the institutional review board at the Johns Hopkins School of Medicine (Baltimore, Md).

SURVEY INSTRUMENT

The 1997 NHLBI asthma guidelines recommend that a patient with daily asthma symptoms should be prescribed a daily inhaled corticosteroid and should use a peak flow meter (PFM) to monitor daily symptoms. The guidelines also recommend that patients with asthma should not smoke or be exposed to tobacco smoke at home. We used the following questions to query respondents about adherence to these 4 guideline components:

1. For what percentage of patients with asthma with daily symptoms (>8 years of age) do you instruct to monitor daily expiratory peak flow meter readings?
2. For what percentage of patients with asthma with daily symptoms do you prescribe a daily inhaled corticosteroid?
3. For what percentage of visits does someone in the practice screen patients with asthma for smoking and counsel smoking cessation?
4. For what percentage of visits does someone in the practice screen patients with asthma for smoking and counsel smoking cessation?

After pilot-testing the survey with a convenience sample of 10 general pediatrics, we selected the following response set for adherence that maximized discrimination among the responses and could be adapted to previously established definitions of adherence.14 For each of the components, pediatricians indicated adherence with 1 of 5 possible responses: “less than half of the time (<50%)”, “just over half of the time (51%-75%)”, “most of the time (76%-90%)”, “almost all of the time (91%-99%)”, and “all of the time (100%).”

Based on a review of guideline adherence15 and focus groups with pediatricians,13 we asked about barriers to adherence to each of the 4 components: awareness of the guidelines overall, familiarity with the specific guideline component, agreement with the component, confidence in the ability to

Table 1. Characteristics of Survey Recipients

<table>
<thead>
<tr>
<th></th>
<th>Respondents (n = 456)</th>
<th>Nonrespondents (n = 373)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male, No. (%)</td>
<td>278 (61)</td>
<td>218 (58)</td>
</tr>
<tr>
<td>Median (SD) age, y</td>
<td>47.7 (10.4)</td>
<td>48.2 (10.8)</td>
</tr>
<tr>
<td>Board certified, No. (%)</td>
<td>416 (91)</td>
<td>304 (82)*</td>
</tr>
</tbody>
</table>

*P<.01.

RESULTS

SAMPLE

Of 1000 pediatrics in our database, we excluded 47 pediatric subspecialists, 58 in practice less than 20 hours per week, and 2 still in training. Sixty-six questionnaires were returned because of incorrect addresses or deceased recipients. Of 827 eligible respondents, 455 (55%) returned the questionnaires. Owing to incomplete questionnaires, not all totals are equal in the analysis of each guideline component.

Demographic data of the survey recipients are presented in Table 1. Based on data from the American Medical Association, respondents did not differ from nonrespondents in terms of sex, median age, and practice setting. However, respondents were more likely to be board-certified in pediatrics (91% vs 82%; P<.01).

GUIDELINE AWARENESS AND ACCESS

Eighty-eight percent of responding pediatricians were aware of the NHLBI guidelines. Eighty-one percent indicated that they had access to a copy of the guidelines; 13% were not sure. The remainder did not have access to a copy. Of the pediatricians who were aware, 77% reported that they were at least “adequately familiar” with the guidelines overall.

Respondents learned about the guidelines by reading a copy of the report (70%), attending continuing medical education (46%), and hearing information from pharmaceutical representatives (27%), other physicians (21%), or nonphysician colleagues (1%). Three percent listed other sources, including the National Institutes of Health, medical journals, residency training, managed care organizations, or insurance companies. Respondents learned about guidelines from 1 source (54%), 2 sources (25%), or 3 or more sources (21%). When multiple sources were cited, the most common combination was reading a copy of the guidelines and continuing medical education (66%). (Since respondents could indicate more than one answer, the totals are greater than 100%.)

We were concerned that respondents might give socially acceptable answers and overreport guideline familiarity. To test this possibility, we asked about items not present in the guidelines. When queried about recommendations for genetic testing for asthma, which are not present in the guidelines, only 5% of respondents in-
Table 3 presents the prevalence of each barrier for each guideline component. The prevalence of lack of familiarity with each recommendation ranged from 23% to 34%. Since becoming familiar with a recommendation represents a more active process than passive awareness, lack of familiarity for all of the guideline components was more prevalent than lack of overall guideline awareness (12%).

In terms of external or practice-related barriers, approximately half of pediatricians reported lack of time for guideline components that involved intensive counseling and education, such as screening and counseling for smoking cessation to parents (50%) and patients (50%). Physicians reported lack of time less frequently for corticosteroid prescription (12%), which may require less counseling. Different barriers were more prominent for different guideline components. For example, lack of agreement was more common for corticosteroid prescription, while lack of outcome expectancy was more common for the other guideline components.

ASSOCIATION OF BARRIERS WITH ADHERENCE

For each of the 4 guideline components, we examined the association between each barrier and pediatrician adherence. The unadjusted odds ratios (ORs) for all barriers were significantly greater than 1, which suggests that the presence of any of these factors increases the likelihood of nonadherence.

We hypothesized that some barriers might be more prominent for each guideline component. In addition, although a barrier might be prevalent, it might not necessarily be associated with physician nonadherence after controlling for the presence of other barriers. Table 4 presents the results of multivariate logistic regression analysis, which was used to control for the presence of...
other barriers and demographic characteristics. Only lack of familiarity (OR, 1.64-2.51) and the presence of external barriers (OR, 1.65-1.90) are significantly associated with nonadherence to all 4 guideline components. Each guideline component has a unique set of barriers associated with nonadherence. For example, nonadherence to corticosteroid prescription is associated with lack of agreement (OR, 6.79; 95% confidence interval [CI], 3.20-14.4) and academic affiliation (OR, 0.52; 95% CI, 0.33-0.82). Nonadherence to recommendations for PFM use is associated with lack of self-efficacy (OR, 3.36; 95% CI, 1.85-6.10) and lack of outcome expectancy (OR, 4.67; 95% CI, 2.46-8.86).

Factors associated with nonadherence to smoking screening and counseling to parents and patients include lack of self-efficacy to inquire about smoking status (OR, 2.81; 95% CI, 1.34-5.89 and OR, 3.81; 95% CI, 1.70-6.19, respectively). For smoking screening and cessation counseling to patients, academic affiliation seems to be associated with increased adherence (OR, 1.63; 95% CI, 1.04-2.51).

We systematically examined barriers to pediatrician knowledge, attitudes, and self-reported adherence to the 1997 NHLBI asthma guidelines and found that each guideline component is associated with specific barriers to adherence. These findings have implications for selecting methods to improve adherence and quality of care for asthma. Self-reported adherence rates (defined as following recommendations for more than 90% of cases) range between only 38% and 53% for the 4 guideline components we queried.

Table 2. Self-reported Adherence to 4 Guideline Components

<table>
<thead>
<tr>
<th>Guideline Component</th>
<th>Overall</th>
<th>Male</th>
<th>Female</th>
<th>Year Physician Completed</th>
<th>Residency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescription of daily inhaled corticosteroids to patients with daily asthma symptoms (n = 446)</td>
<td>53</td>
<td>51</td>
<td>56</td>
<td>53</td>
<td>56</td>
</tr>
<tr>
<td>Instruction of daily peak flow meter use to patients with daily asthma symptoms (n = 447)</td>
<td>38</td>
<td>37</td>
<td>41</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>Screening asthma patients for smoking and counseling for smoking cessation (n = 449)</td>
<td>43</td>
<td>43</td>
<td>42</td>
<td>46</td>
<td>32</td>
</tr>
<tr>
<td>Screening the parents of patients with asthma for smoking and counseling for smoking cessation (n = 449)</td>
<td>53</td>
<td>51</td>
<td>55</td>
<td>52</td>
<td>53</td>
</tr>
</tbody>
</table>

*Data are given as percentage.

Table 3. Percentage of Respondents Indicating Barriers to Adherence

<table>
<thead>
<tr>
<th>Corticosteroid Prescription</th>
<th>PFM Use</th>
<th>Smoking Counseling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of familiarity</td>
<td>25.1</td>
<td>26.8</td>
</tr>
<tr>
<td>Lack of agreement</td>
<td>17.5</td>
<td>7.7</td>
</tr>
<tr>
<td>Lack of self-efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To recognize indications for corticosteroids</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>To recognize adverse effects of corticosteroids</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>To discuss risks of corticosteroids with parents</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>To use PFM to guide therapy</td>
<td></td>
<td>8.9</td>
</tr>
<tr>
<td>To inquire about smoking status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To counsel smoking cessation</td>
<td></td>
<td>15.1</td>
</tr>
<tr>
<td>Lack of outcome expectancy</td>
<td>2.5</td>
<td>27.4</td>
</tr>
</tbody>
</table>

*Data are given as percentage. PFM indicates peak flow meter; lack of familiarity, respondents indicating that they were less than adequately familiar with the recommendation; lack of self-efficacy, respondents who were not at least moderately confident in their skills; ellipses, not applicable; lack of outcome expectancy, respondents who felt that recommendation would have little or no effect; and presence of external barriers, respondents who described barrier as moderately or extremely significant.
Although lack of awareness has been cited as a common barrier to adherence, in our study, pediatrician awareness of the NHLBI guidelines (84% aware) was high compared with other guidelines. A previous study indicated time needed to counsel or educate a patient. Proper reimbursement might compensate for the expected cost of educational materials and support staff are factors that might mitigate the barrier of lack of time, while proper reimbursement might compensate for the extended time needed to counsel or educate a patient.

**LIMITATIONS**

There are several limitations to this study. Our survey response rate was only 55% and respondents were more likely to be board-certified in pediatrics. Both factors may affect the generalizability of our results to practicing pediatricians.

Adherence was based on self-report, which might not reflect actual adherence. Studies of physician practice suggest that physician self-report can overestimate or underestimate actual practice when compared with chart audits or patient surveys. However, our purpose was to investigate if different recommendations are associated with a different profile of barriers. The analysis assumes that self-report bias will affect measures of barriers to adherence as well as guideline adherence, thus preserving the profile of barriers for each guideline component.

It is also encouraging that few respondents reported familiarity with the spurious guideline components that we included to test the validity of self-report. Results from other studies suggest that physician self-report is not wildly misleading. For example, Diette et al surveyed 318 parents of children with asthma and found that 55% of patients with daily asthma symptoms used a daily controller medication compared with 54% in our study. Warman et al surveyed 220 parents of children with asthma and found that only 30% of children with persistent asthma had PFMs. In our sample, self-reported adherence rate for instruction of PFM use was similar at 38%. Finally, the presence of a barrier to adherence is based on the respondents’ perception of the barrier, which may not accurately reflect how problematic a barrier is. Whether the problem is actual or perceived may also affect the type of intervention required.

**IMPLICATIONS**

These results have implications for selecting interventions to improve practice. Interventions should be tailored to the guideline component being addressed. For example, the factors associated with adherence to steroid prescription and PFM use are different and interventions for each recommendation, although from the same guideline, may take different forms.

Since lack of agreement is associated with steroid prescription, interventions might theoretically include physician participation in guideline development or guideline endorsement by local opinion leaders or specialty societies. In several studies, physicians indicated greater confidence in guidelines developed by their own specialty organization. Increased awareness of the endorsement of the NHLBI guidelines by pediatric professional organizations might improve pediatrician guideline agreement. Although the American Academy of Pediatrics was represented during the guideline development and publicly endorsed the guidelines, pediatricians may not be aware of these events.

Since low self-efficacy was associated with nonadherence to instructing PFM use, interventions might include practical workshops rather than traditional continuing medical education lectures. Interactive seminars have demonstrated improved physician communication and management of asthma and use of metered-dose inhalers and spacers. Feedback and audit to demonstrate that PFMs actually affect outcomes of asthma treatment may improve an individual’s outcome expectancy. Interventions might also directly target sources of poor physician outcome expectancy, such as poor patient asthma self-management or compliance in general.

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**Table 4. Logistic Regression Model of Pediatrician Nonadherence to 4 Guideline Components**

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Corticosteroid Prescription, OR (95% CI)</th>
<th>Instructing PFM Use, OR (95% CI)</th>
<th>Screening and Counseling of Parents, OR (95% CI)</th>
<th>Screening and Counseling of Patients, OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of familiarity</td>
<td>2.29† (1.42-3.67)</td>
<td>2.51† (1.55-4.07)</td>
<td>2.02† (1.29-3.49)</td>
<td>1.64† (1.04-2.58)</td>
</tr>
<tr>
<td>Lack of agreement</td>
<td>6.79† (3.20-14.4)</td>
<td>6.46 (0.74-56.3)</td>
<td>1.22 (0.10-5.45)</td>
<td>2.77 (0.22-34.8)</td>
</tr>
<tr>
<td>Lack of self-efficacy</td>
<td>1.41 (0.88-2.25)</td>
<td>3.36† (1.85-6.10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of self-efficacy to inquire</td>
<td>. . .</td>
<td>. . .</td>
<td>2.81† (1.34-5.89)</td>
<td>3.81† (1.70-6.10)</td>
</tr>
<tr>
<td>Lack of self-efficacy to counsel</td>
<td>. . .</td>
<td>. . .</td>
<td>1.44 (0.89-2.32)</td>
<td>1.40 (0.89-2.30)</td>
</tr>
<tr>
<td>Lack of outcome expectancy</td>
<td>4.48 (0.46-43.3)</td>
<td>4.67† (2.46-8.86)</td>
<td>1.12 (0.72-1.75)</td>
<td>1.41 (0.88-2.27)</td>
</tr>
<tr>
<td>Presence of external barriers</td>
<td>1.65† (1.01-2.69)</td>
<td>1.90† (1.17-3.09)</td>
<td>1.78† (1.08-2.92)</td>
<td>1.71† (1.01-2.98)</td>
</tr>
<tr>
<td>Demographic/practice variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residency before 1990</td>
<td>1.23 (0.73-2.09)</td>
<td>1.14 (0.65-1.98)</td>
<td>1.30 (0.78-2.17)</td>
<td>0.72 (0.41-1.24)</td>
</tr>
<tr>
<td>Practice has &lt;100 asthma patients</td>
<td>1.21 (0.76-1.92)</td>
<td>0.93 (0.57-1.51)</td>
<td>1.09 (0.70-1.68)</td>
<td>1.44 (0.91-2.27)</td>
</tr>
<tr>
<td>No faculty affiliation</td>
<td>0.52† (0.33-0.82)</td>
<td>1.01 (0.63-1.62)</td>
<td>0.74 (0.49-1.41)</td>
<td>1.63† (1.04-2.51)</td>
</tr>
<tr>
<td>No pediatric board certification</td>
<td>0.85 (0.37-1.46)</td>
<td>0.58 (0.23-1.47)</td>
<td>1.04 (1.47-2.31)</td>
<td>0.34 (0.40-2.16)</td>
</tr>
</tbody>
</table>

*PFM indicates peak flow meter; OR, odds ratio; CI, confidence interval; and ellipses, not applicable.
†P < .05.
The NHLBI guidelines offer recommendations to improve the care of asthma. Previous studies have shown that despite pediatrician awareness of the NHLBI asthma guidelines, there are additional barriers, such as lack of agreement, poor self-efficacy, or practice-related barriers, that prevent pediatrician adherence to these guidelines. This study documents that different components of the guidelines are associated with specific barriers to adherence. To improve pediatrician adherence to the NHLBI guidelines and asthma care, interventions should be tailored to these barriers.

In general, multipronged interventions are more successful than single interventions in changing practice. This study reinforces the need for multiple interventions for overall adherence and tailored interventions to address characteristic barriers of each guideline component.

Accepted for publication May 10, 2001.
This research was supported in part by the Robert Wood Johnson Foundation, Princeton, NJ.
We would like to thank Suchitra Chandrasekaran and Yezhisai Thirumavalavan for their help in organizing this study.

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