Providers Underestimate Symptom Severity Among Urban Children With Asthma

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Background: Guidelines recommend that children with mild persistent to severe persistent asthma receive maintenance anti-inflammatory medications. However, providers may not be aware of the severity of their patients’ symptoms. The underestimation of severity may contribute to poor adherence to asthma care guidelines.

Objectives: To describe the use of preventive medications among a group of urban children with mild persistent to severe persistent asthma and to evaluate the degree to which their health care providers are aware of their asthma severity.

Design: Children (ages 4-6 years) from urban schools in Rochester, NY, were eligible if their parents reported mild persistent to severe persistent asthma symptoms. Each child’s health care provider was asked to assess the child’s asthma severity and use of medications based both on their knowledge of the child and review of the medical record. Parent and provider assessments were compared. Bivariate and regression analyses were used to identify factors associated with concordant classifications of asthma severity.

Results: Ninety children with parent-defined mild persistent to severe persistent asthma participated (64% boys, 67% black, 73% receiving Medicaid). Only 40% of the children were described accurately by their providers as having mild persistent to severe persistent asthma, and only 50% of the total had been prescribed maintenance medications. Thirty-six percent of families reported that their child used maintenance medications daily. In contrast, most of the children who were classified by their provider as having mild persistent to severe persistent asthma were prescribed a maintenance medication (83%), and 58% used them daily. Sociodemographic characteristics and asthma severity were not associated with provider accuracy.

Conclusions: Most children in this study were not accurately classified by their providers as having mild persistent to severe persistent asthma and had not been prescribed maintenance medications. When providers were aware of their patient’s asthma symptoms, most of the children were prescribed maintenance medications. Attempts to improve adherence to asthma guidelines should take into consideration provider underestimations of asthma severity.

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Asthma is the most common chronic childhood illness,1,2 and childhood asthma morbidity and mortality are increasing despite improvements in asthma therapy.3-6 The burden of asthma is particularly significant for young children living in the inner city.4-11 Recent guidelines from the National Heart, Lung, and Blood Institute (NHLBI)12 recommend daily use of maintenance medications for all children with mild persistent to severe persistent asthma. However, many studies have shown that inadequate therapy with maintenance medications is common, particularly for poor urban children.13-17 Although the reduction of asthma morbidity has been targeted as a national health care objective,18 a recent study showed that 74% of children living in the United States were receiving inadequate maintenance therapy for asthma.19

The reasons for inadequate maintenance therapy for asthma are not clear. Studies have considered many factors that may affect adherence, such as the complexity of the disease and day-to-day variability of symptoms20; patient factors such as health beliefs, family stress, and concerns about medication adverse effects21,22; physician factors such as lack of familiarity or agreement with guidelines23-25; and the patient-physician relationship.22,26,27 All of these potential factors assume that the health care provider is aware of the child’s asthma symptoms and asthma severity and has the opportunity to prescribe maintenance medications. In a prior study, we found, among a group of children with significant asthma,
PARTICIPANTS AND METHODS

The University of Rochester Medical Center (Rochester, NY) institutional review board approved the study protocol. The sample for this study consisted of children (aged 4-6 years) from 33 schools in urban Rochester who were enrolling in a longitudinal clinical trial. Children were identified with an asthma diagnosis from a school-based health screening survey administered to all children on school enrollment. Families had indicated an asthma diagnosis were contacted by telephone to assess the child’s eligibility. Children were eligible if they met symptom criteria for mild persistent to severe persistent asthma (based on NHLBI guidelines), had access to a telephone, and were not planning to leave the school district in the following 6 months. According to a review of school records, 322 children had asthma. Of these children, we were unable to reach 78 because of wrong telephone numbers or disconnected telephones, 80 had mild intermittent asthma, and 137 had mild persistent or more severe asthma and were eligible. We were able to obtain consent and enrolled 92 of these children into the study, for a total response rate of 67%.

Once a child was deemed eligible via telephone contact, the caretaker was asked to complete a brief telephone survey that inquired about sociodemographic characteristics, health care contacts, and medication use. Each caretaker was asked to identify the primary health care provider who knew the child best, and informed consent was obtained for contact with that provider.

The health care providers for each child enrolled in the study were subsequently contacted and asked to complete a survey. Information about the child’s health care utilization, asthma severity, and medication use was obtained using a written questionnaire. Providers were encouraged to impart information based both on their personal knowledge of the patient and their review of the medical record. For the 92 children who met eligibility requirements and for whom informed consent was obtained, 90 provider surveys (from 55 different providers) were returned for a provider response rate of 98%.

DEFINITIONS

Asthma Severity

All children enrolled in this study had symptoms of mild persistent to severe persistent asthma based on our initial asthma screen. Children with mild intermittent asthma were not eligible and were not involved further in this study. Table 1 presents the symptom criteria that were used (extrapolated from NHLBI guidelines). Families reported the average number of symptomatic days and nights with asthma symptoms per week during the past year. Eligibility criteria required children to have 3 or more days per week with asthma symptoms or 3 or more nights per month with asthma symptoms. Families also reported the frequency of rescue medication use, the number of acute office and emergency department visits and hospitalizations for asthma during the past year. Lastly, they were asked to comment on whether or not they felt their child’s primary care provider was aware of the severity of the child’s asthma symptoms.

Providers were asked to independently rate the child’s asthma severity during the past year by choosing “mild intermittent,” “mild persistent,” “moderate persistent,” or “severe persistent” from a checklist of symptoms with NHLBI definitions consistent with those used to define severity on the parent report. We considered the parent’s description of asthma symptoms as the “gold standard” for each child. Therefore, if providers described the child as having either mild persistent, moderate persistent, or severe persistent asthma symptoms, they were considered to be accurate in their classification. Since National guidelines recommend that all children with mild persistent or more severe asthma receive maintenance medications, we did not attempt to distinguish between these categories of severity. Providers were only considered to be inaccurate if they defined the child as having mild intermittent asthma, because, by inclusion criteria, none of the children had mild intermittent asthma according to parent report.

Medications

Families were asked if their child used a medication every day to prevent asthma symptoms. If they answered yes to this question, they were asked for the name of the medication and the dosing regimen. We defined children as using a maintenance medication if they described using a preventive anti-inflammatory medication (inhaled corticosteroid, cromolyn sodium, or montelukast sodium). Further, if they reported the use of a maintenance medication daily (in contrast to sporadic use or use only with acute symptoms), they were considered to have daily use of maintenance therapy.

Providers were similarly asked if they (or another member of their practice) had prescribed a maintenance medication for the child. The type of medication was documented along with the reason for the prescription. If a preventive anti-inflammatory medication was reported, the child was considered to have been prescribed a maintenance medication.

INDEPENDENT VARIABLES

Independent variables included age (4, 5, or 6 years), sex, race (defined as white, black, or other), ethnicity (Hispanic or not Hispanic), and insurance (Medicaid or other). Asthma severity measures included rescue medication use (every day vs not every day), the number of acute office or emergency department visits for asthma (<3 vs ≥3 during the past year) and the number of asthma hospitalizations (0 vs ≥1 during the past year). Lastly, health care factors included the time since the child’s last office visit (≥6 months vs <6 months), and whether the family believed the provider was aware of the frequency of the child’s asthma symptoms.

ANALYSIS

We performed all analyses using SPSS version 10.0 software (Statistical Product and Service Solutions 10.0; SPSS Inc, Chicago, Ill.). Standard cross-tabulations and χ2 analyses were used to test for differences in proportions. Logistic regression was used for multivariate analysis to identify factors independently associated with accurate provider classifications of asthma severity.
that few of even the most symptomatic children had any contact with a health care provider during a 3-month symptom-monitoring period. This finding suggests that providers often may not be aware of the severity of their patients' symptoms, and that provider underestimations of asthma severity may contribute to poor adherence to asthma care guidelines.

The objectives of this study were to describe the use of preventive medications among a group of urban children with mild persistent to severe persistent asthma and to evaluate the degree to which their health care providers were aware of their asthma severity.

**RESULTS**

**Table 2** presents the demographic characteristics for the 90 children in this sample. Twenty-seven percent of all of the children were 4 years old, and of the remaining children, there were approximately equal numbers of 5- and 6-year-olds. Sixty-four percent of the children were boys. The majority of the children in the sample were black (67%), 8% were white, and 25% indicated other racial backgrounds. Thirty percent of the children were described as having Hispanic ethnicity, and most of the children (73%) had Medicaid insurance.

Only 40% of the children were classified by their providers as having mild persistent to severe persistent asthma. Since all of the children in this study met criteria for mild persistent to severe persistent asthma based on our screening survey, these providers were considered to be accurate in their classification. The remaining 60% of children were inaccurately classified by their providers as having symptoms consistent with mild intermittent asthma.

**Table 3** presents the use of maintenance medications among all the children in this sample and among those children whose providers were accurate or inaccurate in their classification of the child's asthma severity. Several findings are noted. First, the use of maintenance medications was not common among children in this sample. Only 50% of all of the children were prescribed a maintenance medication, 41% of families reported having a maintenance medication, and only 36% reported using a maintenance medication daily. Second, the use of maintenance medications among this group of children varied significantly depending on the accuracy of their provider's severity classification. Among the children whose providers were accurate in their classification of asthma severity (mild persistent to severe persistent asthma), more were prescribed a maintenance medication (83% vs 28%, P<.001), more families reported having a maintenance medication at home (64% vs 26%, P<.001), and more families reported the use of a maintenance medication daily (58% vs 20%, P=.001) compared with children whose providers were inaccurate.

**Table 4** presents the percentage of children accurately classified by their providers, according to sociodemographic characteristics, asthma severity, and health care factors. There were no differences in provider accuracy by any of the sociodemographic characteristics, including age, sex, race, ethnicity, or insurance type. Similarly, children who used rescue medications daily were not more likely to be described as having mild persistent to severe persistent asthma by their providers compared with those children with less frequent use of rescue medications. Further, there was no difference in provider accuracy among those children with 3 or more acute visits for asthma or with 1 or more hospitalization for asthma during the past year compared with children with fewer health care contacts.

The only factors that were found to be related to provider accuracy were health care factors. Those children who had been seen in the office within the past 6 months were more likely to be correctly classified by their provider (47% vs 25%, P=.04) compared with children who had not had a visit to the office in the past 6 months. Similarly, if the family reported that they believed the provider was aware of the frequency of their child's asthma symptoms, the provider was more likely to be accurate in their severity classification (46% vs 20%, P=.03).

A logistic regression was subsequently performed to identify factors independently associated with accurate provider classifications of asthma severity. All covariates included in the model are presented in **Table 5**. None of the factors were found to be associated with accurate provider classifications of asthma severity in this analysis.

**COMMENT**

All of the children in this study had asthma symptoms consistent with national criteria for mild persistent to severe persistent asthma. While national guidelines now uniformly recommend daily maintenance medications for children with this level of asthma severity, only a third of children in this sample were receiving such medica-
The findings from this study suggest that adherence at the patient level is a problem, since 50% of the children were prescribed a maintenance medication but only 36% of families reported the daily use of such medications. We also found, however, that provider underestimations of asthma severity likely contributed to inadequate therapy among the children in this sample. Most of the providers were not aware of the severity of their patients’ asthma symptoms. Among the children whose providers correctly classified their asthma severity, prescriptions for maintenance medications were quite common (83%). This suggests that these providers are aware of national guidelines for asthma management and that they are using these guidelines to direct patient care.

A significant barrier to providing appropriate care may, therefore, occur at the level of provider-patient communication. The families interviewed for this study were able to categorize their child’s asthma severity by an-
swering simple questions based on NHLBI guidelines. For some reason, this information had not reached the health care providers in the majority of instances. Interestingly, many families were aware of their provider’s knowledge or lack of knowledge about the frequency of the child’s asthma symptoms. Those providers who were felt to be “aware” by the families were more likely to be accurate in their severity classifications.

The reasons for this communication gap between providers and families are not clear. Prior work from our group has suggested that families may not make contacts with health care providers to notify them of symptoms even when these symptoms are occurring daily.28 Some families may accept that their children with asthma will experience a certain amount of morbidity and may be unaware of effective medications that are available to prevent asthma symptoms. Other families may be concerned about medication side effects.26,28 Further, asthma symptoms, and even hospitalizations, may occur without a primary care provider’s knowledge.28 Thus, the lack of preventive therapy could be related to communication barriers and problems integrating health services. It is also possible that some providers are not screening patients with specific questions about symptom severity, and are thus missing patients with significant asthma even when contact occurs.

A lack of recent contact with health care providers may also play a role. We found that children who had been seen by their primary providers in the previous 6 months were more likely to have been classified accurately. Similarly, Diaz et al29 found that children who had seen a physician in the previous 6 months were more likely to use a daily anti-inflammatory medication. These findings suggest that regular contact with providers could improve adherence to preventive therapy. However, all children in this sample had a primary care provider, and most of them had an office visit in the past 6 months.

Regardless of the reasons, providers cannot provide appropriate care for their patients with asthma unless they are aware of the frequency of their asthma symptoms, and thus are able to accurately classify their asthma severity. Future strategies to improve asthma care might include specific screening questionnaires about asthma symptoms that could be administered either through the provider’s office or through the schools, as was done in this study. Further, families could be better educated about the availability of effective asthma therapies and the need to inform their health care providers of the frequency of their child’s symptoms. Lastly, improved tracking of patients with asthma, more frequent scheduled visits with care providers for “tune-ups,” and better access to preventive care might help to decrease barriers in communication and improve adherence to guidelines.

There are some potential limitations to this study. First, we considered the caretaker’s description of the child’s asthma symptoms to be the gold standard for our definition of asthma severity. We did not obtain objective measures of severity such as peak flow readings or spirometry. However, the NHLBI criteria for defining asthma severity use parent report of symptom frequency to determine severity; therefore, our definitions are consistent with this standard.

National guidelines recommend maintenance medications for all children with mild persistent to severe persistent asthma. Many studies have shown that inadequate therapy with maintenance medications is common, particularly for poor urban children. Providers may not be aware of the severity of their patients’ symptoms, and provider underestimations of asthma severity may contribute to poor adherence to guidelines. Most children in this study were not accurately classified by their providers as having mild persistent to severe persistent asthma, and they had not been prescribed maintenance medications. When providers were aware of their patient’s asthma symptoms, most of the children were prescribed maintenance medications. Efforts to increase provider awareness of asthma severity are likely to improve adherence to asthma care guidelines.

It could be argued that the children described by their providers as having mild intermittent asthma experienced less severe symptoms compared with those children who were accurately described by their providers as having mild persistent to severe persistent symptoms. However, those children with the most severe asthma symptoms (those who used rescue medications daily) were not more accurately classified by their providers. In fact, even those children with multiple acute visits for asthma and with hospitalizations for asthma were frequently misclassified as having mild intermittent asthma.

The providers we surveyed were aware that the children were selected for this study because they met our screening criteria for mild persistent to severe persistent asthma. Their severity assessments may, therefore, have been biased by this knowledge. In this case, our findings of inaccurate classifications of asthma severity would underestimate the true problem. Similarly, families may have been affected by a social desirability bias, which would lead to overreporting of the use of maintenance medications. Our findings, therefore, may represent an underestimation of the magnitude of inadequate therapy.

The subjects in this study were young children (ages 4-6 years) attending preschool, kindergarten, or first grade. Therefore, our findings can only be generalized to children of a similar age range. Further, only urban children from Rochester were included in the study. The experiences of children with asthma and their providers might be different in rural or suburban localities, or in different urban areas.

In conclusion, most children in this study were not accurately classified as having mild persistent to severe persistent asthma, and they had not been prescribed maintenance medications. Further research is needed to identify the cause for provider underestimations of symptom severity. Since most of the children who were correctly classified by their providers had been prescribed a maintenance medication, it is likely that improved communication between families and providers would substantially improve adherence to asthma care guidelines.
REFERENCES