

Poor adherence and reasons for nonadherence to the asthma guidelines among pediatricians in Korea

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Summary

Background: Information is limited regarding adherence to the asthma guidelines in Asia, especially for children.

Objective: The aim of the study was to estimate adherence to the asthma guidelines, and investigate reasons for nonadherence.

Methods: We conducted a cross-sectional questionnaire survey on the primary care pediatricians practicing in Incheon, Korea.

Results: Surveys were returned by 81 of 131 eligible primary care pediatricians for a response rate of 61.8%. Almost all respondents (98.8%) had heard of the asthma guidelines, and most (93.8%) had read or received education about them. The classification of asthma severity was well understood with the accuracy of 85.7%. Correct responses for treatments were 51.3% for intermittent, 68.5% for mild persistent and 56.9% for moderate persistent asthma. For severe persistent asthma, the accuracy was high (85.7%). Only 21.5% of the respondents reported routine use of office peak flow measurement for patients with moderate or severe persistent asthma for diagnosis, and fewer (10.3%) used spirometry. A written action plan was reported to be given to only 5.2% of patients with asthma. The principal barrier to adherence was the presence of external barriers (lack of time, equipment, supporting staff etc.). Different barriers were prominent for different types of guideline components.

Conclusions: There is poor adherence to the asthma guidelines in several aspects of their recommendations. Tailored interventions that address the current state of barriers need to be designed and implemented. (*Asian Pac J Allergy Immunol* 2010;28:147-54)

Key words: asthma, guideline, adherence, barrier, intervention

Introduction

Asthma remains a serious healthcare problem for children.¹ The prevalence of asthma is high, and the range of its variation is striking between different countries throughout the world.² The prevalence of asthma is generally lower in Asia than in Western countries. However, the prevalence in the more modernized areas, such as Hong Kong and Japan, is similar to that in Western countries. As in Europe and the United States, asthma morbidity, such as hospitalization and missed school days, is high and the treatment is suboptimal in Asia.³ Korea is no exception and the prevalence of asthma in Korea continues to increase.⁴

To reduce practice variability and improve the quality of asthma care, the Global Initiative for Asthma (GINA) guidelines had been developed and updated by the World Health Organization in collaboration with the National Heart, Lung and Blood Institute.⁵⁻⁶ The guidelines are currently recognized as the standard of care. They include recommendations for diagnosing and monitoring and organize treatment strategies into a stepwise approach in response to the asthma severity along with offering a self-management plan.

Despite more than a decade of dissemination effort, translating the asthma guidelines into clinical practice has been inadequate, and poor adherence to the guidelines has been documented at the physicians' level.⁷⁻⁸ It is hard to identify

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Diurnal symptoms	One or two a month	Three or four a month	One or two a week	Three to six a week	daily
Nocturnal symptoms	One or two a month	Three or four a month	More than one a week	Near daily	
FEV1 or PEF (% predicted or personal best)	> 80%	60 – 80%	< 60%		
PEF variation	> 30%	20 – 30%	< 20%		

Figure 1. Example of 4 items about the criteria of the asthma severity steps based on the GINA guidelines classifications. Abbreviations: PFM, peak flow meter; ICS, inhaled corticosteroids.

definite reasons for poor adherence to the asthma guidelines. Although physicians are aware of the existence of the guidelines, casual awareness may not guarantee familiarity with the guidelines. Previous studies found that physicians had a poor understanding for estimating the disease severity.⁸⁻⁹ We hypothesized that a poor understanding of the disease severity classifications may be associated with poor adherence to pharmacological recommendations of the asthma guidelines.

There is limited information regarding adherence to the asthma guidelines and the reasons for nonadherence in Korea, and especially for treating children. We examined pediatricians' familiarity with the classification criteria of asthma severity, and assessed the appropriateness of prescribing anti-inflammatory medications. We also investigated the barriers to adherence to several recommendations of the asthma guidelines by using the theoretical model of knowledge, attitude and behavior framework.¹⁰

Methods

Study design

We conducted cross-sectional questionnaire survey of primary care pediatricians practicing in Incheon, Korea.

Survey instrument

The survey instrument was constructed using the GINA guidelines as the source of the survey's content and validity. Focusing on the frequency of symptoms (with giving attention to nocturnal symptoms) and the variation of airway obstruction, the GINA guidelines classify patients into mild intermittent, mild persistent, moderate persistent or severe persistent categories of asthma.⁵⁻⁶ The GINA guidelines define required medications in association with the incremental level of severity. We evaluated the familiarity with the guidelines by measuring the correct answers to 4 items concerned with the criteria of the asthma severity steps. (Figure 1.)

To better understand pediatricians' approach to asthma treatment independent from their knowledge of the guidelines' terminology for the asthma severity classification, we used a descriptive form with the same frequency of symptoms (with giving attention to nocturnal symptoms) and the variation of airway obstruction based on the guideline's definition: "A patient with symptoms less than once a week or nocturnal symptoms not more than twice a month and a forced expiratory volume in one second (FEV1) > 80% of the predicted or personal best and peak expiratory flow (PEF) variability < 20%" (for the intermittent severity classification). We made an

assumption that patients were not receiving controller medications for a long time (three months) because asthma severity is defined by using clinical features without concurrent treatment, and controller medications can minimize these features and reduce the severity of asthma. The treatment options included (a) oral β agonists (b) inhaled β agonists (regular/as needed) (c) systemic corticosteroids (d) inhaled corticosteroids (low/moderate-high dose) (e) inhaled corticosteroids plus long-acting β agonists (low/high dose) (f) inhaled cromoglycate (g) theophylline (h) leukotriene antagonists. The participants were instructed to choose their treatment options according to their practice pattern rather than their understanding of the guidelines. On the basis of the GINA guideline, we defined the preferred or alternative treatment as the correct answers. Additionally, we asked pediatricians whether they used a peak flow meter or spirometry for the patients with moderate or severe persistent asthma at the initial evaluation and follow-visit, and if they used a written action plan for the management of asthma care.

We investigated the barriers to the adherence to the use of inhaled corticosteroids, a peak flow meter and the guidelines in general by using the theoretical model of knowledge, attitude and behavior framework.¹⁰ In the process of adoption, the internal barriers first have an effect through the cognitive components of knowledge, and then through the affective components of attitudes. Internal barriers of cognitive components are lack of ability to acknowledge a guideline's existence (awareness) and lack of ability to correctly answer questions about the guideline's content as well as the self-reported lack of sufficient knowledge (familiarity). Internal barriers of affective components included lack of agreement with the guideline components, lack of confidence in the ability to perform the guideline component (self-efficacy) and lack of belief that following the guideline's component will affect the patients' outcomes (outcome expectancy). Although the needs of the internal barriers are met, the factors that restrict the physicians' ability due to guideline, patients' and environmental components may limit adherence. These are called external barriers and include lack of time, equipment or clinical space, education materials, support staff, and reimbursement for services. We asked about the barriers to adherence for

components as follows, except lack of awareness: familiarity, agreement with the guideline components, self-efficacy, outcome expectancy and the presence of external barriers.

Sample population

The sample included all pediatricians in Incheon, Korea. They registered with the Incheon Medical Association which includes all physicians and surgeons. We chose to exclude pediatric specialists who served at the tertiary hospital care because we were interested in focusing on the primary care practice. We also excluded the pediatricians who spent most time outside of clinical practice (i.e., administration, research), and the pediatricians who had moved, were deceased or had resigned from their hospitals. We obtained information about physicians' age, gender, the number of years from medical school graduation and the practice settings from the master file of the medical association.

Survey Methods

This study was approved by the Institutional Review Board of Gil Medical Center. A questionnaire in a postage-paid return envelop was sent to pediatricians along with a nominal incentive fee between February and April in 2005. The first mailed questionnaire was supplemented by additional mail, telephone calls and direct visits. Nonrespondents received up to 3 reminder surveys.

Analysis

Demographic and clinical characteristics were examined using descriptive statistics [frequency, mean and standard deviation (SD)]. Numeric variables such as age, years from medical school graduation were compared by using t tests. Chi-squared tests were used for comparing dichotomous variables. The p values < 0.05 were considered significant. Fischer's exact probability test was used if the sample size was less than 5. Statistical analyses were performed using the software MedCalc (v10.0.1 MedCalc software, Mariakerke, Belgium).

Table 1. Characteristics of survey respondents compared with nonrespondents

	Respondents (n=81)	Nonrespondents (n=50)	<i>p</i> value
Age, years (mean ± standard deviation)	43.9 ± 7.9	47.0 ± 10.0	0.06
Sex (% female)	34.6	31.7	0.91
Median number of years since medical school graduation (mean ± standard deviation)	19.1 ± 7.5	22.1 ± 10.1	0.07
Professional activity (%)			
Office-based	88.9	90.0	0.93
Hospital-based	11.1	10.0	

Results

The master file of the Incheon Medical Association contained a list of 161 pediatricians. We excluded 19 pediatricians because they were pediatric subspecialists who worked full-time in the tertiary care hospital. Of remaining 142, 11 were ineligible, 10 because they moved or resigned, and 1 because he spent most time as a hospital manager. The final number of completely eligible pediatricians was 131. The surveys were returned by 81 of the 131 eligible primary care pediatricians for a response rate of 61.8%.

The demographic characteristics of respondents and nonrespondents are displayed in Table 1. Most were male (65.4%) and in office-based practice (88.9%). The mean number of patients in daily practice was 67.8 ± 27.1 with asthma representing an average of $8.0 \pm 6.2\%$. The respondents did not differ from the nonrespondents in terms of gender, age, the years since medical school graduation and the professional settings. Almost all respondents (98.8%) had heard of the asthma guidelines, and 93.8% of the respondents had read the copy of the asthma guidelines or received education about them. Respondents learned about the guidelines by attending a medical educational seminar (72.5%), reading a copy of the report (16.3%), from asthma specialists (13.8%), physicians (7.5%) and publications (7.5%). The other rare sources included textbooks and internet

Table 2. Percentage of correct answer to 4 items about the criteria of asthma severity classification.

Severity	Correct answer rate ± standard deviation (%)
Intermittent	85.3 ± 21.3
Mild persistent	85.3 ± 24.1
Moderate persistent	82.9 ± 26.6
Severe persistent	87.4 ± 19.0
Total	85.7 ± 20.5

Familiarity with asthma guidelines

Familiarity was surveyed by assessing the understanding of the content about the detailed items of asthma symptoms, nocturnal symptoms and pulmonary function tests based on severity classification of asthma in the GINA guidelines. Pediatricians understood well with the accuracy of $85.7\% \pm 20.5$ (Table 2). The results of each severity step showed no differences among the various asthma severities (*p* value = 0.31). The results also did not differ in terms of the respondents' age, gender and mean number of years since medical school graduation (data not shown).

Adherence to asthma guideline recommendations

Pediatricians were asked about treatment plans according to asthma severity steps. We broadly defined both preferred and alternative treatments in the GINA guidelines as correct answers, but the accuracy for treatment were 51.3% for intermittent, 68.5% for mild persistent, and 56.9% for moderate persistent asthma. (Figure 2.) For severe persistent asthma, the accuracy was high (85.7%). However, it was seemingly overestimated because any combination of treatments including high dose inhaled corticosteroids are considered as appropriate answers for severe persistent step in the guideline recommendations and because of the nature of the multiple choice questionnaires. For treatment of intermittent asthma, over-treatment was selected by 48.8%; inhaled corticosteroids by 32.5% and other anti-inflammatory medications than corticosteroids by 27.5%. In case of mild persistent asthma, under-treatment was performed by 6.8% and over-treatment by 24.7%. For the treatment of moderate persistent asthma, under-treatment was performed by 22.2% and over-treatment by 20.8%.

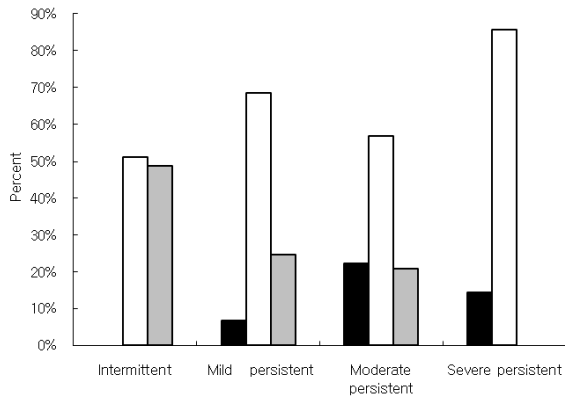


Figure 2. Percentage of adequate and inadequate treatment according to the asthma severity steps: (□) appropriate treatment; (▨) overtreatment; (■) undertreatment.

When asked about prescribing daily inhaled corticosteroids for patients with moderate or severe persistent asthma, 93.7% prescribed them. When questioned about the regular use of inhaled β agonists according to the severity of asthma, 12.8% used them regularly for intermittent asthma. As the level of asthma increased, the regular use significantly increased (36.8%, 40.0% and 50.0% for mild persistent, moderate persistent and severe persistent asthma, $p < 0.05$, Figure 3.)

For initial evaluation and monitoring, the office peak flow measurement for the patients with moderate or severe persistent asthma was performed routinely by 21.5% and 20.3% respectively, and fewer (10.3% and 7.7%, respectively) used spirometry. When asked about

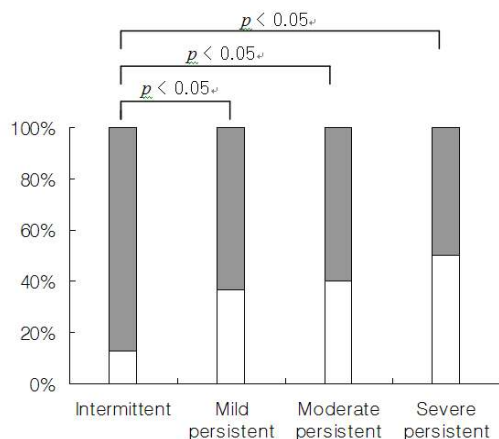


Figure 3. Regular or as-needed use of inhaled β agonists according to the asthma severity steps: (□) regular use of β agonists; (▨) as-needed use of β agonists.

using a written action plan for managing asthma care, only 5.2% of the respondents reported giving a written action plan to their patients.

Barriers to adherence to the asthma guideline recommendations.

Table 3 presents the barriers to the adherence to the use of inhaled corticosteroids, a peak flow meter and the guidelines in general. The sample size varied because only the respondents who reported nonadherence gave reasons for nonadherence. In general, the principal barrier to adherence was the presence of external barriers, followed by lack of familiarity and lack of self-efficacy. Lack of agreement and lack of outcome expectancy were rarely cited as barriers. In terms of external barriers, the barriers to the adherence to the use of peak flow meter and the guidelines in general were more prevalent than those to the use of inhaled corticosteroids ($p < 0.05$). For the case of lack of familiarity, the barrier to the adherence to the asthma guidelines in general was more prevalent than that to the use of peak flow meter ($p = 0.02$). Although the barriers to the guidelines and the use of the peak flow meter were generally of a similar order, the barriers to the use of inhaled corticosteroids were of a different order. Different barriers were prominent for different types of guideline components.

Table 3. Prevalence of different barriers to adherence to asthma guideline recommendations.

Barriers	Pediatricians, No. (%)		
	Guideline in general	PFM use	ICS use
Lack of familiarity*	20 (50.0)	15 (24.6)	3 (33.3)
Lack of agreement	3 (7.5)	1 (1.6)	1 (10.0)
Lack of self-efficacy	10 (25.0)	7 (11.5)	2 (20.0)
Lack of outcome expectancy	1 (2.5)	2 (3.3)	1 (10.0)
Presence of external barriers†	21 (52.5)	44 (64.0)	1 (10.0)

*The prevalence of barriers to the adherence to the asthma guidelines in general were higher than that to the use of peak flow meter ($p = 0.02$).

†The prevalence of barriers to the adherence to the use of peak flow meter and the guidelines in general were higher than that for the use of inhaled corticosteroids ($p < 0.05$).

Abbreviations: PFM, peak flow meter; ICS, inhaled corticosteroids.

Discussion

This study displays poor adherence to the asthma guidelines for several aspects of their recommendations. On pharmacologic treatment, a previous population-based study showed that less than 50% of the children with asthma used anti-inflammatory medications and fewer still used them regularly.¹¹ This study examined the steps of treatment according to the guidelines in detail, and found inconsistency with wide variation of the pharmacologic treatment, as compared to the asthma guidelines. Besides the inadequate use of anti-inflammatory medications, this study found increasing the regular use of inhaled β agonists in association with the incremental level of severity. The regular use of inhaled β agonists is associated with an increased risk of death from asthma.¹² It may suggest the reluctance to increase the dose of inhaled corticosteroids due to concerns about adverse effects. This study also suggests significant underutilization of the accessory means of management such as a peak flow meter, spirometry and a written action plan, which is consistent with several studies. For instance the Chicago-area survey reported a rate of 55% use of spirometry for the evaluation of asthma, and a rate of 48% use of a written action plan.⁷ The study of pediatricians and family physicians found that 68% of the pediatricians used a peak flow meter, and 12% used spirometry.⁸

We first focused on physicians' understanding of the guidelines, because it is the first and essential step for applying the guidelines. Doershug, et al found that physicians had a poor understanding of the asthma severity staging system and appropriately staged the severity in only 46% of the patients.⁹ Poor understanding may result in inappropriate treatment because treatment is closely tied to the disease severity staging. In contrast to our expectation, this study suggests that pediatricians were well aware of the staging system of asthma severity but did not prescribe medications according to the guidelines.

We further investigated the reasons for poor adherence by using the theoretical model of knowledge, attitude and behavior framework,¹⁰ and found that the presence of external barriers is mostly associated with nonadherence despite some discrepancy among the guideline components. We did not explore which factors play a major role in nonadherence to the guidelines among the external barriers. One

possibility is that lack of time from the environmental factors may be an important barrier because Korean pediatricians in this study serve about 70 patients in daily practice. A study on the asthma care program in Canada reported that health care providers cited lack of time as the most common barrier for applying the asthma care program.¹³ Secondly, guideline-related factors may also play an important role in preventing adherence. An expert stressed that the asthma guidelines are not light reading because of their length and complexity, nor convenient for evaluating the severity and control of asthma and prescribing medicine in busy practice.¹⁴ This study suggests that the asthma guidelines need modification if they are to be effectively applied in everyday practice. The GINA guidelines, revised in 2006, made changes that medications should be initiated according to the child's needs without specifying the criteria and that the detailed severity levels should be used for 'research purposes only'.¹⁵

We confirmed that different barriers are prominent for different types of guideline components.¹⁶ We can infer that different barriers might be prominent for the same guideline component according to circumstances, such as the doctor's specialty, the level of adherence and the geographic areas. A survey of primary care pediatricians in the United States found that each component was associated with a unique set of barriers, and lack of familiarity and the presence of external barriers were associated with nonadherence to all of the components.¹⁶ The survey was consistent with this study. A survey of inner-city minority practitioners reported that lack of self-efficacy was independently associated with all the key guideline components for the application of the asthma guidelines.¹⁷ A study at an academic family health center showed that attitude was more strongly associated with adherence than knowledge for implementing the asthma guidelines.¹⁸ The reasons for this discrepancy are unknown. However, this study showed similar results to those of the study with the same specialty sample, and also different results to those of the studies with a different sample.

Several limitations should be noted. This study was limited to pediatricians in Korea. This survey response rate was only 61.8%, and there may be a nonresponse bias. These factors may limit the



generalizability of this study. However, there were no significant differences between respondents and nonrespondents in terms of gender, age, the years since medical school graduation and the professional settings. Additionally, the purpose of this study was to identify nonadherence to the asthma guidelines and investigate the barriers to nonadherence to the asthma guidelines. Assessing actual clinical practice was not the purpose. A second limitation is that since this study was based on self-report, self-report might be subject to a social desirability response bias because the respondents might report what they believe to be acceptable instead of their actual practice. However, this study showed negative results as compared to the guideline recommendations. These negative findings are also supported by the results of the previous studies.⁷⁻⁸

Although the practice guidelines for asthma have been published and updated in the last decade, there is evidence that applying the guidelines in clinical practice has not been highly successful.¹⁹ This study reported inadequate adoption of the asthma guidelines by pediatricians. Efforts to improve adherence should consider the range of barriers to adherence, and the implications for various intervention should be tailored according to the present state of the barriers. Continuous medical education increased the adoption of the asthma guidelines.²⁰ An educational program based on self-learning and case-based discussion in small groups improved the doctors' knowledge and attitude, as well as some of their prescribing behavior in some health care settings.²¹ Success in implementing the asthma guidelines may depend on national efforts, as well as doctors' efforts. The asthma program, which the Ministry of Social Affairs and Health in Finland designed after recognizing asthma as an important health issue, increased the use of PFT monitoring or spirometry testing and the use of preventive medicine.²² The asthma program also decreased the use of short acting β agonist and the visits to specialist units.

In conclusion, this study reported poor adherence to the asthma guidelines for several of their recommendations from pediatricians. A greater understanding of the barriers to the adherence can help implement and adopt the asthma guidelines. Tailored interventions that

address the current state of barriers need to be designed and implemented.

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