

Patients' and primary care physicians' beliefs about asthma control and risk

Reynold A. Panettieri, Jr., M.D.,¹ Sheldon L. Spector, M.D.,² Michael Tringale, M.S.M.,³ and Matthew L. Mintz, M.D.⁴

ABSTRACT

Patients' and physicians' knowledge of asthma control and risks can affect long-term outcomes. The Asthma General Awareness and Perceptions II (Asthma GAP II) survey sought to assess the beliefs and behaviors of asthma patients and their physicians. In the United States, a telephone survey was conducted among 1885 adults with asthma (representative population sample [n = 1001] plus additional black [n = 436] and Hispanic samples [n = 448]) who took asthma medication in the previous year. An online survey included 300 primary care physicians. Most patients (66, 84, and 78% of national, black, and Hispanic samples, respectively) and physicians (80%) considered asthma a very or extremely serious condition. In contrast to current guidelines, most patients (69, 72, and 70%) believed that quick-relief medications could be taken daily. Many patients (42, 52, and 60%) and some physicians (22%) stated controller medications could be taken less regularly when symptoms decrease, although most patients (92, 92, and 89%) and physicians (95%) indicated that controller medications are most effective when taken daily. Of patients who discontinued controller medications (21%), 71% discontinued when symptoms abated. Most physicians (87%) believed that patients discontinued controller medications without their advice. After controller medication cessation, more black (22%) and Hispanic patients (22%) than patients in the national sample (15%) experienced serious health consequences after an asthma attack. Gaps exist between patients' understanding of asthma control and their use of controller and quick-relief medications. Many patients and physicians fail to recognize that, even with symptom abatement, serious asthma risks remain.

(Allergy Asthma Proc 30:519–528, 2009; doi: 10.2500/aap.2009.30.3281)

Key words: Asthma, awareness, control, controller medication, minority, patient, perception, physician, quick relief medication, risk

Current guidelines for asthma management from the U.S. National Heart, Lung, and Blood Institute (NHLBI) emphasize ongoing assessment and monitoring of asthma severity, control, and response to treatment.¹ Asthma control is defined by the guidelines as the degree to which symptoms, impairment, and risk are reduced, and the degree to which therapy goals are met.¹ "Impairment" is assessed according to the frequency and inten-

sity of symptoms and functional limitations experienced by the patient. "Risk" is an estimate of the likelihood of experiencing an asthma exacerbation, a decrease in pulmonary function, or a medication-related adverse event.¹ The guidelines recommend initial treatment based on asthma severity at the patient's first presentation. However, because response to asthma therapy is highly variable, it is important to regularly assess the degree of control attained and to adjust or maintain treatment accordingly.^{1,2}

The results of the Gaining Optimal Asthma control (GOAL) study^{3,4} have shown that well-controlled asthma can be achieved with currently available medications. In patients with previously uncontrolled asthma, as many as 77% (salmeterol/fluticasone propionate combination) and 68% (fluticasone propionate alone) of patients achieved well-controlled asthma at 1 year.³ This study's findings showed that a majority of patients can achieve at least well-controlled asthma when therapy is stepped up based on the patient's level of asthma control.^{3,4} However, despite the apparent attainability of asthma control, more than one-half of asthma patients in the United States have uncontrolled asthma.^{2,5,6}

For patients who receive adequate treatment and physician follow-up, much of the disparity between

From the ¹Division of Pulmonary, Allergy, and Critical Care, University of Pennsylvania, Philadelphia, Pennsylvania, ²California Allergy and Asthma Medical Group, Inc., Los Angeles, California, ³External Affairs Department, Asthma and Allergy Foundation of America, Washington, D.C., and ⁴Department of Medicine, George Washington University School of Medicine, Washington, D.C.

Presented as a poster at the 65th Annual Meeting of the American Academy of Allergy, Asthma, and Immunology, Washington, D.C., March 14, 2009

Financial support for this article was provided by AstraZeneca LP. S.L. Spector is a consultant, speaker, advisor, and/or research grant recipient from Abbot Laboratories, AstraZeneca, Genentech, Novartis, Schering-Plough, Merck, Sepracor, and Skypharma. M.L. Mintz is a consultant and/or speaker for AstraZeneca, GlaxoSmithKline, and Sepracor. R.A. Panettieri and M. Tringale have nothing to disclose pertaining to this article

Approval by Institutional Review Board: Not applicable; not a clinical study

Address correspondence and reprint requests to Reynold A. Panettieri, Jr., M.D., Asthma Section, Division of Pulmonary, Allergy, and Critical Care, University of Pennsylvania Medical Center, 125 South 31st Street, TRL Suite 1200, Philadelphia, PA 19104-3403

E-mail address: rap@mail.med.upenn.edu

Copyright © 2009, OceanSide Publications, Inc., U.S.A.

the degree of asthma control possible and the clinical reality may be caused by noncompliance with controller medication.^{5,7} To explore how asthma outcomes may be improved, several large surveys were conducted to query the knowledge and beliefs of physicians and/or patients about asthma and its treatment. Findings from many of these studies have identified gaps of various kinds: guideline-recommended versus actual prescribing practices,^{8,9} patient versus physician perceptions and expectations,^{10,11} real versus perceived levels of asthma control among patients and physicians,^{8,9} and patient knowledge of appropriate medication use versus real-world behavior.⁸ In 2007, the Asthma General Awareness and Perceptions (GAP I) survey assessed knowledge and beliefs about asthma in the general population and in persons with asthma.¹² Survey findings showed a misperception among patients as to what is meant by well-controlled asthma. Although almost two-thirds of patients with asthma reported that their condition was under control, more than one-half of patients experienced symptoms at least once a week.¹²

For a better understanding of these misperceptions and to gain perspective on the potential for corrective actions, the Asthma GAP II survey, reported here, provides comprehensive insights into the beliefs and behavior of asthma patients and their physicians. The goals of the survey were to examine asthma patients' understanding of asthma and asthma control and how this understanding affects their use of controller medications and to identify gaps between patient and physician beliefs about asthma control to provide insights into ways to improve asthma control. A unique aspect of this survey is the inclusion of large samples of black and Hispanic patients.

METHODS

Study Population

The study was based on surveys completed by asthma patients and primary care physicians in the United States. Asthma patients were defined as adults who reported that they had ever had asthma diagnosed by a health professional, still had asthma, and had taken any medication to control their asthma in the past 12 months. Primary care physicians included general practitioners, family practitioners, and internal medicine practitioners who met the eligibility criteria: board certified or board eligible in their specialty and treating at least three asthma patients per week.

Data Collection Methods

Patient Survey. Respondents in the national sample were randomly selected from a telephone access panel of 400,000 prerecruited households including >6000 adults with a reported diagnosis of asthma (Ipsos

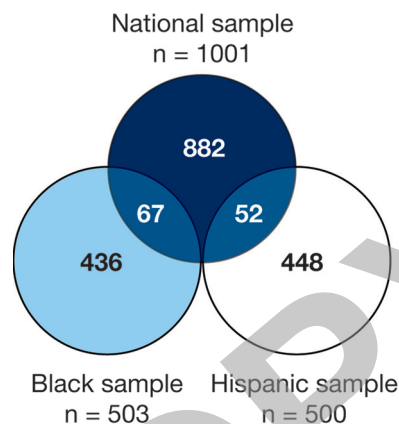


Figure 1. Number of patients in each sample group ($n = 1885$).

North American Offline Panel, Westbury, NY). Additional patients with asthma were obtained through targeted lists from a survey database provider (Marketing Systems Group, Fort Washington, PA) to achieve a total sample of at least 500 black patients and 500 Hispanic patients. Respondents were asked to self-identify their race and ethnicity. Patients were surveyed by computer-assisted telephone interviews conducted in English or Spanish between June 27 and August 18, 2008. Each interview lasted ~15–20 minutes. The survey included questions regarding patients' understanding of asthma and its risks and their use of asthma medications.

Physician Survey. The physicians were randomly selected from a managed online "double opt-in" panel (e-Rewards Market Research, Dallas, TX) of 14,000 primary care physicians. Potential participants were screened and those who met the eligibility criteria were invited *via* e-mail to complete the online questionnaire. Physicians were surveyed between August 4 and August 6, 2008 about their treatment of asthma and their perceptions of how patients view various aspects of asthma, including its control.

Statistical Analysis

The results from the national sample of patients and physicians and the black and Hispanic samples were analyzed separately. Sampling quotas were applied to the patient samples and data were weighted to balance demographics and ensure that the sample composition matched that of the population of U.S. adults with asthma in terms of age, sex, and race/ethnicity according to the 2007 U.S. Census. This approach provided results that approximated a probability sample. Estimated margins of error and a 95% level of confidence around unweighted probability samples with a 100% response rate were ± 3.1 percentage points for a sample size of 1001 (national sample) and ± 4.4 percentage points for a sample size of 500 (black and Hispanic samples).

Table 1 Demographics of the patient populations

Characteristic*	National Sample (n = 1001) (%)	Black Sample (n = 503) (%)	Hispanic Sample (n = 500) (%)
Sex			
Men	36	42	35
Women	64	58	65
Mean (SD) age, yr	47.4 (0.5)	44.0 (0.7)	44.1 (0.6)
Ethnicity/race			
Non-Hispanic white	76	—	—
Black	13	100	—
Hispanic	8	—	100
Other	3	—	—
Regions			
Northeast	20	20	21
Midwest	23	23	10
West	21	21	33
South	36	36	36
Marital status			
Married/domestic partnership	56	40	58
Not married (single, divorced, or widowed)	44	59	42
Education			
High school or less	31	33	35
Some college	30	36	37
College graduate or above	38	31	28
Household annual income, US\$			
<\$25,000	33	37	34
\$25,000–50,000	23	30	28
\$50,000–75,000	15	11	14
≥\$75,000	22	13	16
Don't know/not sure	8	9	8
Employment status			
Employed	49	53	52
Not employed	14	15	16
Retired/student	26	23	20
Other	11	23	21
Baseline medication use			
Controller medication	62	56	58
Quick-relief medication	59	52	64

*Values are percentages of patients (%) unless otherwise indicated. Percentages may not sum to 100 because of rounding.

RESULTS

Patient and Physician Demographics

The 1885 patients surveyed comprised 1001 patients in the national sample, 503 in the black sample (67 from the national sample plus 436 recruited), and 500 in the Hispanic sample (52 from the national sample plus 448 recruited; Fig. 1). Of the 56,758 telephone numbers initially called for the survey, 28,863 (51%) numbers were not in service or there was no answer, 13,886

(24%) respondents declined to participate, 2085 (4%) asked to be called back, and 9835 (17%) were ineligible or indicated language barriers. Of the 2089 eligible respondents, 204 did not complete the survey. Patient demographics were similar across the national, black, and Hispanic samples (Table 1). Of the national sample, 62 and 59% reported currently taking a controller medication and a quick-relief medication, respectively, when compared with 56 and 52% for the black sample and 58 and 64% for the Hispanic sample. Of 1985

Table 2 Demographics of the physician population (n = 300)

Characteristic*	%
Sex	
Men	74
Women	26
Mean age, yr#	45.1
Regions	
Northeast	21
Midwest	27
West	17
South	35
Board certification/eligibility	
Board certified	89
Board eligible	11
Years qualified in current practice	
≤5	18
6–10	22
11–15	18
16–20	16
>20	26
Patients treated per week	
11–50	5
51–100	36
101–200	51
>200	8
Asthma patients treated per week	
3–5	26
6–10	33
15–30	31
≥40	10
Conditions treated	
Asthma	100
High blood pressure	99
High cholesterol	99
Diabetes	98
Heart disease	97
Arthritis	96
Obesity	95
Sleep apnea	85

*Values are percentages unless otherwise indicated.

#No standard deviation is available because the question pertaining to age was based on age ranges, not individual ages.

invited physicians, 593 physicians responded, and 300 of these completed the survey. Demographic data for the participating physicians are shown in Table 2.

Patient Knowledge of Asthma Risk and Correct Medication Use

Most patients considered asthma to be a very or extremely serious condition (66, 84, and 78% of the

national, black, and Hispanic samples, respectively), ranking it just below diabetes (78, 87, and 81%) and high blood pressure (73, 86, and 76%). Most patients recognized the multiple causes of asthma. Patients were asked to answer “yes” or “no” to four factors as a potential cause of asthma; airway inflammation was most frequently cited (88%, national sample), followed by airway obstruction (76%), genetics (73%), and mucus production (59%).

Almost all patients stated that they recognized there are serious risks associated with uncontrolled asthma and knew the difference between quick-relief and controller medications (Fig. 2). Most patients (92% of national sample) reported that they knew controller medications are most effective when taken every day and that there are risks associated with discontinuing a controller medication (85%; Fig. 2). Despite this knowledge, many patients stated that it was appropriate to take controller medications less often when asthma symptoms decreased and to stop taking them if asthma symptoms were absent (Fig. 2). Approximately 70% of patients believed that quick-relief medications could be taken daily, but ~75% believed that they should be taken only in the case of an asthma attack (Fig. 2).

Patient Knowledge About Asthma Control

There was no clear consensus among patients regarding what it means to have “well-controlled” asthma (Fig. 3). A substantial proportion (44%) of patients in the national sample believed that asthma was well controlled when they needed to use quick-relief medication only three times per week. More than one-half of all patients believed that their asthma was well controlled if they had only two urgent physician visits per year or one Emergency Department (ED) visit per year.

Reported Use of Asthma Medications

Of the patients in the national sample who were currently taking controller medications ($n = 639$), 84% reported taking them on a regular basis for asthma prevention and maintenance, and 12% reported as-needed use for quick relief of an asthma attack. As-needed use of controller medication was more prevalent in black patients (18%) and Hispanic patients (20%). Many patients currently taking controller medications reported that they were instructed by their doctor to take controller medications on a daily basis (89% of national sample), and 10% reported being told to take them only as needed for symptoms.

Of the patients in the national sample who reported that they previously took, but no longer take, a controller medication ($n = 194$), 71% said that they took controller medication only when they had symptoms, and 70% said they stopped using controller medication

Patients responding "strongly/somewhat agree"

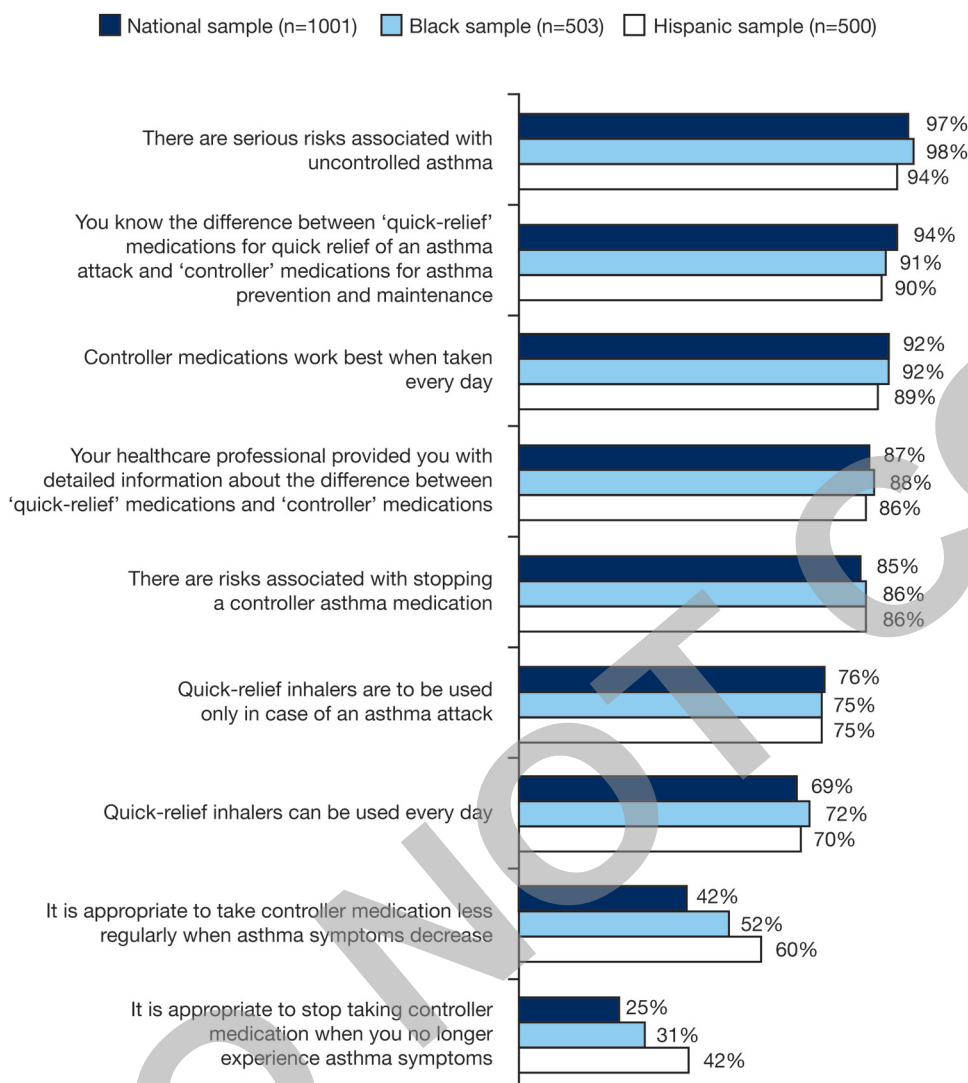


Figure 2. Patient beliefs about asthma-related risks and appropriate use of medication. Survey question: "Do you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree or strongly disagree that . . . ?"

because their asthma was under control without it (Fig. 4). Among black ($n = 138$) and Hispanic patients ($n = 118$) who reported that they stopped taking controller medication, 24 and 31%, respectively, cited inconvenience of regular administration as a reason, compared with 16% of the national sample. Most patients (78, 79, and 82% of the national, black, and Hispanic samples, respectively) reported taking controller medications currently or had taken them in the past 12 months. Of those 194 patients in the national sample who stopped controller medication within this period, >60% stopped for longer than 1 month (Fig. 5).

As a consequence of asthma attacks that occurred in patients who stopped taking controller medication, 21% in the national sample required oral steroid treatment, 17% needed an emergency doctor visit, 12% missed work, 12% visited the ED, and 6% were admitted to a hospital. After discontinuing controller medi-

cation, more black (22%) and Hispanic patients (22%) than those in the national sample (15%) experienced serious health consequences after an asthma attack. Thirty-two percent of black patients had an emergency physician visit, and 26% had an ED visit; 23% of Hispanic patients had to miss work.

Physician Survey

Most physicians (80%) viewed asthma as a very or extremely serious condition, compared with 97% for diabetes and 93% for high blood pressure. Physicians' beliefs about the risks of uncontrolled asthma and its treatment were generally consistent with guidelines (Fig. 6). However, contrary to guideline advice, some physicians believed that it was appropriate for patients with moderate to severe asthma to take controller medications less regularly when symptoms decreased (22%) or to stop

Patients responding "yes"

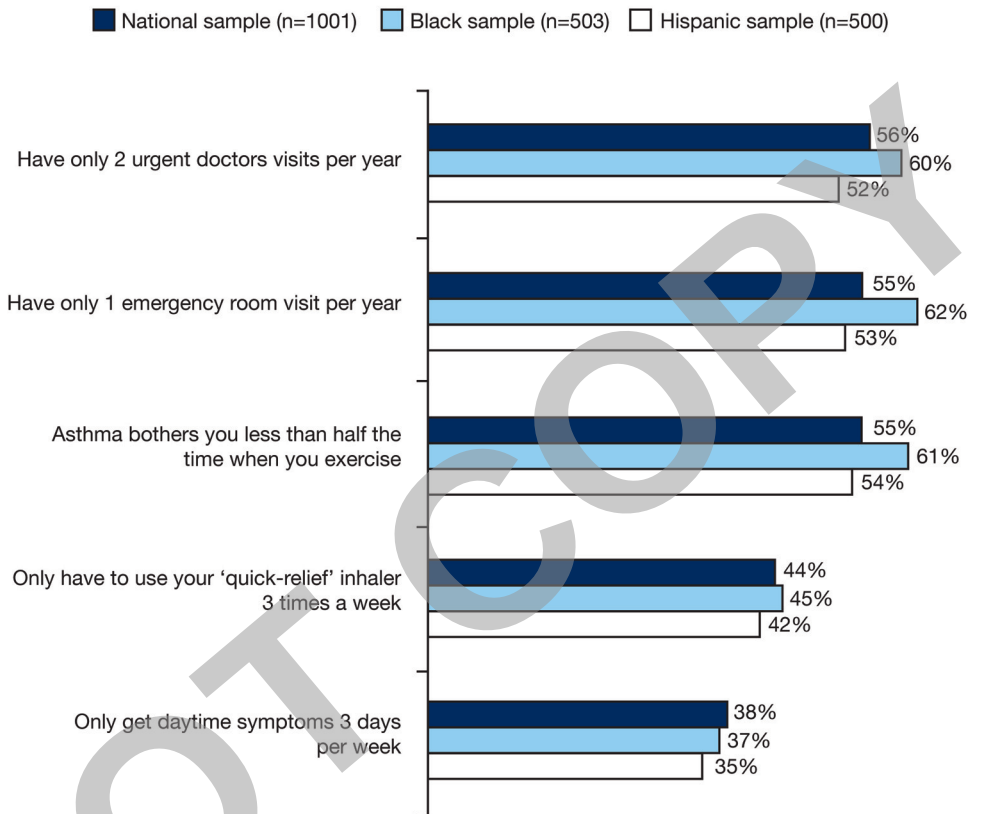


Figure 3. Patient opinions on what it means to have "well-controlled" asthma. Survey question: "Do you consider your asthma is well controlled if . . . ?"

taking controller medications when asymptomatic (14%). Only 15% of physicians thought that at least 70% of their patients took their controller medication as directed. Notably, 87% believed that patients frequently stop taking their controller medications without consulting them. Most physicians (>60%) were concerned about possible negative consequences of discontinuation of controller medication, notably asthma exacerbations resulting in an ED visit, underlying disease progression, hospitalization, emergency physician visit, and missing work.

DISCUSSION

The Asthma GAP II results showed that two-thirds of patients recognized asthma as a serious condition and most patients recognized that there are serious risks associated with uncontrolled asthma. This finding is not consistent with the outcome of a previous study that attributed a lack of compliance with asthma treatment to the patient belief that asthma is not a serious health problem.¹³ In the International Asthma Patient Insight Research (INSPIRE) study, patients reported being aware of the signs and symptoms of deteriorating asthma; however, many failed to adjust treatment appropriately to prevent an asthma attack.⁶ The survey results also showed that most patients recognized airway inflammation as a potential cause of asthma; however,

patients did not acknowledge the importance of controlling airway inflammation for effective asthma control. In contrast, in the case of cardiovascular disease, patients recognize the contribution of increased cholesterol levels to an increased risk of cardiovascular disease, and the importance of therapeutically managing cholesterol levels.¹⁴ A similar paradigm is needed for patient recognition that airway inflammation aggravates asthma symptoms and that managing inflammation with an inhaled corticosteroid is necessary to reduce airway inflammation and leads to improved asthma control.^{3,15}

A substantial proportion of patients misunderstood what constitutes good asthma control and underestimated the level of control that could be achieved. Approximately one-half believed that their asthma was well controlled if they had to take quick-relief medications only three times per week or had only two urgent physician visits or one ED visit per year. By contrast, NHLBI guidelines state that asthma symptoms are minimized in well-controlled asthma (*i.e.*, quick-relief medication use no more than twice per week, nighttime awakenings no more than twice per month, and no more than one exacerbation per year).¹ The results of other studies have also shown that patients underestimate what constitutes good control; many patients reported well-controlled asthma despite experiencing significant symptoms and the need

■ National sample (n=194) ■ Black sample (n=138) ■ Hispanic sample (n=118)

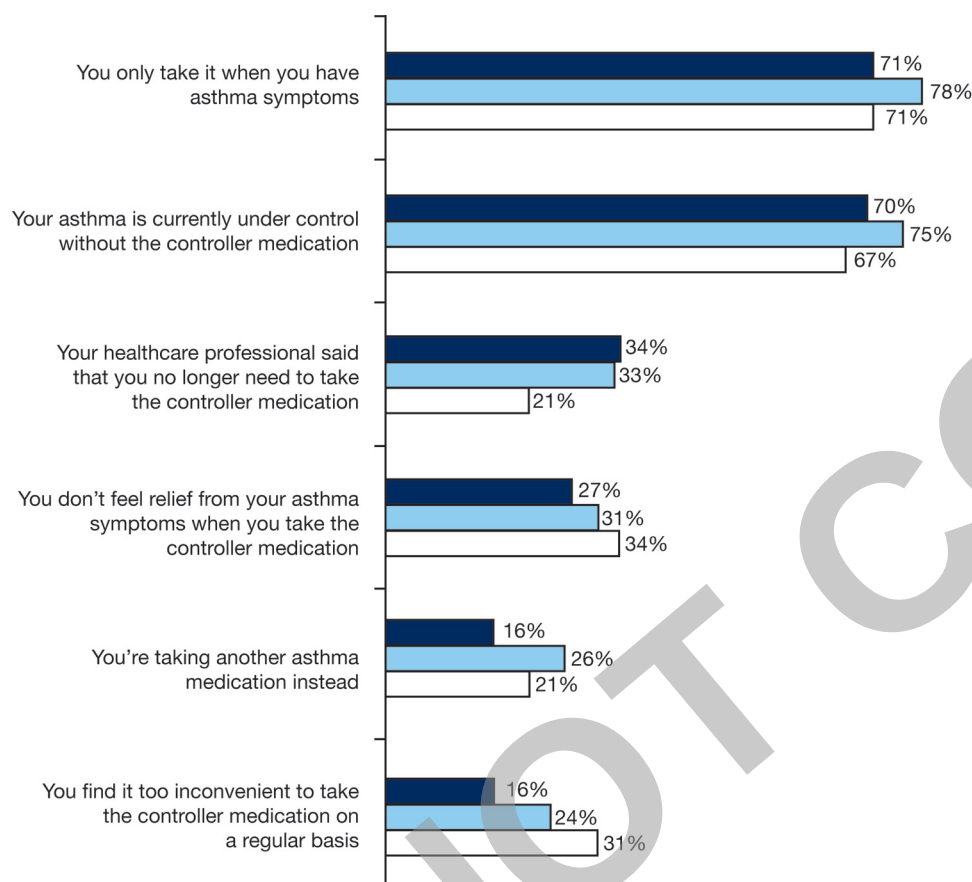


Figure 4. Reasons why patients stopped taking their controller medication. Survey question: "You answered that you were previously on a controller medication but not currently taking any. Please tell me why you are not currently taking any controller medication."

for quick-relief medication.^{6,8} Moreover, patients were less likely to seek physician advice or report symptoms if they overestimated their level of control or believed symptoms were inevitable. Indeed, many physicians believed that their patients underreported symptoms, and they expressed concern about the high levels of symptoms that patients consider normal.¹¹ Educational efforts should be directed at increasing patient understanding of asthma control in terms of acceptable levels of symptoms, quick-relief inhaler use, and its impact on daily activities.

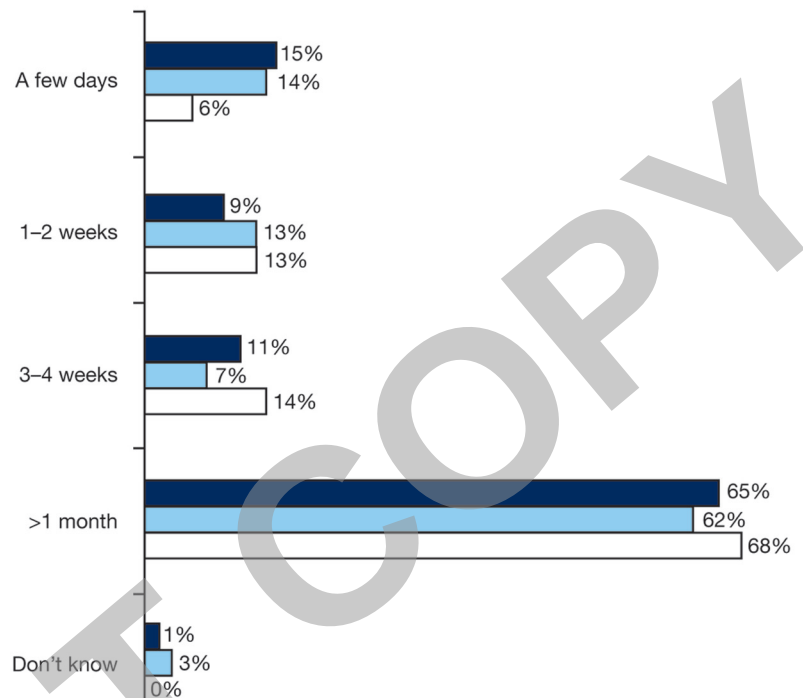
This survey also revealed gaps between patients' understanding of the appropriate use of controller and quick-relief medications and patients' behavior. Although most patients recognized that there were risks associated with discontinuing controller medications, nearly one-half believed that controller medications could be taken less frequently when symptoms decreased, and one-quarter believed the medications could be stopped altogether when symptoms decreased. Many patients who reported discontinuation of controller medication said they took controller medication only when they had symptoms or that they stopped because their symptoms were under control without it. More than two-thirds of patients believed

that quick-relief medications could be taken every day, suggesting that they did not realize that regular use of quick-relief medications indicates poor asthma control. These findings are consistent with those of other studies showing that adherence to asthma medication was poor.^{10,16} Patient educators may be able to improve adherence by clarifying for patients that regular use of controller medication means daily use even in the absence of symptoms.

An important aspect of the Asthma GAP II survey is the inclusion of a large population of black patients and Hispanic patients. Data documenting knowledge and beliefs about asthma in these populations are lacking. Black patients were more likely than the overall population to underestimate what constitutes well-controlled asthma. Both black and Hispanic patients were more likely than the overall population to consider asthma a serious or very serious condition, believe that controller medications could be taken less frequently or stopped if symptoms decreased or disappeared, and experience adverse health consequences after an asthma attack after discontinuing controller medications.

Findings from other studies have identified differences between the overall U.S. population and minority groups

■ National sample (n=154) ■ Black sample (n=84) □ Hispanic sample (n=103)



Percentages may not sum to 100 due to rounding.

Figure 5. Duration of interruption of controlled medication. Survey question: "For how long did you stop taking your controller medication the last time you did in the last 12 months?"

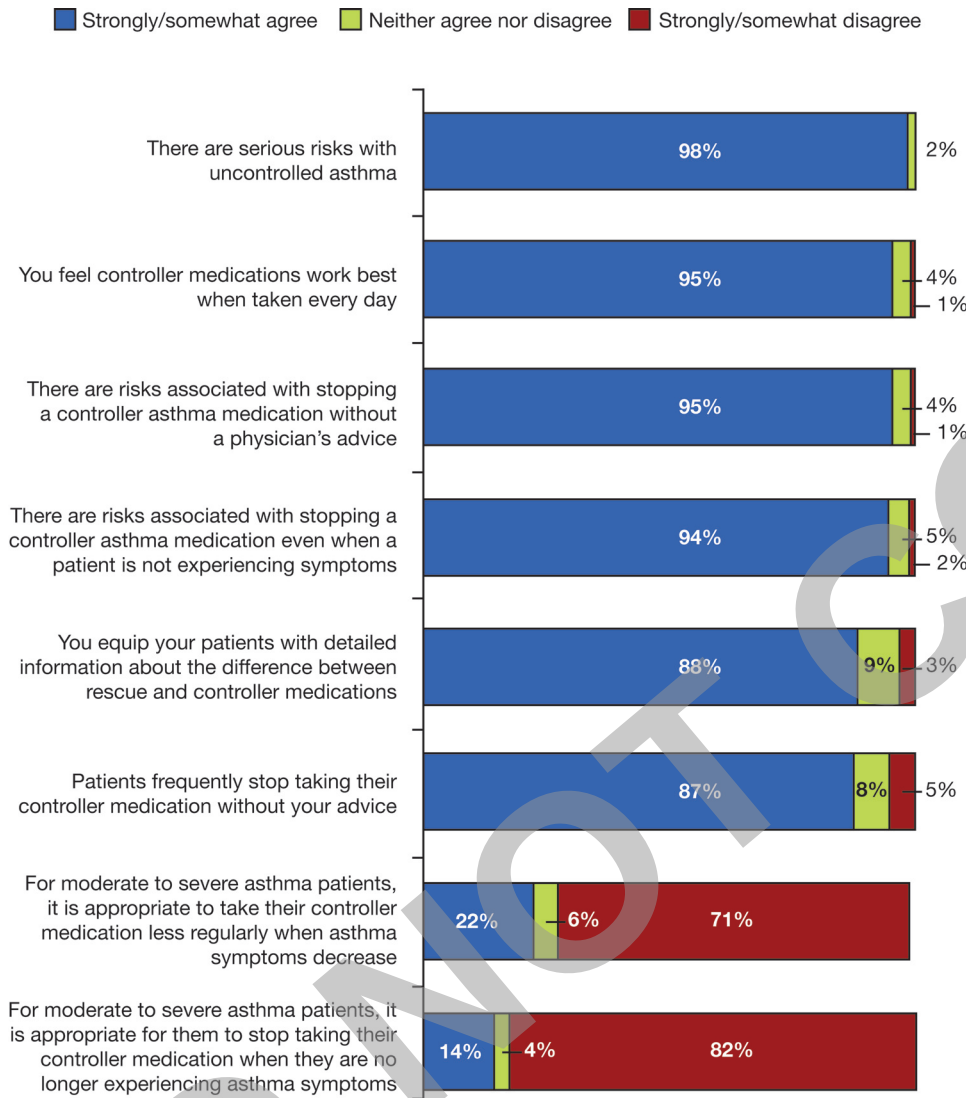
with regard to asthma diagnosis and treatment. The Asthma GAP I survey showed that, although more than one-half of black and Hispanic respondents reported experiencing asthma symptoms, in only 13 and 8%, respectively, had asthma been diagnosed.¹² Rates of hospitalization and ED visits resulting from asthma were higher in Hispanic and black populations.^{17,18} George *et al.*¹⁹ found that black patients with asthma understood the importance of taking inhaled corticosteroids on a daily basis even when asymptomatic, but nevertheless discontinued therapy when symptoms abated. Racial and ethnic differences in medication adherence among patients with asthma may necessitate group-specific interventions to improve adherence.²⁰

Asthma GAP II results showed that ~20% of physicians believe that the intermittent use of controller medications in patients with moderate to severe asthma is appropriate when symptoms decrease; >10% believe that medications can be stopped altogether in the absence of symptoms. Neither of these beliefs is in accordance with NHLBI guidelines.¹ Bender *et al.*¹⁶ found that one-third of patients reported that their physicians instructed them to use controller medications intermittently at their own discretion based on symptom levels. Other survey findings have also identified gaps between prescribing practices and guideline recommendations.^{8,10} The results of two studies have suggested that as-needed use of cortico-

steroids may be appropriate in some patients who have mild persistent asthma.^{21,22} However, neither study's findings provided support for intermittent use of controller medication in patients with moderate to severe asthma. Physicians responding to the Asthma GAP II survey were concerned about the potential negative consequences of discontinuing controller medications; it was unclear whether this concern applied to all patients or those with moderate to severe asthma.

Asthma GAP II was designed to compare the knowledge and beliefs of patients with those of physicians. Physicians were more likely than patients to rate various medical conditions, including asthma, as very or extremely serious. This finding is consistent with that of another survey that showed many physicians believed that patients did not take asthma seriously enough.¹¹ In the Asthma GAP II survey, however, patients ranked asthma as the third most serious condition, after diabetes and high blood pressure, whereas physicians ranked asthma fifth of six choices, after diabetes, high blood pressure, obesity, and high cholesterol, but before arthritis.

Physicians' perceptions of patients' knowledge and beliefs about asthma were generally accurate in this study. Both patients and physicians had misperceptions about the appropriate use of controller medications, although a lower proportion of physicians felt that it was appropriate to decrease or discontinue con-



Percentages may not sum to 100 due to rounding.

Figure 6. Physician beliefs about asthma risks and treatment approaches. Survey question: "How much do you agree/disagree with the following statements?"

troller medication in moderate or severe asthma depending on symptom levels.

Although progress has been made in educating both patients and physicians about guideline recommendations, the persisting gaps between knowledge and behavior must be addressed to correct common misperceptions. It is important to ensure that patients and physicians have a common understanding of what is meant by regular use of a controller medication, especially in moderate to severe persistent asthma. The importance of consistent daily use of controller medications must be emphasized in practice, just as it is emphasized in the guidelines. Patients need a better understanding of what is meant by asthma control and what is achievable. A qualitative study could refine our understanding of the gaps between patients' knowledge and their behavior.

The Asthma GAP II survey did not collect data on the patients' severity of asthma and level of control; there-

fore, how these factors may have influenced the results is unknown. Although questions were designed to elicit patient beliefs, the influence of the interviewer and the wording and sequence of questions on patients' answers cannot be excluded. For many questions, patients and physicians were required to choose from a defined list of options read in a random order. Qualitative survey instruments that would provide more open-ended and exploratory questions may be more effective in eliciting perceptions and beliefs.²³ Different survey tools (online versus telephone versus mail) may yield different cross-sections of respondents and lead to different results.²⁴ Telephone surveys tend to have higher response rates compared with Web-based surveys, especially when older respondents and those with a lower educational level are included.²⁴ Random-digit dialing, a sampling technique often used for telephone interview surveys to produce a representative sample of the general population,²⁵ was impractical for this survey considering that

patients with asthma represent only a fraction of the U.S. population. Instead, the survey was conducted with samples lists of preidentified patients with asthma. Finally, the different methods used to survey physicians (Web-based) and patients (telephone) might have contributed to apparent gaps between the two groups in certain beliefs and perceptions.

Summary

The results of the Asthma GAP II survey show the gap between patients' stated knowledge/belief about the appropriate use of controller medications and their actual use of such medications. Disparities in asthma control among black and Hispanic populations compared with the national sample appear to be associated with gaps in patient knowledge/beliefs about asthma control and real-world behavior. Educational interventions targeting patient behavior need to convey that asthma is a serious, chronic disease and shift the paradigm for patients to one that emphasizes that regular use of controller medication means daily use. Identification of the gaps between knowledge/belief about asthma and behavior could provide insights into reducing barriers to medication use that may increase the use of controller medications and, in turn, may possibly improve asthma control.

ACKNOWLEDGMENTS

The authors acknowledge Mary Greenacre, Ph.D., and Susan M. Kaup, Ph.D., (Evidence Scientific Solutions, Philadelphia, PA) for writing and editorial assistance funded by AstraZeneca LP (Wilmington, DE).

REFERENCES

1. National Heart, Lung, and Blood Institute. National Asthma Education and Prevention Program. Expert panel report 3: Guidelines for the diagnosis and management of asthma. National Institutes of Health Publication No. 07-4051, 2007.
2. Peters SP, Jones CA, Haselkorn T, et al. Real-world Evaluation of Asthma Control and Treatment (REACT): Findings from a national Web-based survey. *J Allergy Clin Immunol* 119:1454–1461, 2007.
3. Bateman ED, Boushey HA, Bousquet J, et al. Can guideline-defined asthma control be achieved? The Gaining Optimal Asthma Control study. *Am J Respir Crit Care Med* 170:836–844, 2004.
4. Bateman ED, Bousquet J, Busse WW, et al. Stability of asthma control with regular treatment: An analysis of the Gaining Optimal Asthma control (GOAL) study. *Allergy* 63:932–938, 2008.
5. Carlton BG, Lucas DO, Ellis EF, et al. The status of asthma control and asthma prescribing practices in the United States: Results of a large prospective asthma control survey of primary care practices. *J Asthma* 42:529–535, 2005.
6. Partridge MR, van der Molen T, Myrseth SE, et al. Attitudes and actions of asthma patients on regular maintenance therapy: The INSPIRE study. *BMC Pulm Med* 6:13, 2006.
7. Corsico AG, Cazzoletti L, de Marco R, et al. Factors affecting adherence to asthma treatment in an international cohort of young and middle-aged adults. *Respir Med* 101:1363–1367, 2007.
8. FitzGerald JM, Boulet LP, McIvor RA, et al. Asthma control in Canada remains suboptimal: The Reality of Asthma Control (TRAC) study. *Can Respir J* 13:253–259, 2006.
9. Chapman KR, Boulet LP, Rea RM, et al. Suboptimal asthma control: Prevalence, detection and consequences in general practice. *Eur Respir J* 31:320–325, 2008.
10. Canonica GW, Baena-Cagnani CE, Blaiss MS, et al. Unmet needs in asthma: Global Asthma Physician and Patient (GAPP) Survey: Global adult findings. *Allergy* 62:668–674, 2007.
11. Bellamy D, and Harris T. Poor perceptions and expectations of asthma control: Results of the International Control of Asthma Symptoms (ICAS) survey of patients and general practitioners. *Prim Care Respir J* 14:252–258, 2005.
12. Asthma and Allergy Foundation of America. The Asthma G.A.P. in America: General Awareness and Perceptions. G.A.P. I survey findings (2007). Available online at www.asthmagap.com/for-the-media/gap-survey-1-2007/survey-findings/; last accessed May 13, 2009.
13. Chambers CV, Markson L, Diamond JJ, et al. Health beliefs and compliance with inhaled corticosteroids by asthmatic patients in primary care practices. *Respir Med* 93:88–94, 1999.
14. Muntner P, DeSalvo KB, Wildman RP, et al. Trends in the prevalence, awareness, treatment, and control of cardiovascular disease risk factors among noninstitutionalized patients with a history of myocardial infarction and stroke. *Am J Epidemiol* 163:913–920, 2006.
15. Halm EA, Mora P, and Leventhal H. No symptoms, no asthma: The acute episodic disease belief is associated with poor self-management among inner-city adults with persistent asthma. *Chest* 129:573–580, 2006.
16. Bender BG, Long A, Parasuraman B, et al. Factors influencing patient decisions about the use of asthma controller medication. *Ann Allergy Asthma Immunol* 98:322–328, 2007.
17. Asthma prevalence and control characteristics by race/ethnicity—United States, 2002. *MMWR Morb Mortal Wkly Rep* 53: 145–148, 2004.
18. Laditka JN, and Laditka SB. Race, ethnicity and hospitalization for six chronic ambulatory care sensitive conditions in the USA. *Ethn Health* 11:247–263, 2006.
19. George M, Freedman TG, Norfleet AL, et al. Qualitative research-enhanced understanding of patients' beliefs: Results of focus groups with low-income, urban, African American adults with asthma. *J Allergy Clin Immunol* 111:967–973, 2003.
20. Wells K, Pladevall M, Peterson EL, et al. Race-ethnic differences in factors associated with inhaled steroid adherence among adults with asthma. *Am J Respir Crit Care Med* 178: 1194–1201, 2008.
21. Boushey HA, Sorkness CA, King TS, et al. Daily versus as-needed corticosteroids for mild persistent asthma. *N Engl J Med* 352:1519–1528, 2005.
22. Turpeinen M, Nikander K, Pelkonen AS, et al. Daily versus as-needed inhaled corticosteroid for mild persistent asthma (The Helsinki early intervention childhood asthma study). *Arch Dis Child* 93:654–659, 2008.
23. Carter S, and Henderson L. Approaches to qualitative data collection in social science. In *Handbook of Health Research Methods: Investigation, Measurement and Analysis*. Bowling A, and Ebrahim S (Eds). New York: Open University Press, 215–229, 2005.
24. Rodriguez HP, von Glahn T, Rogers WH, et al. Evaluating patients' experiences with individual physicians: A randomized trial of mail, internet, and interactive voice response telephone administration of surveys. *Med Care* 44:167–174, 2006.
25. Bowling A. Quantitative social science: The survey. In *Handbook of Health Research Methods: Investigation, Measurement and Analysis*. Bowling A, and Ebrahim S (Eds). New York: Open University Press, 190–214, 2005. □

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.