

Factors Associated with Physician-Patient Discordance in the Perception of Asthma Control



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What is already known about this topic? Assessments of asthma control are sometimes different between patients and physicians, and the discordance has a negative impact on current symptom control and future risk.

What does this article add to our knowledge? Not well-controlled asthma and no history of lung function testing are independently associated with the discordance between physicians and patients in the perception of asthma control.

How does this study impact current management guidelines? This study suggests that periodic use of objective parameters such as Asthma Control Questionnaire and lung function testing could have a pivotal role in attenuating the physician-patient discordance in the perception of asthma control.

BACKGROUND: Physicians' perception of asthma control has a direct impact on treatment options and patients' outcomes.

OBJECTIVE: To analyze the differences between patients and their physicians in the perception of asthma control. Moreover, factors associated with this discordance were explored.

METHODS: A multicenter, cross-sectional survey was conducted in patients visiting primary or secondary facilities for routine asthma reviews. Before the review, patients completed the 5-item Asthma Control Questionnaire (ACQ) under the supervision of a medical staff. Physicians recorded their perception of the patients' asthma control without viewing the ACQ results. After the review, physicians completed the demographic and clinical data.

RESULTS: A total of 1697 patients were included. ACQ results showed that asthma was well controlled in 52.2% of the patients, but physicians perceived that 79.6% of patients were well controlled. The concordance analyzed by the kappa index was weak (0.27). The discordant physician-patient pairs had significantly worse ACQ scores than the concordant pairs ($P < .0001$), but the use of neither inhaled corticosteroids nor other controller medications showed any differences between

the groups. In a multivariate model, ACQ score of 0.75 or more and lack of lung function assessment within the previous 6 months were independently associated with the physician-patient discordance in the perception of asthma control.

CONCLUSIONS: The subjective perception of the physicians did not show a good agreement with the patients' asthma control based on validated ACQ scores, with increased rates of discordance among patients whose asthma was not well controlled and patients who had not received lung function assessment. © 2019 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2019;7:2634-41)

Key words: Allergy; Asthma; Inflammation; Lung function

INTRODUCTION

Asthma is a chronic airway inflammatory disease with a high prevalence and a major health problem worldwide.^{1,2} There are still many patients with poorly controlled asthma in the world,³ and poor asthma control is positively associated with the rate of exacerbations, emergency department visits, and deaths.⁴

Although an accurate review of the asthma condition is essential for adequate treatment, assessments of asthma control are sometimes different between patients and physicians.⁴⁻¹⁰ In a previous study of 2902 patients with asthma, the rate of patient-physician opinion discordance was 27.2%,⁵ and such a disconnection can have a negative impact on current symptom control and future risk.⁴⁻¹⁰ It has been reported that inappropriate treatment due to the physicians' underestimation was associated with higher mortality in patients with asthma.^{4,8} The physicians' perception of asthma control has a direct impact on treatment options and patients' outcomes. However, few observational studies have provided detailed data regarding the differences between patients and their physicians in the perception of asthma control,⁵⁻⁷ and none of these studies attempted to explain factors associated with the discordance.

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Abbreviations used

ACQ- Asthma Control Questionnaire

FENO- Fractional exhaled nitric oxide

HR- Hazard ratio

We used data from a large, multicenter, observational study that included detailed assessments of patients with asthma, to examine the discordance between physicians and patients in the perception of asthma control, and to explore whether certain related factors could be responsible for this dissociation.

METHODS

Study design and patients

Our analysis was based on data collected in the Subjective Evaluation of Asthma CONTROL (SEACON) multicenter, cross-sectional, observational study approved by the Ethics Committee of Yamaguchi University (institutional review board no. H28-108-4). The study was conducted in 29 primary or secondary care facilities in Yamaguchi, Japan, from October 2017 to December 2017. Informed consent for using data was obtained from all patients. All patients who satisfied the standard criteria for asthma,¹¹ were being treated for the asthma condition, and had a history of routine asthma reviews more than 4 times during the past 1 year were recruited. Because Japan's insurance system mandates prescriptions for asthma medications to be 3 months at maximum in principle, this criterion has been set up to register patients with asthma who need regular asthma reviews for at least 1 year or more. In other words, patients who needed more than 4 visits within the last year were included. However, this does not imply that the patients had more severe or less well-controlled asthma that required many visits. Patients who had a recent exacerbation were also excluded, because both the physicians and the patients would be certain that the asthma control had not been adequate. Patients with other pulmonary and cardiovascular diseases or with disorders that would prevent them from being able to complete the study assessments were not enrolled.

Study assessments

This survey was conducted in 3 steps to eliminate the impact of the clinical laboratory data, asthma treatment, and patients' asthma control assessment on the physicians' perception. Before the routine asthma review, patients completed the 5-item Asthma Control Questionnaire (ACQ) under the supervision of a medical staff. It is a composite measure that assesses the asthma condition according to 5 patient-reported items.^{12,13} The overall ACQ score is the mean of 5 responses. An ACQ score ranging from 0.75 to 1.5 was defined as "inadequately controlled asthma," and an ACQ score of 1.5 or more was defined as "poorly controlled asthma."^{12,13} In the present study, "inadequately controlled asthma" and "poorly controlled asthma" were both defined as "not well-controlled asthma."

During the asthma review, physicians recorded the demographic data (age, sex) and their perception of the patients' asthma control (well-controlled or not well-controlled) on the basis of interview and physical examination. Based on the American Thoracic Society/European Respiratory Society statement, asthma exacerbation was defined as a worsening of asthma requiring the use of systemic corticosteroids, or an increase from a stable maintenance dose, for at least 3 days.¹⁴ If the patients had exacerbations or a change in controller treatment within the last 4 weeks, they were not included in the survey. The physicians could refer to the ACQ results after

their perception of asthma control was recorded, but the report was managed by the serial number, and the record with the modification of description on their perception was not permitted.

After the asthma review, physicians completed the rest of the demographic data (body mass index, smoking history) and clinical characteristics (asthma controller medications, exacerbation history in the last 12 months). FEV₁, blood eosinophils, and fractional exhaled nitric oxide (FENO) were documented if these data were evaluated within 6 months of the data collection. Lung function and FENO were measured according to the American Thoracic Society Guidelines,^{15,16} as previously described.¹⁷

Statistical analyses

All data are expressed as mean values and SD for continuous variables. For categorical variables, the number of observations and percentages were given in each category. The Cohen's kappa (κ) index was obtained to assess the degree of concordance between the patients and the physicians in the perception of asthma control. The magnitude of the κ coefficient, which ranges from 0 (without concordance) to 1 (maximum concordance), is usually interpreted as follows: poor ($\kappa < 0.20$), weak (κ between 0.21 and 0.40), moderate (κ between 0.41 and 0.60), good (κ between 0.61 and 0.80), and very good (κ between 0.81 and 1.00).¹⁸ In addition, we dichotomized the patients into 2 groups on the basis of the presence or absence of the patient-physician discordance. Comparisons between different 2 groups were performed by Fisher exact test and Mann-Whitney U tests. Multivariate logistic regression analysis was used to estimate hazard ratios (HRs) with 95% CIs for increased risk of the discordance. The variables with P values of less than .05 in the univariate analysis were included. All analyses were performed with JMP pro version 13.0.0 (SAS Institute, Inc, Cary, NC). A P value of less than .05 was considered significant.

RESULTS

A total of 1780 patients with asthma were enrolled in the study, and 83 patients were excluded for the following reasons: 25 patients whose perceptions or those of their physicians had not been recorded, and 58 patients who failed to complete the demographic data. Finally, 1697 patients were included in the analysis (Figure 1). The patients' demographic and clinical characteristics are listed in Table I. The subjects consisted of 698 males and 999 females with a mean age of 62.6 ± 16.0 years. Almost all subjects were older than 18 years, and only 8 subjects were younger than 18 years. A total of 581 (34.2%) patients had a smoking history. Almost all the patients (95.7%) were receiving inhaled corticosteroids, and 82.4% of patients were using inhaled long-acting bronchodilators. The mean ACQ score was 0.90 ± 0.94 and the prevalence of patients with exacerbation history was 22.7%.

Regarding patients' asthma control assessment according to the ACQ scores, 52.2% ($n = 886$) were well controlled, 24.2% ($n = 411$) were inadequately controlled, and 23.6% ($n = 400$) were poorly controlled, whereas the physicians perceived that 79.6% ($n = 1350$) of their patients had well-controlled asthma and 20.4% ($n = 347$) did not have well-controlled asthma (Figure 2). Table II and Figure 3 show the results of the concordance analysis between the 1697 pairs of observers (each patient with the corresponding physician). When patients' assessment was classified as either well controlled or not well controlled, the rate of patient-physician discordance was 35.4%. The κ coefficient showed a weak concordance (κ value = 0.274;

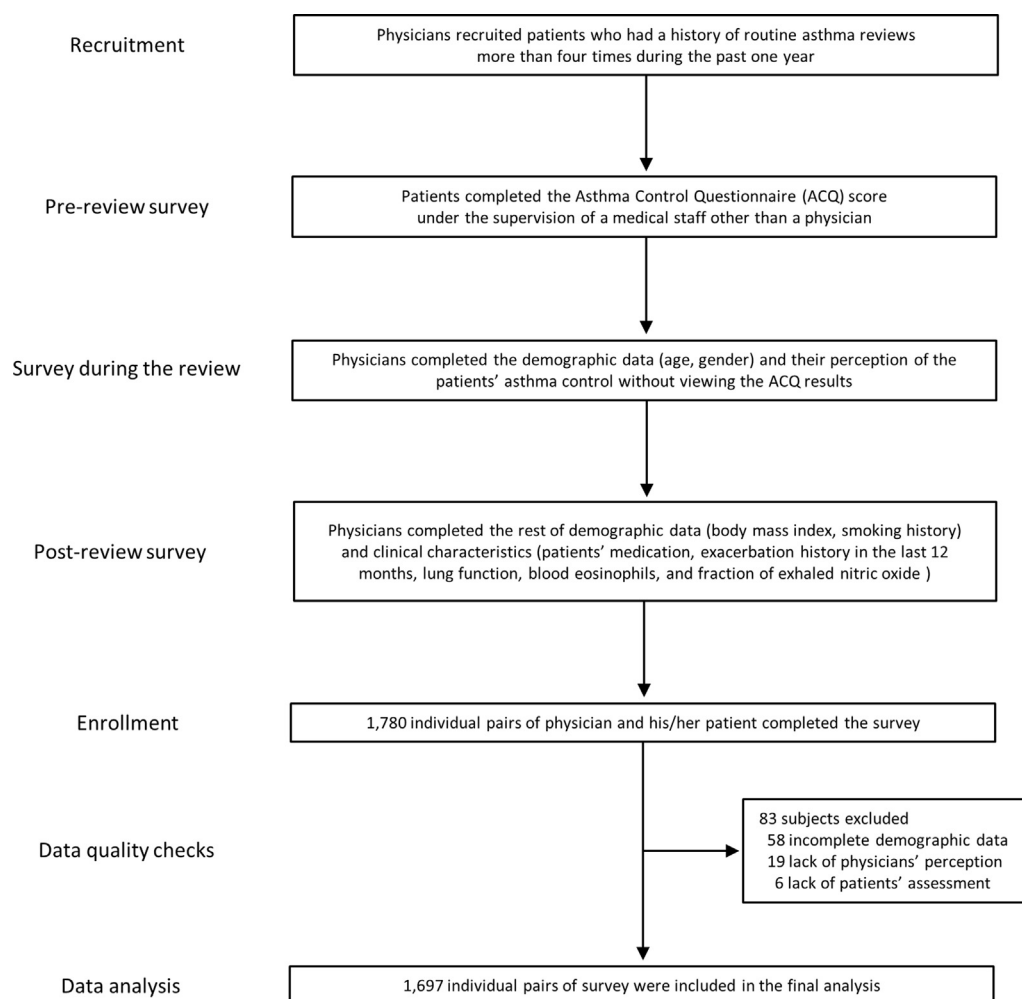


FIGURE 1. Study profile.

95% CI, 0.227-0.321). All specific items on the ACQ equally contributed to the discordant results (data not shown). Figure 3 shows a histogram of patients' ACQ scores and their physicians' perception of asthma control. The coincidence rate between patient and physician was 92.3% in patients with well-controlled asthma. However, only 34.4% of their assessments coincided in patients whose asthma was not well controlled. In other words, more than 65% of patients whose asthma was not controlled were perceived as having controlled asthma by their physician.

Comparisons between the characteristics of the patients in the concordant group and those in the discordant group are presented in Table III. The discordant physician-patient pairs had worse ACQ scores (1.3 ± 0.7) than the concordant pairs (0.7 ± 1.0) ($P < .0001$), but the use of neither inhaled corticosteroids nor other controllers showed any differences between the groups. The univariate analysis identified a total of 4 statistically significant factors, such as age, obesity (body mass index ≥ 25 kg/m²), not well-controlled asthma based on the ACQ score, and no history of lung function testing. The multivariate analysis revealed that not well-controlled asthma (HR = 2.10; 95% CI, 1.87-2.37; $P < .0001$) and no history of lung function testing (HR = 1.87; 95% CI, 1.56-2.31; $P < .0001$) were independently associated with the

physician-patient discordance in the perception of asthma control (Figure 4).

DISCUSSION

In this observational study of patients with asthma, we found that the subjective perception of the physicians did not show a good agreement with the patients' asthma control based on validated ACQ scores. The rate of patient-physician discordance was 35.4%. Dissociation of perceptions was noticeable especially in patients whose asthma was not well controlled. An ACQ score of 0.75 or more and lack of lung function assessment were identified to be independent determinants of increased risk of discordance between physicians and patients in the perception of asthma control.

The patient-physician concordance was weak in the SEACON survey, but we observed that this disconnection was strongly associated with the asthma control level according to the ACQ scores. In fact, only 7.7% of patients with well-controlled asthma were perceived as not having well-controlled asthma by their physicians. In contrast, more than 65% of patients whose asthma was not well controlled were underestimated by their physicians,

TABLE 1. Demographic and clinical characteristics of study patients (n = 1697)

Characteristic	Value
No. of females/males	999/698
Age (y), mean $\pm$ SD	62.6 $\pm$ 16.0
Body mass index (kg/m ²), mean $\pm$ SD	23.4 $\pm$ 4.1
Patients with smoking history, n (%)	581 (34.2)
Asthma reviews at primary/secondary care facilities	875/822
Use of inhaled corticosteroids, n (%)	1624 (95.7)
Use of inhaled long-acting β_2 -agonist, n (%)	1340 (79.0)
Use of inhaled long-acting muscarinic receptor antagonist, n (%)	93 (5.5)
Use of inhaled long-acting bronchodilators, n (%)	1398 (82.4)
Use of leukotriene receptor antagonists, n (%)	638 (37.6)
Use of theophylline, n (%)	251 (14.8)
Use of regular oral corticosteroids, n (%)	100 (5.9)
Use of any biologics, n (%) [*]	16 (0.9)
ACQ score, mean $\pm$ SD	0.90 $\pm$ 0.94
Nocturnal awakening	0.8 (1.2)
Morning symptoms	0.8 (1.1)
Activity limitation	0.8 (1.0)
Shortness of breath	1.1 (1.1)
Wheeze	1.0 (1.2)
FEV ₁ % of predicted, mean $\pm$ SD ^{†,‡}	82.3 $\pm$ 23.4
% of blood eosinophils, mean $\pm$ SD [§]	5.1 $\pm$ 4.6
FENO (ppb), mean $\pm$ SD	38 $\pm$ 36
Patients with exacerbations in the last 12 mo, n (%) [¶]	386 (22.7)

^{*}Biologics included anti-IgE and anti-IL-5.

[†]The values were calculated using the predicted values for the Japanese population.

[‡]n = 964.

[§]n = 953.

^{||}n = 848.

[¶]An exacerbation was defined as an event outside patient's usual range of day-to-day asthma variation, requiring a change in controller treatment.

indicating that this discordance should be focused on the physicians' underestimation. Many previous studies have reported a disconnection between patients' assessments of their asthma and the guideline-defined control level.^{6,9,10} Taken together, these data suggest that a "double underestimation" by patients and physicians may be involved in the inappropriate asthma management. Our outcomes are in line with a previous study that found that physician-patient discordance on perceptions of the impact of asthma on a patient's daily life is high, particularly in uncontrolled asthma.¹⁹ Importantly, in our study, the discordant physician-patient pairs had a significantly worse ACQ score than did the concordant pairs, but no difference in the use of controller medications was observed between the groups.

The lack of lung function assessment was identified as one of the determinants for the discordance. Current Global Initiative for Asthma (GINA) guidelines recommend that lung function should be assessed at diagnosis or the start of treatment, after 3 to 6 months of controller treatment, and periodically thereafter.²⁰ However, it is well known that adherence by physicians to the recommend use of spirometry is not sufficient.^{21,22} In fact, in our study, nearly half (43.2%) the patients coming for routine asthma reviews had not been assessed for their lung function within the previous 6 months. The reason for the lack of lung function assessment related to the disconnection between patients and physicians is not clear, but if the spirometry showed abnormalities, the physician should assess their patients' symptoms in detail or take care to avoid continuing inappropriate asthma treatment. Our study suggests that periodically testing the lung function may be useful to attenuate physician-patient discordance. At present, assessment of inflammatory markers plays only a limited role in monitoring asthma.²⁰ However, recent studies have demonstrated that simultaneously increased airway (FENO) and systemic (blood eosinophil) markers of type 2 inflammation related to a higher likelihood of uncontrolled asthma.²³⁻²⁵ The present study could not observe the association

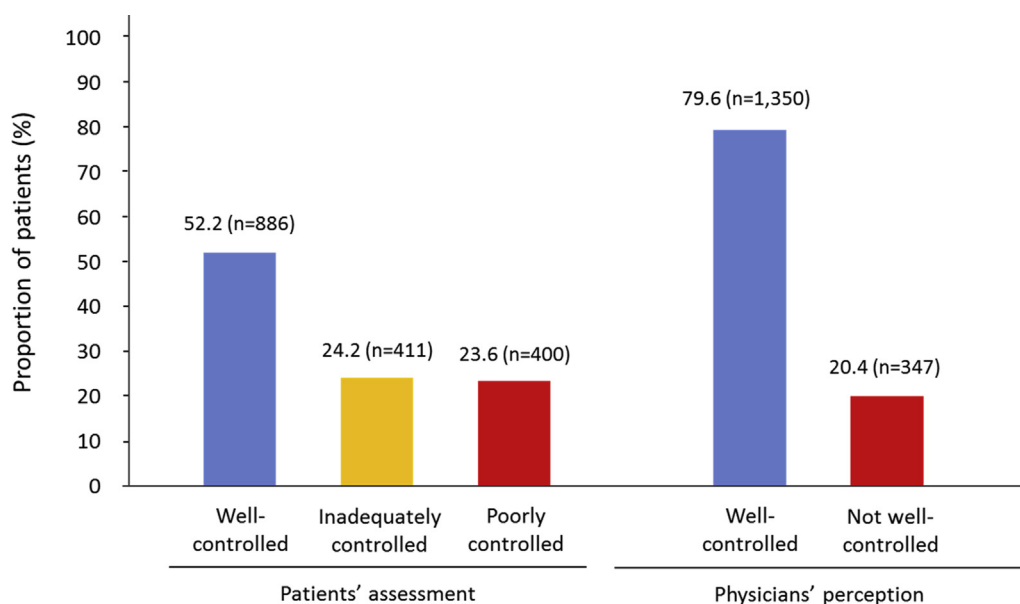
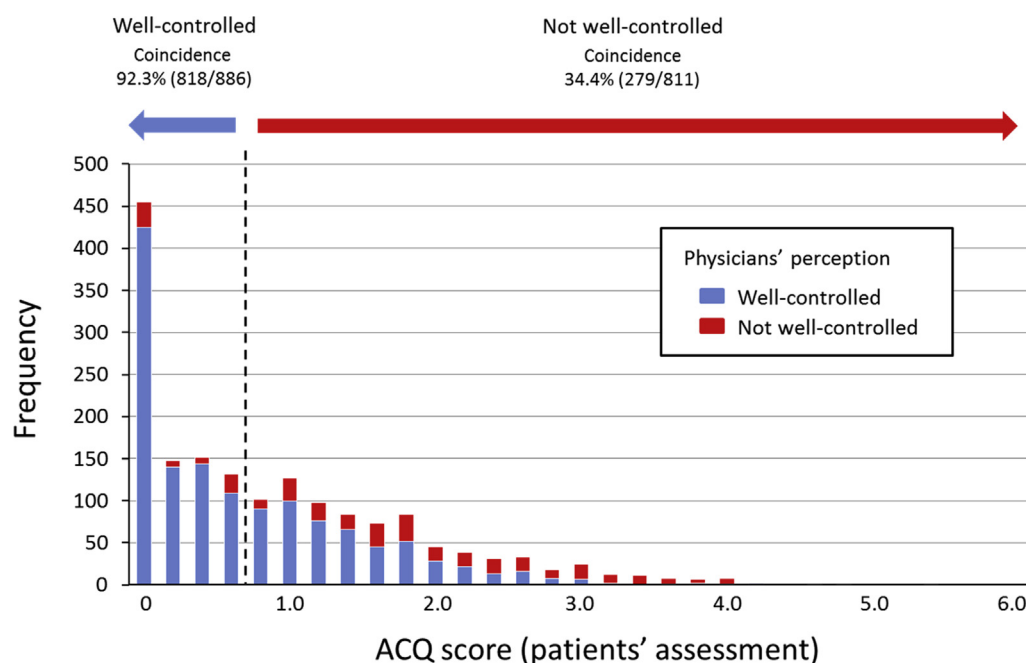


FIGURE 2. Proportion of patients according to the asthma control levels assessed by patients and physicians. Percentages are based on the number of patients in the full analysis set (n = 1697).

TABLE II. Degree of concordance between the patients and physicians in the perception of asthma control

Patients' assessment ACQ	Physicians' perception		Kappa index between assessors
	Well-controlled, n (%)	Not well-controlled, n (%)	
Well-controlled asthma*	818 (48.2)	68 (4.0)	0.274
Not well-controlled asthma	532 (31.4)	279 (16.4)	

*ACQ score of <0.75 was classified as well-controlled asthma.

**FIGURE 3.** A histogram of patient's ACQ scores and their physician's perception of asthma control. The coincidence rates between the patients and physicians were analyzed separately in patients with well-controlled asthma (ACQ score <0.75) and in patients with not well-controlled asthma.

between inflammation assessment and the concordance in the perception of asthma control, but both blood eosinophil and FENO were measured in approximately one-third of the participants. Further studies are required to verify whether inflammation assessment has a potential to attenuate the dissociation in the perceptions of asthma severity.

There might be some reasons why not well-controlled asthma was associated with the physician-patient discordance in the perception of asthma control. In our study, patients who had experienced exacerbations within the last 4 weeks were excluded. Therefore, some physicians may have perceived their patients' asthma control as being adequate, due to lack of recent exacerbations, although the long-term goals of asthma management are to achieve good symptom control and to minimize future risk of exacerbations.²⁰ The goals might not be sufficiently shared in both patients and health care practitioners. A candid relationship between physicians and patients might be effective to attenuate the physician's underestimation.²⁰ This study showed that increasing age was associated with the physician-patient discordance in the perception of asthma control. Although the association was statistically significant, the impact of age on the discordance was too small to be of any clinical significance (HR = 1.01; 95% CI, 1.00-1.02; $P < .05$).

The strength of our study is that it was a large-scale, multi-center study of 1697 patients in primary and secondary care facilities. Previous studies that investigated patient-physician opinion differences were conducted among a small sample size^{6,7} and did not capture patients across a full spectrum of asthma in primary and secondary settings.^{5,6} Another strong point was that physicians were blinded from the ACQ results and symptom control parameters until they recorded their perception of asthma control. In previous studies, the physicians had been provided much clinical data of asthma when they described their assessment of asthma control, including asthma severity, lung function, asthma treatment, and history of exacerbation.⁵⁻⁷ These clinical data obviously have a critical impact on the physicians' evaluation. There could be some limitations of our study. First, we used the ACQ score in this observational study. Thus, assessment of asthma control was limited to the previous 1 week. The interpretation of data should take into account that it was a cross-sectional study to evaluate differences between the patients and the physicians in the perception of current symptom control. Next, certain variables that may affect the asthma control such as inhaled drug delivery, adherence, allergic comorbidities, and psychological factors could not be accounted for and verified. It is known that anxiety and depression are associated with the

TABLE III. Patient characteristics according to the presence or absence of concordance in the perception of asthma control

Characteristic	Concordant group (n = 1097)	Discordant group (n = 600)	P value
Female, n (%)	656 (59.8)	343 (57.2)	.29
Age (y), mean $\pm$ SD	61.8 $\pm$ 15.9	64.0 $\pm$ 15.9	<.01
Patients with age $\geq$ 65 y, %	51.5	58.3	<.01
Body mass index (kg/m ²), mean $\pm$ SD	23.4 $\pm$ 4.0	23.6 $\pm$ 4.3	.35
Patients with body mass index $\geq$ 25 kg/m ² , %	28.3	33.0	<.05
Patients with smoking history, n (%)	381 (34.7)	200 (33.3)	.56
Asthma reviews at primary care facilities, %	50.8	53.0	.77
Use of inhaled corticosteroids, n (%)	1048 (95.5)	576 (96.0)	.65
Use of inhaled long-acting bronchodilators, n (%)	890 (81.1)	508 (84.7)	.07
Use of leukotriene receptor antagonist, n (%)	424 (38.7)	214 (35.7)	.23
Use of theophylline, n (%)	150 (13.7)	101 (16.8)	.08
Use of regular oral corticosteroids, n (%)	57 (5.2)	43 (7.2)	.10
Use of any biologics, n (%)	12 (1.1)	4 (0.7)	.38
ACQ score, mean $\pm$ SD	0.67 $\pm$ 0.97	1.32 $\pm$ 0.71	<.0001
Nocturnal awakening	0.6 (1.1)	1.2 (1.1)	<.0001
Morning symptoms	0.6 (1.0)	1.2 (1.0)	<.0001
Activity limitation	0.6 (1.0)	1.2 (0.8)	<.0001
Shortness of breath	0.8 (1.2)	1.6 (0.9)	<.0001
Wheeze	0.7 (1.0)	1.3 (0.7)	<.0001
Patients with exacerbations in the last 12 mo, n (%)	242 (22.1)	144 (24.0)	.36
FEV ₁ % of predicted, mean $\pm$ SD	83.1 $\pm$ 23.5	80.2 $\pm$ 22.9	.08
No history of lung function testing, n (%)*	411 (37.5)	322 (53.7)	<.0001
% of blood eosinophils, mean $\pm$ SD	5.2 $\pm$ 4.6	5.0 $\pm$ 4.5	.48
Fraction of exhaled nitric oxide (ppb), mean $\pm$ SD	36 $\pm$ 36	40 $\pm$ 37	.16
No history of both systemic and airway inflammation assessment, n (%)*	684 (62.4)	398 (66.3)	.10

*Patients who had not had both blood eosinophils and FENO measured within 6 mo of the data collection.

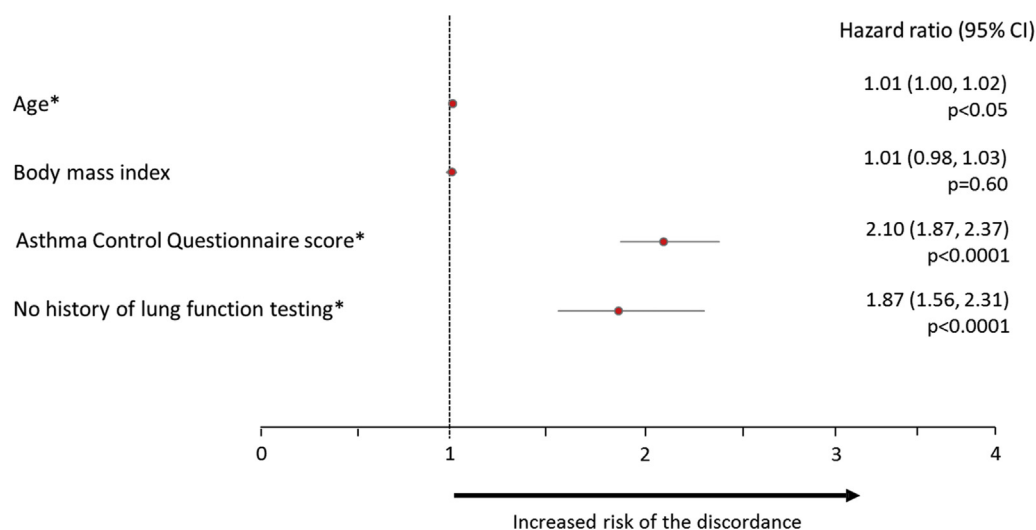


FIGURE 4. HRs and associated 95% CI for the physician-patient discordance in the perception of asthma control. *Independent factors associated with the discordance.

patients' perception of asthma control.^{6,26,27} The impact of these factors should be assessed in a future study. The average age of the participants was 62.6 years, and approximately one-third of the study subjects had a smoking history. The subjects of the present study tended to be of advanced age. If our survey had

included a younger population, the results might have been different. In addition, the perceptions of asthma control might be affected by misattributed symptoms due to clinically occult comorbidities such as chronic obstructive lung disease and heart failure. It cannot be denied that the degree of physician-patient

discordance was overestimated because of the exclusion of patients with a recent exacerbation. The frequency of exacerbation of 22.7% in our study was relatively lower than that in a previous report, in which the percentage of asthma exacerbations was 28%,²⁸ which also might have been because of the result of excluding patients with a recent exacerbation. However, both physicians and patients would have realized that asthma control was not well if the patients had had a recent exacerbation, which might be a confounding factor in exploring factors associated with the physician-patient discordance.

In conclusion, our data demonstrated that the subjective perception of the physicians did not show a good agreement with patients' asthma control based on the ACQ scores, with increased rates of discordance in patients whose asthma was not well controlled and patients who had not received lung function assessment. Not only patients' but also physicians' underestimation should be focused on to improve asthma management. This study suggests that periodic use of objective parameters such as the ACQ score and lung function testing could have a pivotal role in attenuating the physician-patient discordance in the perceptions of asthma control.

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