

Persistent Asthma Defined Using HEDIS Versus Survey Criteria

Michael Schatz, MD, MS; Robert S. Zeiger, MD, PhD; Su-Jau T. Yang, PhD; Wansu Chen, MS; William W. Crawford, MD; Shiva G. Sajjan, PhD; and Felicia Allen-Ramey, PhD

Persistent asthma is clinically defined based on the frequency and severity of asthma symptoms and on pulmonary function test results when available.¹ It is important to differentiate persistent from intermittent asthma because persistent asthma requires daily controller therapy, while intermittent asthma can be treated with rescue therapy as needed.¹

The National Committee for Quality Assurance² has developed an administrative data-based definition of persistent asthma as part of the Healthcare Effectiveness Data and Information Set (HEDIS) quality measurement program. This definition relies on asthma-coded medical visits and asthma-related pharmacy utilization and is meant to define a population for whom asthma controller therapy is indicated. However, studies^{3,4} have shown that only a modest relationship exists between this administrative data-based definition of persistent asthma and a definition based on patient report of symptoms. Moreover, findings from other studies^{5,6} suggest that 24% to 45% of patients who qualify as having persistent asthma in one year based on the HEDIS definition do not qualify again the next year. This raises the question of how persistent is persistent asthma. In other words, is persistent asthma a sufficiently stable characteristic of asthma to warrant the recommendation for long-term controller therapy? We are unaware of studies that have specifically addressed this question.

Because data suggest that patients who qualify for administrative data-based persistent asthma for 2 consecutive years have increased markers of asthma morbidity and are more likely to receive controller therapy,⁷ the HEDIS definition of persistent asthma for the purposes of assessing appropriate controller use has been modified to require qualification in each of 2 successive years.² However, no studies to date have investigated the relationship of this 2-year administrative data-based definition of persistent asthma to persistent asthma as defined by patient report of symptom frequency, severity, and treatment. The objectives of this study were (1) to investigate the relationship of the 2-year HEDIS definition of persistent asthma to persistent asthma as defined by patient report, (2) to compare medical utilization for patients with versus without persistent asthma, and (3) to determine the persistence of persistent asthma over time.

Objectives: To describe the relationships between persistent asthma defined by administrative versus survey data and their stability over time.

Study Design: Longitudinal survey and retrospective administrative database.

Methods: Administrative data were used to identify patients meeting the Healthcare Effectiveness Data and Information Set (HEDIS) criteria for persistent asthma in year 1 (2006). At the end of year 2 and on 3 occasions during year 3, patients were mailed a survey to define persistent asthma based on symptoms and medication use in the prior month and exacerbations in the prior 12 months. Administrative data were also used to define medical utilization for asthma in year 3.

Results: Of 13,833 eligible patients, 2895 (20.9%) returned the survey; 2751 of these respondents reported physician-diagnosed asthma, of whom 2517 (91.5%) had survey-defined persistent asthma. Patients having survey-defined persistent asthma (68.0%) were more likely to requalify as having HEDIS-defined persistent asthma in year 2 than patients not having survey-defined persistent asthma (22.2%). However, 81.6% of survey respondents who did not requalify as having HEDIS-defined persistent asthma in year 2 had survey-defined persistent asthma. Patients with survey-defined persistent asthma in year 2 had significantly more medical utilization for asthma in year 3 than patients without survey-defined persistent asthma. Approximately 82% of the 799 patients completing all 4 surveys had persistent asthma on all surveys.

Conclusions: HEDIS-defined persistent asthma is generally consistent with survey-defined persistent asthma. Persistent asthma usually remains persistent over a 3-year period, indicating that it is a stable characteristic of asthma for most patients. The low survey response rate suggests that further population-based studies will be necessary to confirm the validity and generalizability of our study findings regarding persistent asthma.

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METHODS

Patients

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Take-Away Points

Healthcare Effectiveness Data and Information Set (HEDIS)-defined persistent asthma seems to reflect clinical persistent asthma.

- The 2-year HEDIS definition is more specific for persistent asthma than the 1-year definition.
- Persistent asthma is associated with increased medical utilization compared with nonpersistent asthma.
- Persistent asthma seems to be persistent over a 3-year period and is an appropriate target for intervention.

California Institutional Review Board. Using computerized Kaiser Permanente Southern California inpatient, outpatient, pharmacy, and membership records, we identified patients aged 18 to 56 years with persistent asthma in 2006 (study year 1) based on their meeting 1 or more of the following HEDIS criteria: (1) 4 or more asthma medication dispensings, (2) 1 or more emergency department visits or hospitalizations with a principal diagnosis of asthma, or (3) 4 or more asthma outpatient visits with 2 or more asthma medication dispensings. Patients with continuous membership in 2007 who also met 1 or more of these HEDIS criteria in 2007 (study year 2) were considered to requalify for 2-year HEDIS-defined persistent asthma (Table 1). Only patients with continuous membership in Kaiser Permanente Southern California from 2006 to 2008 were included in the study.

Administrative Data

The following additional information was captured from the Kaiser Permanente Southern California records: (1) sex, (2) age, (3) smoking status, (4) Medicare or Medi-Cal insurance, (5) hospitalization with asthma coded (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] code 493.xx) as the primary diagnosis or as the second diagnosis with another respiratory primary diagnosis, (6) emergency department visit with asthma coded (ICD-9-CM code 493.xx) as the primary diagnosis or as the second diagnosis with another respiratory primary diagnosis, (7) outpatient visit with asthma coded (ICD-9-CM code 493.xx) as a diagnosis, (8) any oral corticosteroid dispensing, (9) dispensings of more than 6 short-acting β -agonist canisters in a 12-month period, (10) any asthma controller dispensing, and (11) address. We successfully linked more than 95% of the addresses of our enrollees to census block groups and assigned block group-level income and education estimates in 2006 to patients by using the proprietary demographic estimates supplied by Nielsen Claritas (<http://www.claritas.com>). Census-based income and education variables have been widely used as proxies for the socioeconomic status of individuals in many health-related investigations.⁸ Using

this method, we determined (1) the proportion of the population older than 25 years in the patient's census block having more than a high school education and (2) the median household income in the patient's census block. Medical utilization for asthma was assessed during 2006 (study year 1) and during 2008 (study year 3) (Table 1).

Survey

In November 2007, all eligible patients were mailed a survey to define persistent asthma based on symptoms and medication use in the prior month and exacerbations in the prior 12 months. The survey used the Expert Panel Report 3 definition of persistent asthma, which includes impairment and risk domains.¹ The impairment domain includes the frequency and intensity of symptoms and functional limitations that the patient is currently experiencing. The risk domain includes the likelihood of asthma exacerbations based on the number of exacerbations in the prior 12 months. Four yes or no questions asked whether the patient in the past 30 days had (1) "experienced asthma symptoms at least 3 times per week," (2) "used your rescue inhaler for symptoms at least 3 times per week," (3) "been awakened by asthma symptoms at least 3 times," and (4) had asthma that "interfered with your normal activity." One question asked "In the past 12 months, how many times have you been given oral corticosteroids (such as prednisone, methylprednisolone, medrol) for a flare up of your asthma?" The final question regarding persistent asthma asked "Over the past 30 days, have you taken any of the following medications every day for your asthma?" and was followed by a list of controller medications with a yes or no option for each. A comparison of the HEDIS and survey definitions of persistent asthma is given in Table 2.

Patients who completed the baseline surveys were sent follow-up surveys in April, July, and October 2008 (Table 1). Only survey respondents who reported physician-diagnosed asthma on the baseline survey were included in the study.

Statistical Analysis

The main analyses were directed at (1) identifying the relationships between HEDIS-defined persistent asthma (hereafter HEDIS persistent asthma) and survey-defined persistent asthma (hereafter survey persistent asthma) among patients completing the survey, (2) comparing medical utilization for asthma among patients with versus without persistent asthma, and (3) determining the persistence of persistent asthma over time. Hypothesis testing for comparisons of character-

Table 1. Timing of Data Collection

Time	Administrative Data	Surveys
Year 1		
January 1, 2006, to December 31, 2006	Baseline utilization, HEDIS qualification	—
Year 2		
January 1, 2007, to December 31, 2007	HEDIS requalification	—
November 2007	—	Baseline
Year 3		
January 1, 2008, to December 31, 2008	Outcome utilization	—
April 2008	—	First follow-up
July 2008	—	Second follow-up
October 2008	—	Third follow-up
HEDIS indicates Healthcare Effectiveness Data and Information Set.		

Table 2. Comparison of the 2 Definitions of Persistent Asthma Used in the Study

Variable	HEDIS-Defined Persistent Asthma Meets ≥1 of the Following in a Calendar Year	Survey-Defined Persistent Asthma Meets ≥1 of the Following
Asthma symptoms (wheezing, chest cough, chest tightness, dyspnea)	Not applicable	In past 30 days due to asthma, symptoms ≥3 times/wk, interference with sleep ≥3 times/mo, any interference with normal activity ^a
Medications	≥4 Asthma medication dispensings, or ≥2 asthma medication dispensings with ≥4 outpatient asthma visits	In past 30 days, self-reported daily controller use or rescue inhaler use ≥3 times/wk ^a
Exacerbations	≥1 Asthma hospitalizations or ≥1 asthma emergency department visits	Oral corticosteroid dispensing for an asthma flare ≥2 times in past 12 mo ^b

HEDIS indicates Healthcare Effectiveness Data and Information Set.

^aIncluded in the Expert Panel Report 3 definition of the impairment domain of persistent asthma.¹

^bIncluded in the Expert Panel Report 3 definition of the risk domain of persistent asthma.¹

istics among survey responders versus nonresponders was by means of χ^2 test (categorical variables) or *t* test (continuous variables).

Survey Persistent Asthma Versus HEDIS Persistent Asthma. The presence or absence of survey persistent asthma on the baseline survey administered at the end of 2007 was assessed relative to requalification or nonrequalification for HEDIS persistent asthma in 2007 using χ^2 test.

Persistent Asthma Versus Medical Utilization. Hypothesis testing was conducted for the relationship between the presence of survey persistent asthma on the baseline survey at the end of 2007 (year 2) or HEDIS requalification in 2007 and medical utilization for asthma in 2008 (year 3). This was performed by means of χ^2 test.

Persistence of Persistent Asthma. Concordance between survey persistent asthma at baseline and on follow-up surveys was evaluated. Among patients who completed all 4 surveys, the proportions of patients with persistent asthma on 0, 1, 2, 3, or 4 surveys were determined.

Nominal 2-tailed statistical significance for all analyses was set at *P* < .05. All analyses were conducted using SAS version 9.13 for Windows (SAS Institute Inc, Cary, North Carolina).

RESULTS

Respondents

A total of 13,833 patients aged 18 to 56 years met the HEDIS criteria for persistent asthma in 2006 and were continuously enrolled in Kaiser Permanente Southern California from 2006 to 2008. Of these, 2895 (20.9%) returned the November 2007 baseline survey; 144 denied a history of physician-diagnosed asthma, leaving a sample of 2751 survey respondents.

Compared with nonrespondents, respondents were more likely to be female, were older, lived in neighborhoods (census blocks) with higher education and household income, and were less likely to be smokers (Table 3). Respondents experienced fewer exacerbations requiring emergency department visits or oral corticosteroid dispensings and were less likely

■ **Table 3.** Selected Baseline Characteristics of Survey Respondents Versus Nonrespondents

Characteristic	Respondents (n = 2751) ^a	Nonrespondents (n = 10,938)	P ^b
Female sex, No. (%)	1933 (70.3)	6543 (59.8)	<.001
Age, mean (SD), y	44.0 (11.0)	40.8 (11.8)	<.001
Census block proportion with >high school education, mean (SD), %	57.7 (19.3)	54.0 (20.0)	<.001
Census block median household income, mean (SD), \$	62,587 (26,324)	58,866 (25,193)	<.001
Medicare or Medi-Cal insurance, No. (%)	158 (5.7)	659 (6.0)	.58
Smoking status, No. (%)^c	(n = 2053)	(n = 7577)	<.001
Current smoker	126 (6.1)	822 (10.8)	
Past smoker	439 (21.4)	1647 (21.7)	—
Nonsmoker	1488 (72.5)	5108 (67.4)	—
Utilization, No. (%)			
Asthma hospitalization	38 (1.4)	200 (1.8)	.11
Asthma emergency department visit	330 (12.0)	1875 (17.1)	<.001
Asthma hospitalization or emergency department visit	351 (12.8)	1980 (18.1)	<.001
Asthma outpatient visit	1978 (71.9)	7433 (68.0)	<.001
Medication, No. (%)			
Any oral corticosteroid dispensing	1097 (39.9)	4661 (42.6)	.009
>6 Canisters of short-acting β-agonists	523 (19.0)	2930 (26.8)	<.001
Any asthma controller	2614 (95.0)	9917 (90.7)	<.001
HEDIS requalification, No. (%)	1764 (64.1)	6219 (56.9)	<.001

HEDIS indicates Healthcare Effectiveness Data and Information Set.
^aWith physician-diagnosed asthma (144 of 2895 respondents had no such history).
^bχ² Test for categorical variables and *t* test for continuous variables.
^cPatients for whom smoking information is available.

■ **Table 4.** Relationship of Survey-Defined Persistent Asthma to Requalification for HEDIS-Defined Persistent Asthma

Survey-Defined Persistent Asthma	Requalification for HEDIS-Defined Persistent Asthma		Total, No. (%)
	Yes	No	
Yes	1712	805	2517 (91.5)
Row %	68.0	32.0	—
Column %	97.1	81.6	—
No	52	182	234 (8.5)
Row %	22.2	77.8	—
Column %	2.9	18.4	—
Total, No. (%)	1764 (64.1)	987 (35.9)	2751 (100.0)

HEDIS indicates Healthcare Effectiveness Data and Information Set.

to receive more than 6 canisters of short-acting β-agonists in 2006. In contrast, respondents were more likely to have asthma outpatient visits, to receive asthma controllers, and to requalify for HEDIS persistent asthma in 2007.

Of 2751 respondents to the baseline survey, 799 (29.0%) completed all 4 surveys. A total of 455 (16.5%) completed 3 surveys, 422 (15.3%) completed 2 surveys, and 1075 (39.1%) completed only the baseline survey.

Table 5. Year 3 (2008) Medical Utilization for Asthma^a

In Patients With Versus Without Survey-Defined Persistent Asthma in Year 2 (2007)			
2008 Utilization	Survey-Defined Persistent Asthma, %		P
	Yes (n = 2517)	No (n = 234)	
Asthma hospitalization or emergency department visit	5.0	1.7	.02
Any oral corticosteroid dispensing	34.5	21.4	<.001
≥2 Oral corticosteroid dispensings	15.3	6.0	.001
>6 Canisters of short-acting β-agonists	20.1	5.6	<.001
In Patients With Survey-Defined Persistent Asthma Who Did Versus Did Not Requalify for HEDIS-Defined Persistent Asthma in Year 2 (2007)			
2008 Utilization	HEDIS Requalification, %		P
	Yes (n = 1712)	No (n = 805)	
Asthma hospitalization or emergency department visit	6.1	2.7	<.001
Any oral corticosteroid dispensing	37.6	28.0	<.001
≥2 Oral corticosteroid dispensings	17.4	10.9	<.001
>6 Canisters of short-acting β-agonists	25.4	8.9	<.001

HEDIS indicates Healthcare Effectiveness Data and Information Set.
^aP values are by χ^2 test.

Survey Persistent Asthma Versus HEDIS Persistent Asthma

A total of 2517 among 2751 respondents (91.5%) had survey persistent asthma on the baseline survey. These 2517 patients met the following persistent asthma criteria: (1) symptoms with or without other criteria (74.7%), (2) medications without qualifying symptoms (24.5%), or (3) exacerbations without symptom or medication criteria (0.8%).

A total of 1764 among 2751 respondents (64.1%) requalified for HEDIS persistent asthma in 2007. Of those who requalified, 97.1% reported survey persistent asthma (Table 4). Patients with survey persistent asthma were significantly more likely to requalify for HEDIS persistent asthma in 2007 than patients without survey persistent asthma (68.0% vs 22.2%, $P < .001$). However, 805 of 987 patients (81.6%) who did not requalify as having HEDIS persistent asthma in 2007 (but who had qualified in 2006) reported survey persistent asthma in 2007.

Persistent Asthma Versus Medical Utilization

Compared with patients without survey persistent asthma, patients with survey persistent asthma in year 2 (2007) had significantly more year 3 (2008) asthma hospitalizations or emergency department visits, oral corticosteroid dispensings, and short-acting β-agonist canisters (Table 5). Similarly, among patients with survey persistent

asthma, those who requalified for HEDIS persistent asthma in year 2 had significantly more year 3 medical utilization for asthma (asthma emergency department visits or hospitalizations, oral corticosteroid dispensings, and short-acting β-agonist canisters) than patients who did not requalify.

Survey Persistent Asthma Over Time

The relationships between survey persistent asthma at baseline and at the first follow-up survey 5 months later are summarized in Table 6. For this analysis, persistent asthma was based only on impairment and not on risk (exacerbations) because the interval between surveys (5 months) was too short to identify persistent asthma based on exacerbations over the interval (12 months) recommended in the Expert Panel Report 3 guidelines to assess risk.¹ Ninety-four percent of 1199 patients who reported persistent asthma at baseline also reported persistent asthma on the first follow-up survey.

Table 6. Concordance Between Survey-Defined Persistent Asthma at Baseline Versus on the First Follow-up Questionnaire^a

Survey-Defined Persistent Asthma at Baseline	Survey-Defined Persistent Asthma on the First Follow-up Questionnaire, No. (%)	
	Yes	No
Yes (n = 1199)	1129 (94.2)	70 (5.8)
No (n = 91)	47 (51.6)	44 (48.4)

^aExacerbations were not evaluated as part of the definition of persistent asthma for this analysis because of the short interval (5 months) between baseline and the first follow-up survey.

Of 91 patients who did not report persistent asthma on the baseline survey, more than half (51.6%) reported persistent asthma on the first follow-up survey (Table 6).

Among 799 patients who completed all 4 surveys, 80.4%-81.6% reported persistent asthma on all 4 surveys, and 9.5%-9.6% reported persistent asthma on 3 of 4 surveys. There was little difference whether or not exacerbations were included in the definition of persistent asthma (Figure).

DISCUSSION

The concept of persistent asthma was formally introduced as part of the 1997 Expert Panel Report 2 national asthma guidelines.⁹ A major objective in defining persistent (vs intermittent) asthma was to identify patients for whom daily controller therapy was indicated. In an attempt to monitor quality of asthma care among managed care plans based on these Expert Panel Report 2 guidelines, the National Committee for Quality Assurance created the HEDIS asthma metric, which measures the proportion of patients with persistent asthma for whom an asthma controller medication is dispensed. The HEDIS asthma metric uses administrative data-based criteria to define persistent asthma.² However, studies that have attempted to validate the HEDIS asthma metric against patient-reported or clinician-reported persistent asthma have found poor sensitivity³ or poor specificity⁴ for the HEDIS metric in identifying persistent asthma, although both studies were among children.

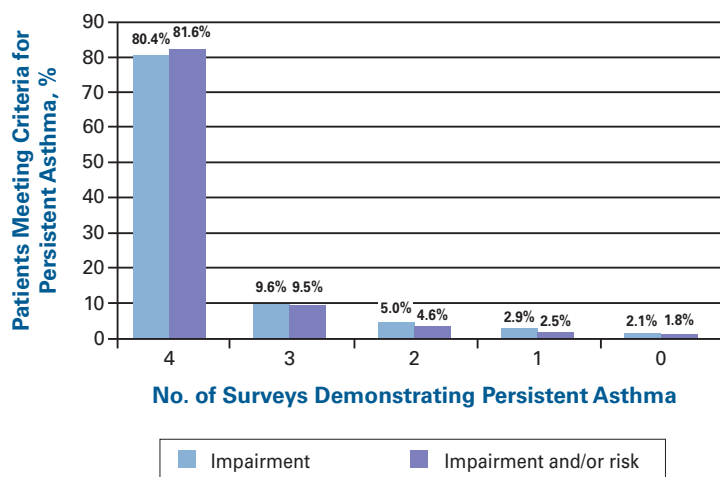
The present study among adults could not evaluate the sensitivity of the HEDIS criteria because only patients who

qualified for HEDIS in the first year of the study were included. However, our data support high specificity, as almost 92% of patients who met HEDIS persistent asthma criteria in year 1 and who completed the subsequent survey reported persistent asthma in year 2. This pattern suggests that utilization of the HEDIS criteria to identify adult patients with persistent asthma for outreach should be useful because such patients are likely to have clinically defined persistent asthma. The present study also shows that such patients have increased subsequent medical utilization for asthma, rendering them an important target for intervention.

Prior studies^{5,6} reported that 24% to 45% of patients who qualified as having administrative data-based persistent asthma as defined by the HEDIS criteria in 1 year did not qualify as having persistent asthma the following year. Similarly, in the present study, approximately 35% of respondents having HEDIS persistent asthma in year 1 did not requalify as having HEDIS persistent asthma in year 2. However, of those patients who did not requalify in year 2, more than 80% reported persistent asthma on the survey that year. This discrepancy suggests that the HEDIS criteria are missing some patients with persistent asthma based only on symptom frequency or impact, as medications and emergency department visits or hospitalizations are captured by the HEDIS criteria.

Lack of HEDIS requalification from year to year in one-quarter to almost one-half of patients in prior investigations and in the present study also raises the question of how persistent is persistent asthma. We are unaware of data that have addressed this question using patient-reported information.

■ **Figure.** Percentage of Patients Meeting Criteria for Survey-Defined Persistent Asthma



Percentage of patients meeting criteria for survey-defined persistent asthma on 0 to 4 surveys over 12 months among 799 patients who completed all 4 surveys. Impairment is persistent asthma based on asthma symptoms or medications; impairment and/or risk is based on asthma symptoms, medications, or exacerbations (Table 2).

Results of the present study suggest that markers of persistent asthma are likely to persist over a 12-month period, with more than 90% of patients reporting persistent asthma on 3 or 4 of 4 surveys over a 12-month period ending in year 3 (Figure). Because all of these patients had administrative data markers of persistent asthma during year 1, this suggests that the construct of persistent asthma is a stable characteristic of asthma, at least over an almost 3-year period.

In 2005, Mosen et al⁷ reported a relationship between the number of years of consecutive HEDIS qualification and increased medication and emergency hospital utilization. This relationship suggested that the specificity of the HEDIS persistent asthma criteria

could be increased by requiring 2 consecutive years of qualification, and the National Committee for Quality Assurance² subsequently changed the HEDIS persistent asthma criteria to require qualification in each of 2 consecutive years (both the measurement and premeasurement years). However, no prior studies to date have tested the specificity of the 1-year versus 2-year HEDIS criteria relative to patient-reported measures of persistent asthma. The present study confirms that patients who qualify for HEDIS persistent asthma in 2 consecutive years are more than twice as likely (97.1% vs 81.6%) to report survey persistent asthma during year 2 than patients who qualified for HEDIS persistent asthma only during the first year (Table 4). In addition, among patients with survey persistent asthma, the present study shows that patients who requalify for HEDIS persistent asthma (vs those who do not) have increased subsequent medical utilization for asthma, suggesting increased risk (emergency department visits or hospitalizations and oral corticosteroid dispensings) and increased impairment (short-acting β -agonist canister use) (Table 5). These data suggest that the 2-year HEDIS criteria are indeed more specific for persistent asthma than the 1-year criteria.

As recommended in current national asthma guidelines,¹ survey persistent asthma was defined to include impairment (symptom frequency and impact) and risk (exacerbations requiring oral corticosteroid dispensing). International guidelines also recommend medication use as an indirect measure of asthma severity in patients already using controllers, such that patients using controllers are considered to have varying degrees of persistent asthma.¹⁰ Approximately 25% of our patients were deemed to have persistent asthma based on reported controller use, without impairment based on symptom frequency or impact. A study¹¹ among pregnant women confirmed that patients with mild-to-moderate persistent asthma defined based on controller use had similar asthma morbidity during pregnancy compared with patients considered to have mild-to-moderate persistent asthma defined based on symptom frequency and pulmonary function. The significant relationships between survey persistent asthma as defined in the present study and subsequent medical utilization for asthma (Table 5) also support the validity of the survey criteria used to define persistent asthma.

Based on several considerations, we used a 4-week recall window to define impairment on the survey. First, Expert Panel Report 3 guidelines recommend that impairment should be assessed over the prior 2 to 4 weeks.¹ Second, 2 validated tools that assess asthma impairment use a 4-week recall window.^{12,13} Third, a strong correlation has been demonstrated between a validated impairment tool that uses a 4-week window (Asthma Control Test) and a validated impairment tool that uses a 1-week window (Asthma Control Questionnaire).¹⁴

This study has some potential limitations. The most important one is that only 20.9% of eligible patients completed the survey, raising the possibility of important selection bias. The major threat of this selection bias to the study conclusions would be if the sample who completed the survey was enriched with patients having true persistent asthma, artificially inflating the apparent specificity of the HEDIS criteria and perhaps the apparent persistence of persistent asthma. The demographic differences among survey respondents (older, female, nonsmokers, and higher socioeconomic status) versus nonrespondents (Table 3) probably reflect in general the types of patients who are more likely to complete surveys but would not necessarily enrich the responder group with patients having true persistent asthma. Respondents were more likely to have outpatient asthma visits, to have received asthma controllers, and to requalify for HEDIS persistent asthma, consistent with the possibility that patients who did not have persistent asthma were less interested in completing a survey about asthma and that respondents were more likely to have true persistent asthma. However, nonrespondents had more markers of severe or poorly controlled asthma (emergency hospital care, oral corticosteroid dispensings, and short-acting β -agonist use), which might be more common among patients with persistent asthma. Further population-based studies will be necessary to confirm the validity and generalizability of our study findings regarding persistent asthma.

Another potential limitation of the present study is the lack of pulmonary function data. Current guidelines recommend spirometry or peak expiratory flow measurements as part of the assessment for persistent asthma.¹ However, in patients with other markers of persistent asthma, normal pulmonary function test results would not negate this diagnosis.¹ Therefore, only abnormal pulmonary function test results in patients without other markers of persistent asthma would add to the present findings and serve to increase the already high prevalence of persistent asthma in our study.

In summary, adult patients who meet HEDIS administrative data criteria for persistent asthma are likely to have clinically defined persistent asthma, especially if they qualify for 2 consecutive years. Therefore, such patients are appropriate intervention targets for evaluation for optimal asthma controller therapy, especially as our study shows that persistent asthma is associated with increased medical utilization. In addition, our findings suggest that persistent asthma is a stable characteristic of asthma for most adult patients over a 3-year period, further supporting the appropriateness of daily long-term asthma controller therapy for such patients. Additional studies about the natural history of persistent asthma over time and among children seem warranted.

Author Affiliations: From the Department of Allergy (MS, RSZ, WWC), Kaiser Permanente Medical Center, San Diego, CA; Department of Research and Evaluation (S-JTY, WC), Kaiser Permanente Southern California, Pasadena, CA; and Department of Global Outcomes Research and Reimbursement (SGS, FA-R), Merck & Co, Inc, West Point, PA.

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Address correspondence to: Michael Schatz, MD, MS, Department of Allergy, Kaiser Permanente Medical Center, 7060 Clairemont Mesa Blvd, San Diego, CA 92111. E-mail: michael.x.schatz@kp.org.

REFERENCES

- 1. National Asthma Education and Prevention Program.** Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma: Summary Report 2007 [published correction appears in *J Allergy Clin Immunol*. 2008;121(6):1330]. *J Allergy Clin Immunol*. 2007;120(5)(suppl):S94-S138.
- 2. National Committee for Quality Assurance. HEDIS Technical Specifications.** Washington, DC: National Committee for Quality Assurance; 2008.
- 3. Wakefield DB, Cloutier MM.** Modifications to HEDIS and CSTE algorithms improve case recognition of pediatric asthma. *Pediatr Pulmonol*. 2006;41(10):962-971.
- 4. Cabana MD, Slish KK, Nan B, Clark NM.** Limits of the HEDIS criteria in determining asthma severity for children. *Pediatrics*. 2004;114(4):1049-1055.
- 5. Fuhlbrigge AL, Carey VJ, Finkelstein JA, et al.** Validity of the HEDIS criteria to identify children with persistent asthma and sustained high utilization. *Am J Manag Care*. 2005;11(5):325-330.
- 6. Dombkowski KJ, Wasilevich EA, Lyon-Callo SK.** Pediatric asthma surveillance using Medicaid claims. *Public Health Rep*. 2005;120(5):515-524.
- 7. Mosen DM, Macy E, Schatz M, et al.** How well do the HEDIS asthma inclusion criteria identify persistent asthma? *Am J Manag Care*. 2005;11(10):650-654.
- 8. Kreiger N.** Overcoming the absence of socioeconomic data in medical records: validation and application of a census-based methodology. *Am J Public Health*. 1992;82(5):703-710.
- 9. National Asthma Education and Prevention Program, National Heart, Lung, and Blood Institute. Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma.** Bethesda, MD: National Institutes of Health. July 1997. NIH publication 02-4051.
- 10. Global Initiative for Asthma (GINA).** GINA Report: Global Strategy for Asthma Management and Prevention. 2008. <http://www.ginasthma.com/Guidelineitem.asp?i1=2&l2=1&intId=1561>. Accessed September 29, 2009.
- 11. Schatz M, Dombrowski MP, Wise R, et al.** Asthma morbidity during pregnancy can be predicted by severity classification. *J Allergy Clin Immunol*. 2003;112(2):283-288.
- 12. Nathan RA, Sorkness CA, Kosinski M, et al.** Development of the Asthma Control Test: a survey for assessing asthma control. *J Allergy Clin Immunol*. 2004;113(1):59-65.
- 13. Vollmer WM, Markson LE, O'Connor E, et al.** Association of asthma control with health care utilization and quality of life. *Am J Respir Crit Care Med*. 1999;160(5, pt 1):1647-1652.
- 14. Schatz M, Sorkness CA, Li JT, et al.** Asthma Control Test: reliability, validity, and responsiveness in patients not previously followed by asthma specialists. *J Allergy Clin Immunol*. 2006;117(3):549-556. ■