Race and Sex Differences in Consistency of Care With National Asthma Guidelines in Managed Care Organizations

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Background: In the United States, morbidity from asthma disproportionately affects African Americans and women. Although inadequate care contributes to overall asthma morbidity, less is known about differences in asthma care by race and sex.

Subjects and Methods: To examine the relationships of race and sex with asthma care, we analyzed responses to questionnaires administered to adults enrolled in 16 managed care organizations participating in the Outcomes Management System Asthma Study between September and December 1993. Indicators of care consistent with National Asthma Education and Prevention Program (1991) recommendations were assessed. Of a random sample of 8640 patients asked to participate, 6612 (77%) completed the survey. This study focused on 5062 (14% African American, 72% women) patients with at least moderate asthma symptom severity.

Results: Fewer African Americans than whites reported care consistent with recommendations for medication use (eg, daily inhaled corticosteroid use, 34.9% vs 54.4%; P = .001), self-management education (eg, action plan, 42.0% vs 53.8%; P = .001), avoiding triggers (37.6% vs 53.6%; P = .001), and specialist care (28.3% vs 41.0%; P = .001). Differences in asthma care by sex were smaller and tended to favor women except for daily inhaled corticosteroid use (women vs men: 49.6% vs 58.3%; P = .001) and having specialist care (37.7% vs 43.1%; P = .001). Similar race and sex differences were observed after adjusting for age, education, employment, and symptom frequency.

Conclusions: Even among patients with health insurance, disparities in asthma care for African Americans compared with whites exist and may contribute to race disparities in outcomes. Women generally reported better asthma care but may benefit from greater use of inhaled corticosteroids.

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SUBJECTS AND METHODS

STUDY DESIGN

This was a cross-sectional study using patient-reported survey data from the Managed Health Care Association Outcomes Management System Asthma Study (MHCA study). The MHCA study was undertaken by 11 large US corporations and their managed care partners to test the feasibility and usefulness of patient-reported information to identify opportunities to improve the quality of asthma care.

The survey instrument was constructed by the MHCA Asthma Study group based largely on the Asthma TypE instrument developed by the Health Outcomes Institute (1994). Additional items were added, including the impact of asthma on daily life, self-management knowledge, and ratings of access to care. In a feasibility study conducted in 962 patients, there was moderately high concordance between patient and physician reports of medication use (80.1% for inhaled β-agonists, 73.4% for oral methylxanthines, and 81.7% for ICS). In the MHCA study (source of data for present study), concordance between patient and physician report of physician specialty was 93.7%.

The Committee on Human Research at The Johns Hopkins School of Hygiene and Public Health approved this study.

STUDY POPULATION

Participants were selected from the pool of enrollees in 16 MCOs using claims data or other central information sources. The inclusion criteria were age 18 years or older on September 1, 1993; enrollment in the MCO at the time of sampling; and 2 or more medical encounters (outpatient visits, ED visits, or hospitalizations) with a diagnosis of asthma (International Classification of Diseases, Ninth Revision, Clinical Modification, code 493.xx) between September 1991 and August 1993.

The sampling pool was divided into 2 strata: inpatient (at least 1 hospitalization or ED visit during the previous 24-month period) and outpatient (all asthma contacts in the outpatient setting). From each stratum, a random sample of 300 patients was selected from each MCO. If fewer than 300 patients had hospitalizations or ED visits, then the size of the outpatient stratum was increased to obtain a sample of at least 600 patients. This sampling strategy was selected to increase the number of participants with more severe disease. Individuals were excluded if they denied having asthma, had disenrolled, or were expected to disenroll before January 1, 1994.

In August 1993, 10,539 patients were sampled, of whom 8,640 were eligible. Reasons for ineligibility included not having asthma (844 patients), disenrollment (839 patients), and other reasons (216 patients). Between September and December 1993, patients meeting eligibility criteria were mailed a questionnaire. To increase the response rate, patients who had not responded were sent a postcard reminder after 2 weeks, another questionnaire 2 weeks later, and followed up in another 2 weeks (if necessary) by a telephone call and an offer to complete the interview by telephone. A total of 6,612 patients (77%) completed the survey. Data are not available to compare responses of patients completing the survey by mail vs telephone.

To help clinicians improve care, the National Heart, Blood, and Lung Institute sponsored the NAEPP guidelines to develop guidelines for management of asthma based on evidence and a consensus of expert opinion. This analysis focused on 5,062 patients (77% of patients who completed surveys) with incomplete control of asthma symptoms consistent with 1991 NAEPP guideline definitions of moderate or severe asthma. We used the 1991 NAEPP guidelines rather than those from 1997 for this study because the former existed at the time these data were collected.

VARIABLES

Dependent Variables

The primary dependent variables of interest were indicators of consistency of care with various aspects of the NAEPP guidelines for patients with at least moderate asthma severity. For analytic purposes, we separated guideline recommendations into 5 domains: (1) medication, (2) self-management education, (3) control of factors related to asthma severity, (4) periodic assessment, and (5) asthma specialist care. In each of these domains, we selected 1 or more indicators of NAEPP-consistent care (Table 1).

Table 2 presents the survey questions by care indicator.

The guidelines suggested a choice of 2 alternative medication regimens that we collapsed into a single indicator (NAEPP-recommended combination; Table 1). Because of the importance of airway inflammation in the pathogenesis of asthma and the effectiveness of ICS in reducing this inflammation, patients were asked if they possessed an ICS. Among those who reported having an ICS, patients were also asked if ICS were used daily.

Continued on next page
The NAEPP guidelines also recommended that an asthma specialist evaluate patients with moderate or severe asthma, so we included responses from patients regarding whether they had seen a specialist in the previous 1 year (yes; no, but would have preferred to; no, but did not need to).

Independent Variables

Race and sex were the main independent variables. We restricted the study sample to whites and African Americans because there were too few patients of other races (<5% of all patients) to permit meaningful analyses. Other patient descriptors included age (18-35, 36-64, and ≥65 years), college education (yes [completed some college, a college graduate, or completed postgraduate work] vs no [high school graduate or less]), employment status (full-time or part-time work vs not working), smoking status (ever vs never), age of asthma onset (years), duration of asthma disease (current age minus age of onset, years), and history of atopy (allergies or hay fever).

The NAEPP-based classification of asthma severity and indications for asthma therapy are driven, in large part, by the level of asthma symptom control. Thus, information was collected about the frequency of several respiratory symptoms during the previous 4 weeks. We asked patients to report the frequency of cough, sputum production, chest tightness, wheezing, and shortness of breath using a 5-point scale (1, never; 2, once a week or less; 3, 2-3 times a week; 4, 4-5 times a week; and 5, daily). Patients were asked the frequency of nocturnal awakening due to asthma symptoms (1, never; 2, once; 3, 2-4 times; 4, 5-7 times, and 5, ≥8 times). Patients were also asked about the presence of asthma symptoms between attacks (1, no problem; 2, some symptoms on some days; 3, some symptoms on most days, requiring an inhaler for relief; and 4, symptoms most of the time). To account for symptom frequency in multivariate models while avoiding problems with collinearity, we combined the frequency of these respiratory symptoms into a global measure of asthma symptom severity (Asthma Symptom Index).35 The index (range, 1-5) is the arithmetic mean of the patient-reported frequency for these respiratory symptoms. A higher score on the index indicates more frequent symptoms and has been shown to predict overuse of inhaled β₂-agonists.36

Patients were asked to report the frequency of asthma attacks in the previous 4 weeks (1, not at all; 2, less than once a week; 3, 1 or 2 times a week; and 4, ≥3 times a week). For bivariate analyses, we tabulated the proportion of patients reporting 3 or more attacks a week (i.e., threshold for defining moderate asthma severity based on frequency of attacks). We also collected information on utilization of acute health services during the previous year, including the number of ED visits for asthma and whether patients had been hospitalized for asthma.

STATISTICAL METHODS

Variables were examined using descriptive frequencies. Bivariate associations were measured using χ² tests for categorical variables and t tests or Wilcoxon rank sum tests for continuous variables. Simple and multivariate logistic regression models were constructed to determine whether race and sex were significantly associated with indicators of NAEPP-consistent care with and without adjusting for cross-sectional differences in age, college education, employment status, and Asthma Symptom Index. Age and education were included because they have been reported to be independent predictors of inadequate pharmacotherapy. We included employment status to reduce potential confounding related to socioeconomic status and Asthma Symptom Index to account for reporting bias related to symptom frequency, respectively. The NAEPP recommendations for care are not based on factors such as age of asthma onset, duration of asthma, smoking history, or history of hospital admissions or ED visits, so we did not include them in multivariate analyses identifying independent predictors of care.

The general format for the multivariate logistic regression models for each care indicator is shown below:

Log Odds (Care Indicator) = α + β₁ (Sex) + β₂ (Race) + β₃ (Race × Sex) + β₄ (Age, 36-64 Years) + β₅ (Age, 65 Years and Older) + β₆ (College Education) + β₇ (Employed Full-time or Part-time) + β₈ (Asthma Symptom Index)

We constructed separate models for the inpatient and outpatient sampling strata to determine if there were qualitative differences in the relationships between race, sex, and care. We included race-sex interaction terms (β₁ [race × sex]) in the simple and multivariate logistic regression models to determine if the relationship between race (sex) and care was modified by sex (race). Finally, separate analyses were performed by MCO to determine if the relationships of race and sex to care were significantly different in the various MCOs. Model calibration was assessed using the Hosmer-Lemeshow goodness-of-fit test.43 A 2-tailed P < .05 defined statistical significance for all analyses. Computations were performed with SAS version 6.07 software (SAS Institute, Cary, NC).

RESULTS

POPULATION DEMOGRAPHICS

Of the 5062 patients with moderate or severe asthma symptoms, approximately 14% were African American and 72% were women (Table 3). Age was similar between the men and women. Whites were slightly older, on average, than African Americans (mean age, 44.6 vs 43.4 years, P < .001). A similar proportion of men and women were college educated (60.6% of all patients). Compared with African Americans, more whites reported college education. More African Americans than whites and more men than women were likely to be employed full-time or part-time. More whites than African Americans and more men than women reported having been a smoker. African Americans compared with whites (24.6 years vs 26.4 years; P = .02) and men compared with women (25.4 years vs 26.4 years; P = .03) reported slightly earlier age of asthma onset. Duration of asthma was not significantly different by race, but was slightly longer in men than women. More whites than African Americans and more women than men reported a history of allergies or hay fever.
Table 1. Care Indicators by Asthma Care Domain*

<table>
<thead>
<tr>
<th>Asthma Care Domain</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Medication</td>
<td>Possess inhaled corticosteroid (ICS)</td>
</tr>
<tr>
<td></td>
<td>Daily ICS: Daily use of ICS among patients who possess ICS</td>
</tr>
<tr>
<td></td>
<td>NAEPP-recommended combination: Medications recommended for moderately severe asthma:</td>
</tr>
<tr>
<td></td>
<td>(1) β₂-agonist and either ICS or cromolyn OR (2) β₂-agonist with theophylline</td>
</tr>
<tr>
<td>Self-management education</td>
<td>Action plan: Physician or nurse informed patient everything he/she needed to know for a severe flare-up of asthma</td>
</tr>
<tr>
<td></td>
<td>Adjusting medications: Physician or nurse informed patient of everything he/she needed to know to adjust medicines when asthma worsens</td>
</tr>
<tr>
<td>Control of factors related to asthma severity</td>
<td>Avoid triggers: Physician or nurse told the patient everything he/she needed to know about factors that can worsen asthma and ways to avoid them</td>
</tr>
<tr>
<td>Periodic assessment</td>
<td>Possess peak flowmeter (PFM)</td>
</tr>
<tr>
<td></td>
<td>Daily PFM: Daily use of PFM among patients who possess PFM</td>
</tr>
<tr>
<td></td>
<td>PFM instructions provided: For patients with a PFM, instructions on PFM use provided</td>
</tr>
<tr>
<td>Asthma specialist care</td>
<td>Specialist care: Has seen an asthma specialist in the previous 12 mo</td>
</tr>
</tbody>
</table>

*The 1991 National Asthma Education and Prevention Program (NAEPP)—recommended aspects of asthma care are separated into 5 domains, each with 1 or more indicators of care.

Table 2. Survey Questions by Care Indicator

1. Medication
   - Do you have a steroid inhaler for your asthma? Examples include Aerobid, Azmacort, Beclovent, Decadron, Respinaler, and Vancercil. (no, yes, don’t know)
     - Patients answering “yes” were asked:
       - In the past 4 weeks, how often have you used your steroid inhaler? (never, less than 1 day/week, 1-2 days/week, 3-4 days/week, 5-6 days/week, or 7 days/week)
     - Do you have any bronchodilator inhalers—such as Alupent, Asthmahaler, Brethair, Broniten, Bronkaid, Bronkometer, Maxair, Metaprel, Primatene, Primatens Mist, Proventil, Tornalate, or Ventolin—for your asthma? (no, yes, don’t know)
     - Do you use cromolyn inhalers, such as Intal? (no, yes, don’t know)
     - Did you take theophylline—such as Aerolate, Bronkodyl, Constant-T, Elixophyllin, Quibron, Respind, Slo-bid, Slo-phyllin, T-Phyl, Theo-24, Theoclear, Theo-Dur, Theo-Sav, Unicontin, or Uniphyl—for asthma? (no, yes, don’t know)
   - Do you have any bronchodilator inhalers—such as Alupent, Asthmahaler, Brethair, Broniten, Bronkaid, Bronkometer, Maxair, Metaprel, Primatene, Primatens Mist, Proventil, Tornalate, or Ventolin—for your asthma? (no, yes, don’t know)

2. Self-management Education
   - How much information have you been given by your doctor or nurse about the following: (nothing; some things, but you could use more information; everything you need to know)
   - What to do when you have a severe flare-up of your asthma?
   - How to adjust your medicines when your asthma gets worse?

3. Control of Factors Related to Asthma Severity
   - How much information have you been given by your doctor or nurse about the following: (nothing; some things, but you could use more information; everything you need to know)
   - What things can make your asthma worse and how to avoid them?

4. Periodic Assessment
   - Do you have a peak flowmeter at home? (no, yes)
     - Patients answering “yes” were asked:
       - How often do you use your peak flowmeter? (every day, occasionally, rarely, or never)
       - Did a doctor or nurse show you how to use your peak flowmeter? (no, yes)

5. Asthma Specialist Care
   - Have you seen a physician who is an asthma specialist in the past 12 months? (no, didn’t need to; no, would have liked to; yes)

SELF-REPORTED ASTHMA SYMPTOMS AND ACUTE CARE UTILIZATION

Race

There was a trend toward more frequent respiratory symptoms in whites compared with African Americans (Table 3). More whites reported frequent asthma attacks, while African Americans had substantially more ED visits and hospitalizations for asthma.

Sex

Overall, women reported slightly more frequent respiratory symptoms (Table 3). Although more men reported frequent asthma attacks, more women reported asthma-related ED visits and hospitalizations during the previous year.

CONSISTENCY OF CARE WITH NAEPP GUIDELINES

Bivariate Analyses

A substantial proportion of all patients reported care that was inconsistent with NAEPP guidelines (Table 4 and Figure). The proportion of patients reporting indicators of care consistent with guidelines varied by MCO (data not shown), but where significant race or sex differences existed, the patterns of such differences were
Race. In all 5 domains of asthma care, significantly fewer African Americans than whites reported care that was consistent with guideline recommendations. Greatest differences by race were seen in the daily use of an ICS (for patients with an ICS, 34.9% vs 54.4%; \( P = .001 \); African American vs white), education to avoid triggers (37.6% vs 53.6%; \( P = .001 \)), and use of specialist care (28.3% vs 41.0%; \( P = .001 \)). Race differences in specialist care did not appear to be driven by patient preferences for source of asthma care, since 30.3% of African Americans vs 17.2% of whites reported not seeing a specialist but wanting to (\( P = .001 \)). There was a significant race-sex interaction for use of a NAEPP-recommended combination of asthma medications but not for other indicators of care. African American men were least likely to report a medication combination consistent with guidelines (65.8%; \( P < .05 \)),

<table>
<thead>
<tr>
<th>Table 3. Characteristics of 5062 Patients*</th>
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<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>Age, y</td>
</tr>
<tr>
<td>19-35</td>
</tr>
<tr>
<td>36-64</td>
</tr>
<tr>
<td>( \geq 65 )</td>
</tr>
<tr>
<td>College educated</td>
</tr>
<tr>
<td>Employment status, full-time or part-time</td>
</tr>
<tr>
<td>Ever smoker</td>
</tr>
<tr>
<td>Age of onset, y†</td>
</tr>
<tr>
<td>Duration of disease, y†</td>
</tr>
<tr>
<td>Allergies or hay fever</td>
</tr>
<tr>
<td>Asthma Symptom Index†</td>
</tr>
<tr>
<td>Asthma attacks ( \geq 3 ) times per week</td>
</tr>
<tr>
<td>Acute care use for asthma</td>
</tr>
<tr>
<td>Emergency department visit(s)</td>
</tr>
<tr>
<td>Yes§</td>
</tr>
<tr>
<td>No. of visits(s)†</td>
</tr>
<tr>
<td>Hospitalization(s), yes§</td>
</tr>
</tbody>
</table>

*Percentages of patients with a characteristic are shown and \( P \) values were derived from \( \chi^2 \) unless otherwise noted.
†Median (interquartile range); Wilcoxon rank sum test.
‡Mean (SD) frequency of cough, sputum, chest tightness, wheezing, shortness of breath, nocturnal awakening, and symptoms between attacks (range 1-5, more frequent). \( t \) test used.
§Patients with 1 or more encounter(s) during previous 1 year.

<table>
<thead>
<tr>
<th>Table 4. Consistency of Asthma Care With Guidelines, Bivariate Analyses</th>
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<tbody>
<tr>
<td>Indicators of Asthma Care</td>
</tr>
<tr>
<td>Medication, %†</td>
</tr>
<tr>
<td>Possess inhaled corticosteroids (ICS)</td>
</tr>
<tr>
<td>Daily ICS†</td>
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<tr>
<td>Self-management education, %</td>
</tr>
<tr>
<td>Action plan</td>
</tr>
<tr>
<td>Adjusting medications</td>
</tr>
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<td>Control of factors related to asthma severity, %</td>
</tr>
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<tr>
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<tr>
<td>Possess peak flowmeter (PFM)</td>
</tr>
<tr>
<td>Daily PFM†</td>
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<tr>
<td>PFM instructions provided</td>
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</tbody>
</table>

*Race-sex interaction was significant (\( P < .05 \)) for National Asthma Education and Prevention Program–recommended combinations. A lower proportion of African American men (65.8%) had medications consistent with recommendations than African American women (78.9%), white women (78.2%), or white men (76.5%). Race-sex interaction was not significant for other care indicators.
†For patients with ICS.
‡For patients with a PFM.

qualitatively similar (eg, favoring whites and/or men). For example, whites were more likely to report having an ICS in 11 of the 16 MCOs, with significant differences in 3 of 16 MCOs. However, African Americans were not significantly more likely to report having an ICS in any of the 16 MCOs. Thus, combined results from all MCOs are reported below.
whereas the rates were similar among other patients (African American women [78.9%], white women [78.2%], and white men [76.5%]).

**Sex.** Care indicators did not exclusively favor men or women. With the exception of medication and specialist domains, however, consistency of care with guidelines generally favored women. In the medication domain, men were less likely to possess an ICS but were more likely to use it daily if they had one (58.3% vs 49.6%; *P* = .001). Men were also more likely to have seen a specialist (43.1% vs 37.7%; *P* = .001; Figure) in the previous 12 months than were women. As in the analyses by race, lower use of specialist care in women compared with men did not seem to be related to patient preferences.

**Multivariate Analyses**

The relationships of race and sex to indicators of asthma care were similar in the inpatient and outpatient sampling strata. In addition, the race-sex interaction term was not significant in any of the multivariate models (*P* > .05 in all models; Table 5). Thus, we reported results of multivariate analyses in the combined inpatient-outpatient strata after excluding the race-sex interaction term. The Hosmer-Lemeshow goodness-of-fit test was not significant in any of these models, suggesting that the multivariate models were adequately calibrated.

After accounting for age, education, employment, and symptom frequency, there were no significant race (*P* > .99) or sex (*P* = .09) differences in the use of a medication regimen consistent with NAEPP recommendations for patients with moderate or more severe asthma. Also, men were less likely to report receiving instructions on the use of a peak flowmeter than women. Otherwise, results from bivariate and multivariate analyses were similar, with significantly fewer African Americans reporting care consistent with several components of the guidelines. As in the bivariate analyses, sex differences were mixed and generally favored women, with the exception of significantly greater daily ICS use and specialist care among men.

**COMMENT**

In this study of patients with moderate or severe asthma enrolled in managed care, African Americans were less likely than whites to report care that was consistent with a comprehensive array of guideline recommendations. By contrast, differences in asthma care by sex were small and, with the exception of daily ICS use and seeing an asthma specialist, tended to favor women. These differences in care by race and sex were largely unchanged after adjusting for age, education, employment status, and asthma symptom frequency. These findings suggest that even among patients with health insurance, differences in several aspects of medical management may contribute to race disparities, and, to a lesser extent, sex disparities in asthma outcomes.

Although patient-physician partnership in asthma care has been shown to improve outcomes and is emphasized in national guidelines,23 African American patients were significantly less likely than whites to report education for self-management and avoidance of asthma triggers. Although we did not assess reasons for this race difference, there is increasing evidence in other settings to suggest that lower levels of partnership may, in part, represent cultural barriers to effective communication between patients and their physicians.44-45 More studies are needed to better understand the basis for race differences in partnership for care among patients with asthma.

While there were no significant race or sex differences in whether patients reported use of 1 of 2 NAEPP-recommended medication regimens, African Americans and women were less likely to use an ICS daily. Similar race disparities in ICS use have been found in other studies evaluating care in MCOs.8,23 To our knowledge, sex variations in the use of ICS have not been previously reported, perhaps reflecting selection bias (31% survey response rate) and the limited ability to estimate patterns of ICS use with pharmacy data22 in other studies.

Similar to our findings, previous studies in managed care populations found that whites were more likely than African Americans to receive care from asthma specialists.23,46 In this study, we also found evidence of disparities in the use of asthma specialists by women. Lower use of specialist care in the previous 12 months was not readily explained by differences in patient preference, age, education, employment, frequency of respiratory symptoms, or health insurance, suggesting that there may be nonpatient barriers to specialist care among African Americans and women with asthma. Further studies are needed to determine whether physician referral patterns or health care system barriers to specialist care differ by race and sex.

Findings from this study have several implications. In this population with inadequate asthma symptom control, only 21.8% of African Americans, 39.3% of whites, 35.7% of women, and 39.6% of men reported daily use of ICS. Since ICS are the most effective long-term control medications for asthma,39,40,47,48 efforts to increase regular ICS use should play a prominent role in strategies to improve asthma outcomes in all patients, but particularly in African Americans and women. In addition, the
presence of lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations. If the relationship between specialist care and improved outcomes is confirmed in other studies, our findings suggest that lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations.49,50 If the relationship between specialist care and improved outcomes is confirmed in other studies, our findings suggest that lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations.49,50 If the relationship between specialist care and improved outcomes is confirmed in other studies, our findings suggest that lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations.49,50 If the relationship between specialist care and improved outcomes is confirmed in other studies, our findings suggest that lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations.49,50 If the relationship between specialist care and improved outcomes is confirmed in other studies, our findings suggest that lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations.49,50 If the relationship between specialist care and improved outcomes is confirmed in other studies, our findings suggest that lower levels of patient-physician partnership for African Americans with asthma suggests that efforts to reduce race inequities in asthma outcomes should extend beyond strategies based on improving medication use alone. Results from a few studies suggest that care provided by asthma specialists may be more likely than care from generalists to conform to national guidelines, improve quality of life, and reduce the number of ED visits for asthma exacerbations.49,50

These results may also not apply to patients with mild disease. We deliberately selected patients who had moderate or more severe asthma because we believe that there would be more agreement that the comprehensive strategy of care recommended by the guidelines would be indicated in patients with more severe disease. Moreover, these findings may not represent the experience of disadvantaged patient populations, such as those with lower prevalence of health insurance, college education, or employment. However, we believe that this nonrepresentative aspect of the study design is one of the greatest strengths of our findings, since we examined patterns of asthma care in a population where confounding due to socioeconomic factors was minimized. Another potential limitation is the risk of reporting bias related to the use of self-reported data. Although patients’ recall of their medication use can be quite good, some may have overreported adherence with medications, resulting in biased estimates of asthma care. The purpose of this study, however, was to measure differences in asthma care by race and sex, rather than absolute levels of care. Nevertheless, if reporting bias varied by these demographic factors, our analyses may have minimized or exaggerated true differences in care. Results of studies evaluating differential reporting in other settings, however, have not been consistent (no race or sex bias, less bias in African Americans compared with whites, and less bias in whites compared with African Americans). Also, similar race differences in ICS use8,23 and sex differences in peak flowmeter possession were reported in previous studies in managed care populations, including a study using pharmacy data. For these reasons, we do not believe that race or sex differences in asthma care can be adequately explained on the basis of race or sex reporting bias alone. Other measures of medication use may be free from reporting bias, but they too have important limitations. For example, pharmacy data cannot differentiate between various patterns of use (eg, 2 puffs/day

**Table 5. Consistency of Asthma Care With Guidelines, Multivariate Analyses**

<table>
<thead>
<tr>
<th>INDICATORS OF ASTHMA CARE</th>
<th>WHITE VERSUS AFRICAN AMERICAN</th>
<th>OR (95% CI)</th>
<th>P</th>
<th>MEN VERSUS WOMEN</th>
<th>OR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medication</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Possess ICS</td>
<td>1.49 (1.25-1.77)</td>
<td>&lt;.001</td>
<td></td>
<td>0.83 (0.72-0.95)</td>
<td>.007</td>
<td></td>
</tr>
<tr>
<td>Daily ICS</td>
<td>2.16 (1.78-2.62)</td>
<td>&lt;.001</td>
<td></td>
<td>1.17 (1.02-1.34)</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>NAEP-recommended combination</td>
<td>1.00 (0.83-1.21)</td>
<td>&gt;.99</td>
<td></td>
<td>0.88 (0.76-1.02)</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td><strong>Self-management education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Action plan</td>
<td>1.60 (1.36-1.88)</td>
<td>&lt;.001</td>
<td></td>
<td>0.93 (0.82-1.06)</td>
<td>.26</td>
<td></td>
</tr>
<tr>
<td>Adjusting medications</td>
<td>1.60 (1.36-1.89)</td>
<td>&lt;.001</td>
<td></td>
<td>0.98 (0.86-1.11)</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td><strong>Control of factors related to asthma severity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoiding triggers</td>
<td>1.94 (1.64-2.29)</td>
<td>&lt;.001</td>
<td></td>
<td>0.85 (0.75-0.97)</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Periodic assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possess peak flowmeter</td>
<td>1.27 (1.06-1.53)</td>
<td>.91</td>
<td></td>
<td>0.76 (0.66-0.88)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Daily use of peak flowmeter</td>
<td>1.06 (0.71-1.59)</td>
<td>.78</td>
<td></td>
<td>1.04 (0.77-1.42)</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>Peak flowmeter instructions provided</td>
<td>0.97 (0.66-1.44)</td>
<td>.89</td>
<td></td>
<td>0.73 (0.55-0.97)</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td><strong>Asthma specialist care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialist care</td>
<td>1.25 (1.06-1.48)</td>
<td>.007</td>
<td></td>
<td>1.17 (1.03-1.33)</td>
<td>.02</td>
<td></td>
</tr>
</tbody>
</table>

*Adjusted for patient age, college education, employment, and asthma symptom index using multivariate logistic regression models. OR indicates odds ratio; CI, confidence interval; ICS, inhaled corticosteroid; and NAEPP, National Asthma Education and Prevention Program, 1991.
for 7 days/week vs 7 puffs/day for 2 days/week) and may underestimate care if patients received medications from other sources (eg, physician samples or from other pharmacies). While electronic monitors on multidose inhalers and peak flowmeters can accurately record patterns of use, they would not be feasible in large patient populations. Physicians’ records can be used to determine if specific care was offered or discussed, but information on patterns of medication use may be incomplete and subject to patients’ reporting biases. Importantly, none of these alternate study designs can provide information on other aspects of care we assessed, such as patients’ perception regarding adequacy of self-management education. Despite adjustments for several factors related to socioeconomic status, there may have been residual confounding. Also, there may have been differences in other factors related to disease severity that were not adequately accounted for in the analyses. However, there is no universally accepted and validated measure of asthma severity, and NAEPP recommendations for asthma care do not specify that, in patients with moderate or more severe asthma symptoms, care should be different for patients with additional factors potentially related to severity.

In this well-educated population of patients with health insurance and moderate or severe asthma symptoms, we found race- and (to a lesser extent) sex-specific differences in consistency of care with national guidelines. This study raises serious concern for the quality of asthma care even among relatively advantaged patients with access to care. More research is necessary to understand the basis for these observed differences in care by race and sex. Our results suggest that a broad strategy that incorporates various components of the asthma guidelines may be necessary to improve outcomes in African Americans with asthma. To reduce sex disparities in outcomes, greater emphasis should be placed on daily ICS use for women with asthma.

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REFERENCES


