# Variation in Managing Asthma: Experience at the Medical Group Level in California

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***Abstract***

***Objective:*** **To explore the degree of variation in the quality of asthma management among physician groups participating in a managed care network.**

***Study Design:*** **Cross-sectional observation.**

***Patients and Methods:*** **The study population consisted of patients with moderate or severe asthma identified through a pharmacy database from a managed care plan in 1996. The patients were surveyed to obtain their assessments of asthma care, including components on quality of care, quality of service, and outcomes of care. We selected 47 physician groups that provided services for at least 35 asthma patients who responded to the survey. Variations in the outcome variables across physician groups were described by quartile, range, and histogram.**

***Results:*** **Compliance with national guidelines varied among physician groups but was generally low. Physician group rates for patient use of steroid inhalers ranged from 10.7% to 45.5% and daily peak flow meter use ranged from 0% to 13.1%. Satisfaction ratings were higher, with overall satisfaction with the quality of asthma care ranging from 74.6% to 94.3%. Outcomes also showed considerable variation among groups. One-month absenteeism rates ranged from 32% to 61%, and 65.7% to 94.3% of respondents did not have an emergency room visit in the past year.**

***Conclusion:*** **The quality of asthma care and service varied significantly across physician groups. Such reports for different physician groups make evidence-based outcomes information directly available to patients and physician groups, help patients make informed healthcare decisions, and stimulate quality improvement efforts by physician groups.**

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The incidence and mortality of asthma continue to increase despite improvements in understanding the pathophysiology of asthma and the availability of effective pharmacologic agents.[1,2] Strategies for improving asthma outcomes have included the use of clinical practice guidelines and more comprehensive "disease management" approaches.[3] Guidelines for the Diagnosis and Management of Asthma were first published in 1991 by the National Asthma Education Program (NAEP) Expert Panel (sponsored by the National Heart, Lung, and Blood Institute) and updated in 1997[4]; however, the NAEP-required quality measures examined in this study were not changed.[5] These guidelines, explicitly designed to allow quality measurement and improvement,[6] have been applied in both urgent care[7] and outpatient clinic-based settings[8] and have also been used to evaluate physician prescribing patterns.[9,10]

Recent evidence showed poor compliance with the NAEP guidelines across the country, although the guidelines were published 8 years ago. In one survey, of the 72% of patients with severe asthma who had a steroid inhaler, only 54% used it daily; and of 26% of respondents who had a peak flow meter, only 16% used it daily.[11] In another study, a large percentage of asthma patients (more than 40% of



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patients with severe asthma and more than 50% of patients with moderate asthma) did not receive anti-inflammatory agents, the recommended first-line therapy.[12] The problem of poor compliance cuts across all geographic regions; a recent study found low compliance with asthma guidelines for members of 8 health plans located across the United States.[13]

Although the reported rates of compliance with guidelines on an aggregate level are low, the extent of the variation among physician groups is not clear. Variations in diagnosis and treatment for many conditions are recognized factors contributing to the observed variation in patient outcomes.[14,15] The process of asthma care may also exhibit variation because of different beliefs among physicians about important aspects of the treatment's safety and efficacy,[16] complexity of guidelines that may limit their dissemination, and lack of resources or time to implement all the recommendations. For example, although use of office spirometry is recommended, many physicians do not control the budgets for the purchase of equipment; or the pressure to meet productivity goals may not allow physicians time to follow recommendations for patient education.[3]

"Physician profiling" or "audit with feedback" provides information to physicians about their practice patterns and helps determine the degree of variation at the group level. Profiling has improved patient outcomes,[17,18] decreased inappropriate use of procedures,[19-21] altered prescribing patterns,[22-24] and improved physician performance.[25]

In a previous study, we performed a population-based survey to assess the quality of life, functional status, and self-management behaviors of asthma patients in a large managed care organization (MCO) in California.[11] That study provided an opportunity to document the current status of care for asthma patients, to compare current practices with the NAEP guidelines, and to identify factors related to adherence to these guidelines. In this study we used data from that survey to assess the variation in quality among physician groups participating in the MCO network in order to determine whether stratification and reporting by group is useful and appropriate.

## ··· METHODS ···

### Selection of Patients

All patients with moderate or severe asthma, aged 5 to 65 years, who were enrolled in Health Net (a network/independent physicians association-type health maintenance organization [HMO] in California with more than 1.3 million members at the time of the study) were included in the study. Selection criteria outlined in the Health Plan Employer Data and Information Set, version 2.5,[26] were used to identify potential asthma patients through the HMO pharmacy and claims databases in 1996. The algorithm identified a cohort of members who were continuously enrolled for 1 year prior to the selection point and had been dispensed any of the following medications: (1) one or more prescriptions for cromolyn sodium or inhaled corticosteroid; (2) two prescriptions for a bronchodilator ($\beta_2$-agonist); or (3) two prescriptions for theophylline. These broad criteria were adopted in order to include all possible asthma patients within the HMO population, but may also have led to inclusion of members with chronic obstructive pulmonary disease or other related conditions. The first question on the survey therefore assessed whether a member had asthma. Members who were not diagnosed with asthma were asked to check the "no" box and return the survey. On the basis of

**Table 1.** Classification Criteria for Current Asthma Severity[4]

| Current Severity | Symptom Frequency | Nocturnal Symptoms | Symptom Chronicity |
|---|---|---|---|
| Mild | Mild symptoms, not more than once a week | Not more than once a month | Asymptomatic between exacerbations |
| Moderate | Exacerbations 2-5 times a week | 2-7 times a month | Some symptoms on most days, requiring inhaler for relief |
| Severe | Frequent exacerbations, more than 5 times a week | Frequent nocturnal symptoms, more than 7 times a month | Symptoms most of the time |

these criteria, 32,625 potential asthma patients were identified and sent the "Health Survey for Asthma Patients" in April 1996. This survey instrument was previously validated as part of the Outcome Management System Consortium Asthma Project.[27]

### Survey

*Quality of Care.* Quality-of-care components on the survey included items to determine the following: (1) provision of instructions on avoiding triggering attacks; (2) regular use of a steroid inhaler by patients; (3) provision of instructions on use of a peak flow meter; and (4) regular use of the peak flow meter. Patients were also asked to indicate whether they considered their physician an asthma specialist.

*Quality of Service.* Quality of service was measured by assessing the patient's satisfaction with the access, communication, and skills of their physician. Responses of "good," "very good," and "excellent" were considered to be indicators of members' satisfaction, whereas responses of "fair" or "poor" indicated dissatisfaction.

*Outcomes of Care.* The number of asthma-related absences from work or school, emergency room visits, and hospitalizations were used as measures of outcomes of care. Functional status was evaluated with the Health Status Questionnaire (HSQ), which measured 8 functional attributes of the patient: general health perception, physical functioning, social functioning, role limited by physical conditions, role limited by emotional conditions, bodily pain, mental health, and energy/fatigue.[28] All 8 functional dimensions were converted to a score of 0 to 100, a higher score representing better health or functional status. In addition, the survey questionnaire measured the risk of developing depression.

*Categorization of Patients.* The self-reported data from the survey were used to categorize the patients' illness by current severity as mild, moderate, or severe asthma using the 1991 NAEP guidelines (summarized in Table 1). The respondents were classified on the basis of the most severe observed response for nocturnal symptoms, symptom frequency, and symptom chronicity. Results are presented for moderate and severe asthmatic patients only.

### Statistical Analysis

Descriptive statistics were used to summarize the characteristics of moderate and severe asthma patients. The mean and standard deviation were calculated for continuous variables such as age and for standardized scores of functional status. Overall population rates were calculated for the dichotomous measures of care, services, and outcomes.

To determine the variability among physician groups, summary outcomes were calculated for individual physician groups. Measures were calculated for groups that had at least 35 respondents in order to have more stable group scores. The median, quartile, and range are presented in order to display measures that were less affected by outliers. The quartiles and the interquartile range, together with the median, give some indication of the center, spread, and shape of the distribution of a measure. Additionally, histograms are presented for selected outcomes.

## ··· RESULTS ···

### Population Characteristics

A total of 9767 members responded to the survey (30% response rate). Although every effort was made to correctly identify this cohort as currently having asthma, 2287 respondents indicated they were not asthmatic. Of the remaining 7480 self-reported asthma patients, 6342 respondents had moderate or severe disease. The analyses focus on the 4743 respondents associated with 47 physician groups with 35 or more patients with moderate or severe asthma.

Table 2 summarizes demographic, socioeconomic, and asthma-specific characteristics of the respondents. The average age of respondents was 32.5 ± 18.9 years, and a majority (59.5%) were women. Respondents were predominantly white (67.1%), had completed some college (76.1%), and were currently employed (76.4%). Almost all members were nonsmokers at the time of the survey (94.2%).

The average duration of asthma for the patient group was 19.2 ± 15.3 years, and equal numbers of patients were classified as having moderate or severe asthma (Table 1). The majority of patients (65.0%) were seeing a generalist who did not specialize in asthma or respiratory care, 17.7% were cared for by an asthma specialist, and 17.3% had no regular physician responsible for their asthma care.

Physician groups with at least 35 respondents were included in this analysis, and 47 groups met this criterion. Table 3 summarizes the distribution of respondents across the physician groups.

### Distribution of Quality Outcomes Across Physician Groups

Table 4 summarizes the distribution of the measures of care and services for the 47 physician

**Table 2.** Characteristics of Subjects with Moderate or Severe Asthma

| Characteristic | Value* |
|---|---|
| Sex | |
| Female | 2823 (59.5) |
| Male | 1920 (40.5) |
| Age | |
| Under 18 | 1618 (33.8) |
| 18 and older | 3169 (66.2) |
| Mean age (± SD) | 32.5 ± 18.9 |
| Duration of asthma (years) (mean [± SD]) | 19.2 ± 15.3 |
| Race/ethnicity | |
| African American | 304 (6.5) |
| White | 3152 (67.1) |
| Asian | 382 (8.1) |
| Hispanic | 619 (13.2) |
| Other | 240 (5.1) |
| Education (some college or above) | |
| Yes | 2546 (76.1) |
| No | 799 (23.9) |
| Employed (full- or part-time) | |
| Yes | 3570 (76.4) |
| No | 1105 (23.6) |
| Smoking status | |
| Current smoker | 274 (5.8) |
| Nonsmoker | 4453 (94.2) |
| Current asthma severity | |
| Moderate | 2395 (50.5) |
| Severe | 2348 (49.5) |
| Provider of care | |
| Generalist | 3079 (65.0) |
| Asthma specialist | 837 (17.7) |
| No regular physician | 820 (17.3) |

* Values are expressed as number (percentage) unless otherwise indicated.

**Table 3.** Distribution of Respondents Across Physician Groups

| No. of Respondents in Each Physician Group | No. of Physician Groups | No. of Respondents in All Physician Groups |
|---|---|---|
| 37-50 | 14 | 588 |
| 51-70 | 11 | 682 |
| 71-100 | 10 | 881 |
| 101-200 | 7 | 970 |
| 201-300 | 3 | 829 |
| 301-423 | 2 | 794 |
| Total | 47 | 4744 |

groups. We used the median, quartile, and interquartile range (IQR) to summarize the variations of the measures. For example, the first measure for quality of care is the percentage of patients (in a medical group) treated by a specialist. This value is 8.0% under the first quartile, which means that 8% or fewer patients were treated by an asthma specialist in one-fourth (or 25%) of the 47 medical groups. The second quartile value is actually the median value (16.3%) for this measure. The value in the third quartile, 23.7%, indicates that 23.7% or less of the patients were treated by a specialist in 75% of the medical groups. Although the difference between the highest (38.7%) and lowest (0%) values gives the range between the 2 extremes, IQR, or the distance between the first and third quartiles, is a more resistant measure of the spread, because it is not affected by changes in either tail of the distribution. Thus, the IQR of 15.7 indicates that the difference between the first and third quartiles for the percentage of patients visiting a specialist is 15.7%. It can therefore be concluded that none of the groups relied primarily on asthma specialists to deliver asthma care, because the highest rate reached was only 38.7%, with a fairly large variation (15.7%) across medical groups. The distributions of other service indicators are similarly summarized by quartile and range.

*Quality of Care.* As discussed in the previous paragraph, none of the groups relied primarily on asthma specialists to deliver asthma care because the highest physician group rate for reliance on asthma specialists was only 38.7%.

The values for proper use of bronchodilators (ie, using a $\beta_2$-agonist inhaler for not more than 8 inhalations daily) were high, with more than 78% of the population using this medication appropriately.

Although all patients reported moderate or severe symptoms, the median for steroid inhaler use was only 28.4%. The upper quartile for steroid inhaler use was 34.2%, and the highest value for any physician group for this measure was only 45.5%; the IQR of 10.3% also indicated that this measure varied considerably among the physician groups.

Peak flow meter use also varied widely, because the IQR was 4.2%, with a median of only 5.1%. The best rate attained by a group for daily peak flow meter use was only 13.1%. The percentage of members who received instruction on peak flow meter usage was also low. The median rate for receiving instruction on peak flow meter use was 26.0%, and fewer than half of the members

**Table 4.** Provider Distribution for Individual Quality Outcomes

| | Quartiles | | | Ranges | | |
|---|---|---|---|---|---|---|
| **Dimension of Quality** | **1st Q (25%)** | **2rd Q (50%)** | **3rd Q (75%)** | **Lowest** | **Highest** | **IQR*** |
| **Quality of Care** | | | | | | |
| Treated by an asthma specialist† | 8.0 | 16.3 | 23.7 | 0.0 | 38.7 | 15.7 |
| Did not overuse bronchodilator inhaler | 85.7 | 88.7 | 91.9 | 78.6 | 100.0 | 6.2 |
| Used steroid inhaler regularly | 23.9 | 28.4 | 34.2 | 10.7 | 45.5 | 10.3 |
| Used peak flow meter daily | 3.5 | 5.1 | 7.7 | 0.0 | 13.1 | 4.2 |
| Instructed on use of peak flow meter | 22.6 | 26.0 | 31.3 | 11.1 | 48.6 | 8.7 |
| Instructed on course of action if peak flow falls below a certain level | 17.5 | 23.4 | 26.6 | 8.3 | 43.2 | 9.1 |
| Discussed how to avoid triggering attacks with physician | 63.8 | 72.1 | 76.5 | 44.8 | 87.5 | 12.6 |
| **Quality of Services** | | | | | | |
| Satisfied with waiting time to get an appointment | 73.2 | 79.5 | 86.8 | 59.6 | 97.2 | 13.7 |
| Satisfied with skill of doctors | 83.5 | 86.8 | 90.6 | 68.8 | 97.1 | 7.0 |
| Satisfied with overall quality of care for asthma | 81.7 | 87.8 | 89.5 | 74.6 | 94.3 | 7.8 |
| Satisfied with ease in reaching a doctor/nurse by phone | 73.7 | 79.5 | 85.4 | 62.5 | 95.6 | 11.7 |
| Satisfied with getting urgent or emergency care for asthma | 82.2 | 87.8 | 90.7 | 69.6 | 97.1 | 8.5 |
| Satisfied with quality of communication with doctors and nurses about asthma | 76.3 | 83.0 | 85.3 | 62.7 | 94.6 | 9.0 |
| **Outcomes of Care** | | | | | | |
| Physical score‡ | 47.6 | 51.5 | 54.3 | 37.9 | 61.8 | 6.7 |
| Social/mental score‡ | 50.0 | 52.4 | 56.0 | 42.7 | 62.0 | 6.0 |
| Was not absent from work/school for asthma in the past month | 47.9 | 52.0 | 56.7 | 38.8 | 67.6 | 8.8 |
| Did not go to emergency room for asthma in the past year | 77.2 | 81.5 | 85.7 | 65.7 | 94.3 | 8.5 |
| Was not hospitalized for asthma in the past year | 94.3 | 95.0 | 96.5 | 87.5 | 100.0 | 2.2 |

Results are expressed as percentages.
*IQR = Interquartile range, the difference between the value for the first and third quartile; Q = quartile.
†Asthma specialist could be a pulmonologist, allergist, or otolaryngologist.
‡Physical and Social/Mental scales of the HSQ.

(48.6%) in the highest scoring physician group received instruction.

A wide interquartile range of 12.6% was also seen for discussion on how to avoid triggering attacks. Physician groups that had discussed asthma triggers with fewer than 64% of members were in the bottom quartile; in the top quartile were the groups that had discussed attack triggers with at least 76.5% of their asthmatic patients.

*Quality of Service.* Measures of the quality of service such as satisfaction with the skill of doctors, satisfaction with getting urgent or emergency care, and satisfaction with overall asthma care all had similar distributions. The median was approximately 87% for these 3 measures and the interquartile range was between 7% and 8.5%. The median was slightly lower (approximately 80%) for waiting time to get an appointment, ease of reaching a physician or nurse by phone, and quality of communication with doctors and nurses about asthma. The largest interquartile range and absolute range was for satisfaction with waiting time (13.7%).

*Outcomes of Care.* The physical and social/mental scores had similar distributions, with most physician group scores staying within 3% of the median. The measure of asthma-related absences varied slightly, with an IQR of 8.8% for a median of 52.0%. The best rate for nonabsenteeism in a group was 67.6% of patients.

For emergency room (ER) use, the best group had 94.3% of its asthmatic patients free of ER visits. The bottom quartile physician groups had between 65.7% and 77.2% of asthmatic members free of ER visits.

Distributions of selected measures are presented in greater detail in Figures 1 to 3. Patterns may be compared across measures because the histograms all use the same scale. Figure 1 indicates a wide distribution for regular steroid inhaler use, with the better physician groups having regular use rates of at least 35%. By contrast, the results for daily use of peak flow meters were less favorable, and the distribution shows a shift to the left with small variation (Figure 2). Despite the low level of peak flow monitoring, the rates for education on asthma triggers were high for patients from most physician groups (Figure 3).

## ··· DISCUSSION ···

This study describes significant variation in the quality of asthma care among groups of physicians. Assessments included adherence to national consensus guidelines, patient satisfaction ratings, and patient-reported outcomes. The results presented here suggest many potential areas for improvement. Using the NAEP critical components as a guide, physician groups performed best in areas relating to patient education but lagged in the use of preventive medications and use of the peak flow meter. Low peak flow meter use may be explained partially by poor patient compliance, although the low rates of instruction in the use of the meter among physician groups are troubling. Even the highest ranked physician groups offered instructions on use of the meter to fewer than half of their patients. The observed variation at the medical group level may be explained by variability among groups regarding institution of programs for asthma management, continuing medical education, and patient education and for asthma-specific feedback measures.

By including information on patient satisfaction and outcomes of asthma care, this report encompasses broader measures of quality than used in previously published applications of the NAEP guidelines. Rather than focusing solely on pharmacologic therapy, we have considered a wider range of criteria for appropriate ambulatory care of the asthmatic patient, in particular, the use of objective measurement of lung function (peak flow meter) and appropriate patient education. With its focus on patient satisfaction and actual outcomes, the definition of quality employed in this study is more closely aligned with patients' view of quality.[29]

The results presented are specific for persons with moderate or severe asthma, with severity determined by self-reported patient symptoms. The low rates of compliance with treatment regimens among some physician groups cannot therefore be explained by the suggestion that these physician groups have more patients with mild asthma for whom anti-inflammatory medications or peak flow meters are inappropriate. Since the NAEP guidelines used in the quality measures are specific to both moderate and severe categories, it is appropriate to measure adherence to the guidelines for the entire group of moderate and severe asthmatic patients. Although the NAEP guidelines have been revised since our survey was conducted, the results are unaffected with respect to treatment patterns and physician or patient compliance with these recommendations. It would be of interest to compare the group with mild asthma and its 2 subsets with the moderate and severe groups for significant differences based on this new classification (Table 1).

**Figure 1.** Distribution of Physician Group Rates: Regular Use of Steroid Inhaler

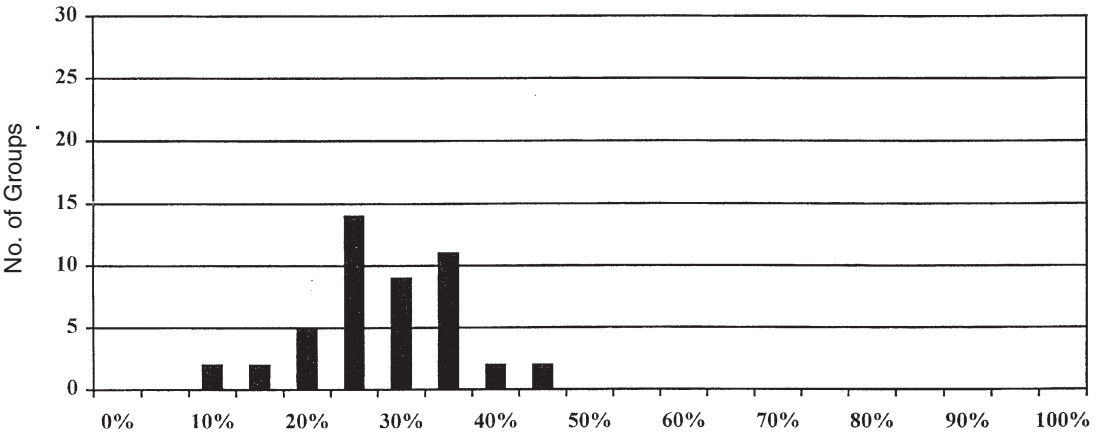



**Figure 2.** Distribution of Physician Group Rates: Daily Peak Flow Meter Use

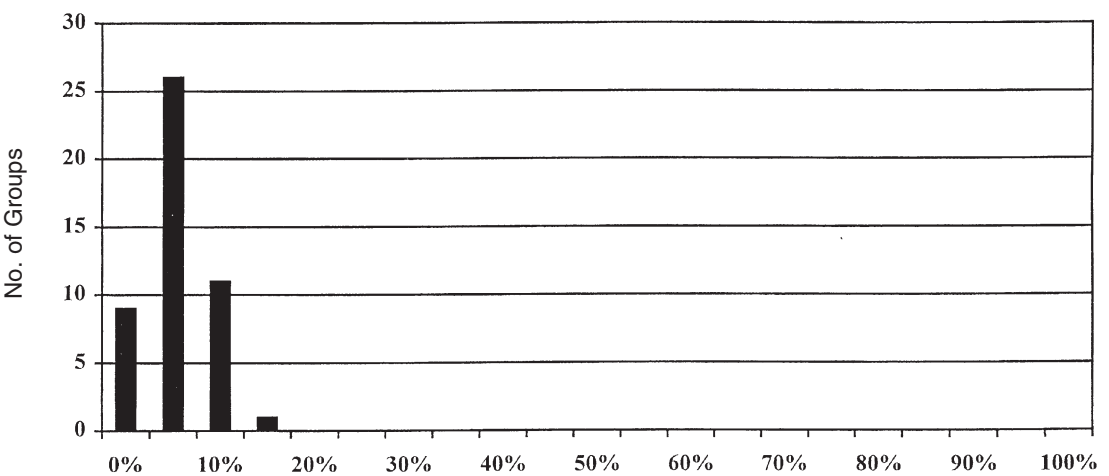
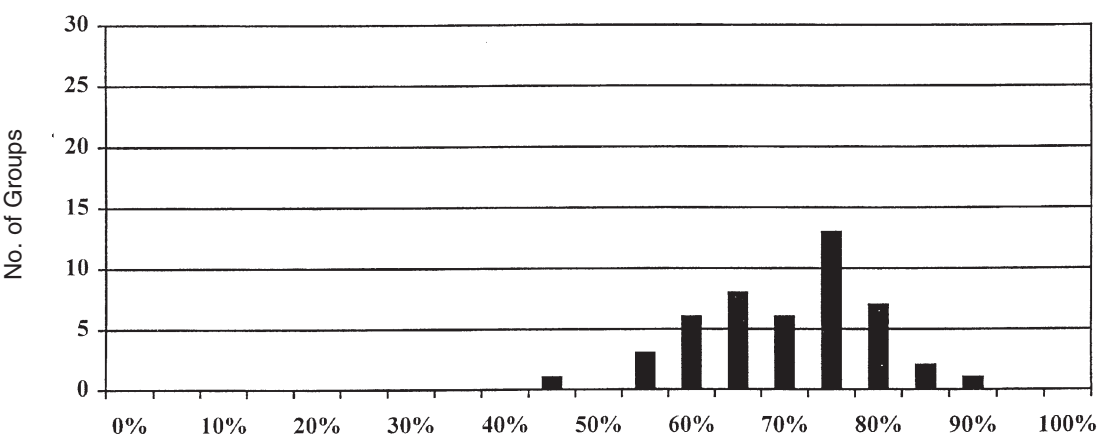



**Figure 3.** Distribution of Physician Group Rates: Discussing Asthma Triggers



Our overall results probably overestimate the level of compliance because noncompliant patients are less likely to be identified by pharmacy claims or to respond to the survey. This bias should be consistent across physician groups and hence should not significantly change the group rankings or categories. Because patients least compliant with pharmacologic management are more likely to be seen in an urgent or inpatient setting, a case-finding algorithm that includes both pharmacy and physician encounter information would be less subject to this source of bias.

An important long-term goal of this project was to make evidence-based outcome information directly available to patients with asthma and to empower patients to make educated choices by providing high-quality information. The results presented here indicate significant and meaningful differences in asthma care among physician groups. Providing patients with such information allows them to act on nonrandom differences and to make comparisons among physician groups or with a community benchmark.

The growth of managed care has provided both incentive and opportunity to develop and implement new techniques for quality evaluation and improvement. Managed care organizations are well positioned to assist patients and physicians by providing them with information about practice patterns and disease outcomes. The results presented here, describing variations in the process of medical care among physician groups, may be useful to physicians as well as patients.

Although the patient-reported categorization of a physician as an asthma specialist may not be completely accurate, our study suggests that the use of specialist care for asthma patients is relatively infrequent. With primary care physicians therefore bearing the major responsibility for asthma care, information on patients' use of preventive measures and the outcomes of care of their patients can help in improving the overall management of asthma. These steps represent a trend toward greater use of objective measures to define healthcare quality and toward more public disclosure of information about quality. This type of information can make it easier for patients to make informed decisions about their healthcare and can stimulate quality improvement efforts by the medical care delivery system.

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