

Effects of an Asthma Management Program on the Asthmatic Member: Patient-Centered Results of a 2-year Study in a Managed Care Organization

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Abstract

Objective: To report the results of a 2-year pilot program of asthma education based on National Heart, Lung, and Blood Institute treatment guidelines.

Patients and Methods: Asthmatic members (n = 6698) of a managed care organization received education about their condition directly or through their primary care physician. Medical and pharmacy administrative claims data were reviewed to measure acute asthma events and prescribed therapies in the first (the baseline) and second years of the study. The claims data were augmented by member surveys from a stratified random sample of 2734 asthmatic patients who were members (6 years of age or older) in the baseline year.

Results: Compared with the first year, asthmatic members received fewer inpatient services and the proportion of asthmatic members prescribed oral inhaled corticosteroids increased 30% in the second year. Health-related quality of life, measured with validated general and disease-specific instruments; satisfaction with the quality of care; exposure to patient education; knowledge of the disease; and member's confidence in their ability to manage their disease showed statistically significant improvements during the follow-up year of the program for both adult and child asthmatic members.

Conclusion: For asthmatic members of this health plan, a comprehensive asthma health management program improved processes of care and outcomes.

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A number of consensus guidelines have been developed for the diagnosis and management of asthma, of which the most recent are the International Consensus Report on Diagnosis and Treatment of Asthma¹ (1992), the Global Initiative for Asthma² (1995), and the updated US National Asthma Education and Prevention Program (NAEPP).³ These consensus statements reflect decades of deepening understanding of the nature of asthma, its diagnosis, and its management. The Global Initiative for Asthma, from the National Heart, Lung, and Blood Institute and World Health Organization, urges community-based initiatives to determine the impact of implementing treatment guidelines in the real world, rather than in controlled environments such as a clinical study.

The Global Initiative for Asthma recommends an integrated asthma management program. Specifically, training and resource materials for primary care health workers should include instruction on the diagnosis and management of asthma. Healthcare services should assess and monitor asthma severity, promote the appropriate use of anti-inflammatory medications, and offer education and materials to guide patients in the self-management of their disease.

The Initiative couples asthma management with outcomes research to monitor the ongoing effectiveness of such an asthma program. Ideally, such studies would include investigations of how well the treatment guidelines are followed, how best to allocate healthcare resources in the treatment of asthma, evaluations of the effectiveness of various interventions and types of care, and assessments of the impact on the patient's health-related quality of life. In summary, the Initiative specifically calls for outcomes studies that capture the entire experience of asthma.

Despite the extensive clinical expertise reflected in the treatment guidelines, however, its recommendations have not been adopted universally.^{4,6} Physician education is thus as important as patient education in translating the treatment guidelines to clinical prac-

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tice. Small-scale studies have suggested that asthma management programs may be cost-effective and improve the quality of care.⁷⁻¹¹ These studies, however, have been based on the experiences of small cohorts of high-risk asthmatic patients, rather than using a population-based approach, ie, one that analyzes and encompasses the asthmatic population.

Below, we report the results of a comprehensive asthma health management program based on the NHLBI treatment guidelines¹² involving the asthmatic members of Mid-Atlantic Medical Services, Inc. (MAMSI), a 500,000-member individual practice association-type managed care organization located in the US mid-Atlantic region. The program was a collaborative effort of MAMSI; the Integrated Therapeutics Group (ITG), the health management subsidiary of Schering-Plough; and Diversified Pharmaceutical Services (DPS), a pharmaceutical benefits management company that is a subsidiary of SmithKline Beecham. The findings of a 2-year pilot program reported here focus on the impact of the program from the asthmatic members' perspective.

... METHODS ...

This study compares a 12-month baseline, ending second quarter 1995, with a 12-month follow-up period of active intervention, ending second quarter 1996. Pharmacy and medical administrative claims, as well as a survey of asthmatic members, were utilized to measure the impact from the asthmatic members' point of view.

Pharmacy and Medical Claims

Asthma-specific pharmacy and medical administrative claims were merged for all identified asthmatic patients into a comprehensive database. Patients were identified as asthmatic if they had at least one medical claim with the ICD-9-CM (*International Classification of Diseases, Ninth Revision-Clinical Modification*)¹³ code 493.xx, selected medical procedures associated with asthma using Current Procedural Terminology, Fourth Revision (CPT-4)¹⁴ procedure codes, and selected classes of pharmaceutical drugs according to their National Drug Classification (NDC)¹⁵ codes. Any patient with claims evidence of emphysema, chronic obstructive pulmonary disease, cystic fibrosis, bronchiolitis, bronchopulmonary dysplasia, chronic bronchitis, or the use of ipratropi-

um bromide was excluded from the study. While these exclusions may have omitted some asthmatics, this step allowed a targeted approach for members who would benefit from the program. This methodology identified 6698 asthmatic members of the health plan who were enrolled during both years of the study and who had claims evidence of asthma in both years.

Asthma severity was characterized using the following resource utilization-based scale that reflects, in part, the diagnosis classification of the NHLBI treatment guidelines¹²: (1) mild asthma was defined as patient utilization of outpatient and/or pharmacy claims only; (2) moderate asthma as evidence of at least one emergency department claim, without a hospital stay; and (3) severe asthma as evidence of at least one hospital inpatient admission.

Changes in clinical outcomes and prescribing of anti-inflammatory therapy were measured utilizing the merged medical and pharmacy claims. The McNemar's test was used to test the differences in the proportion of asthmatic members with one or more inpatient hospital and emergency room service events as well as the proportion of asthmatic members receiving one or more prescriptions for an oral inhaled steroid medication, comparing the baseline year to the following year.

Asthmatic Member Survey

Patient-centered findings were also derived from members who completed a comprehensive survey at baseline and at the end of the follow-up year. The claims-based definition of an asthmatic member (defined above) was employed to select a stratified random sample of all asthmatic members age 6 years and older, the surveys having been validated for respondents and parents/guardians of respondents age 6 and older. We identified 9126 members, 19% of whom had at least one visit for emergency services, inpatient or emergency department, in the baseline year. One out of seven asthmatic members

Table 1. Sample Selection of Asthmatic Members

	Identified in the Baseline Year	% Asthmatic Members		
		Selected in the Sample	Who Were Nonresponders	Who Were Responders
No.	9126	2734	2167	567
Mild	81.0	36.7	35.7	39.9
Moderate	14.2	47.0	48.6	41.7
Severe	4.8	16.3	15.7	18.3

were randomly selected. In addition, all the remaining high-risk, moderate, and severe asthmatics (those with emergency services in the previous year) were also included in the sample as candidates for the program. Ultimately, 2734 members were selected for the survey; the distribution of the sample by asthma severity category is shown in Table 1.

The one-time mailing to the sample of asthmatic members resulted in a 23% response rate with 567 replies. A comparison of responders and nonresponders shows a similar demographic and disease severity profile (Table 2). The 12-month follow-up survey, mailed to responders of the baseline survey, yielded a 67% response rate, resulting in 232 adult surveys and 105 parent/guardian-completed child surveys. About 10% of the responders to the baseline survey were lost to follow-up (moved away, etc.) and were not included in the response rate calculation.

All findings represent the responses of those members replying to both surveys.

Asthma Quality Assessment System

The Asthma Quality Assessment System (AQAS), a self-administered survey instrument comprised of a battery of patient-centered measures, was used to evaluate the patients' experience with their healthcare. AQAS covers general health-related and asthma-specific quality of life self-reported knowledge about and confidence in managing one's own care, and satisfaction with the quality of care.

Two versions of the survey were utilized: one for adult asthmatic patients and one for parent (or guardian) reporting of a child's asthma. The adult version combines a general health assessment questionnaire (SF-36¹⁶) and an asthma-specific quality of life instrument validated together.¹⁷ The parent-completed version for pediatric asthmatic patients combines the recently released Child Health Questionnaire¹⁸ (CHQ-PF50) and a pediatric asthma-specific quality of life module validated together (M.M. McGrath, MS unpublished data, 1998).¹⁹ In order to make comparisons with norms for the SF-36 and to report data in a comparable way, all health-related quality of life (HRQOL) measures are reported on a 100-point scale from 0 to 100. As with the SF-36, higher scores indicate higher functional status.

In order to analyze improvements in health-related quality of life, an individual patient's change in scores was computed for each scale as the follow-up score less the baseline score. Two-sided tests of significance were conducted at 0.05 significance level. Student's *t*-test for paired samples was used to detect statistically significant differences between baseline and follow-up health-related quality of life scale scores for the entire sample.

Measurements of satisfaction with care (access, quality, overall satisfaction, and behavioral intention) relied on specific items that have been shown to be reliable and valid and have been widely adopted.^{20,21} Items were also included that reflected the educational aspects of the overall program. The language and rating-scale format of these items and questions are the same as those used in published surveys. Also included in the follow-up survey was a checklist of all the educational programs and materials offered. Respondents were asked to indicate which they participated in during the intervention year. For all survey-based measures (excluding the HRQOL described above), the McNemar's test was used to detect statistically significant differences between the two time periods, at the 0.05 level, for

Table 2. Demographic Comparison of Responders to Nonresponders of the Asthma Member Survey

	Nonresponders No. (%) n = 2167	Responders No. (%) n = 567
Adult Respondents		
Sex		
Female	977 (64)	291 (74)
Male	550 (36)	102 (26)
Age		
14-19 years	291 (19)	43 (11)
20-39	740 (49)	185 (47)
40-59	435 (29)	134 (34)
60+	61 (4)	31 (8)
Utilization Defined Asthma Severity		
Mild	565 (37)	169 (43)
Moderate	718 (47)	153 (39)
Severe	244 (16)	71 (18)
Child (Parent/Guardian) Respondents		
Sex		
Female	243 (38)	64 (37)
Male	397 (62)	110 (63)
Age		
6-8 years	260 (41)	75 (43)
9-11	248 (39)	63 (36)
12 and 13	132 (21)	36 (21)
Utilization Defined Asthma Severity		
Mild	211 (33)	57 (33)
Moderate	333 (52)	84 (48)
Severe	96 (15)	33 (19)

the entire sample and separately for the moderate and severe asthmatics.

The Asthma Management Program

The asthma health management program developed and implemented for the asthmatic population of this large independent practice association combined a number of educational efforts. These efforts were intended to bring treatment practices and patient behaviors into closer accord with published guidelines. Primary care physician providers, who care for MAMSI's asthmatic members, received visits from health management program coordinators. These coordinators are pharmaceutical sales representatives specifically instructed on the NHLBI guidelines by asthma educators and specialist providers during a day-long seminar and who must pass a physician continuing medical education test on the content of the guidelines. During dedicated time with physicians throughout the intervention year, coordinators reviewed the NHLBI guidelines and the recommended therapeutic approaches. In addition, physicians received "asthma kits," created and supplied by ITG, to give to their patients. The asthma kits, the content of which was reviewed with physicians, contained a peak flow meter, diary, and an educational

video and pamphlet on asthma and self-management. Coordinators suggested to the physicians that they use the kits in educational discussions with their patients. Physicians received monthly prescription profiles of their patients indicating those who had pharmacy claims evidence of high use of β -agonist inhalers and whether or not there was appropriate concomitant use of inhaled or oral anti-inflammatory therapy. This service was provided by DPS through their clinical pharmacy services.

Table 3. Member Reported Educational Interventions

	Adult Responders No. (%)	Child Responders No. (%)
Direct Patient Contact	68 (36)	49 (52)
Educational Workshops/Support Groups	12 (6)	6 (6)
Home Call/Home Care Nurse Visits	17 (9)	13 (14)
Asthma Telephone Nurse Counselor	56 (29)	36 (38)
Educational Materials	153 (80)	86 (92)
Mailings of Educational Booklets to Patient Home	137 (72)	81 (86)
Mailings of Educational Videos to Patient Home	100 (53)	53 (56)
Educational Booklets from Patient Physician	53 (28)	34 (36)
No Educational Interventions Indicated	31 (16)	6 (6)

Note: Percentages reflect the fact that the majority of members received multiple interventions.

Table 4. Asthma Knowledge and Confidence

% Who Say That:	All Adult Asthmatics		Moderate/Severe Adult Asthmatics		All Child Asthmatics		Moderate/Severe Child Asthmatics	
	Baseline	Follow-Up	Baseline	Follow-Up	Baseline	Follow-Up	Baseline	Follow-Up
Told me everything I want to know about what to do for a flare-up	48	56*	49	57	53	64*	54	67*
Received written instructions for a flare-up	45	59*	47	64*	52	65*	51	71*
Very/extremely confident in ability to manage asthma	49	54	51	50	56	74*	54	77*
Extremely/very confident in knowing what to do for a flare-up	52	54	54	52	61	76*	59	78*

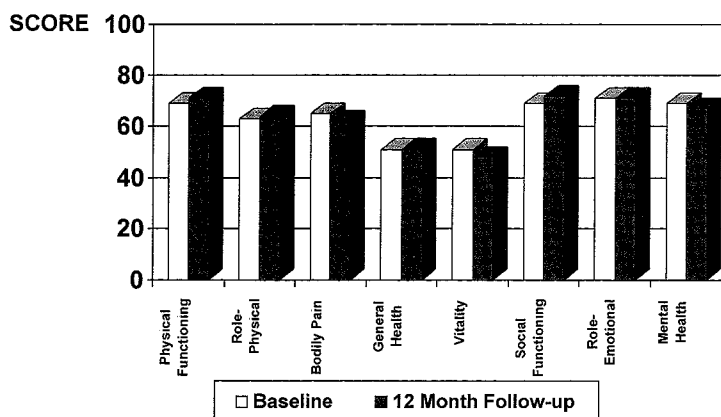
*P < 0.05

Asthmatic members who either were referred by their physicians, were identified because of recent events, or responded to member communications were offered educational sessions that emphasized the importance of medication compliance and the proper use of medications, allergen avoidance, and peak flow

monitoring. The educational programs were conducted by trained asthma educators (primarily RNs and PharmDs) using a training program developed by ITG. The Krames Communications, Inc. educational brochure (a commercially available publication) was also mailed to all asthmatic members.

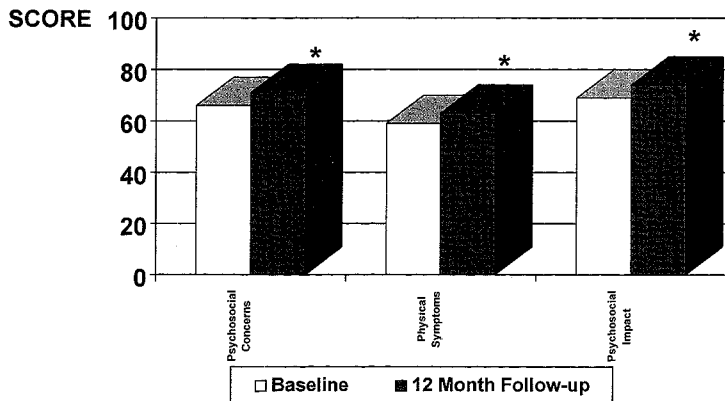
... RESULTS ...

Figure 1. Comparisons of SF-36 Scores for All Asthmatic Adults



P=NS.

Figure 2. Asthma-Specific Quality-of-Life Scales for All Asthmatic Adults



*P < 05

The asthma education sessions were delivered through a variety of vehicles (depending on the asthma members' availability and willingness to participate), including group classes, telephone counselors, and individual home health visits (Table 3). In addition, educational literature was provided directly to the asthmatic members by the health plan as well as given to physicians in the provider network to share with their patients.

Almost all the asthmatic members who responded to the survey reported receiving asthma-related educational mailings to their home. More than half of the parents of child asthmatics and over a third of adult asthmatics reported receiving personal education by an asthma educator either individually or in a group setting.

Impact of Education

Feedback about the quality and quantity of asthma information as perceived by the asthmatic members is presented in Table 4. Asthmatic members were asked whether they felt they had been given enough information about what to do when they had an asthma flare-up and whether they had received written instructions about what to do for an asthma flare-up. At baseline, fewer than half of the respondents replied that they had received "enough information" and written instructions across all severity levels. At the end of the follow-up year, the proportion who reported receiving sufficient information increased among all asthmatic members. Asthmatic members were also asked to report their level of confidence in their ability to manage their

asthma and in knowing what to do in the event of a flare-up. Using a five-point scale, about half of all asthmatic members reported at both baseline and follow-up that they were extremely/very confident in their ability to manage their asthma whether or not they had a serious event in the previous year. However, a greater proportion of parents of child asthmatic members reported increased confidence at the end of the follow-up year.

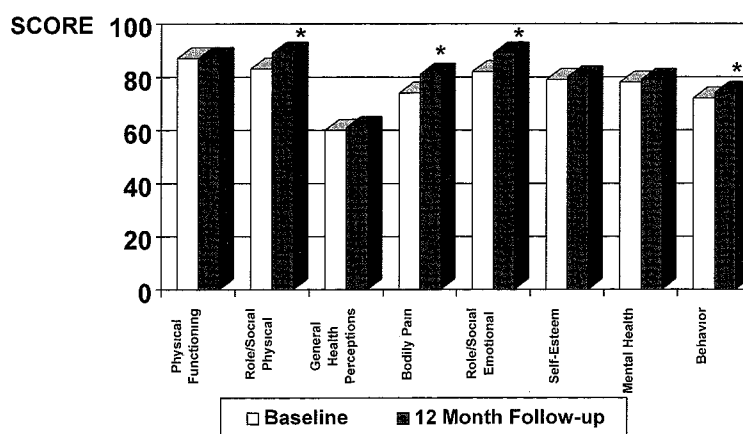
Health-Related Quality of Life

Health-related quality of life was measured at baseline and again at 12 months, utilizing both the general and disease-specific instruments for adults and children described above. Among adult asthmatics, there was no meaningful change in general health status, as measured by the average scale scores of the SF-36 (Figure 1). However, there were improvements in the disease-specific scales, which measure the psychosocial concerns of asthma, such as “I have felt that asthma is controlling my life”; physical symptoms such as “I have felt unable to breathe”; and the psychosocial impact of asthma, such as “asthma has limited my performance at work, school, or other activities.” Among adult asthmatics, there was a statistically significant improvement ($P < 0.05$) in the mean scale scores of all the disease-specific quality of life scales measured (Figure 2).

Health-related quality of life for the child asthmatic members (reported by their parents) showed statistically significant improvements ($P < 0.05$) on both the general and disease-specific instruments. Increases in the average scale scores are observed in four of the eight scales of the CHQ-PF50, specifically “role/social-physical,” “bodily pain,” “role/social-emotional,” and “behavior” (Figure 3). Statistically significant improvements in disease-specific quality of life are observed in four of the five domains measured: daytime symptoms; nocturnal symptoms; psychosocial impact, such as “my child was unable to play with his/her

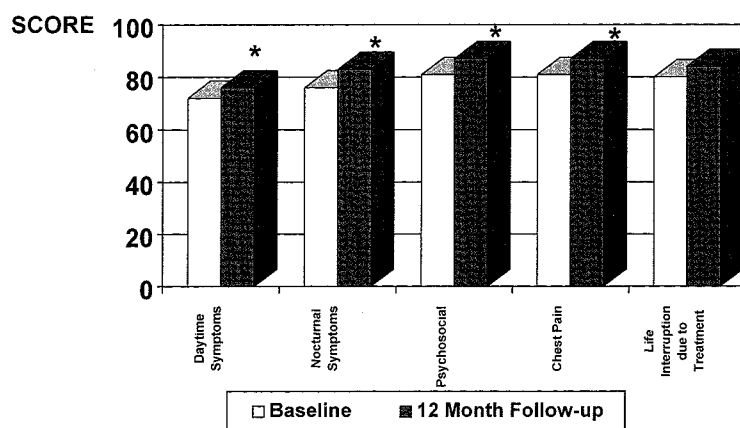
friends” and “asthma interfered with my child’s activities at school”; and chest pain due to asthma. In one domain, “life interrupted due to treatment,” there was no change (Figure 4).

Figure 3. Comparisons of CHQ-PF50 Scores for All Asthmatic Children



* $P < 0.05$.

Figure 4. Asthma-Specific Quality-of-Life Scales for All Asthmatic Children



* $P < 0.05$.

Satisfaction with Care

Patients' satisfaction with care was captured on three levels: items reflecting physician care and treatment, items addressing preventive care and educational programs, and questions on satisfaction with the health plan. No change was seen in the proportion of members rating physician treatment and care as excellent or very good (Table 5). However, there was a statistically significant increase ($P < 0.05$) in the proportion of members who rated the items "advice you get about ways to avoid illness and stay healthy" and "availability of educational materials or programs" as excellent or very good. Measures that address satisfaction with the health plan overall and members' willingness to recommend the health plan to friends and relatives reported mixed results. Among parents of child asthmatics, the program is associated with improved satisfaction with

the health plan overall ($P < 0.05$). There was no change among adult members (Table 6).

Physician Prescribing Behavior

Changes in physician prescribing are reflected in the proportion and rate of dispensed claims for inhaled anti-inflammatory medications. The proportion of asthmatic members with one or more prescription claims for an inhaled corticosteroid increased from just over one in four in the baseline year to just over one in three in the follow-up year, an overall percentage increase of about 30%. Similar increases in inhaled corticosteroid prescribing are seen among asthmatic members who were in the hospital or emergency room for asthma during the baseline year (Table 7). The proportion of asthmatic members on chronic therapy (as defined by four or more claims for an inhaled corticosteroid) increased 25%.

Clinical Outcomes

Adverse events, as defined by the use of inpatient hospital and emergency room services, declined for the population as a whole. The proportion of asthmatic members in the population with one or more inpatient hospitalizations declined from 5.6% ($n = 378$) to 4.6% ($n = 311$), which translates into an 18% reduction in the number of people hospitalized for asthma among the population as a whole ($P < 0.01$). The proportion of asthmatic members with multiple hospitalizations within a calendar year also declined. In the follow-up year, there was a 39% reduction in members with multiple hospitalizations from 0.84% ($n = 56$) to 0.51% ($n = 34$) which is significant at the 0.05 level. The proportion of asthmatic members with one or more visits to the emergency room (and who had no inpatient events) remained unchanged.

Table 5. All Asthmatics' Satisfaction with Physician's Care

% Who Say Excellent/Very Good:	Adult		Child	
	Baseline	Follow-Up	Baseline	Follow-Up
Thoroughness of treatment	49	48	59	64
Attention given to what patients say	55	51	56	64
Personal interest in patients	55	55	65	62
Amount of time spent with doctor during a visit	51	50	60	59
Outcomes of medical care	55	51	64	68
Quality of care and services from doctor	61	58	66	71

P = NS.

Table 6. All Asthmatics' Satisfaction with Care

% Who Say That:	Adult		Child	
	Baseline	Follow-Up	Baseline	Follow-Up
Advice on avoiding illness/staying healthy is excellent/very good	36	43*	47	58*
Availability of educational materials/programs is excellent/very good	27	39*	44	62*
Completely/very satisfied with plan	56	59	51	55*
Would recommend plan to family/friends	73	75	67	71*

* $P < 0.05$.

... DISCUSSION ...

The literature is growing on the benefits of target-

ed asthma programs that reflect the goals of the asthma consensus guidelines, including recommended medications,⁷ patient education and the use of peak-flow monitoring^{22,23} and the use of specialist care,²⁴⁻²⁶ which is generally believed to be more closely aligned with guidelines. This literature measures change among cohorts, usually small, of patients at risk. Interpretation of this literature is therefore complicated by the methodological challenges of generalizability beyond the specified cohort.

A notable exception is a recently released report on the combined efforts of multiple managed care organizations to measure the outcomes of a broad, population-based asthma initiative. One of the goals of the project, described in Managed Health Care Association Outcomes Management System Project, Asthma Patient Outcomes Project Report on One-Year Patient Follow-Up,²⁷ was to assess the usefulness of a broad, population-based data collection effort in detecting and evaluating quality improvement efforts. The project relied primarily on survey data, coupled with administrative data, to identify asthmatic members of interest. A number of methodological similarities exist with the effort we report. Both efforts emphasize the patient perspective and rely on patient-reported outcomes. Utilizing a before and after design, both projects demonstrated improvements in process measures, such as self-reported knowledge, and both showed no overall improvement in health-related quality of life measurement when employing the SF-36 alone. While other studies have shown that the SF-36 is a valid measure of disease burden in asthma, the more sensitive disease-specific scales used in our study were able to detect changes in physical and psychosocial functioning that the general health status measure was not designed to do.¹⁷ In addition, our effort did not rely on self-report for evidence of anti-inflammatory use and inpatient and emergency services, but rather employed administrative claims data to provide a population-wide measurement.

Obvious methodological challenges arise in conducting a population-based analysis that lacks a control group: causality cannot be rigorously determined and other explanatory factors cannot be ruled out. In the present analysis, the same population-wide analysis was

conducted over a 2-year period; therefore, all identified asthmatic members had an equal chance of getting worse or getting better, and thus had an equal chance of having an adverse event or a worsening in health-related quality of life. The fact that the interventions were based on the NHLBI guidelines, with existing empirical evidence supporting their effectiveness, allows the drawing of causal linkages even in the absence of a control group.²⁸ Finally, the current effort employs solid outcomes measures. Accepted claims-based definitions of asthmatic members and resource utilization-based events were employed; validated and accepted health-related quality of life and satisfaction with care measurement approaches formed the basis of the patient-centered measurement.

The results reported here document the efforts of a comprehensive quality improvement program that encompass a range of healthcare services and attempt to measure the collective impact on the managed care organization's asthmatic membership. The asthma health management program had a demonstrable effect on changing physician behavior in a positive direction. A previous study identified underprescribing of anti-inflammatory agents in the asthmatic managed care population, with an expected increase in prescribing of just 4% to 5% over several years.⁴ In just one year, however, through the efforts of the program we described, anti-inflammatory prescribing for the population as a whole increased 20% to 30%, with concomitant increases in the number of prescriptions per person, an indication of better coverage with chronic therapy. Similar increases in prescribing were observed among asthmatic members who had an acute care event in the baseline year and for whom the appropriateness of anti-inflammatory prescribing is less open to question.

The asthma health management program was associated with quality of care improvements in the management of a population identified as having a chron-

Table 7. Use of Oral Inhaled Anti-Inflammatories

	Moderate/Severe Asthmatics (%) (n = 1356)		All Asthmatics (%) (n = 6698)	
	Baseline	Follow-Up	Baseline	Follow-Up
Any cromolyn or nedocromil	17	16	14	14
Any inhaled corticosteroid	26	31*	27	35*

*P < 0.001.

ic disease. For the population as a whole, fewer disease-related adverse events occurred. We also found associated reductions in the overall costs of asthma care, where trends historically have been in the opposite direction.²⁹ Most importantly, for a random sample of the population, measurable improvements occurred in disease-specific quality of life. Improvement in disease-specific quality of life, in process measures of asthma knowledge gained (adults and parents), and in confidence with self-care (parents) coincided with increased satisfaction with the availability of educational support. Satisfaction ratings of physician care remained unchanged; however, satisfaction with the health plan increased among parents of asthmatic children. More child asthmatic members and their parents than adult members received in-person education, which may help to explain the improved satisfaction.

... CONCLUSION ...

A comprehensive, population-wide asthma health management program involving asthmatic member education, increased adherence to published guidelines, and increased use of inhaled anti-inflammatory medications has been shown to improve both processes of care and patient-centered outcomes. Reductions in adverse asthma events and overall costs did not come at the expense of quality. From the perspective of the asthmatic member of this health plan, quality is improved as measured by improved health-related quality of life and the increased likelihood of avoiding adverse outcomes.

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