

## Improved Outcomes of an Outpatient Pediatric Asthma Patient Management Program in an IPA HMO

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### **Abstract**

**Asthma is a disease that results in substantial morbidity for many of those afflicted. The necessity of inpatient and emergency department treatment is considered a sensitive indicator of the outpatient quality of care provided to patients with asthma. This study evaluates the effectiveness and cost-benefits of a patient-centered case management program in a large, independent practice health maintenance organization in the eastern United States.**

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Asthma is a chronic medical condition that accounts for substantial morbidity and mortality in the general population. Self-reported patient data indicate that the prevalence of asthma increased steadily during the 1980s. Despite a slight decrease in age-adjusted hospital discharge rates for asthma in persons aged 5 to 34 years, from 18.4 per 10,000 in 1982 to 17.9 per 10,000 in 1992, the annual age-adjusted death rate increased 40% during that period.<sup>1</sup>

Asthma is a persistent inflammatory disease of the airways that manifests itself by wheezing and chronic coughing. Treatment includes drugs of proven efficacy that target asthma's causative inflammatory component (eg, corticosteroids, cromolyn, and nedocromil) and symptoms (eg, beta-agonist inhalers and theophylline preparations).<sup>2-6</sup>

Asthma is also an expensive chronic illness. The total economic cost in 1990 was estimated to be \$6.2 billion, with \$1.6 billion directly attributable to inpatient hospital costs.<sup>1</sup> A full 43% of asthma's economic

impact was related to costs associated with emergency department use, hospitalization, and death.<sup>7</sup>

Patient education, patient compliance, and medical management can affect the morbidity and mortality rates of asthma. Effectively managing patients with asthma includes preventing emergency department visits, hospitalization, and death, and maintaining an optimal quality of life.<sup>8</sup> The advent of managed care allows for the development of specific programs in which the most severely afflicted members of a population can be identified and offered additional medical resources. Case management programs that offer educational support to both the patient and the treating physician are the means by which managed care organizations can provide these resources. This report details the improved outcomes achieved with the Pediatric Asthma Patient Management Program run by an independent practice association health maintenance organization (HMO).

### ... SUBJECTS AND METHODS ...

#### **Setting**

U.S. Healthcare<sup>®</sup>, Inc (USHC) is a large independent practice model HMO with more than 2 million members in 13 eastern states and the District of Columbia. USHC contracts for care with participating primary care physicians and compensates them through a quality-adjusted capitation methodology (ie, a fixed payment at specific intervals, per member, for all care provided). The physicians, who are selected by the members, are responsible for managing patient care. As necessary, members are referred for specialty care to participating specialists and hospitals, who generally are reimbursed on a modified fee-for-service basis.

#### **Program Description**

The goal of the USHC Pediatric Asthma Patient Management Program is to improve the quality of ambulatory medical care for pediatric asthma patients.

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The program is centered around educational sessions conducted by nurses who visit members at their homes, with the aim of educating both children and their parents. USHC has contracts with several home care agencies to provide home visiting nurse support; these agencies must adhere to predetermined guidelines established by USHC. The agencies were given a list of members selected for the program by USHC whose parents agreed to their child's participation. The program coordinator is a registered nurse employed by USHC who serves as the liaison among the physicians, patients, and home care agency staff.

Soon after a child enters the program, a nurse visits the child and his or her parents at home. The nurse provides and reviews written educational material about the definition and manifestations of asthma, asthma medications and their use, peak flow meters and monitoring, environmental exacerbants, and nebulizer use. A customized, written action plan is then developed by the visiting nurse in conjunction with the physician. The plan is reviewed by the patient's participating primary care physician, who is kept informed about and remains fully involved with the child's care. A visiting nurse may make subsequent visits, depending on the results of an assessment of the severity of asthma and the needs of the patient and family. The first visit is followed up with either monthly or quarterly telephone calls to reinforce the knowledge and skills learned at the first session, and to identify potential problems at an early stage. The program has a 12-month cycle from the entry date for each child. Table 1 summarizes the components of the program.

**Table 1.** Components of the Pediatric Asthma Patient Management Program

<p><b>Case Management</b></p> <ul style="list-style-type: none"> <li>- Initial home nursing visit with follow-up telephone calls monthly or quarterly</li> <li>- Physical, environmental, and educational assessment</li> <li>- "Asthma action plan" developed with primary physician</li> <li>- Additional educational session by nurse educator</li> </ul> <p><b>Comprehensive Educational Program</b></p> <ul style="list-style-type: none"> <li>- Indications for self-administration of therapy</li> <li>- Intensive asthma training programs</li> </ul> <p><b>Durable Medical Equipment</b></p> <ul style="list-style-type: none"> <li>- Nebulizers, peak flow meters, and spacers</li> <li>- Asthma diary to track respiratory status</li> </ul> <p><b>Primary Care Office Certification</b></p> <ul style="list-style-type: none"> <li>- Equipment and staff to treat acute exacerbations of asthma</li> <li>- Observation area to monitor response to therapy</li> </ul>
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To reinforce the knowledge and skills of participating primary care physicians, USHC sponsors continuing medical education (CME) for physicians. The major component of CME is a self-learning tool, "Executive Summary: Guidelines for the Diagnosis and Management of Asthma," sponsored by the National Asthma Education Program. Physicians who participate in the program and who fulfill the requirements of this self-assessment tool are eligible for CME credits and receive an incentive distribution above their base capitation through USHC's Quality Care Compensation System.<sup>9,10</sup>

**Subjects**

The USHC members included in the study were from southern New Jersey and southeastern Pennsylvania. The selection criteria for program entry included an age between 1 and 17 years old, a previous hospitalization for asthma or an asthma-related condition, two emergency department visits for asthma, or five or more urgent outpatient visits for an exacerbation of asthma. Most children were entered into the program after a hospitalization or an emergency department visit for an asthma exacerbation. Approximately 1 year after initiation of the study, the selection criteria were broadened to include physician referrals, thereby increasing the number of children studied.

More than 500 children have been entered into the program since its inception in 1992 through December 1994. However, this analysis focuses on the 260 children who entered before March 31, 1994 and who were followed up through June 1994, thereby allowing for a minimum of three months in the program.

**Study Design**

The study data were derived from USHC's historical claims database. Claims were determined to be directly related to asthma if the principal diagnosis was in the ICD-9 code range of 493 to 493.99.<sup>9</sup> Member information was obtained from membership and enrollment databases.

The clinical outcomes selected for use in evaluating the impact of the program were:

- Hospital admittances
- Hospital days
- Total fee-for-service dollars (including the cost of home nursing visits)
- Emergency department visits

Hospital admittances and emergency department visits are important clinical outcome measures of the successful ambulatory treatment of asthma. A reduction in these measures suggests that a patient was

better managing his or her asthma in the outpatient setting, in that severe symptoms and exacerbations of the disease were prevented and access to hospital-based services was not required.

A retrospective study design was used, in which subjects served as their own controls. The resource utilization of each child entered into the program was compared with his or her historical utilization before program entry. Because the selection criteria included referral into the program immediately after a hospitalization or emergency department visit for asthma, the 30-day pre-enrollment period, labeled the "event month," was excluded from analysis in order to prevent bias in the pre-program cost data for each subject. Figure 1 shows the average number of hospital admissions, per member per month, for the 12 months preceding and during the program. The spike occurring in the month before enrollment demonstrates that many of the patients were enrolled immediately after a hospitalization for an acute asthma exacerbation.

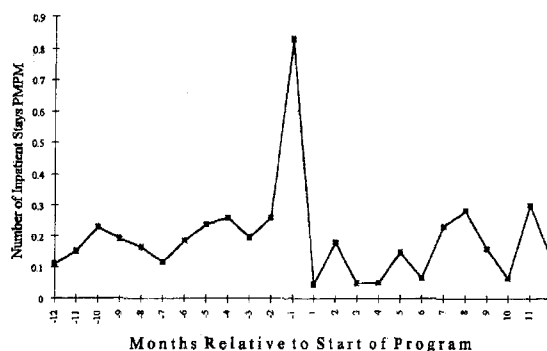
Acute exacerbations of asthma can be precipitated by allergens. Consequently, a seasonal variation in asthma attacks often occurs. In order to control for seasonality, the first analysis was conducted using data only on program graduates (ie, those with 12 months of program experience) who had a 12-month history of asthma prior to program enrollment. Sixty patients met these criteria as of June 30, 1994. (This date was chosen to limit the possible lag factor in the submission of claims for evaluation.)

Each patient in the two groups (ie, the initial 60 patients and the additional 200 patients) had differing time periods of membership within the USHC system, creating unequal samples of activity for analysis. Selected outcomes were analyzed at the per member per month level for each month of data available for a patient.

**Statistical Analysis**

Friedman's test, a nonparametric analysis of variance, was used to test the difference in utilization between the pre- and post-time periods. Because the severity of each patient's illness was not assumed to be equal, a differential impact of the program on each patient was expected. For this reason, each patient was used as a blocking factor in the analysis. This approach controls for differences among patients and more accurately determines the impact of the program.

**Figure 1.** Inpatient Hospitalizations, by Month, Relative to Program Entry



... **RESULTS** ...

Table 2 indicates inpatient days, inpatient stays, fee-for-service costs, and emergency department visits for the periods preceding and during program participation. As shown for the initial cohort of 60 members, the number of hospital days was reduced 73%, from 0.37 per member per month to 0.10 per member per month. Likewise, hospital admissions were reduced 56%; fee-for-service costs, 48%; and emergency department visits, 57%. The per member per month decrease in fee-for-service costs from \$379 to \$196 resulted in a monthly savings of \$183 and an annual savings of almost \$2,200 for each child enrolled.

Similar reductions, although of lesser magnitude, were observed for the full cohort of 260 members. This cohort included both the initial group of 60 patients who participated in the program for 12 months and the 200 patients who either had not yet participated for 12 months or who had not been USHC members for 12 months prior to entry into the Asthma Patient Management Program. The analysis included utilization through June 30, 1994, to allow for 3 months of participation in the program.

**Table 2.** Results for Pre- and Postprogram Start Time Periods

Outcome (per Patient per Month)	First 60 Patients		All 260 Patients	
	Pre	Post	Pre	Post
Hospital Days	0.37	0.10*	0.16	0.07*
Hospital Stays	0.09	0.04*	0.04	0.03*
Fee-for-Service	378.94	195.77	194.59	177.39
Emergency Department Visits	0.28	0.12*	0.17	0.07*

\*P<0.05, versus preprogram result.

As previously stated, these results excluded the event month (ie, the 30 days preceding program entry). Figure 2 shows the percentage improvement in outcomes directly related to asthma during program participation, compared with the 12 months prior to program enrollment. Figure 3 represents the percentage improvement for all 260 patients. All months of program participation and all months of pre-program experience for a maximum of 12 months were included in the analysis. The event month, however, was excluded from the analysis. The reduction in fee-for-service medical costs was less than the reduction in the other factors, primarily because one cata-

strophic case, which cost \$78,499, was not excluded from the study.

... DISCUSSION ...

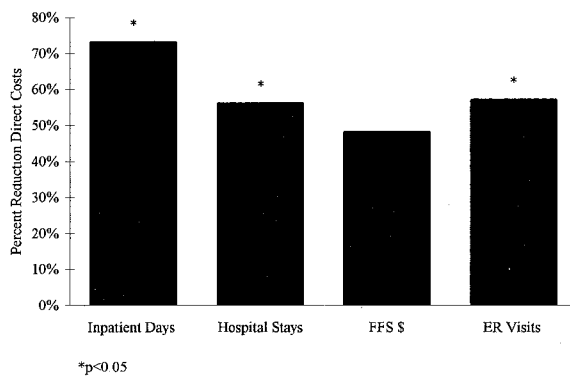
Various intervention programs have been shown to improve both the health of pediatric patients and physicians' knowledge about effective asthma treatment. Key components of the effective treatment of asthma include an understanding of the pathogenesis of the illness, the importance and correct use of peak flow meters and compliance with asthma medications, education about the early warning signs of an asthma exacerbation, and a treatment plan that provides instructions on how to respond to warning signs.

Several patient management programs have also demonstrated improved outcomes for the adult patient with asthma. Wilson and colleagues<sup>12</sup> showed that, when compared with the baseline period, both individual education and small-group education for adult asthma patients led to improved metered dose inhaler technique, reductions in the severity of patients' symptoms, better physician evaluation of the patients' asthma status, and fewer acute care visits for asthma. Although both the individual education and small-group education groups showed improvement in acute care visits over the baseline period, the difference between the two groups during the study period was not statistically significant.

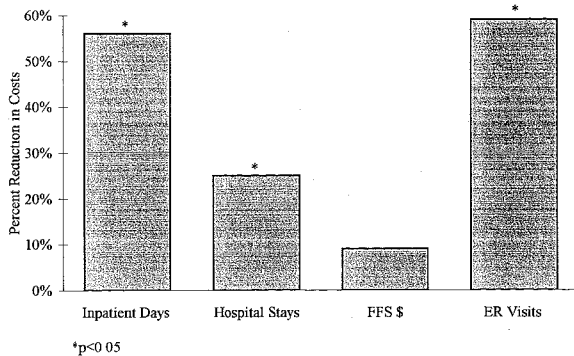
In a study by Mayo and coworkers,<sup>13</sup> a vigorous medical regimen and intensive education program for adult asthma patients selected after having required multiple hospitalizations for asthma attacks led to a threefold reduction in readmission rate. Furthermore, a twofold reduction in hospital day use rate was observed.

In a study similar to this one, Muhlhauser and coworkers<sup>14</sup> demonstrated that an inpatient asthma treatment program led to a significant decrease in severe asthma attacks and asthma-related hospitalizations. A 5-day inpatient asthma education program resulted in fewer hospitalization days, acute asthma attacks, days absent from work, and number of physician consultations, compared with preprogram results.<sup>15</sup> The results persisted for the 3 years after program participation. In another pre/post study design similar to our own,<sup>16</sup> an education and case management program resulted in reductions in emergency department visits and hospitalizations of 79% and 86%, respectively. Others<sup>17,18</sup> have shown that a team approach and physician education help to improve the care given to patients with asthma.

**Figure 2.** Percentage Improvement in Asthma-Related Outcomes for First 60 Patients



**Figure 3.** Percentage Improvement in Asthma-Related Outcomes for All 260 Patients



Our study, which demonstrated improvement in utilization measures, suggests that a pediatric asthma patient management program effectively improves the clinical outcomes of enrolled patients and generates cost-savings for the overall care of the enrolled patients. The weaker results associated with relaxation of the selection criteria have implications for the type of patients who should be targeted for program participation. Aggressive case management seems to be less beneficial for patients with mild asthma than those with more severe asthma.

Because the percentage reduction in costs was less when the selection criteria were less stringent, it is difficult to justify offering case management to all patients with asthma solely on a cost basis. Nevertheless, better outcomes, such as improvement in functional status and patient satisfaction, even in the absence of definitive cost savings, should be factored into any decision about the appropriate selection criteria for offering additional resources.

The strengths of the Pediatric Asthma Management Program include the identification of a group of patients who, with physician approval and parental consent, could be offered additional resources directly by the HMO. The program compared the outcomes of these patients during the period of program participation with outcomes prior to program entry, when the HMO offered no direct resources other than ongoing high-quality care by participating physicians. Our study also demonstrated that a patient education program was beneficial for a pediatric population when parents were involved.

Pre/post study designs are subject to bias. In our study, however, a thorough understanding of the program design and selection criteria was key to the elimination of the event month, which, if included, may have biased the preprogram costs data analysis. Bias in preprogram cost data, in turn, would have led to a bias in the preprogram results inflating the improvement of outcomes. Eliminating data from the month preceding program entry likely produced a conservative estimate of the effectiveness of the program.

Improved performance in the use of anti-inflammatory agents could have contributed to improvements in patient outcomes. However, because the asthma management program and asthma CME programs were two unique programs, it is unlikely that the CME course could have accounted for the size of the impact observed in program participants. No significant changes in the medical delivery system during the study period, such as other physician educational efforts or changes in reimbursement

mechanisms, were instituted that also could have potentially affected the results.

The findings from this program evaluation are most relevant to children with asthma and for whom there has been a previous emergency department visit or hospitalization, as this group tends to be sicker than other asthma patients. The program may not be generalizable to a broader population of patients with asthma.

### ... CONCLUSION ...

The USHC Pediatric Asthma Patient Management Program demonstrates the benefits that the managed care industry brings to improving outcomes for an identified patient population. A health maintenance organization can readily access clinical and demographic data through its administrative databases. This enables the organization to develop selection criteria to identify patients most likely to benefit from the additional healthcare resources that patient management programs offer and allows for the analysis of the programs' cost-effectiveness. Proactive patient management programs that provide cost-effective services to improve the functional status and decrease the morbidity of at-risk patient populations will continue to be a major focus of managed healthcare organizations.

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