

## Impact of a Pediatric Clinic-Based Multidisciplinary Asthma Education and Management Program

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**OBJECTIVE** The objective of this study was to determine if a multidisciplinary asthma education and management program within a general pediatric clinic impacts clinical outcomes of children with asthma.

**METHODS** An asthma education and management clinic was started by a general pediatrician, a pharmacist, and a nurse. At a patient's initial clinic visit, data were collected summarizing hospitalizations, emergency department visits, and number of systemic corticosteroid courses for the previous year. The same data were collected at each subsequent visit. A retrospective review of this data was performed for patients who enrolled in the clinic between February 1999 and 2002 to compare outcomes between the year before enrollment in the clinic and the following year. Patients were included if they received follow-up for at least one year.

**RESULTS** Fifty-seven patients with a mean age of 8.5 years qualified for data analysis. Forty-eight percent of the study population was classified as having moderate persistent asthma, and 11% of patients were severe persistent. Compared to the year prior to clinic enrollment, the number of hospitalizations per patient decreased by 82% ( $P < .001$ ). Emergency department visits decreased by 81% ( $P < .001$ ). The number of systemic corticosteroid courses decreased by 72% ( $P < 0.001$ ).

**CONCLUSIONS** Patient enrollment in a general pediatric clinic-based multidisciplinary asthma education and management program decreases hospitalizations, emergency department visits, and systemic corticosteroid exposure.

**KEYWORDS:** asthma, education, outcome, pediatric

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### INTRODUCTION

According to the National Health Interview Survey of 2002, more than 6 million children in America have asthma.<sup>1</sup> Healthcare utilization for these children in the year 2002 included 727,000 emergency department (ED) visits and 196,000 hospitalizations. In that same

year, 187 children died due to asthma. Despite improvements in the medications available to treat asthma, the disease continues to afflict children, families, and healthcare systems.

**ABBREVIATIONS:** ED, emergency department; PICU, pediatric intensive care unit

The high rates of healthcare utilization for these children may be due to poor adherence to prescribed treatments, inadequate education on asthma self-management, underutilization of inhaled corticosteroids by healthcare providers, or continued exposure to environmental asthma triggers. Studies have shown that the

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use of inhaled corticosteroids in children with asthma improves clinical outcomes. However, other studies show that many deserving children are not receiving this beneficial treatment.<sup>2-4</sup>

Asthma education programs have been shown to decrease the rate of hospitalizations and ED visits in persons with asthma.<sup>5-7</sup> Others have concluded that education programs have no impact on healthcare utilization.<sup>8-9</sup> One study reports a decrease in hospitalizations utilizing a multidisciplinary education and management clinic supervised by a pediatric pulmonologist.<sup>10</sup> This article will be the first to describe the effectiveness of a general pediatric clinic-based multidisciplinary asthma education and management program in reducing hospitalizations, ED visits, and systemic corticosteroid use in children with asthma.

## MATERIALS AND METHODS

An asthma clinic was established within an academic-based general pediatric clinic to improve asthma management as well as patient self-management skills. Clinic personnel included a general pediatrician, a clinical pharmacist, and a registered nurse. Medical residents, medical students, pharmacy residents, and pharmacy students also assisted with the clinic. Patients were referred to the asthma clinic from pediatricians within the practice as well as other physicians in the community. Initially, the clinic scheduled patients one afternoon each week. After 2 years, an additional afternoon was added due to the large demand. During each visit, a detailed history was obtained, a physical exam performed, and either peak flow or spirometry measurements were obtained. The pharmacist provided asthma education, assured proper inhaler technique, performed spirometry, and performed telephone follow-ups and consultations.

The education provided included the basic pathophysiology of asthma, symptoms of asthma, goals of asthma therapy, role of medications, adverse effects of medications, treatment of symptoms, recognizing and modifying triggers, inhaler technique, and proper care of nebulizers and spacers. In addition, all patients were given spacers and an action plan. Action plans were peak flow and symptom-based in

children able to perform peak flows.

Initial visits were scheduled for 1 hour, and 30 minutes were allowed for subsequent follow-up visits. The medical team documented each patient's asthma severity and insured that treatment was consistent with recommendations based on symptom severity.

Patients returned for follow-up every month until symptoms were controlled. They then returned in 3 months. If asthma control was maintained for 3 months, the patient was seen every 6 months. Patients with poor asthma control or difficulty with adherence to the prescribed regimens were seen every 1–3 months. The clinic was also available on an as needed basis. None of the patients received care from an allergist or pulmonologist during the study period.

At their initial visit, patients or their caregivers completed a questionnaire requesting information about their asthma, including healthcare utilization in the year prior to the clinic visit. The same information was completed at each subsequent visit. A retrospective review of this data was performed for patients with an initial clinic visit between February 1999 and February 2002. Outcomes measured included number of hospitalizations, number of ED visits, and number of systemic corticosteroid courses. Patients were included in the analysis if they received at least one year of follow-up from the clinic and information from their surveys was complete.

Data analysis was completed using SPSS 11.0 for Windows. A paired samples t-test was used to compare the number of hospitalizations, ED visits, and systemic corticosteroid courses in the year prior to enrollment with the following year. Institutional review board approval was obtained for the study.

## RESULTS

A total of 142 patients were seen in the asthma clinic during the study period. Of those, 58 were lost due to failure to follow up, 19 did not have an asthma diagnosis, and 8 were excluded due to incomplete data. A total of 57 patients were included in the data analysis. Table 1 describes the population demographics. The most prevalent asthma severity was moderate persistent, as documented in 48% of

**Table 1.** Patient Demographics

Parameter	
Age (yr)	8.5 ± 4.3*
Race	
Caucasian	43%
Hispanic	26%
African-American	26%
Other	5%
Sex, male	60%
Asthma severity at initial visit	
Mild intermittent	23%
Mild persistent	18%
Moderate persistent	48%
Severe persistent	11%
Insurance Type	
Medicaid/state funded	82%
Private insurance	18%

\* mean ± SD

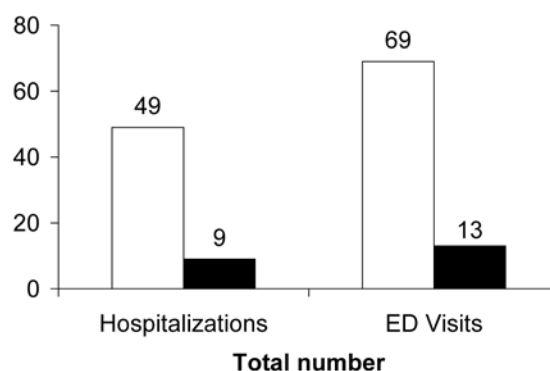
the population. The majority of patients were insured by federally funded programs such as Medicaid or the Children's Health Insurance Program.

Figure 1 demonstrates the reduction in the total number of hospitalizations and ED visits. Table 2 reflects the reduction in mean number of hospitalizations, ED visits, and the use of systemic corticosteroid courses per patient. Hospitalizations were reduced by 82% ( $P < .001$ ). Forty-six percent of the patients were hospitalized in the year prior to clinic enrollment compared with 14% in the year after. Eight patients were admitted to the pediatric intensive care unit (PICU) in the year prior to being seen in the asthma clinic. No PICU admissions occurred in the year after clinic enrollment.

ED visits were reduced by 81% ( $P < .001$ ) in 52 patients with complete data. Only 14% of patients had an ED visit in the year after clinic enrollment compared with 54% in the year before. The number of systemic corticosteroid courses was reduced by 72% ( $P < .001$ ) in 50 patients with complete data.

## DISCUSSION

This study shows that a significant reduction in hospitalizations, emergency department visits, and systemic corticosteroid exposure is possible among patients referred to a general pediatric clinic-based asthma education and

**Figure 1.** Hospitalizations and ED Visits the Year Prior to Study (□) Asthma Clinic Compared to the Year After Study (■).

management program. The reduction in hospitalizations and ED visits is similar to that seen in other studies.<sup>5,11</sup> Only one other study mentions a program's effectiveness at reducing the frequency of systemic corticosteroid bursts.<sup>12</sup> Their study experienced a 50% reduction in corticosteroid bursts in the year following attendance at an asthma day program that was led by either a pediatric allergist or pulmonologist and included a psychosocial clinician, nurses, a dietician, and home health providers. The current study differs in that asthma management and education were provided by a general pediatrician and a clinical pharmacist in a clinic setting. Although not formally assessed, it was noted that the majority of patients referred to the clinic with persistent asthma symptoms were not receiving inhaled corticosteroids or treatment of allergic rhinitis. Some of these patients had not been started on inhaled corticosteroids, while others had chosen not to follow the recommendations of their healthcare provider.

While the outcomes of this study were positive, there were some potential barriers to successful implementation of such a program within the academic general pediatric clinic. Asthma clinic visits are more comprehensive, requiring more time thus decreasing space that may have been needed for other clinic visits. At times, the demand for appointments greatly exceeded the time and space available. Therefore, more patients were scheduled in each clinic session, decreasing the time available for patient education. In an effort to decrease the time commitment required of the attending pediatrician, the pharmacist was able to provide disease state management and

**Table 2.** Number of Emergency Department Visits, Hospitalizations, and Systemic Corticosteroid Courses in the Year Prior to Clinic Enrollment Compared to the Year After

Outcome	Clinic Enrollment		Mean Difference	P value (95% confidence interval)
	Before	After		
ED visits (n = 52)	1.33 ± 1.85*	0.25 ± 0.81*	1.08	< .001 (0.56-1.60)
Hospitalizations (n = 57)	0.86 ± 1.43*	0.16 ± 0.41*	0.7	< .001 (0.34-1.07)
Systemic corticosteroid courses (n = 50)	1.48 ± 1.92*	0.42 ± 1.13*	1.06	< .001 (0.51-1.61)

ED, emergency department

\* mean ± SD per patient

education through an asthma drug therapy management agreement with the physician when necessary.

The patient population was mostly indigent, making telephone contact difficult and follow-up inconsistent. With only one pediatrician involved in the clinic, it was difficult to provide after-hours assistance to the asthma patients. Pediatric residents responded to after-hours and weekend calls from asthma clinic patients. When they had a question about a patient, they contacted the attending physician or clinic pharmacist. In an effort to improve communication and to help assure consistency with treatment recommendations and familiarity with patient action plans, the pediatric residents rotated through the asthma clinic.

One limitation to the study was the use of the study patients as their own controls. It is unknown if these children would have had similar outcomes without intervention. It has been our observation that patients seen in the general pediatric clinic for asthma often receive inadequate follow-up and instruction on the proper use of medications, placing them at risk for poorer outcomes. However, using the same group of patients ensured that the groups were matched for asthma severity and socioeconomic factors. Another limitation was the high patient drop out rate. Efforts were made to maintain follow-up through telephone calls. Many patients lost telephone service during the study period and were unable to be located.

Using the average cost of hospitalizations and emergency department visits for Medicaid patients in the community, we estimate that the reduction in these visits has saved over \$300,000. A complete pharmacoeconomic analysis has not been performed to determine

if the increased frequency of medication, device use and office visits are less costly than hospitalizations and emergency department visits. A previous study in the Medicaid population estimated a savings of \$721/child/year by utilization of an asthma education and management program in an allergy clinic.<sup>11</sup>

National health goals of *Healthy People 2010* include a reduction in asthma-related deaths, hospitalizations, emergency department visits, and missed school and workdays.<sup>13</sup> Another goal is to increase formal education on disease self-management among those afflicted with asthma. A final goal is to increase compliance with appropriate asthma treatments according to national guidelines. The program described is consistent with many of these goals and has undoubtedly improved the quality of asthma care in the surrounding community.

The clinic has also served to educate medical and pharmacy residents and students so that they may implement similar asthma management and education strategies in their current and future practices. Medical students and residents were able to complete histories and physical exams and were involved in the discussion of drug therapy selection. They also observed the education provided to the patient and their parents. Also, pharmacy students and residents were able to obtain histories and provide asthma education in the clinic. The use of a pharmacist as patient educator as well as disease state manager allowed for patient education without requiring additional physician time commitment.

A multidisciplinary pediatric asthma education and management clinic within an academic medical center improves asthma outcomes by reducing hospitalizations, emergency

department visits, and systemic corticosteroid exposure. The establishment of such clinics helps meet the goals of *Healthy People 2010* and recommendations of the National Heart Lung and Blood Institute.

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### REFERENCES

1. National Center for Health Statistics. Asthma prevalence, health care use and mortality, 2002. Available at <http://www.cdc.gov/nchs/data/asthmahealthstat1.pdf>. Accessed November 2005.
2. Halterman JS, Aligne CA, Suinger P, et al. Inadequate therapy for asthma among children in the United States. *Pediatrics* 2000;105:272-276.
3. Legorreta AP, Christian-Herman J, O'Connor RD, et al. Compliance with national asthma guidelines and specialty care: a health maintenance organization experience. *Arch Intern. Med* 1998;158:457-464.
4. Laumann JM, Bjornson DC. Treatment of Medicaid patients with asthma: comparison with treatment guidelines using disease-based drug utilization review methodology. *Ann Pharmacother* 1998;32:1290-1294.
5. Greineder DK, Loane KC, Parks P. A randomized controlled trial of a pediatric asthma outreach program. *J Allergy Clin Immunol* 1999;103:436-440.
6. Clark NM. The impact of health education on frequency and cost of health care use by low income children with asthma. *J Allergy Clin Immunol* 1986;78:108-115.
7. Fireman P. Teaching self-management skills to asthmatic children and their parents in an ambulatory care setting. *Pediatrics* 1981;68:341-348.
8. Stevens CA, Wesseldine LJ, Couriel JM, et al. Parental education and guided self-management of asthma and wheezing in the pre-school child: A randomized controlled trial. *Thorax* 2002;57:39-44.
9. Bailey WC, Kohler CL, Richards JM, et al. Asthma Self Management. Do patient education programs always have an impact? *Arch Intern Med* 1999;159:2422-2428.
10. Chan DS, Callahan CW, Moreno C. Multidisciplinary education and management program for children with asthma. *Am J Health-Syst Pharm* 2001;58:1413-1417.
11. Kelly CS, Morrow AL, Shults J, et al. Outcomes evaluation of a comprehensive intervention program for asthmatic children enrolled in Medicaid. *Pediatrics* 2000;105:1029-1035.
12. Bratton DL, Price M, Gavin L, et al. Impact of a multidisciplinary day program on disease and healthcare costs in children and adolescents with severe asthma: A two-year follow-up study. *Pediatr Pulmonol* 2001; 31:177-189.
13. US Department of Health and Human Services. *Healthy People 2010*. 2nd ed. With *Understanding and Improving Health and Objectives for Improving Health* (2 vols). Washington, DC: US Department of Health and Human Services, 2000. Available at <http://www.healthypeople.gov>.