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Sheniz Moonie

University of Nevada, Las Vegas, sheniz.moonie@unlv.edu

Robert C. Strunk

Washington University School of Medicine

Mario Castro

Washington University School of Medicine

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A Program to Change the Approach to Care of Children with Asthma in the Primary Care Setting Did Not Reduce Rates of Hospital Admissions: Lessons Learned from a Descriptive Study

Sheniz Moonie, Robert C. Strunk, and Mario Castro

Asthma is a critical global health issue. It affects people of all ages in countries throughout the world. The prevalence of asthma is increasing in most countries among young children who also represent the greatest proportion of health care utilization. Outpatient asthma-treatment programs managed by chest physicians or allergists have reduced hospitalizations, yet programs in pediatric offices have not successfully impacted hospitalizations. The Community Asthma Program (CAP) was designed to support pediatrician use of clinical guidelines in their everyday office practice. The goal was to reduce asthma hospitalizations by 15 percent from selected pediatric practices. A study was done in 4 pediatric practices closely associated with St. Louis Children's Hospital. The program included a continuous quality improvement process quarterly.

INTRODUCTION

Asthma is the most common chronic disease of childhood, affecting an estimated 6.8 million children in the United States.¹ The healthcare and economic burden of asthma in our society remains substantial. Asthma accounts for \$12.6 billion in annual medical costs, 1.8 million emergency department visits and approximately 5,000 deaths per year Nationwide.² Over the past decade, numerous federal asthma initiatives have been addressed and implemented and special interest groups have pressured policy makers to develop asthma policy agendas. "Action Against Asthma", a report issued by the DHHS, identified urgent Federal government investment needs in the fight against asthma.³ One major emphasis included public health practices for asthma to support partnerships that will increase dissemination and use of information by health care providers, patients and their families.

Interventions that have generally favorable impact on rates of hospitalization include asthma self-management program⁴ and outpatient asthma-treatment programs that have been managed by chest physicians or allergists.⁵ The National Asthma Education and Prevention Program (NAEPP) of the National Heart Lung and Blood Institute (NHLBI) developed Guidelines for the Diagnosis and Management of Asthma in 1991, with updates in 1997, 2002 and 2007.⁶ Use of guidelines for practice of chronic disease has been shown to improve outcomes.⁷ Clark et al. used the NHLBI Guidelines as a component of an interactive seminar for primary care physicians (PCP) designed to improve asthma care by focusing on treatment practices, communication, and education.⁸ Patients treated by program physicians were more likely to receive a prescription for inhaled anti-inflammatory medication and have improvements in asthma symptoms, however, there were no differences in ED visits or hospitalizations.⁹

Despite the distribution of the NHLBI Guidelines, care is often not provided based on their recommendations. Warman et al. found that the guidelines for home

management were not being followed for children previously hospitalized for asthma exacerbations.¹⁰ Cabana et al. identified barriers to guideline adherence, including lack of awareness, familiarity, agreement, self-efficacy, outcome expectancy, and previous practice.¹¹ In a subsequent study, Cabana et al. studied reasons that pediatricians do not follow asthma guidelines specifically.¹² For example, inhaled corticosteroids (ICS) were not prescribed because of lack of agreement with effectiveness of the medication.¹³

The Community Asthma Program (CAP) was developed to enhance regular, preventative care in primary care settings, supporting the practicing pediatrician's use of the NHLBI Guidelines in their everyday office practice. CAP focused on areas of concern by pediatricians about their ability to provide care by NHLBI Guidelines in busy pediatric offices. The goal of CAP was to reduce asthma admissions in the practices by 15 percent in the 2 years of the program. We hypothesized that variations in effectiveness of the program would be related to indicators of quality management (such as provision of asthma action plans) apparent on asthma forms used during office visits.

METHODS

Initial Development and Involvement of Pediatric Practices

CAP was developed in 1997-98 with support from the Washington University School of Medicine Department of Pediatrics, the Center for Healthcare Quality and Effectiveness of the BJC Health System, and St. Louis Children's Hospital. Pediatric practices from four separate areas of the St. Louis metropolitan area were chosen. These practices were selected because of their diversity of patients and locations within the metropolitan area. The practices are closely associated with St. Louis Children's Hospital (SLCH) and used this hospital for all their hospital-based care. Involvement of pediatric practices was approved by a "physician champion" in each practice during an individual meeting at the practice office. In each practice, the physician champion was the current lead physician, who was also involved in the pediatric residency program and had expressed an interest in asthma care within the community. Subsequent input into the program and agreement to participate was obtained from the entire physician staff at the time of a regular staff meeting. The first practice started CAP in April, 1998, with subsequent practices starting in July and October, 1998, and May, 1999. The length of involvement of an office with CAP was two years. All components of the CAP were approved by the Washington University School of Medicine IRB Human Subjects Committee.

Staff

CAP employed two pediatric nurse practitioners with extensive experience in asthma care. A part-time secretary and clerical staff facilitated communications with the offices and entered data obtained from the office forms. Programming support was available for development of summaries of office forms data for use in the Continuous Quality Improvement (CQI) process during regular office visits.

Design of the Program Components

A. Office Visit Forms. The form was to be used at each visit of a patient with a diagnosis of asthma regardless of the specific chief complaint for the visit. Suggestions

for content of the form included two general areas: 1) questions to establish asthma morbidity, and 2) prompts to facilitate asthma management. The morbidity questions, e.g., frequency of asthma symptoms, nocturnal awakenings, and interference with exercise in the previous month allowed determination of severity based on the NHLBI classification system. Parents answered the questions on patient status referring to the month prior to the visit before the physician entered the examination room. This process facilitated routine access to morbidity data to help determine severity and thus guide choice of medications and appropriate follow-up interval. The prompts to facilitate management included: 1) a severity designation, 2) category of treatment prescribed, 3) interval of follow-up visit, and 4) use of the asthma action plan. All four practices agreed to use forms containing the prompts. Two practices agreed to use the morbidity questions, with a third instituting use of the questions in the second year of the program. The fourth practice did not institute use of these questions. Visit forms had a duplicate non-carbon reproduction that was collected during the regular visits to the office by a CAP nurse practitioner. A copy of a visit form that includes both types of questions and prompts is shown in Figure 1.

B. Telemanagement by CAP nurse practitioners. The pediatrician could request for a follow-up visit with the parent via a phone call from a CAP nurse practitioner using a standard format. The completed telemanagement form was faxed or hand delivered to the office with comments about the clinical course and actions taken.

C. Durable Medical Equipment (DME) closets. Each insurance company in the St. Louis market has different methods of dispensing DME, often requiring that the patient go to a pharmacy or that a call is made by office staff for prior approval. CAP contacted insurance companies and gained permission to have DME dispensed in the office. Many, but not all, companies agreed to participate. A closet was committed to the purpose of storing the DME, including nebulizer compressors and tubing, nebulizers and peak flow meters, and holding chambers for metered-dose inhaler use. The office staff filled out a form based on insurance company requirements.

D. Education about CAP for the PCPs and office staff. “On-site” visits from the CAP physician and nurse practitioner were done at the beginning of involvement of practices in CAP, and then were scheduled quarterly to provide updates on asthma care generally and on the progress of the program. Sessions were held mid-day during times already scheduled regular meetings with the physicians and lead office staff. During these visits, the Guidelines were reviewed and essential elements highlighted. A laminated “Guideline pocket card” with symptoms and medications to be used by severity were presented for use. Physician feedback was used to modify the office visit form to meet the needs of the practice. Approval was obtained to give physicians continuing medical education credit for these sessions and lunch was provided by the program. All physicians and nurse practitioners in each office attended all the sessions.

E. Continuous Quality Improvement (CQI). The CAP staff gave feedback at the time of on-site visits. Feedback included the number of forms used and their completeness and numbers of patients hospitalized since the last visit. For the office visit forms, data on the forms were entered centrally into a clinical database for use in feedback sessions. Information gathered from the office included the number of forms returned, both for new patients and patients previously enrolled. Thoroughness in use of the forms was indicated by percentages of forms containing severity designation, classification of medicines prescribed, whether an asthma action plan was developed (or

already in the chart and reviewed), and the follow-up interval suggested for either an office or telemanagement visit. Information on numbers of patients from the practice hospitalized in the last 3 months was obtained by medical record search before the feedback session.

F. Patient Education Materials. Patient education was standardized throughout the system so that consistent messages would be given to patients in all possible sites of care. The same Asthma Action Plan and educational materials as well as messages about chronic and acute care were used during office visits and hospitalizations. For care in the ED, a standardized discharge plan was used to emphasize key messages, medication to take regularly, early and late warning signs and appropriate actions to take, and specific advice to return to the PCP within 72 hours of the visit. Standardized patient materials were made available to the offices at their request.

Method to Facilitate Use of the Office Visit Form

The proposed plan was to have the office visit form given to the parent at the time of checking in, having the parent fill out the relevant sections, and then attaching it to the chart before the doctor visit. Identification of asthma charts varied. Two offices provided a list of patients with >1 diagnostic code for asthma in the billing record for the office in the previous year. One had a computerized record keeping system identifying patients with ICD-9 codes and developed a visit sheet using the asthma form as template for collection of the history and physical examination information each time a child came to the office. One office had no identification system in place.

DATA COLLECTION

Hospitalization Data

Data on hospitalizations were obtained from St. Louis Children's Hospital's medical records system using hospital discharge records. All hospitalizations by patients from the participating offices were identified by the CAP physician's name available on the discharge record. The admitting policy of the hospital dictates that the PCP is listed as the admitting physician. Where appropriate, a subspecialist physician would be indicated as the admitting physician but always along with the PCP. The number of hospitalizations two years prior to the start of the implementation of CAP for each office was compared with that two years since this start date. Asthma hospitalizations were identified by code 493.xx from the International Classification of Diseases (clinical modification, 9th revision) based on the admitting diagnosis. All other hospitalizations of patients from the four participating practices were considered non-asthma-related. Data for all hospitalizations other than those in the 4 practices were also obtained for asthma and all other diagnoses.

Data from Office Visit Forms

Indication of asthma severity, prescription of asthma medication including anti-inflammatory medications, review of an Asthma Action Plan, and requests for telemanagement were tracked from the visits forms returned to the CAP office. While

tracking of specific prescription of anti-inflammatory medication was desired, this pilot study did not include pharmacy records.

RESULTS

Characteristics of Participating Practices

The numbers of pediatricians in each of the practices remained stable during the 2 years before and the 2 years during the CAP intervention, ranging from 2-6 (Table 2). Two offices had nurse practitioners seeing patients in addition to the pediatricians. The numbers of patients receiving care and the percentage with Medicaid insurance varied each by more than 2-fold.

Program Implementation in the Four Practices

Extent of participation by the four practices was highly variable as measured by the physician and nurse CME visits (Table 2). Site visits were attempted at each site four times per year, with no practice having all eight visits planned (Table 2). Participation in nursing in-services was also variable (Table 2).

Use of office visit forms, both in the numbers used (Table 3) and completeness of use (Table 4), was also highly variable. Three of the practices increased use of the forms in the second year compared to the first, but the practice with the lowest use in the first year continued at low levels. Examination of various other components of the form found the same overall patterns across practices as the number of forms (Table 4), with the practice with the fewest number of forms also having the most incomplete use of the forms. For all practices, the physicians were more likely to complete prompts for severity and medication categories than for Asthma Action Plan use and regular follow-up (Table 4). Telemanagement visits were requested in only 6-23 percent of visits (Table 4).

As indicated in the description of the practices, only Practice #1 had a computerized record keeping system. A patient with a diagnostic code for asthma entered for any previous visit had an asthma visit form generated as the form for that visit regardless of the chief complaint. This practice appeared to have the greatest use of the form, both for all and return patients (Table 3), although asthma action plans were indicated on the forms in only 43 percent of visits even with the prompts appearing regularly (Table 4).

Outcomes of CAP

Hospitalizations of patients from the practices for the two years during CAP were compared to values in the two years before CAP was initiated in the individual practice (Table 5). Overall, there were no differences in the changes in admissions within the four CAP practices when compared to the overall admission to hospital for asthma, either in numbers of admission or percentage of admissions that were due to asthma. Two of the four practices had decreases in admissions during CAP. Practice 1 had a decrease in asthma admissions of 24.3 percent even though non-asthma admission for the practice increased by 24.8 percent in the same interval. Practice 4 had a decrease in

asthma admissions of 43.3 percent with no change in non-asthma admissions. The remaining two practices had increases in asthma admissions (6.1 and 10.5 percent).

Because there was such great variability in the outcome of admissions for asthma within the 4 practices, a comparison was done between program implementation and outcomes. We hypothesized that use of action plans would reflect education about and permission for early intervention with exacerbations, and that indication of the action plan on the visit form would correlate with changes in hospitalization rates. However, the number of times the asthma action plan was checked on the form did not correlate with decreases in hospitalization, with the largest decrease in admissions in Practice #4 with almost no AAP indicated. For the two practices with the most AAP indicated only one had a decrease in admissions. We also speculated that the number of forms returned might indicate involvement in the process and be a surrogate for changes in practice even when specifics on the form were not completed. Again, the practice with the fewest forms (#4) had the largest decrease in hospitalizations; the practice with the largest number of forms (#1) did have a decrease in admissions but the other practice with a large number of forms (#2) had an increase in hospitalizations.

DISCUSSION

Regular care for asthma can substantially reduce morbidity.¹⁴ However, previous demonstrations of the effects of regular care on hospitalization rates have been undertaken by subspecialists. International surveys provide direct evidence for suboptimal asthma control in many countries, despite the availability of effective therapies.¹⁵ Methods to promote regular care for asthma in a pediatric setting have been associated with changes in asthma care, but not hospitalization rates.¹⁶ Evans et al. demonstrated that training staff in New York City, Bureau of Child Health clinics improved continuity of care and use of inhaled anti-inflammatory medicine, but did not change hospitalization rates.¹⁷ Clark et al. used an interactive seminar for general pediatricians.¹⁸ The intervention improved a number of aspects of patient care and patient confidence, but did not decrease hospitalizations. The Community Asthma Program (CAP) presented here was introduced in four general pediatric practices operating independently in the community. The results of CAP were not uniformly encouraging, with reduction of admissions in only 2 of the 4 practices and the overall reduction in the 4 practices no different than changes in overall rates of admission for asthma to the hospital in the same era.

There were some lessons learned during this program. First, substantially simplified NHLBI Guidelines for asthma care remained too complicated even for “academically-inclined” practices. Therefore, implementation in other facilities would most likely not be well received, indicating the need to further condense intervention strategies and reassess the mode of dissemination. Second, concerns were expressed about the extra paper for the office visit form and the resulting storage issues. It would be entirely more effective to switch to a computerized data entry process, which would eliminate the storage concern entirely. In addition, data could be quality checked and exported more conveniently for data analysis without concern of transcription errors. Third, the organizational status of a practice seemed critical in program implementation. This is exemplified by the experience with Practice #1, which had a computer system that generated the asthma visit form whenever a patient with a

previous diagnostic code for asthma came for a visit, insuring use for all visits for that child whether for asthma or another complaint. While implementation in this practice was not complete, it appeared more thorough than in other practices, and was accompanied by a sizable reduction in hospitalizations especially when compared to the numbers of other admissions from the practice. Fourth, the DME closet was very popular with the physicians and office staff, as it facilitated delivering equipment without the usual series of phone calls to insurance companies. But not all insurance companies were willing to participate, leading to confusion and decreased efficiency of the system.

Before initiation of CAP we speculated that differences in outcomes would be related to the extent of implementation in CAP. In contrast to this expectation, the practice with the least involvement in the terms measured (use of the visit forms and asthma action plans and visits with the CAP staff) had the greatest decrease in hospitalizations. The various changes in the practices may have contributed to the outcomes, either positive or negative, and were difficult to measure.

There are many limitations to this study. We intervened in only four practices. These practices were diverse in their nature, and characteristics that may have impacted outcomes were difficult to quantitate for use in evaluation of program success. Furthermore, the program evolved during its implementation. However, the core elements of getting input from the pediatricians about the design of the program in their office (as opposed to a single design for every office), use of office visit forms, and availability of telemanagement from program nurse practitioners, and regular feedback to the practices about the content of the forms remained constant. The approach to the offices was multi-factorial. Lastly, the issue of formally comparing the groups was problematic for reasons related to changes in the sample size and/or characteristics of the sample over time and to uncertainties regarding the number of subjects in each group at the various time points. Therefore we could not present any formal statistical analyses, making this a purely qualitative comparison.

Pediatricians care for a large number of disease types and the majority are acute diseases. Asthma is the only chronic disease seen with such frequency in a pediatric practice, but still occupies only a small portion of patients on any given day. Having special forms for a disease seen only a few times in a day seemed to be cumbersome to offices. The greater success of form use when a computer generated asthma form was based on disease code for any prior illness may indicate that computer generated prompts might be necessary to simplify asthma care and make use of the Guidelines a regular part of care. In a computer based system, parents could fill out the morbidity questions and the system would generate a severity, appropriate medications (even based on types available in the patient's insurance plan), print prescriptions, and fill out an action plan. The pediatrician could override any portion of the process, but would be given a flow of information as the basis of planning. Protocol-based computer reminders¹⁹ or use of other prompts²⁰ have been used to induce physicians to ask questions relevant to illness presented by patients and order tests appropriate for medicines being used. Certainly more work is required to integrate Guideline care in general pediatric care.

Lastly, it is imperative from a global perspective that state government and policy supports public health activities including those for asthma. The active funding of public health efforts for asthma includes regulation of the threats and environmental factors

that trigger asthma attacks²¹ and clinical asthma management through more targeted and comprehensive programs than this paper outlines. Environmental laws are crucial for the development of prevention strategies and management of asthma. Federal officials are the key towards development of solutions to complex health problems such as asthma. Since 2000, legislatures nationwide have introduced 220 bills for asthma, and 79 of these have already been enacted. These bills encompass a variety of areas including the banning smoking in public places to help those with asthma, permitting children to take asthma medications to school and education for clinical adherence to national guidelines. The large number of bills indicates the level of attention raised for asthma by our state legislators. While the current program was not successful, further research for the clinical management of asthma is necessary in order to promote programs that will decrease asthma hospitalizations and ultimately health care utilization.

Table 1: Program Components

Component	Content
Office visit forms	<ol style="list-style-type: none"> 1. Questions to establish asthma morbidity and quality of life 2. Prompts to facilitate Guideline management 3. Non-carbon reproduction for collection by CAP staff for feedback to office
Telemanagement by nurse practitioners	<ol style="list-style-type: none"> 1. Used form similar to office visit form 2. Asthma education about symptom goals, need for regular medicine, response to exacerbation 3. Used algorithm for treatment of symptoms apparent during call
Durable Medical Equipment closet	Equipment could be dispensed without prior approval from insurers
Continuous Quality Improvement	<ol style="list-style-type: none"> 1. Quarterly visits to office 2. Results of audits of forms 3. Numbers of ED visits and hospitalizations from practice
Onsite education	<ol style="list-style-type: none"> 1. Practical approach to Guideline use via the visit form and asthma action plan 2. Review use of equipment 3. Review telephone triage by office staff based on action plan
Patient education	Forms standardized throughout system (hospital, ED, offices)

Table 2: Characteristics of Practices

Practice	Characteristics of practices			Extent of participation		Form design*
	# patients in practice	% patients with Medicaid	# asthma admissions in prior 2 years	# “quarterly” site visits in 2 years	# nursing inservices	
1	5,978	25	214	7	0	P
2	12,679	18	82	5	2	P
3	10,870	27	38	6	8	P and M
4	12,000	10	53	4	6	P and M

*P – Prompts only – reminders on the form to classify severity, indicate type of medication, provide or review an Asthma Action Plan, and indicate type and interval of follow-up visit.

*P and M – Prompts + morbidity and quality of life questions

Table 3: Determination of Extent of Practice Participation by Use of Program Materials; Number of Forms Returned

Practice	# unique patients for whom a form was generated	# total forms		
		Year 1	Year 2	Total
1	1246	659	1124	1783
2	822	392	926	1318
3	358	169	458	627
4	112	75	46	121

Table 4: Determination of Extent of Practice Participation by Use of Program Materials; Data Obtained from Visit Forms

Practice	# Forms on return patients	% Forms with: severity indicated	Medicines prescribed categorized	Anti-inflammatory medicine prescribed	Asthma Action Plan generated or reviewed from past visit	Follow-up for next asthma appointment indicated	Telemanagement requested
1	537	78	84	48	43	34	20
2	496	69	95	50	59	27	23
3	269	74	79	48	39	49	18
4	8	42	40	13	19	26	6

Table 5: Hospitalizations

	Asthma admissions			Non-asthma admissions			Total admissions		% asthma of all admissions	
	2 yrs before	2 yrs after	% change	2 yrs before	2 yrs after	% change	2 yrs before	2 yrs after	2 yrs before	2 yrs after
Clinics										
1	214	162	-24.3	218	272	+24.8	432	434	49.5	37.3
2	82	87	+6.1	319	316	-0.9	401	403	20.5	21.6
3	38	42	+10.5	137	152	+10.9	175	194	21.7	21.6
4	53	30	-43.3	207	207	0.0	260	237	20.4	12.7
Total for 4 clinics	387	321	-8.7	881	947	+1.1	1,268	1,268	30.5	25.3
Other "clinics"	2,036	1824	-10.4	21,310	28,164	+32.2	23,346	29,988	8.7	6.1

NOTE:

1. Asthma admissions identified from primary diagnosis.
2. Hospitalizations of patients from CAP clinics identified by physicians from these clinics.
3. Non-asthma admissions includes all other diagnoses.

Figure 1: Visit form containing 3 morbidity questions and prompts for asthma severity, medications used, review of asthma action plan, and interval for follow-up appointment

1. How often have you/the patient had a cough, wheeze, shortness of breath, or chest tightness during the past MONTH?

2. How often have you/the patient awoken from sleep because of coughing, wheezing, shortness of breath or chest tightness in the past MONTH?

3. In the past MONTH, how often have you/the patient had cough, wheeze, shortness of breath, or chest tightness while exercising or playing?

Current medication(s):

2 or less times per week
 3-4 times per week
 daily
 more than once per day
 2 or less times per month
 3-4 times per month
 6-8 times per month
 10 or more times per month
 2 or less times per month
 3-4 times per month
 6-8 times per month
 10 or more times per month

ASTHMA CLASSIFICATION: <input type="checkbox"/> Mild intermittent <input type="checkbox"/> Mild persistent <input type="checkbox"/> Moderate persistent <input type="checkbox"/> Severe persistent	INDICATION(S) TO USE: <input type="checkbox"/> No symptoms <input type="checkbox"/> Allergic <input type="checkbox"/> Omalizumab/edecranil <input type="checkbox"/> Long acting bronchodilator <input type="checkbox"/> Leukotriene modifier <input type="checkbox"/> Inhaled steroids <input type="checkbox"/> Oral steroids <input type="checkbox"/> Other	ASTHMA ACTION PLAN PROVIDED OR REVIEWED: <input type="checkbox"/> Yes <input type="checkbox"/> No
TYPE OF FOLLOW-UP VISIT FOR ASTHMA:		
<input type="checkbox"/> Office	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Home Care	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PRN (pre-asthma visit)	<input type="checkbox"/>	<input type="checkbox"/>

Sheniz Moonie, PhD, is an Assistant Professor in The Division of Biostatistics and Epidemiology at the School of Public Health, University of Nevada, Las Vegas. She is a statistician with expertise in clinical programming and pediatric asthma research.

Robert C. Strunk, MD, is a Professor of Pediatrics at Washington University School of Medicine.

Mario Castro, MD, MPH, is an Associate Professor of Medicine and Pediatrics in the Division of Pulmonary and Critical Care Medicine at Washington University School of Medicine.

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¹⁸ Clark et al., “Impact of education for physicians on patient outcomes.”

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²⁰ Feder et al., “Do clinical guidelines introduced with practice based education improve care of asthma and diabetic patients?”

²¹ National Conference of State Legislatures. *Legislative Actions Related to Asthma 2003* [cited November, 2004, from <http://www.ncsl.org/programs/environ/envhealth/asthma2.html>]