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UNDERSERVED POPULATIONS

Increased identification of the primary care provider as the main source of asthma care among urban minority childrenSabah F. Iqbal, MD¹, Jennifer Jiggetts, BA¹, Cheryl Silverbrook, MD², Deborah Q. Shelef, MPH¹, Robert McCarter, ScD¹, and Stephen J. Teach, MD, MPH¹¹Children's National Health System, Washington, DC, USA and ²George Washington University School of Medicine and Health Sciences, Washington, DC, USA**Abstract**

Objective: Urban, minority, and disadvantaged youth with asthma frequently use emergency departments (EDs) for episodic asthma care instead of their primary care providers (PCPs). We sought to increase the rate of guardians' identification of the PCP as the source of asthma care for their children through integrated electronic health records and care coordination. **Methods:** In this prospective cohort study, we implemented an electronic communication process between an asthma specialty clinic and PCPs coupled with short-term care coordination in sample of youth aged 2–12 years with asthma and surveyed their guardians at baseline and 3 and 6 months after the intervention. **Results:** Guardians of 50 children (median age 5.8 years, 64% male, 98% African American, 94% public insurance) were enrolled. Compared to baseline, at 3 and 6 months after the intervention, significantly more guardians reported that the PCP was their child's primary asthma health care provider [70% at baseline, 85% at 3 months, 83% at 6 months (time averaged adjusted OR 77.4, 95% CI 3.0, 2027.1)]. Further, significantly more guardians reported that they took their child to the PCP when the child experienced problems with his/her asthma [16% at baseline, 35% at 3 months, 41% at 6 months (time averaged adjusted odds ratio (OR) 10.6, 95% CI 2.7, 41.7)]. **Conclusion:** Care in a subspecialty asthma clinic augmented by electronic communication with PCPs and short term care coordination was associated with significantly improved identification of PCPs as the primary source of asthma care in a cohort of urban minority youth.

Keywords

Primary care medical home, controller medication, pediatrics, care coordination, electronic health records

History

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Introduction

The 2007 guidelines from the National Asthma Education and Prevention Program (NAEPP) stress partnerships in asthma care among patients, parents, subspecialists, and primary care providers (PCPs) [1]. Consistent asthma care within a medical home has been shown to be associated with improved care and outcomes, including reducing emergency department (ED) visits for acute exacerbations [2,3]. The NAEPP guidelines also advise follow up with a PCP within 3–5 days of an acute exacerbation. However, such follow-up occurs infrequently among urban, minority, and disadvantaged children with asthma [4]. Minorities also consistently use the ED more than non-minorities [5], and they frequently do not identify PCPs as the usual source of asthma care [6].

Widespread implementation of electronic health records (EHRs) facilitates sharing of clinical data about specific patients among care providers in diverse care settings, including PCPs, subspecialists, and hospital-based clinicians. Use of EHRs has been strongly advocated among patients with chronic

diseases like asthma because patients repeatedly seek care for such conditions from different providers [7].

At our institution, we have an existing clinical intervention targeting patients with a history of ED recidivism for asthma (ICD 493.XX). It delivers a previously validated [6], short-term (1–3 visits) program of asthma education, medical care, and care coordination. However, while the program has been shown to decrease subsequent ED visits for acute asthma, it has not been shown to increase rates of follow up with PCPs [6]. Because we believe that improved identification of the PCP as the primary asthma care provider will improve subsequent utilization of the PCP for ongoing asthma care, we examined the effect of implementing electronic communication within an EHR coupled with enhanced short term care coordination as a means to increase guardians' identification of the PCP as their children's primary asthma care provider.

Methods

We performed a prospective cohort study of patients with asthma recruited from our existing asthma specialty clinic employing our validated intervention [6]. It sees >1,000 new patients annually at a free-standing children's hospital located in an urban city. This study was approved by the Institutional Review Board at our institution.

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Population

From May 2010 to May 2011, we enrolled a seasonally balanced convenience sample of children who met the following eligibility criteria: age 2–12 years, previous physician diagnosis of asthma, ≥ 2 ED visits or ≥ 1 hospital admission for asthma within the prior 12 months, no co-existing medical comorbidities (including, but not limited to, other chronic diseases of the cardiorespiratory system), no subspecialty (pulmonary or allergy) care for asthma in at least 6 months, English speaking, and a PCP within the health system that utilized its outpatient primary care EHR (eClinicalWorks®, Kansas City, MO).

Enrollment procedure

Trained research assistants approached the guardians of appropriately aged patients at the start of their clinic visits and assessed eligibility. Guardians of eligible patients were then offered voluntary participation in the study. After providing written informed consent (and assent by their children if applicable), guardians answered a structured questionnaire that gathered their child's demographic information, asthma care variables, history of healthcare utilization for asthma, asthma severity classification by the 2007 criteria of the NAEPP, and their preferred sources of asthma care for their children (see Primary Outcome below). All reported healthcare utilization within our healthcare system (primary care visits, emergency department visits, and hospitalizations) was validated through the electronic medical record. Reported utilization outside of our system was then added to yield total healthcare utilization. Prior validation of parental report of emergency department visits from the same population documented high agreement [6].

Each child then received individualized care according to the standard curriculum of our asthma clinic. This included education about asthma and its triggers and the creation of a tailored asthma action plan.

Intervention

The study's intervention, locally known as ECCO ("Electronic Care Coordination"), consisted of three newly implemented elements which occurred after the standard Asthma Clinic visit finished: (1) a clinical summary and follow-up plan for each patient was electronically transmitted to the child's PCP via eClinicalWorks®; (2) a dedicated care coordinator scheduled an asthma follow-up appointment with the PCP for each patient within 8 weeks; and, (3) the care coordinator called each family 1 week prior to their scheduled PCP visit ("coaching call") to remind them of their follow-up plan and scheduled appointment, to reschedule the appointment as necessary, and to address any perceived barriers to attending that appointment.

Follow-up

Guardians were administered structured follow-up interviews by phone at 3 and 6 months after enrollment. These addressed the same variables as at baseline.

Primary outcome

Our primary outcome was the proportion of guardians identifying their child's PCP as their primary source of asthma care. This was assessed at baseline and at the 3- and 6-month follow-up points with the following question:

"Who is your child's primary asthma health care provider? By this we mean the person or place that is the primary source of asthma care for your child."

A second question used in one of our earlier studies [6], assessed each guardian's behavior when their child was experiencing asthma-related problems:

"When your child is having problems with asthma, where do you usually take him/her?"

In both cases, the guardian's response was classified as "PCP" if they named a specific primary care provider or primary care practice.

Statistical analysis and sample size considerations

To describe the study sample, demographic and baseline clinical variables are presented as means with standard deviations, medians with interquartile ranges (IQR), or proportions as appropriate. We implemented longitudinal logistic regression modeling to estimate and compare the primary outcome: the time-averaged proportion of guardians who identified the PCP as the primary source of their children's asthma care at 3 and 6 months while controlling for the baseline proportion. This method allows us to correct standard error estimates for the correlation between repeat assessments within each patient. Results of these analyses are reported as odds ratios (ORs) with 95% confidence intervals (CIs).

The study was powered to detect at least a 20% absolute increase in the proportion of guardians who identified their child's PCP as their child's usual source of asthma care at 6 months after the intervention. To estimate the baseline rate, we referred to data collected as part of our asthma clinic's original randomized clinical trial conducted from 2002–2004 where 169/488 (34.6%) of patients reported taking their child to the PCP for asthma care at baseline [6]. Therefore, to have 80% power to detect at least a 20% absolute increase in this proportion with a 2-tailed alpha of 0.05, we needed to enroll at least 46 subjects. On the basis of our previous studies, we anticipated a 5–10% attrition rate at 6 months and enrolled a total of 50 subjects.

Results

We screened 82 patients for eligibility, of which 30 were ineligible and 52 provided consent. No guardian refused participation. An additional 2 participants were subsequently excluded for not completing the baseline clinic visit, leaving a total of 50 participants. Of these, 42 (84%) successfully received the "coaching call," and 46 (92%) completed each of the follow-up phone calls (Figure 1). Follow-up PCP appointments were made for 100% of patients; 31 patients (62%) attended the scheduled visit.

The median age of the patients at enrollment was 5.8 years (IQR 3.8–8.0); 64% were male, 98% were African American,

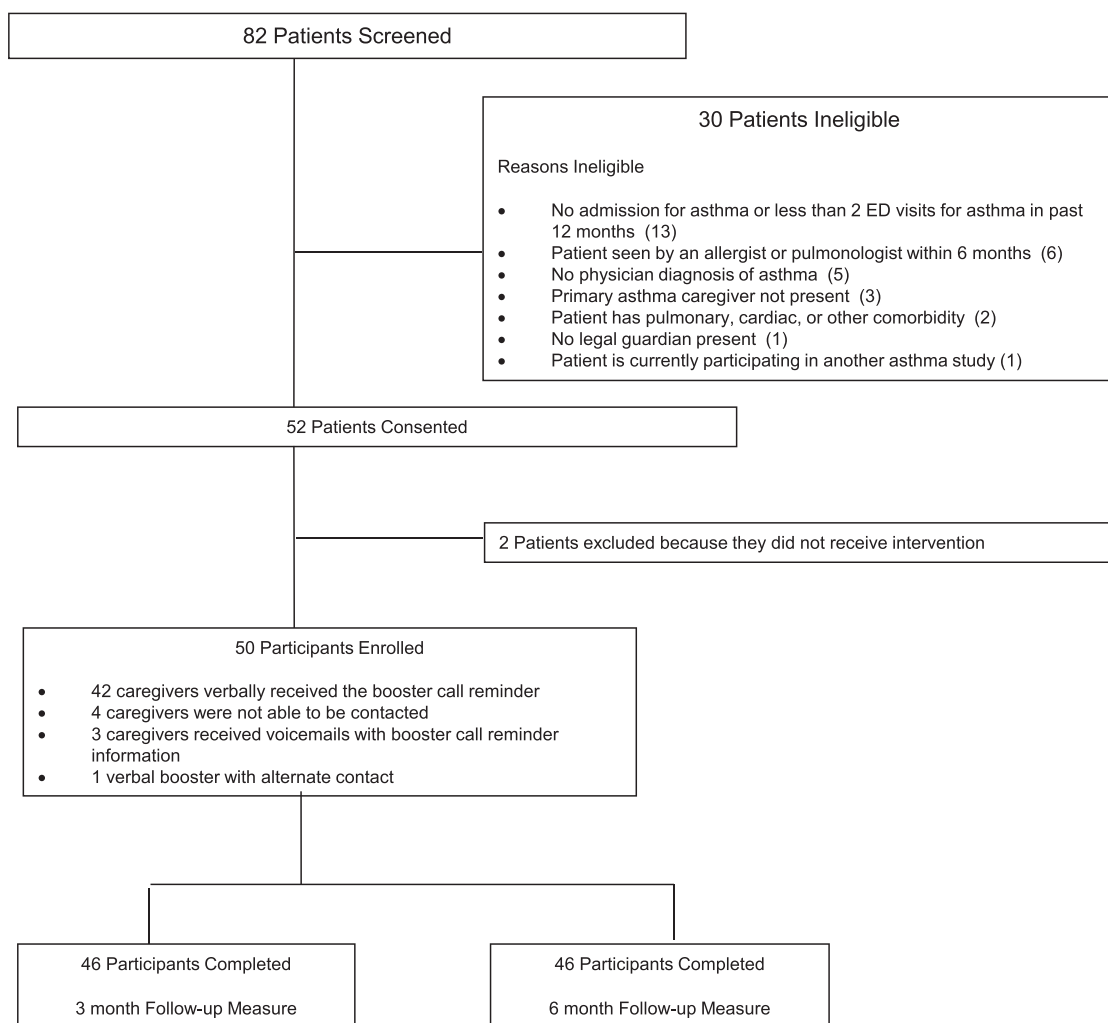


Figure 1. Enrollment and progress of participants.

and 94% had public insurance (Table 1). By NAEPP guidelines [1], 80% of the study group had persistent asthma, and over half of the subjects had ≥ 2 ED visits for asthma over the prior 12 months. In contrast, 38% had ≥ 2 PCP visits for asthma over the same time period.

Table 1. Characteristics* of patients at baseline ($n = 50$).

Mean age $\pm$ SD (median, interquartile range)	6.2 $\pm$ 2.9 (5.8, 3.8–8.0)
Male	32 (64%)
African American	49 (98%)
Public Insurance	47 (94%)
NAEPP Asthma Severity Classification	
• Intermittent	10 (20%)
• Mild Persistent	23 (46%)
• Moderate Persistent	15 (30%)
• Severe Persistent	2 (4%)
Visits to ED for asthma in prior 12 months	
• 0–1	22 (44%)
• 2–3	21 (42%)
• 4+	7 (14%)
Visits to PCP for asthma in prior 12 months	
• 0–1	31 (62%)
• 2–3	19 (38%)
• 4+	0 (0%)

*Unless otherwise indicated values are expressed as n (%).

Primary outcome

Compared to baseline, at 3 and 6 months after the intervention (Figures 2a and 2b), significantly more guardians reported that the PCP was their child's primary asthma health care provider [70% at baseline, 85% at 3 months, and 83% at 6 months (adjusted OR 77.4, 95% CI 3.0, 2027.1)]. Further, significantly more guardians reported that they usually took their children to the PCP when the child experienced problems with his/her asthma [16% at baseline, 35% at 3 months, and 41% at 6 months (adjusted OR 10.6, 95% CI 2.7, 41.7)].

Asthma care variables

Of the asthma care variables assessed at baseline, all improved significantly at 3- and 6-month follow-up by parental self-report (Table 2). Significantly more of the guardians reported use of inhaled corticosteroids in the prior 2 days, use of an asthma action plan, and use of an allergen barrier pillow cover. Significantly fewer guardians reported that there was smoking in the child's home in the prior month.

Discussion

In a cohort of largely minority, poor, and urban young patients with asthma and a history of recent ED recidivism and/or

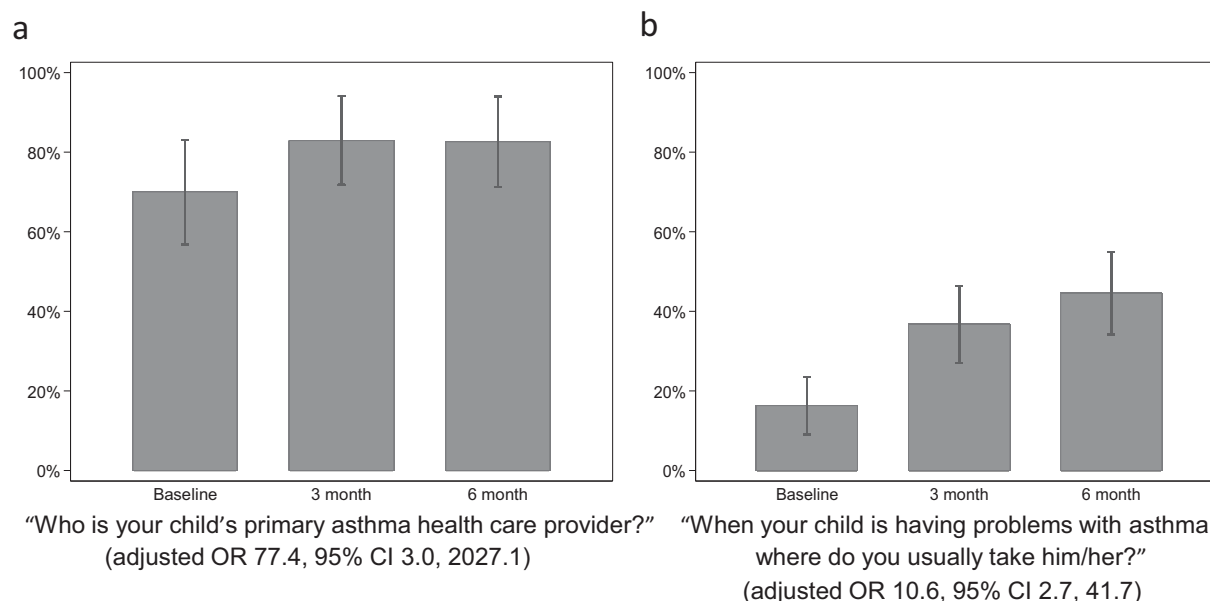


Figure 2. Percentage of guardians identifying the PCP at 3 and 6 months follow up with 95% CI.

hospitalization for asthma who were seen in a subspecialty asthma care clinic, electronic communication within an EHR coupled with short term care coordination was associated with significant improvement in the guardians’ identification of the PCP as the primary source of the children’s asthma care. In addition, consistent with observations from our original clinical trial,⁶ this intervention was associated with improvement in parental report of key asthma care variables, such as compliance with inhaled corticosteroids, having an asthma action plan, decreasing environmental tobacco smoke exposure in the home, and using allergen barrier pillow covers.

Although our study was not designed to assess subsequent PCP utilization compared to a control group, our expectation is that increased identification of the PCP as the primary asthma care provider may lead to increased utilization of the PCP for ongoing longitudinal care (including subsequent minor asthma exacerbations) and in decreased utilization of the ED. Of note, at baseline, 30% of the guardians reported that they did not consider their child’s PCP to be their child’s primary asthma care provider. It is perhaps even more striking that only 16%

stated at baseline that they usually took their children to the PCP when the child experienced problems with his/her asthma. Taken together, these proportions dramatically highlight the need for improvement in identification and utilization of the PCP as the primary asthma care provider.

Use of an EHR has been shown to be associated with improved asthma care in children. A study in primary care practices demonstrated increased adoption of NAEPP guidelines when electronic prompts to determine asthma severity were implemented in the EHR⁸ and at a children’s hospital, modification of an inpatient EHR to be asthma-focused led to more complete and more consistent asthma histories [9]. However, the impact of EHR on communication between asthma specialists and PCPs has not been well described. In our study, we were able to create an electronic link between a specialty asthma clinic and PCPs through the EHR in order to improve connect- edness of our patients’ guardians with their children’s PCPs.

One of the most notable findings in our study was the discrepancy between the 70% of guardians at baseline who stated that their child’s PCP was also their child’s primary asthma care provider and the 16% at baseline who stated that they would take their child to his/her PCP when they were “having problems with asthma.” While we observed significant improvements at 3- and 6-month follow-up in both of these outcomes, large discrepancies persisted (Figures 2a and 2b). There are many identified barriers to asthma care for at-risk children including difficulty making appointments with PCPs, limited after-hours access, and difficulty arranging transportation [10–13].

In addition, perception of asthma as an acute illness, and not as one requiring chronic care, may discourage guardians from seeking follow up care from a PCP after an emergency visit [14]. Zorc et al. showed that arranging follow-up appointments for children with asthma during their ED visit improved compliance with follow-up; the impact of this intervention was greatest on children with public insurance, who had lower baseline follow-up rates [15].

In this study, we addressed several of the barriers to long-term asthma care. We emphasized the importance of

Table 2. Asthma care variables* by parental report at baseline and at 3 and 6 month follow-up.

Variable	Baseline (n = 50)	3 months (n = 46)	6 months (n = 46)	OR (95% CI)
Use of inhaled corticosteroids in the past 2 days	24 (48%)	38 (83%)	29 (63%)	9.5** (2.7, 33.7)
Have asthma action plan	38 (76%)	46 (100%)	46 (100%)	12 ⁺ (1.8, 513.0)
Smoking in home in the past month	22 (44%)	12 (26%)	6 (13%)	0.1** (0.02, 0.3)
Use of allergen-barrier pillow cover	5 (10%)	39 (85%)	37 (80%)	1855.3** (203.9, 16880.0)

*Indicated values are expressed as n (%).

follow-up with a PCP for asthma care. The study team made appointments for the family at convenient times and called to remind the family of the appointments. Finally, we electronically communicated directly with the PCP to ensure that asthma history and information was immediately available to the PCP. Future studies may wish to work more closely with PCPs to overcome additional barriers including increasing the ease of making appointments, offering after-hour and weekend appointments, and assisting with transportation.

Limitations to this study included its reliance on a small sample size from a single site and a largely homogenous population of urban, inner-city patients with high morbidity. The small sample size resulted in large confidence intervals around our estimates of change in asthma care variables (Table 2) and change in identification of the PCP (Figure 2). Nonetheless, all of the reported findings are statistically significant and highly suggestive of real and clinically significant changes.

In addition, several of the asthma care variables reported in Table 2 show evidence of regression towards baseline between 3 and 6 months. We observed this same pattern in our prior work [6]. It likely reflects loss of retained knowledge from the original intervention, and it reinforces the need for ongoing primary care contact and education. Finally, our study was conducted within the context of a specifically structured existing intervention. Its results may therefore not be generalizable to other populations seen in other care settings.

In addition, our design did not include a comparison group, and we cannot be certain that the 3 elements of our ECCO intervention were entirely responsible for the improved 3- and 6-month follow-up rates of identification of the PCP as the children's source of asthma care. We note, however, that these rates compare favorably with the same rates achieved among the intervention group in our original clinical trial [6]. In that trial, for example, the absolute proportion of guardians of participants in the intervention group identifying the PCP in answer to the question "When your child is having problems with asthma, where do you usually take him/her?" increased by a relative 41% between baseline and one month compared to a relative 119% between baseline and 3 months in the current study. Interestingly, at baseline, fewer guardians in this study stated that they usually took their child to their PCP when their child was having problems with asthma (16%; CI 5.8–26.1%) than in the original study (34.6%; CI 30.3–38.8%).

This may be due to a systematic way in which asthma care is delivered to our population, including the institutionalization of our asthma specialty clinic in the intervening years. In the absence of a comparison group, we were not able to determine if the intervention improved PCP visit rates over the follow-up period. Finally, all outcome variables were measured by parental report alone, and may be impacted by social desirability reporting bias.

Conclusion

In conclusion, using electronic communication and short term care coordination within a previously validated intervention, we demonstrated significant and sustained improvements in the identification of the PCP as the primary source of asthma care among the guardians of an at-risk cohort of children with

asthma and a history of ED recidivism. These observations may inform future efforts to modify their healthcare seeking decisions. Ultimately, we believe that increased identification of the PCP as the primary provider of asthma care will be among the crucial first steps in encouraging families to increase their PCP visits and thereby to improve their children's longitudinal asthma control.

Declaration of interest

Dr. Stephen Teach has asthma research funding from Novartis. The authors alone are responsible for the content and writing of the article.

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