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Are inner-city children with asthma receiving specialty care as recommended in national asthma guidelines?

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ABSTRACT

Objective: To examine whether children with asthma in an urban health care network are receiving asthma specialty care, and which factors, if any, are associated with the receipt of this care, including child's racial/ethnic group, age, socio-economic status (SES), insurance, and/or acute care utilization. **Methods:** This study is a retrospective cohort study of children aged 7–17 years who received primary care at an urban medical center in 2012 and had a primary or secondary ICD9 code for asthma. Data on asthma-related health care utilization from 1997 to 2012 were accessed using a software application linked to the electronic medical record. Analyses included descriptive statistics (means and percentages) as well as bivariate and multivariable logistic regressions. **Results:** The participants were 4959 children (59% Hispanic and 37% Black, Non-Hispanic) with a mean age = 11.1 years $\pm$ 3.05, with 56.8% males. Only 19% of the children had outpatient asthma specialist care: pulmonary (16%) and/or allergy (7%). Only 42% with an asthma-related hospitalization had an outpatient asthma specialist visit. The receipt of specialty care did not vary by race/ethnicity, SES or private vs. public insurance, but was more likely with hospitalization for asthma (OR 3.4) or ≥ 2 lifetime ED visits (OR 2.6) and less likely for those who were uninsured (OR 0.7). **Conclusions:** In contrast to guideline recommendations, few inner-city children with high asthma morbidity in this sample had seen asthma specialists. Efforts are needed to ensure that inner-city children with asthma are receiving guideline-recommended asthma specialty care.

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Introduction

Asthma remains a major public health concern for children. There are an estimated seven million US children with asthma [1]. In national, community-based samples, asthma is uncontrolled in 46% of the children with asthma [2]. In New York State, approximately 10% of the children aged 0–17 years have current asthma [3]. Asthma prevalence and morbidity are the highest among those of Black race, Puerto Rican ethnicity and with lower household incomes [4]. For children with asthma, aged 2–17 years, enrolled in NY State Medicaid managed care in 2010, an estimated 44.2% of the asthma hospital admissions could potentially have been avoided through more effective outpatient care [5].

In order to improve asthma management, the National Asthma Education Program Expert Panel, sponsored by the National Heart Lung and Blood Institute, published the Guidelines for the Diagnosis and Management of Asthma [6–8]. Both 1997 and 2007 asthma guidelines recommend referral to an asthma specialist for poorly controlled asthma, evaluation for inhaled allergen exposures, and spirometry testing for children with asthma

beginning at the age of five years [7, 8]. The 2007 Expert Panel Report 3 (EPR-3) Guidelines [8] specifically recommend referral to an asthma specialist for “an exacerbation that requires hospitalization, difficulty in achieving or maintaining the control of asthma, if additional testing is indicated, if immunotherapy or omalizumab is considered or if two or more bursts of oral steroids in a year are required or for step 4 care (medium dose inhaled steroids and either a long-acting beta agonist or montelukast) or higher.” The guidelines define an asthma specialist as “usually, a fellowship – trained allergist or pulmonologist; occasionally, other physicians who have expertise in asthma management, developed through additional training and experience.” Physician asthma specialty practices are more likely to prescribe a higher level of inhaled corticosteroids [9], perform pulmonary function tests, discuss trigger identification and environmental control, provide written instruction for managing asthma attacks, and instruct on the use of inhalers, than primary care physicians [10]. In contrast, most pediatric primary care physicians are unlikely to report the routine use of office spirometry testing (12%) or allergy testing (3%) for

children with asthma [11]. Access to pediatric asthma specialists may be limited by workforce shortages [12, 13].

We undertook this study to determine what proportion of children with asthma in this urban health care setting had received asthma specialty care in accordance with national asthma guidelines' recommendations and whether the receipt of asthma specialty care varies by patient characteristics such as child's racial/ethnic group, age, socio-economic status (SES), insurance, and/or levels of acute care utilization (hospitalizations and/or emergency department (ED) visits).

Design and methods

This study is a retrospective cohort study of children aged 7–17 years who were identified as having received primary care at an urban medical center in 2012 and had a primary or secondary diagnosis code for asthma (International Classification of Diseases, Ninth Revision codes 493.00–493.99) [14]. Data were accessed using Clinical Looking Glass (CLG), an interactive software application linked to our health system's electronic medical record [15]. All scheduled and unscheduled utilizations occurring within the system are captured. We assessed asthma-related health care utilization from 1997 to 2012 for children in three racial/ethnic groups: Hispanic; Black, Non-Hispanic (NH); and White, NH. Puerto Ricans constitute the largest group of Hispanics in our population [16]. The cohort was identified in 2012 and we examined their health care utilization retrospectively back until 1997. Therefore, health care utilization of the 17 year olds was examined for 15 years, beginning at age of two years, while utilization by the seven-year-old participants was examined over their seven-year lifespan. We chose to include children aged seven years and older so that the cohort was observed for a minimum of two years after the age of 5, the age at which the guidelines recommend spirometry testing for children with asthma. The Montefiore IRB deemed the study exempt.

Socio-demographic variables

Variables included child's age in years as a continuous variable and categorized into two age groups (aged 7–11 years vs. 12–17 years), gender, type of insurance (private, public [includes Medicaid or Child Health Plus, which is NY State's Child Health Insurance Plan], self-insured or unknown) and SES compared to the reference mean of NY State based on a composite created from small census tract data. CLG provides a quantitative estimate for each patient's SES based on home address using small census tract data that include median household

income, housing unit values, education level, and occupation statistics [15, 17]. This measure of SES is an aggregate of different measures based on census areas and CLG does not provide information on individual component variables such as education level for parents. SES was reported as a z-score with the reference being the mean score for the New York State [17].

Asthma-related primary care and acute care utilization

We assessed the frequency of asthma-related care as follows: primary care visits and acute care utilization, ED visits and/or hospitalizations for each child between 1997 and 2012.

Asthma morbidity assessed by the frequency of acute care utilization

We identified a subgroup of children with ≥ 1 asthma-related hospitalizations, as a single hospitalization for asthma is an EPR-3 recommended criterion for referral to a specialist. We also examined the specialty use for children with two or more asthma-related hospitalizations during the study period. Finally, we examined a subset of children who had two or more asthma-related ED visits during the study period.

Asthma specialist care

We assessed the receipt of asthma specialty care by extracting data regarding outpatient visits to a pulmonologist and/or allergist between 1997 and 2012. As allergy immunotherapy requires serial visits to an allergist, often over several years, we examined how many children had 10 or more allergy visits as a minimum threshold to identify children who could potentially have initiated a course of immunotherapy.

Data analysis

All analyses were conducted using SPSS. Descriptive analyses were conducted to calculate the means and percentages. Bivariate analyses were conducted using a logistic regression to examine the associations of having had any specialty care utilization with the following categorical variables: age group (7–11 vs. 12–17 years old), race/ethnicity (Hispanic, Black, NH, and White, NH), SES ($>$ or ≤ 2 SD below the NY State mean), insurance category (private, public, self-pay/unknown), having had two or more asthma-related ED visits (yes/no), and both the presence and the absence of any asthma-related hospitalization and the presence and the absence of two or more

asthma-related hospitalizations. Two multivariable logistic regression models were then used to determine which factors were independently associated with the receipt of specialty care. Both models included racial/ethnic group, age group (7–11 vs. 12–17), SES, insurance status and ED visits for asthma (1 or fewer vs. 2 or more). The first regression model dichotomized hospitalizations by the presence or absence of any hospitalization for asthma, while the second logistic regression model compared those with two or more asthma-related hospitalizations to those with one or fewer hospitalizations.

Results

Patient characteristics and life-time asthma care utilization

There were 4959 children, aged 7–17 years, with a diagnosis of asthma who received outpatient pediatric primary care at this urban medical center in 2012. The patient characteristics and acute care utilization from 1997 to 2012 are shown in Table 1. The mean age of the children was 11.1 years $\pm$ 3.05 and 56.8% were males. The majority were Hispanic (58.9%) or Black, NH (36.6%) and a small proportion were White (4.5%). The children

in the three racial/ethnic groups did not differ by gender or age. Almost half of the children had public insurance, which included Medicaid insurance (44.2%) or Child Health Plus (3.6%). The mean SES *z*-score for the sample was -3.93 , indicating that the SES level of these patients was much lower than that of NY State residents overall. Between 1997 and 2012, the participants had an average of 7.8 asthma-related primary care visits, 0.34 allergy visits, 0.74 pulmonary visits, 1.66 ED visits and 0.56 asthma-related hospitalizations.

Receipt of asthma specialist care

In this sample of inner-city children with asthma, most children (80.6%) had not received outpatient care from an asthma specialist during the study period. Only 19.4% of the children had an outpatient asthma specialist evaluation: 16.2% with a pulmonologist, 7.2% with an allergist and 4% with both specialists (Table 2). Very few children had serial visits to an allergist, defined as >10 visits, to allow for possible initiation of immunotherapy (only 0.5% of the sample). Even among those children with an asthma-related hospitalization, only 1.5% had >10 allergy visits suggesting the potential for possible initiation of immunotherapy.

Table 1. Patient characteristics and asthma care utilization from 1997 to 2012 ($N = 4959$).

Age, mean $\pm$ SD, years	11.1 $\pm$ 3.05 (median = 11.0)
Male, %	56.8
Racial/ethnic group	
Hispanic, <i>n</i> (%)	2924 (58.9)
Black, Non-Hispanic, <i>n</i> (%)	1814 (36.6)
White, Non-Hispanic, <i>n</i> (%)	221 (4.5)
Insurance	
Medicaid, <i>n</i> (%)	2194 (44.2)
Child Health Plus ¹ , <i>n</i> (%)	179 (3.6)
Private	1864 (37.6)
Self or unknown, <i>n</i> (%)	722 (14.5)
SES <i>z</i> -scores, compared with New York	
State mean ²	
Hispanic	-4.19 (-4.29 to -4.10)
Black, NH	-3.83 (-3.99 to -3.72)
White, NH	-0.95 (-1.28 to -0.62)
Mean	-3.93 (-4.00 to -3.85)
Total asthma primary care visits, 1997–2012, mean $\pm$ SD, range	7.8 $\pm$ 8.03 (1–151) Median = 5
Total allergy visits 1997–2012, mean $\pm$ SD, range	0.34 $\pm$ 3.178 (0–64) Median = 0
Total pulmonary visits, 1997–2012, mean $\pm$ SD, range	0.74 $\pm$ 2.78 (0–37) Median = 0
Total ED visits for asthma, 1997–2012, mean $\pm$ SD, range	1.66 $\pm$ 3.67 (0–94) Median = 0
Total Hospitalization for asthma, 1997–2012, mean $\pm$ SD, range	0.56 $\pm$ 1.86 (0–33) Median = 0
Ever hospitalized for asthma, <i>n</i> (%)	1,850 (37.3)
≥ 2 lifetime hospitalizations for asthma, <i>n</i> (%)	504 (10.2)
Ever had ED visit for asthma, <i>n</i> (%)	2,157 (43.5)
≥ 2 lifetime ED visits for asthma, <i>n</i> (%)	1,359 (27.4)

Notes. ¹NY State's Child Health Insurance Plan.

²SES *z* scores were higher for White, NH vs. Black, NH and Hispanic; $p < .001$.

Factors related to receipt of specialty care

Table 2 shows the percentages of children who were evaluated in the health care network by pulmonologists, allergists or both specialists broken down by child race/ethnicity, age group, SES, insurance type and asthma-related acute care utilization. When we looked at the factors related to receiving any specialty care (see unadjusted ORs in Table 3), we found that the utilization did not vary significantly by either race/ethnicity or SES. Larger percentages of the younger age group (7–11 years old) than the older age group (12–17 years) had seen an asthma specialist (21.0% vs. 17.4%; $p < .0001$). There was no difference in specialty care use by children covered by public vs. private insurance; however, those who were self-insured or with unknown insurance were less likely to have seen asthma specialists than those with either public or private insurance (14.0% vs. 20.9% and 19.7%, respectively, both $p < .0001$). Children with one or more asthma-related hospitalizations were more likely than those with no asthma-related hospitalizations to have had an outpatient visit with an asthma specialist during the study period; 41.7% vs. 12.8%; $p < .0001$. Similarly, children with two or more asthma-related hospitalizations were significantly more likely to have seen a specialist than those with fewer hospitalizations (59.9% vs. 14.8%; $p < .0001$). Children with two or more ED visits during

Table 2. Specialty care utilization by race/ethnicity, age, socio-economic status (SES), insurance type, and asthma-related acute care utilization ($N = 4959$).

	Pulmonologist visit %	Allergist visit %	Both %	Neither %
Race/ethnicity				
All (%)	16.2	7.2	4.0	80.6
Hispanic	16.3	7.3	4.2	80.6
Black, NH	16.4	7.2	3.6	79.9
White, NH	13.6	5.0	3.6	85.1
Age				
7–11 years old	17.4	7.6	4.1	79.0
12–17 years old	14.4	6.6	3.7	82.6
SES				
SES < 2 SD below New York State mean	15.9	7.6	4.0	80.6
SES $\geq$ 2 SD below New York State mean	17.3	6.2	3.9	80.4
Insurance type				
Medicaid	16.6	8.0	4.1	79.4
Child Health Plus*	19.0	11.7	5.6	74.9
Private	16.7	7.2	4.2	80.3
Self	12.6	3.6	2.4	86.2
Unknown	14.3	4.0	2.1	80.6
Asthma-related Acute Care Utilization				
$\geq$ 1 lifetime hospitalizations for asthma	37.3	15.5	11.1	58.3
No lifetime hospitalization for asthma	9.9	4.7	1.8	87.2
$\geq$ 2 lifetime hospitalizations for asthma	55.8	21.6	17.5	40.1
< 2 lifetime hospitalizations for asthma	11.6	5.5	2.4	85.2
$\geq$ 2 lifetime ED visits	32.7	14.0	9.6	62.9
< 2 lifetime ED visits	10.0	4.6	1.8	83.6

Note. *NY State's Child Health Insurance Plan.

the study period were also more likely than those with fewer ED visits to have seen either specialist (37.1% vs. 12.8%; $p < .001$).

The results of the first multivariable logistic regression analysis, where asthma hospitalization was dichotomized as any vs. none, are shown in Table 3 and confirm the findings of the simple bivariate analyses. With all variables in the model, specialty care utilization did not differ by racial/ethnic group or by SES. There was also no difference in specialty care use between children with private insurance and those with public insurance. Children whose insurance status was self-pay or unknown were less likely than those with private insurance to have had outpatient visits with specialists (Adj. OR = 0.71;

95% CI = 0.55, 0.92; $p < .01$). Younger children were more likely to have seen specialists (Adj. OR = 1.25; 95% CI = 1.07, 1.46; $p < .006$). Participants with two or more lifetime ED visits were more than twice as likely to have received outpatient specialty care compared to those with lower lifetime ED use (Adj. OR = 2.64; 95% CI = 2.24, 3.11; $p < .0001$). Finally, participants with any asthma admissions were thrice as likely to have seen an asthma specialist outpatient as those who were never hospitalized for asthma (Adj. OR = 3.4; 95% CI = 2.88, 4.02; $p < .0001$). In the second regression analysis, keeping all the other variables the same, children with two or more asthma-related hospitalizations were more than five times (Adj. OR = 5.63; 95% CI = 4.47, 6.81; $p < .0001$) as

Table 3. Factors associated with the receipt of specialty care: logistic regressions assessing likelihood of asthma specialty care by age, race/ethnicity, SES, insurance category, and asthma-related acute care utilization.

	Unadjusted OR	95% Confidence interval	p -Value	Adjusted OR	95% Confidence interval	p -Value
Age						
7–11 years old	1.26	1.09–1.46	<.0001	1.25	1.07–1.46	<.006
12–17 years old	1.00			1.00		
Race/ethnicity						
White, NH	1.00			1.00		
Hispanic	1.37	0.94–2.01	.10	0.92	0.60–1.39	.68
Black, NH	1.43	0.97–2.11	.07	0.97	0.64–1.47	.88
SES 2SD below NY State mean	0.99	0.85–1.15	.91	0.97	0.81–1.15	.69
Insurance						
Private	1.00			1.00		
Medicaid/Child Health Plus*	1.08	0.93–1.25	.33	1.15	0.97–1.36	.11
Self-insured or unknown	0.66	0.52–0.84	<.001	0.71	0.55–0.92	<.01
Acute Care Utilization						
Any lifetime asthma-related admissions	4.87	4.18–5.66	<.0001	3.40	2.88–4.02	<.0001
$\geq$ 2 lifetime asthma-related ED visits	4.02	3.47–4.66	<.0001	2.64	2.24–3.11	<.0001

Note. *NY State's Child Health Insurance Plan.

likely to have received outpatient specialty care as those with lower rates of hospitalizations.

Discussion

In this sample of inner-city children with high asthma morbidity receiving care at a large urban medical center, only one in five of the children had utilization data in their medical records that suggested that they had an outpatient appointment with either an allergist and/or pulmonologist within the network and fewer than one in 10 children had evidence of an outpatient evaluation by an allergist. This is in contrast to the guideline estimates that half of the children with asthma, those with persistent asthma and indoor inhalant allergen exposures, would benefit from the evaluation for sensitization to indoor inhalant allergens [8]. The EPR-3 guidelines also specifically recommend asthma specialist care for all children who have been hospitalized for asthma [8]; yet in this sample, fewer than half of the children who were hospitalized for asthma had an outpatient asthma specialist visit. Even among those children with two or more hospitalizations for asthma, only one in five had an outpatient visit with an allergist and half had received outpatient care by a pulmonologist. Most asthma-related visits were with primary care providers rather than specialists. These findings suggest a need to either increase asthma specialist visits for children at a high risk for asthma morbidity and/or augment the delivery of asthma care in primary care settings.

This study was a retrospective study of health care utilization and as such we were unable to examine perceived and/or real barriers to asthma specialist use such as referral rates or access to care. Within our integrated health care network, we did not find differences in the receipt of asthma specialty care by racial/ethnic group, public or private insurance status or SES. This suggests that other systemic factors may be contributing to the low rates of specialist visits such as limited access to specialists, low referral rates by primary care providers, and/or families not following through with referrals.

A concern regarding the low proportion of children with asthma specialist visits is that the lack of asthma specialist visits may limit the receipt of guideline-recommended spirometry testing and inhalant allergen testing which are not usually performed in the primary care setting. According to the EPR-3 guidelines, referral to an asthma specialist is based on Evidence D (Expert Opinion alone). However, the recommendation for spirometry testing, every one or two years, beginning at the age of five years is Evidence B (Randomized Controlled Trials, limited body of data) and the recommendation to assess exposure to inhalant allergens is

Evidence A (Randomized Controlled Trials, rich body of data).

In a national survey of primary care providers, only 21% reported using spirometry routinely [11]. Reported barriers include time and training [18]. Claims' data also support limited spirometry testing with only 22.8% of the children with asthma having the documentation of spirometry testing during a three-year period [19]. Measuring lung function with spirometry can lead to the re-classification of asthma severity and correction under treatment [20–23]. Assigned asthma severity increased for 36% of the children referred to a subspecialist asthma program when determined by spirometry compared to clinical criteria [21]. Increasing access to high-quality spirometry testing may be an important intervention to improve asthma care for inner-city children.

Evidence supports tailoring environmental interventions based on the identified sensitivities to reduce asthma morbidity in inner-city children [24]. This population of children has very high rates of household aero-allergen sensitivities and exposures [25, 26]; yet, few see allergists for allergy skin prick testing and counseling. Fewer than one in 10 children in the sample was evaluated by allergists.

The asthma guidelines recommend that allergy testing can be performed for all children with persistent asthma with household exposure to perennial indoor inhalant allergens to assess for the sensitization in order to tailor treatment. Given that 60% of the US children with asthma have persistent asthma [27] and 80% have inhalant allergy exposures [28], allergy testing would be recommended for 48% of the US children with asthma who have both persistent asthma and perennial exposure to indoor allergens. In this sample, only 7% of the children had outpatient visits to an allergist during the study period suggesting that very few receive the recommended care. It is unlikely that most of these children received allergy testing in the primary care setting as only 10% of the primary care physicians practicing in the inner-city report performing allergy testing [29]. The lack of serial visits to allergists also suggests that very few children with asthma in this setting receive immunotherapy.

Asthma specialist utilization was the highest for children with higher levels of acute care utilization; however, we did not examine the influence of physician referral patterns or beliefs on specialty referrals. Poowuttikul et al. [30] surveyed primary care pediatricians in Michigan and found that the two most likely reasons for referral to an asthma specialist include poor asthma control (89.3%) or a single life-threatening event (82.1%) and most respondents stated that they would refer for severe asthma (85.2%) but fewer for moderate asthma (55.5%).

In their study, most respondents preferred consultation with an allergist (42.5%) than a pulmonologist (22.8%). Only a minority of participants reported that they would always consider referring an asthma patient to an asthma specialist for allergy skin testing (13.5%), possible allergen immunotherapy (24.2%) or spirometry (11.8%). The major barrier to asthma specialist consultation was considered to be insurance coverage (66.8%) and 41% were concerned with the “loss of autonomy” when seeking help from specialists.

Children who were uninsured, self-paid or had unknown insurance were less likely than those with public or private insurance to have had outpatient visits with specialists. In our sample, most of the children (86%) were insured, so this was not the primary reason for the low receipt of specialty care. Our network cares for children with both public and private insurances and within our sample, we did not find differences in asthma specialist utilization based on private or public insurance status. Other studies have found variations in the receipt of specialty care by race and ethnicity [31–33] and the lower receipt of specialist care for those with Medicaid rather than private insurance [34]. Mitchell et al. [35] examined the level of asthma morbidity present when children presented for an initial outpatient pediatric pulmonary appointment. They found that Black children had greater asthma morbidity than White children at their initial evaluation, which they interpreted as suggesting that there may be a higher morbidity threshold for Black vs. White children in being referred and evaluated by asthma specialists.

In our cohort, younger children (aged 7–11 years) were more likely than the older children (aged 12–17 years) to have seen asthma specialists suggesting changing practice patterns toward the utilization of asthma specialists. While in our cohort, more children saw a pulmonologist than an allergist, in a study by Cabana et al. [34], more children saw an allergist (80%) than a pulmonologist (14%). This likely reflects regional variations in practice patterns related to available resources. In 2012, there were only 1091 board-certified pediatric pulmonologists in the US. This is unlikely to change as the percentage of pediatric residents choosing pediatric pulmonology as a career has stayed relatively constant at around 4.5% [12]. There is also limited access to allergists. The forecast of allergy/immunology physician supply in the US from 1999 to 2014 had decreased from 1.39 FTE per 100,000 population to 0.85 FTE per 100,000 population in 2014 [13].

According to the guidelines, asthma specialists can include physicians other than pulmonologists and allergists, who have expertise in asthma management,

developed through additional training and experience. Primary care physicians are a logical choice to augment the asthma specialist workforce. In keeping with the concepts and goals of primary care as elucidated by Starfield, primary care physicians provide first contact with families, comprehensive care, continuity and coordination [36].

Applying the EPR-3 guidelines' recommendations for assessing asthma severity in the primary care setting can improve the detection and treatment of persistent asthma in inner-city children [23]. With appropriate training, staff on the site in primary care settings can perform and interpret spirometry. Spirometry can be billed for and can help to identify children with reversible obstruction who are not recognized by symptom inventories alone.

Increasing access to allergy testing for children with asthma may also improve care. In the National Cooperative Inner-City Asthma Study, allergy testing was performed by research staff using standardized panels of skin prick testing to tailor therapy [37]. With appropriate training, primary care staff could learn to perform skin prick testing panels to assess for the sensitization to common indoor inhalant allergens and provide counseling to families regarding evidence-based interventions. Likewise, primary care doctors could receive training in appropriate, selective use of specific IgE in vitro testing to help assess the sensitization to common respiratory allergens. In vitro testing is more expensive than skin testing but could be ordered in the primary care setting. Enhancements to primary care delivery of asthma could also include expanded patient teaching regarding asthma inhaler/spacer use and increased distribution of written plans to manage asthma attacks. Certified asthma educators [38] and community health workers [39] could also be utilized to expand the asthma workforce to improve outreach and asthma outcomes.

There were several limitations to our study. We included children identified with all ICD9 codes for asthma and our dataset did not allow us to assess utilization based on asthma control or asthma severity. While the study assessed care for five years after the release of the 2007 EPR-3 guidelines, it also included care prior to the release of these guidelines. However, both 1997 and 2007 guidelines recommend spirometry testing beginning at the age of five years, evaluation for inhalant allergen exposures, and referral to asthma specialists for poorly controlled asthma. Our dataset is limited to children who received their care within our network, so we may have underestimated some specialty care if the children received care out of our network. Our health care network is the largest provider of health care within our geographic

region. In 2012, there were 142 locations within our integrated health care system and 1800 physicians employed. Given the extensiveness of our integrated health care network, most children who receive their primary care in our network are referred to specialists within the network. We did not specifically examine billing for spirometry or allergy testing. It is possible that some testing was performed in the primary care setting. We also could not measure “asthma specialists” outside of allergists or pulmonologists. At the time of this study, spirometry was not widely available in the pediatric primary care offices. Likewise, while some primary care doctors may have sent blood tests to evaluate for allergies, this is currently not a common practice [29]. We also did not examine referral rates and missed appointments as the focus of our study was actual utilization. Finally, this study includes data from one large urban medical center and regional variations in resources may affect specialty utilization patterns.

Conclusion

In this sample of inner-city children with high asthma morbidity receiving care at a large urban medical center, most children, even those who had been hospitalized for asthma, did not receive outpatient asthma specialty care. Very few children received outpatient care by an allergist to help identify and address inhalant allergens and even fewer had serial allergy visits to allow for the possible receipt of immunotherapy. Low rates of specialist care were irrespective of child’s racial/ethnic group, public or private insurance or SES. These findings suggest that interventions are needed to ensure that inner-city children at a high risk for asthma morbidity receive recommended asthma specialty care services. Efforts could include increasing asthma specialty care visits and/or providing training and resources to augment the delivery of asthma care in the primary care setting.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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