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Caregiver education to promote appropriate use of preventive asthma medications: What is happening in primary care?

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Abstract

Objective—To describe actions taken by providers at primary care visits to promote daily use of preventive asthma medication, and determine whether patient or encounter variables are associated with the receipt of asthma medication education.

Methods—As part of a larger study in Rochester, NY, caregivers of children (2 to 12 years old) with asthma were approached before an office visit for well-child, asthma-specific, or other illness care from October 2009 to January 2013. Eligibility required persistent symptoms and a prescription for an inhaled asthma controller medication. Caregivers were interviewed within 2 weeks to discuss the health care encounter.

Results—We identified 185 eligible children from 6 urban primary care offices (27% Black, 38% Hispanic, 65% Medicaid). Overall, 42% of caregivers reported a discussion of appropriate preventive medication use, fewer than 25% received an asthma action plan, and 17% reported ‘ideal’ medication education (both discussing proper medication use and completing an asthma action plan); no differences were seen upon comparing well-child and asthma-specific visits with other visits. Well-child and asthma-specific visits together were more likely, compared with other visits, to include a recommendation for a follow-up visit (43% vs 23%, $p = 0.007$). No patient factors were associated with report of preventive medication education.

Conclusions—Guideline-recommended education for caregivers about preventive asthma medication is not occurring in the majority of primary care visits for urban children with symptomatic persistent asthma. Novel methods to deliver asthma education may be needed to promote appropriate preventive medication use and reduce asthma morbidity.

Keywords

Prevention; Education; Control/Management; Pediatrics; Therapy

INTRODUCTION

Clinical asthma guidelines, first published by the National Heart, Lung, and Blood Institute (NHLBI) in 1991, provide a comprehensive set of recommendations for health care providers on the diagnosis and management of asthma. Subsequent revisions have increasingly emphasized preventive asthma care⁽¹⁾. The best available evidence indicates that adherence with guideline-based preventive care, particularly daily use of an inhaled corticosteroid^(2–5), improves clinical outcomes for children with persistent asthma⁽⁶⁾. Nevertheless, national morbidity rates have not significantly declined in the two decades since the guidelines were introduced⁽⁷⁾. This may be attributable, at least in part, to sub-optimal provider adherence to recommended preventive asthma care^(8, 9).

Many clinicians do not routinely perform guideline-based actions considered essential to good asthma care^(10, 11); they do not consistently assess asthma severity^(12, 13), educate families about proper medication use^(14–16), provide written asthma care plans^(14–19), or recommend appropriate asthma-specific follow-up^(14, 15). In this study, we consider education on “proper” or “appropriate” use of preventive medications to be an inclusive categorical term representing discussions about adherence promotion strategies, appropriate dose, and/or device technique. Educating families about preventive asthma medications and appropriate use is particularly important since focused education can empower caregivers to adhere to a preventive treatment regimen, and enhanced self-management skills in asthma are known to lead to improved clinical outcomes⁽²⁰⁾. The need for effective education about preventive medications is especially critical for inner-city, poor, and minority children. These high-risk children bear a disproportionate burden of both asthma and asthma-related morbidity^(21–27), yet they are less likely to receive^(5, 9, 28, 29) or adhere to^(29, 30) prescribed preventive therapy.

Most of the available data about clinician delivery of preventive asthma care is derived from physician surveys or larger cross-sectional studies not connected to a specific encounter. Limited data describe guideline-based preventive education actions taken by primary care providers for high-risk children with persistent asthma in the clinic setting. Furthermore, we know little about the delivery of preventive care at non-asthma visits. An evaluation of provider actions across a variety of outpatient encounter types is needed to assess whether clinicians are taking advantage of every opportunity to deliver high-quality asthma care.

To address these gaps in knowledge, we conducted a study with two objectives. First, we sought to describe caregiver report of providers’ actions during primary care encounters that follow NHLBI guidelines about educating families and promoting daily use of preventive asthma medications. Second, we aimed to document whether the delivery of preventive asthma medication education, and specifically any discussion about proper use of preventive medications or receipt of an asthma action plan, is associated with key patient variables, disease severity, or type of ambulatory care encounter. We hypothesized that a higher rate of preventive education-related actions would be identified during encounters where asthma was a primary focus, given time constraints and competing clinical demands on physicians at other visits.

METHODS

Settings and Participants

The study protocol was approved by the institutional review boards of the University of Rochester and the Rochester General Health System. The Prompting Asthma Intervention in Rochester - Uniting Parents and Providers (PAIR-UP) trial is a recently completed randomized study conducted in 12 urban primary care offices in Rochester, NY⁽³¹⁾. Each practice was randomly assigned to be a treatment site or usual-care site, with matching for size and patient demographics. Treatment sites received the “PAIR-UP” intervention, which included prompts to caregivers and providers to promote NHLBI guideline-based asthma care at the time of the visit, as well as practice level supports and feedback on asthma care delivery. The six control sites provided usual asthma care, without parent or provider prompts. All 12 practices received copies of the national asthma guidelines.

Recruitment into PAIR-UP occurred from October 2009 through January 2013, targeting primary caregivers (parent or guardian) of children between the ages of 2 and 12 years with medical record documentation of asthma. Caregivers were approached in the waiting room of all 12 participating offices prior to scheduled visits. A 10 minute structured screening was conducted by recruiters prior to the appointment to assess eligibility, which was based on the child’s level of asthma symptoms in the preceding 4 weeks. For inclusion, children were required to have caregiver-reported persistent asthma symptoms in accordance with NHLBI guidelines. Eligibility also required that the visit be scheduled with a physician, physician’s assistant, or nurse practitioner. The indication for the encounter was identified by the caregiver (i.e., well child care, asthma visit, or other illness visit), and all three visit types were included in the study. Of note, the “other illness visit” category encompassed any other scheduled visit to the clinic that was not for well child or asthma specific care; this included visits for both acute illness and injury as well as other chronic disease management (e.g. ADHD).

Only one child per family was eligible for enrollment. If more than one child met enrollment criteria, caregivers were given a choice in deciding which child to enroll. Written informed consent was obtained from each caregiver, as was verbal assent from all children 7 years or older. Caregivers then completed a brief, structured, interviewer-administered baseline survey, with a \$10 grocery store gift certificate provided to each family completing this step.

In order to accurately characterize typical, urban, outpatient pediatric asthma care, the current analysis was limited to data collected from subjects enrolled at the six usual care sites who had follow-up data available (94% of subjects). Further, this analysis only included subjects whose caregiver reported a prescribed preventive asthma medication (either a prior prescription or a new prescription at the visit). Although guidelines recommend preventive medications for all children with persistent asthma, previous work has documented poor preventive medication prescription rates among children with persistent level symptoms⁽³²⁾. Accordingly, we sought to focus attention on those subjects for whom preventive medication teaching would be most expected.

Assessment

Provider Delivery of Preventive Asthma Medication Teaching—Caregivers were contacted by telephone shortly after the encounter (within 14 days), and were asked to characterize asthma-specific actions that occurred during the encounter by answering questions from a structured interview tool. All questions were based on NHLBI guidelines on the diagnosis and management of asthma⁽¹⁾. They reported on whether the health care provider asked targeted questions to assess the child's asthma severity or control (i.e., frequency of daytime symptoms, nighttime symptoms, and rescue medication use), and also whether the provider inquired about current asthma medications or delivered other guideline-recommended preventive asthma education and care. Information regarding updates or changes to the child's asthma medications and treatment plan was also collected.

Specific guideline-based measures of interest in this study included a caregiver-reported discussion with the provider about asthma symptoms and proper medication use, receipt of a written asthma action plan, and provider recommendation for an asthma-specific follow-up visit. We also constructed and assessed two guideline-based measures of interest: "Ideal Teaching," in which the caregiver reported both receiving an action plan and discussing appropriate preventive medication use, and "Minimal Expected Teaching," in which the caregiver reported either receiving an action plan or discussing appropriate preventive medication use.

Assessment of Asthma Severity and Symptoms—The severity of asthma symptoms for each subject, or level of control if already using a preventive medication, was determined in the baseline assessment using structured questions adapted from NHLBI guidelines. Each subject was then classified as having mild persistent, moderate persistent, or severe persistent asthma symptoms in accordance with these guidelines. This classification was based on an assessment of recent impairment and expected risk. Caregivers recalled asthma-related impairment over the preceding four weeks: the number of days that their child experienced daytime symptoms (including cough, wheeze, shortness of breath, or chest tightness), nighttime symptoms, used rescue medication, or experienced activity limitation due to asthma. To ascertain risk, caregivers were also asked to report on the number of asthma exacerbations requiring systemic corticosteroids over the previous year. Eligibility for inclusion into the study required either caregiver-reported persistent asthma symptoms, or poor control in accordance with NHLBI guidelines if a preventive medication was used in the previous three months.

Assessment of Covariates—Caregivers were asked about standard demographic variables in the baseline survey, including child age and gender, race, ethnicity (Hispanic or not Hispanic); caregiver age, marital status, and education; primary language spoken at home; and insurance type. All encounters were categorized as well-child care, asthma visit, or other illness visit, based on the caregiver report. We combined well-child and asthma visits for the analysis a priori, as these two visit types represent encounters where asthma care could be reasonably expected to take primary focus for children with persistent symptoms.

Analysis

Analysis was completed using SPSS version 22 software (SPSS Inc., Chicago, Ill). Pearson's chi-square tests and t-tests were used to compare each encounter type with demographic variables and preventive actions taken by providers during encounters, including "Ideal Teaching" and "Minimal Expected Teaching." A multivariable logistic regression analysis was conducted in order to clarify the relationship between encounter type and delivery of guideline-based preventive asthma care and education. Well care and asthma-specific visits were combined into a single category to ensure adequate power. The constructed regression model controlled for asthma severity, indication for visit, and several demographic variables including child gender and race, caregiver age and education, insurance type, and language spoken at home. A 2-sided alpha of <0.05 was considered statistically significant.

RESULTS

The overall response rate among all participants in the PAIR-UP study was 82%. Of 319 total children with persistent asthma symptoms enrolled in the six primary care offices that were randomly assigned as 'usual care' (control) sites, 196 were reported to have a daily preventive asthma medication by their caregiver. This preventive medication was either already prescribed when the baseline survey was completed (76%), newly prescribed during the healthcare encounter (11%), or both (13%). The first follow-up interview was completed by 185 caregivers (94.4%), with time until follow-up ranging from 0–14 days (mean 6.68 days, SD 7.00 days); 88% of caregivers followed up within a 2 week period.

The demographic characteristics of this sample are displayed in Table 1. Children were 6.9 years old on average. The majority were male (58.7%); 27% were Black and 38.3% were Hispanic in ethnicity. A majority of children (65.3%) were insured by Medicaid. Caregivers had an average age of 34.9 years, with almost half reporting married status (44.9%) and most reporting at least a high school education (80.1%). Asthma severity, based on caregiver report of symptoms in the 4 weeks preceding the baseline survey, was almost evenly distributed into mild persistent (32.7%), moderate persistent (36.2%), and severe persistent (31.1%) categories. Neither demographic characteristics nor asthma severity differed significantly among children presenting for well child care or asthma visits, compared to children presenting for other illness visits.

Across encounter types, clinician delivery of guideline-based asthma care and preventive medication education was low (Table 2). Less than half of all caregivers (42%) reported that their child's provider discussed how to properly use asthma medications. Fewer than one in four caregivers (21.5%) reported receiving a written asthma action plan. Caregivers reported 'Ideal Teaching,' (education on proper medication use and the receipt of an asthma action plan) in only 16.7% of all encounters; "Minimum Expected Teaching," (education on either proper medication use or receipt of an asthma action plan) was reported in 46.2% of visits. A comparison of caregiver responses to these items revealed no statistically significant differences between well care and asthma visits vs. other illness visits. While our limited sample size precluded extensive subgroup analysis, however, we did find that ideal teaching

most commonly occurred during asthma visits, even when compared to well care visits (23.9% vs. 11.4%, respectively; $p=0.021$).

Children seen at well care and asthma visits, compared with children seen for other illnesses, were at significantly higher odds of receiving a recommendation for an asthma-specific follow-up visit (42% vs 23%, $p=0.007$) and to be asked about the frequency of daytime symptoms (53.9% vs 34.4%, $p=0.01$), frequency of nighttime symptoms (58.3% vs 32.9%, $p=0.001$), rescue medication use (60.5% vs 41.4%, $p=0.015$), and current asthma medications (80.9% vs 55.7%, $p<0.001$). However, more than a third of caregivers at well care and asthma visits were not asked about any recent symptoms. Moreover, fewer than half of these caregivers reported that they received a recommendation to schedule an asthma-specific follow-up visit. No significant differences between encounter types were identified for discussion of proper medication use and provision of written action plans.

The results of a logistic regression analysis examining the independent relationship between encounter type and caregiver-reported asthma actions largely confirm these findings (Table 3). Caregivers at well care and asthma-specific visits, compared with other illness visits, were significantly more likely to be asked about daytime symptoms (OR 2.60, 95% CI 1.34–5.06), nighttime symptoms (OR 3.42, 95% CI 1.72–6.80), rescue medication use (OR 2.86, 95% CI 1.45–5.64), current asthma medications (OR 4.17, 95% CI 2.02–8.63), and receive a recommendation to schedule an asthma-specific follow-up visit (OR 3.2, 95% CI 1.51–6.8). In addition, regression analysis found that both discussion of proper medication use (OR 2.27, 95% CI 1.12–4.62) and receipt of ‘minimum teaching’ (OR 2.05, 95% CI 1.02–4.1) were significantly more likely to occur during well care and asthma-specific visits.

DISCUSSION

Two decades have elapsed since NHLBI guidelines on the diagnosis and management of asthma were first published. The findings of this study indicate that guideline-based preventive asthma education is still not occurring in the majority of primary care visits for high-risk children with persistent asthma, despite having preventive medication prescriptions (Tables 2,3). This is consistent with the results of a complementary study published from the PAIR-UP trial demonstrating suboptimal clinic-based delivery of preventive asthma care, in which children with mild persistent asthma were least likely to receive guideline-based care⁽³³⁾. Further, caregiver receipt of asthma action plans was comparable with prior estimates in the literature ranging from 19%⁽¹⁵⁾ to 29%⁽³⁴⁾, as was discussion of preventive medication use which occurred in 35% of encounters in one study⁽¹⁵⁾, and in 45% of encounters in another⁽¹⁶⁾.

Particularly striking is the finding that providers caring for children with persistent symptoms were no more likely in base analysis to discuss proper medication use or provide action plans during encounters where asthma should be a key focus (i.e., well care and asthma visits), as compared with encounters for other illness concerns. Fewer than 20% of all encounters met the criteria for “ideal teaching,” which includes both discussion of proper medication use and provision of action plans. Providers were more likely to ask about recent

symptoms and recommend asthma-specific follow-up during well care and asthma visits, but caregiver report indicates that even these actions were omitted the majority of the time.

It is not entirely clear why providers were non-adherent with NHLBI guidelines for so many of these high-risk children. Most providers state they are aware of the guidelines and use them in practice⁽¹⁷⁾, and all practices in this study were furnished with copies of the guidelines. Moreover, most physicians agree that preventive asthma education is important⁽³⁵⁾. However, competing demands in a busy office visit are often cited as a reason for missed opportunities. Yarnall⁽³⁶⁾ examined the time required to dutifully execute top tier U.S Preventive Services Task Force recommendations, and concluded that a single clinic encounter is insufficient to complete all items. Hence, clinicians may need to triage which health information is most essential to discuss during brief encounters, understanding that some topics cannot be addressed. Time constraints have been identified by providers as a significant barrier to guideline adherence⁽⁸⁾, and competing demands are likely even more common in this high-risk population for whom access to regular and timely health care is often restricted.

Another potential barrier is inaccurate clinician assessment of asthma severity⁽⁸⁾, which would be expected to influence the level of care provided in a visit. In fact, providers often do underestimate asthma severity⁽¹²⁾, particularly when they do not ask specific questions about asthma symptoms⁽³⁷⁾. Given that a significant proportion of caregivers in our study reported that they were not asked about the child's symptoms, this omission may contribute to our findings. Provider disagreement with NHLBI guidelines on the use of inhaled corticosteroid medications may also act as a barrier to prescription and daily use⁽⁸⁾. As our study was limited to children who were prescribed a daily preventive medication, we can assume that each child was already assessed and diagnosed with persistent asthma (either before or during the index visit); we may likewise assume that provider disagreement with prescribing inhaled corticosteroids was not a key barrier. Most providers did ask about current asthma medications, especially during well care and asthma encounters, but failed to take the next step of providing appropriate education.

Ensuring that patients know which medications to take, when to take them, and how to use them with proper technique is a vital care step for clinicians caring for a child with symptomatic asthma. Preventive medications won't effectively control asthma if they are not used consistently and if the delivery of the medication is suboptimal. Our findings suggest that novel methods are needed to assist providers in systematically screening for asthma severity, delivering education efficiently, and ensuring patients have a written asthma action plan. If time constrains these steps, a follow-up can be scheduled to specifically address these issues; in fact, this may be a preferred option for many primary care providers conducting well care encounters. However, we found that recommendations for follow-up occurred in fewer than half of all asthma-specific and well care encounters, and in fewer than a quarter of other illness visits. There may be an opportunity for delivering education about preventive medications through a clinic-based designated asthma educator or home-based community health worker, but research on these and other methods of care delivery is ongoing.

For this study, we only included children with persistent symptoms who were prescribed a daily preventive asthma medication. NHLBI guidelines recommend that all patients with persistent asthma be treated with a daily preventive medication⁽¹⁾. Limiting inclusion to children with preventive medications likely acted as a filter to identify children for whom guideline-based care was, at least in part, already occurring. As prescription rates of these medications continue to be low, our findings likely overestimate the true rate of guideline-based preventive education occurring for urban children with asthma. On the other hand, limiting the study to this population allowed for a closer examination of what actions are taken on behalf of symptomatic children for whom asthma medication education would be most beneficial.

Our findings are supported by several strengths of the study. This population of urban subjects was enrolled from multiple primary care practices, lessening the likelihood that any one clinician providing stellar or sub-optimal care would unduly influence measured outcomes. By examining a range of encounter types, we were able to better contextualize the rates of guideline adherence and patient education occurring in visits where asthma would be expected to take a primary focus. In addition, the short period between the health care visit and the follow-up interview likely protected against recall bias.

There are also some potential limitations. Our results may not be widely generalizable, because we examined the delivery of asthma care at only six primary care practices in urban Rochester, NY, whose patient populations included some of the highest-risk children with persistent asthma. Our findings can only be generalized to similar populations and patient care settings. However, the children enrolled represent a medically underserved, inner-city population in which asthma has a very high prevalence and severity, so their health care experiences may have important public health implications.

Another potential limitation was that outcomes were assessed only by caregiver report. The choice of this approach is supported by Senturia's work, which found that caregiver accounts of outpatient asthma encounters are accurate when collected within 2 weeks of the visit⁽³⁸⁾. Our study team has also found parental report to be reliable when compared to medical record documentation^(15, 33). Use of caregiver report within a short period of time after a visit is likely to minimize effective recall bias. If a guideline-based preventive care action was taken but the caregiver cannot recall the occurrence, it is unlikely that the action was effective or meaningful. Senturia's work indicates that caregivers may in fact overestimate the delivery rate of preventive asthma education, in which case our findings would be falsely elevated. A review of available medical charts in the current study further validates this methodological choice. Across all encounters, while 42% of caregivers reported that proper medication use was discussed, only 13% of medical charts contained supporting documentation of these discussions. Additionally, 20% of caregivers reported having received an action plan, compared with 7% of charts documenting this care delivery.

Although six different practices contributed data, we conducted no sub-analysis comparing guideline adherence between practices (or providers within the practices) because of the relatively small sample size. In addition, we do not have information on whether or not asthma education or a recent action plan was delivered at a prior asthma visit. A busy

clinician aware of previous education efforts might have chosen to focus attention elsewhere during the encounter. Importantly, though, there were no differences in the delivery of asthma education at the index visit among those with and without an asthma-specific visit in the prior 6 months. Further, all of these children had continued to have persistent symptoms at the time of the index visit and so warranted further preventive care.

CONCLUSIONS

Our findings, based on a limited sample from six primary care practices, suggest that adequate preventive asthma education is not consistently occurring in the primary care clinic 20 years after the publication of guideline recommendations. Less than half of all participants received “Minimal Expected Teaching” on prescribed, preventive asthma medications, regardless of encounter type. These findings have important implications. If as a nation we wish to improve the significant, stagnant rates of asthma-related morbidity, this high-risk urban population of children with persistent asthma will require more comprehensive care in accordance with established, evidence based guidelines. It is crucial that we develop better approaches both inside and outside of the clinic to provide better education of caregivers and higher quality asthma care for children.

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Table 1

Demographics and Other Baseline Characteristics:

Characteristic	All Visit Types (n = 196)	Other Illness Visit (n = 77)	WCC or Asthma Visit (n = 119)
Child Age, y	6.9 (2.9)	7.2 (2.9)	6.7 (2.9)
Gender (Male)	115 (58.7%)	47 (61.0%)	68 (57.1%)
Black	53 (27.0%)	17 (22.1%)	36 (30.3%)
Hispanic	75 (38.3%)	35 (45.5%)	40 (33.6%)
Medicaid Insurance	128 (65.3%)	51 (66.2%)	77 (64.7%)
Caregiver age (years)	34.9 (9.2)	35.2 (9.4)	34.7 (9.1)
Caregiver marital status: Married	88 (44.9%)	30 (39.0%)	58 (48.7%)
Caregiver education: High school	157 (80.1%)	60 (77.9%)	97 (81.5%)
Language spoken at home			
English only	132 (67.3%)	44 (57.1%)	88 (73.9%)
Spanish only	6 (3.1%)	3 (3.9%)	3 (2.5%)
English and Spanish	54 (27.6%)	27 (35.1%)	27 (22.7%)
Asthma severity			
Mild Persistent	64 (32.7%)	27 (35.1%)	37 (31.1%)
Moderate Persistent	71 (36.2%)	29 (37.7%)	42 (35.3%)
Severe Persistent	61 (31.1%)	21 (27.3%)	30 (33.6%)

Data are presented as n (%) or mean (standard deviation).

Table 2

Caregiver Report of Provider Actions

Visit Action	All Visit Types (n = 185)	Other Illness Visit (n = 70)	WCC or Asthma Visit (n = 115)	P value*
Provider asked about frequency of daytime symptoms*	86 (46.5%)	24 (34.4%)	62 (53.9%)	0.01
Provider asked about frequency of nighttime symptoms*	90 (48.6%)	23 (32.9%)	67 (58.3%)	0.001
Provider asked about rescue medication use*	98 (53.3%)	29 (41.4%)	69 (60.5%)	0.015
Provider asked about current asthma medications*	132 (71.4%)	39 (55.7%)	93 (80.9%)	<0.001
Talked about proper use of medication	77 (41.8%)	25 (35.7%)	52 (45.6%)	0.22
Provided asthma action plan	40 (21.5%)	15 (21.1%)	25 (21.7%)	1.00
Suggested asthma-specific follow up visit*	65 (35.1%)	16 (22.9%)	49 (42.6%)	0.007
“Ideal Teaching”: discussed proper use AND provided action plan	31 (16.7%)	11 (15.5%)	20 (17.4%)	0.84
“Minimum expected teaching”: discussed proper use OR provided action plan	86 (46.2%)	29 (40.8%)	57 (49.6%)	0.29

* Statistically significant at $P < 0.05$

Table 3

Logistic Regression Models: Encounter Type Predicting Preventing Visit Actions*

Visit Action	B	Standard Error	OR (95% CI)	P value *
Provider asked about frequency of daytime symptoms **	0.96	0.34	2.60 (1.34, 5.06)	0.005
Provider asked about frequency of nighttime symptoms **	1.23	0.35	3.42 (1.72, 6.80)	<0.001
Provider asked about rescue medication use **	1.05	0.35	2.86 (1.45, 5.64)	0.002
Provider asked about current asthma medications **	1.43	0.37	4.17 (2.02, 8.63)	<0.001
Talked about proper use of medication **	0.82	0.36	2.27 (1.12, 4.62)	0.023
Provided asthma action plan	0.33	0.43	1.39 (0.60, 3.19)	0.44
„Ideal Teaching”	0.48	0.47	1.62 (0.65, 4.03)	0.30
„Minimum Teaching” **	0.72	0.36	2.05 (1.02, 4.10)	0.044
Provider suggested specific asthma follow-up **	1.16	0.38	3.20 (1.51, 6.80)	0.002

OR = Odds Ratio; CI = Confidence Interval

* Logistic regression models include: encounter type, gender, race, Medicaid, parent education, Spanish language in the home, caregiver age, and asthma severity level

** Statistically significant at $P < 0.05$