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Characteristics of Inner City Children with Life-Threatening Asthma

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Children; Inner City; Asthma; Intensive Care

Introduction

Poor children living in US inner cities have high prevalence of asthma as well as asthma related morbidity and mortality.(1–3) In 2013, there were 3,640 deaths due to asthma in the US; a rate of 1.1 deaths per 100,000 population.(4) Between 2007-2009, the death rate for African Americans aged 0–14 years was almost eight times greater than for whites in that age group(3). Several risk factors have been identified for fatal and near fatal asthma including a prior asthma admission to an intensive care unit (ICU), overuse of short acting beta agonists, underutilization of controller medication, poor recognition of asthma severity, psychosocial factors and multiple allergen sensitivity(5–8). There have been few studies examining the risk factors for fatal asthma and most have been in small populations of adults. It is important to examine factors in high risk minority children with asthma to try to prevent near fatal and fatal asthma exacerbations. The purpose of this study was to identify risk factors for ICU admission by comparing a group of minority inner city children with asthma with a history of prior ICU asthma admission to children without a prior ICU asthma

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Conflict of Interest Statement

Drs. Bollinger, Butz, Tsoukleris, Mudd and Ms. Lewis-Land and Morphew declared no conflicts of interest with respect to the research, authorship and /or publication of this article.

admission who were enrolled in a behavioral educational intervention trial. The results of this study will increase awareness of these high risk factors and inform potential opportunities for prevention of fatal or near fatal asthma.

Methods

Study Design and population

This manuscript presents a sub-analysis of baseline data on 222 participants enrolled in an ongoing randomized controlled trial testing the effectiveness of an emergency department (ED) and home-based environmental control intervention for children with frequent ED visits for asthma. The study was approved by the Johns Hopkins and University of Maryland Medical Institution Review Boards. The study is registered with [Clinical Trials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01981564) number NCT01981564. Children were recruited, consented and enrolled during an ED visit for treatment of an acute asthma exacerbation (ED visit at enrollment). Data were collected from August 2013 through March 2016. Inclusion criteria were physician diagnosed persistent asthma and uncontrolled asthma based on current National Asthma Education Prevention Program (NAEPP) guidelines,(9) 2 or more ED asthma visits or 1 hospitalization due to asthma during the past 12 months, aged 3-12 years of age and residence in the Baltimore metropolitan area. Children were excluded if they had significant other non-asthma respiratory conditions such as cystic fibrosis, were enrolled in another asthma study, refused blood draw for allergen specific IgE testing, or were homeless and lacked access to a phone. Out of the 554 child/caregivers screened in the ED during an asthma exacerbation, 215 caregivers declined to participate and another 117 children were ineligible for enrollment, resulting in 222 children enrolled in the study. After caregiver/legal guardian written informed consent and verbal assent from children over age 8 years were obtained, children were randomly assigned to either an ED-home based intervention or an attention control group in a 1:1 ratio. Detailed description of study methods are previously reported.(10) In brief, during the enrollment ED visit, all children received: (1) serologic allergen specific IgE testing by fluorescent enzyme immunoassay (FEIA) to assess sensitization to ten common indoor and outdoor allergens and (2) saliva collection to measure cotinine, a metabolite of nicotine, to determine their level of second hand smoke (SHS) exposure with positive cotinine level set at 1.0 ng/ml. Allergen sensitization and cotinine test results were sent to each child's primary care provider (PCP) and caregiver within 1-2 weeks post enrollment ED visit as part of the ED and home environmental control intervention. PCPs and caregivers from the control group received the same information at the end of the 6 month intervention period. Surveys were administered to the caregivers at baseline via face-to-face interview at study enrollment. The surveys included demographic characteristics such as age, gender and race of the child and co-morbid conditions. Caregiver relationship to the child, age, education level, employment status, household income level and depression screening were also obtained. For caregiver depression, a score of 16 on the Center for Epidemiological Studies Depression Scale (C-ESD) validated survey was defined as consistent with depression.(11) Caregiver perception of their neighborhood was assessed using the validated Perceived Neighborhood Scale (PNS)(12) which includes four dimensions: Social embeddedness, sense of community, satisfaction with neighborhood and fear of crime. For this analysis, the mean of

neighborhood perception was calculated based on the average across 4 subscales, with reverse coding applied where required, encompassing a total of 34 items ranges from 1-5. Scores of 1-2 reflected above average neighborhood perception, 3 reflected average neighborhood perception and 4-5 below average neighborhood perception. Social support was measured using an eight-item five-point Likert subscale from the Medical Outcomes Study that focuses on the availability of emotional/informational support.(13) Social Support scores ranged from 8-40, where higher values indicate greater perceived social support. A specific question about caregiver perception of child asthma control was also included. Caregiver self-report and home visit observation of child asthma trigger exposure was also collected. Prior history of intensive care unit (ICU) admission was initially based on caregiver report and confirmed by electronic medical record-EMR. High concordance was found between caregiver report and EMR for lifetime ICU admission (83% agreement). Pharmacy records were obtained from all pharmacies used per child as reported by the caregiver over a 12-month period as previously described.(14) All asthma medication fills dispensed over the prior 12 months were obtained on each child. HEDIS Asthma Medication Ratios (AMR) were also calculated ($\# \text{ controller fills} / (\# \text{ controller} + \text{ reliever fills})$).(15)

Statistical Analysis

Child and caregiver characteristics, health care utilization, co-morbid conditions, allergen sensitization, cotinine levels and asthma trigger exposure, asthma medication fills and AMRs and psychosocial factors were compared between subjects with and without a prior history of ICU admission using Chi-square and independent t-tests. Factors significantly contributing to increased odds of prior ICU admission based on unadjusted logistic regression analyses were included in the final multivariate model. Factors in the 0.05-0.10 level of significance were not included in the final model: Parent perception of asthma control, seen by an asthma specialist in past 2 years, and food allergy. Analyses were performed using SPSS for Windows V22.0.

Results:

Study Sample

As shown in Table 1, the children were primarily male (64.8%), African American (93.7%), Medicaid insured (92.8%) with a mean age (SD) of 6.4 (2.7) years. Caregivers of the children were mostly mothers (92.3%) and single (84.4%). Average caregiver age (SD) was 31.3 (7.5) years and most (80.8%) were high school graduates or higher. About ½ were employed (55.7%), yet 31.4% had a household income well below the poverty level. Based on the CES-D depression screening tool, 30.5% of caregivers had scores consistent with depression (≥ 16). Co-morbid allergic rhinitis was reported in 40.5% of the subjects, 27.3% had a history of food allergy and 57.7% had atopic dermatitis. Despite considerable atopy and persistent uncontrolled asthma, only 20.1% had been seen by an asthma specialist in the previous 2 years and 56.4% of the caregivers perceived their child's asthma as well controlled.

Comparison of ICU Status

Demographic and Clinical Characteristics: Of the 222 subjects enrolled in the study, 27.9% had a prior history of an ICU admission. As shown in Table 1, there were no statistically significant differences between the ICU and non ICU subjects for age, gender, presence of co-morbid allergic rhinitis or atopic dermatitis or type of insurance coverage. Groups were similar in average number of symptom days during past two weeks (median=4.0 [IQR 2.0-8.0]) and night awakenings in the past month (median=4.0 [IQR 1.5-7.0]; nearly a third (32.9%) had been to the ED two or more times and ½ had not been to their PCP in the past three months which was also similar between the ICU and no ICU groups ($p>0.05$, data not shown). There was a trend toward children with co-morbid food allergy to have had a prior ICU admission (Odds ratio: 1.74 (0.92-3.28), $p=0.089$), and to have previously seen a specialist (Odds ratio: 1.82 (0.91-3.65), $p=0.092$). However, only 27.4% of children previously admitted to the ICU had seen an asthma specialist. There were no statistically significant differences in demographic characteristics between caregivers of subjects with and without a prior ICU admission except for those living in extremely poor households the odds of a prior ICU admission was double ($<\$10,000$ versus $\$10,000$ annual income) Odds ratio= 2.06, (1.07-3.96), $p=0.030$.

Atopy and Asthma Trigger Exposure

As shown in Table 2, atopy was high in this group of children with 82.6% sensitized to at least one of 10 environmental allergens tested. Specific allergen sensitization revealed that more than ½ of the children tested were sensitized to dog (60.3%), cat (58.5%) and mouse (54.1%) and more than 1/3 were sensitized to oak tree (45.2%), Timothy grass (44.5%), house dust mite (42.0%), cockroach (41.4%), alternaria (37.6%), ragweed (37.4%) and aspergillus (33.2%). Those with sensitization to at least one of the 10 allergens tested were almost 3 times more likely to have had a prior ICU admission. (Odds ratio: 2.74 (1.01-7.45), $p=0.049$). Mouse allergen sensitization was of particular importance in contributing to increased odds of prior ICU admission (Odds ratio: 2.01 (1.05-3.83), $p=0.035$). There was no significant difference in sensitization rates as a predictor for prior ICU admission for all other allergens tested. Reported exposure to potential environmental asthma triggers was high with almost half reporting mice in the home (48.2%), almost 1/3 reporting cockroaches in the home (32%) and more than ½ reporting smokers in the home (52.1%). Over half of the children (57.9%) had detectable cotinine in their saliva, indicative of passive smoke exposure. There was no significant difference between exposure to these potential asthma triggers between the ICU and no ICU groups.

Asthma Medication Fill Patterns

As shown in Table 3, use of controller medication in the overall study population was poor. Controller prescription use was low, with 27.9% without any prescription fills for a controller medication in the previous year with no significant difference between ICU and no ICU subjects. Two of the subjects on controller medication were on leukotriene modifiers (LTM) alone (one in each group). Distribution of type of asthma medication therapy prescribed in past 12 months significantly differed in patients with a prior ICU compared to no prior ICU admissions ($p=0.030$). The most common controller medication treatment was

inhaled corticosteroids (ICS) alone and this treatment was found more commonly in the no ICU subjects (40%) than the ICU subjects (24.2%). The most common combination therapy regimen based on prescription fills was ICS+LTM with 20.6% of the ICU group and 32.2% of the no ICU group on this regimen. There was a higher % of ICU subjects on combination therapy that included ICS with a long-acting beta agonist (LABA) with 18.7% of ICU subjects with at least one fill vs. 8.8% of no ICU subjects. Overuse of short acting beta agonists (SABAs), defined as ≥ 4 SABA fills, was common with almost 1/3 of the study sample filling ≥ 4 SABA fills in the previous year and overuse nearly doubled the odds of a prior ICU admission (Odds Ratio: 1.97 (1.07-3.62), $p=0.029$). There was no difference in oral corticosteroid fills in the previous year between the groups (overall average=1 fill). HEDIS Asthma Medication Ratios (AMR) distributions did not significantly differ between the groups with an overall mean AMR of 0.45 (0.27), below the minimal standard of 0.5 for appropriate asthma controller medication use.

Caregiver Perception/Psychosocial Factors:

As shown in Table 4, almost 1/3 of the caregivers had CES-D scores of ≥ 16 , consistent with depression. There was no difference in caregiver depression scores between ICU and no ICU subjects. Nearly 20% of the caregivers reported below average neighborhood perception scores (average score of 4-5 using validated survey) (12) although there was no significance difference in neighborhood perception between the 2 groups. Caregiver perceived social support scores was high, on average (mean = 85.1(18.5 SD), based on possible score range of 20-100 and did not significantly differ between the two groups. Of note, based on NAEPP guidelines, none of the children enrolled in this study would be considered well-controlled based on eligibility criteria, yet 60.1% of caregivers in the no ICU group and 46.8% of caregivers in the prior ICU group perceived their child's asthma as well controlled, $p=0.074$.

Multivariate Analysis:

As shown in Table 5, after adjustment for all significant predictors of prior ICU admission, the final model included the following contributory factors: Extreme poverty (household income $< \$10,000/\text{year}$) with odds ratio= 2.25 (1.07-4.72), $p=0.032$ and having at least one prescription fill for combination controller therapy in the previous year with odds ratio=2.63 (1.02-6.80), $p=0.046$. Mouse allergen sensitized (+ vs. -) and SABA fills (≥ 4 vs. < 4) were included in the final model; although non-significant at the 0.05 level after adjustment for poverty and controller therapy.

Discussion:

Despite the availability of numerous effective preventive asthma medications, uncontrolled asthma is a common problem, and there is often a disconnect between caregiver perception of child asthma control and level of control assessed by NAEPP guideline criteria (16). ED visits and hospitalizations are the most costly end result of poor asthma control with significant impact on the child, family, healthcare system and society as a whole. Admission to an Intensive Care Unit for asthma is terrifying for the child and family and puts the child at high risk for fatal asthma(6). What was alarming in this cohort of inner city minority children with uncontrolled asthma was the high rate of prior ICU admission (27.9%).

Significant risk factors associated with near-fatal asthma admissions from limited previous publications include: Overuse of short acting beta agonists, underutilization of controller medications, poor recognition of asthma severity, multiple allergen sensitivity and psychosocial factors.(5–8, 17) The current study found a significant association between high short acting beta agonist use (defined as 4 fills for SABA in 1 year) and prior ICU admission. Although prior studies noted that 2 SABA fills in 1 month was associated with near fatal and fatal asthma, only one subject in our study had an equivalent SABA fill rate based on dividing patients' annual number of fills by 12 months. Although psychosocial factors have been suggested to be associated with near fatal and fatal asthma,(18) there are no detailed studies examining specific effects in large cohorts of pediatric patients. In our study, an analysis of caregiver depression scores and caregiver neighborhood perception as well as caregiver perception of social support did not yield any significant differences between ICU and no ICU subjects. Although 97% of our study sample had incomes in a range to qualify for public assistance, children from homes with extreme poverty (<\$10,000/year) were more likely to have had a prior ICU admission. This information supports the need for increased availability of social work services for these high risk children to assist their families with identifying areas of need and referral to available resources to assist them.

It is important for healthcare providers to obtain a history of prior ICU admission at every medical visit and consider screening caregivers of high risk children for depression and refer them to available resources. In addition, this study supports NAEPP guideline recommendations to perform allergy testing for all children with persistent asthma and specific IgE serology for the 10 common allergens used in this study as the test is readily available and not cost-prohibitive. Sensitization to at least one of these common allergens was associated with prior ICU admission and mouse allergen sensitization in particular was the one allergen among the 10 studied that was more common in children with prior ICU admission. In several studies, mouse allergen sensitization has been found to be associated with high asthma-related morbidity.(19–22) Our findings suggest that this may in fact, also be predictive of the potential for increased risk for life threatening or fatal asthma. Performing allergy testing and discussing allergy test results and avoidance recommendations is important for all allergens, but particularly for inner city children with mouse sensitization. Suboptimal prescribing and/or utilization of appropriate NAEPP guideline based controller therapy has been well documented in inner city children with asthma resulting in increased morbidity and mortality in this high risk population.(23–25) The fill rates for controller therapy in our sample were poor, with approximately 28% without any fills for controller therapy in the previous year; although, subjects with at least one prescription fill for combination controller therapy were more than twice as likely to have had a prior ICU admission. We previously reported that higher controller medication fills in our study population were found in subjects with specialty care;(10, 26) however, the low percentage of children with previous ICU admission who had seen a specialist in the past 2 years is very concerning (<20%). The NAEPP guidelines recommend consideration of referral to an asthma specialist for children with uncontrolled asthma(9) and in this particular high risk group it should be strongly considered.

Study limitations:

The results of this study may not be generalizable to all pediatric populations since our subjects were poor, inner city, primarily African American children. However, this is the highest risk population for asthma morbidity and mortality and these results may inform healthcare providers, insurers and public health officials of potentially modifiable factors that can be identified and addressed. The results of this study should be examined in other areas of the country and in other high risk populations.

It is important for providers to query caregivers of children with asthma about previous ED visits and hospitalizations to assess asthma control, but specific questions regarding prior ICU admission should be included as standard asthma history. Testing for allergen sensitization, identification of potential triggers, appropriate use of controller medications, adherence monitoring and referral to an asthma specialist are indicated for all children with uncontrolled asthma, but are of utmost importance for children with prior life-threatening admissions.

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Child and Caregiver Demographic Factors, described in relation to whether child had a prior asthma-related ICU admission.**Table 1.**

Valid % or mean (SD) or median [IQR]	Overall	No Prior ICU Admission	Prior ICU Admission	Unadjusted Odds of prior ICU admission compared to reference cat. ^a
Child Characteristics:	N=222	N=160 (72.1%)	N=62 (27.9%)	OR (95% CI), p-value
Age, mean (SD),	6.4 (2.7)	6.2 (2.6)	6.6 (2.8)	1.05 (0.95-1.18), p=0.341
Age <5 years	31.7%	33.3%	27.4%	0.76 (0.40-1.45), p=0.397
Male	64.8%	64.3%	66.1%	1.08 (0.58-2.01), p=0.802
African-American	93.7%	93.8%	93.5%	0.97 (0.29-3.21), p=0.956
Medicaid Insured	92.8%	91.3%	96.8%	2.88 (0.63-13.05), p=0.171
Allergic rhinitis (yes)	40.5%	43.7%	32.3%	0.61 (0.33-1.14), p=0.122
Food allergy (Yes)	27.3%	24.1%	35.5%	1.74 (0.92-3.28), p=0.089
Atopic Dermatitis (Yes)	57.7%	56.3%	61.3%	1.23 (0.67-2.24), p=0.503
Child has been seen by an asthma specialist in past 2 yrs	20.1%	17.2%	27.4%	1.82 (0.91-3.65), p=0.092
Caregiver survey responses:				
Mother - Caregiver responding to survey	92.3%	93.1%	90.3%	0.69 (0.24-1.95), p=0.483
Age, mean (SD) [range]	31.3 (7.5)	31.3 (7.5)	31.4 (7.8)	1.00 (0.96-1.04), p=0.946
Married	15.6%	15.8%	15.0%	0.94 (0.41-2.16), p=0.886
Education:				
Some high school or less	19.2%	19.1%	19.4%	Reference
High school graduate	40.2%	39.5%	41.9%	1.05 (0.47-2.36), p=0.909
Some college or more	40.6%	41.4%	38.7%	0.92 (0.41-2.09), p=0.848
Employed	55.7%	55.4%	56.5%	1.04 (0.58-1.89), p=0.889
Combined Family Income <\$10,000 for Household ^f	31.4%	26.7%	42.9%	2.06 (1.07-3.96), p=0.030 [*]
Caregiver reports child's asthma well-controlled	56.4%	60.1%	46.8%	0.58 (0.32-1.05), p=0.074

^a Per one unit increase in variables evaluated on continuous scale;^f p<0.05,^g p<0.01; Distributional difference between prior ICU groups assessed for significance using chi-square test for categorical factors, and for continuous variable t-test when distribution normal and Mann-Whitney U test when departures from normality apparent.

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*
>0.05, odds of prior ICU admission significantly differ between groups (per one unit increase in variable for continuous factors)

Child Allergen Sensitization and Environmental Exposures, described in relation to whether child had a prior ICU admission.**Table 2.**

Valid % or mean (SD) or median [IQR]	Overall	No Prior ICU Admission	Prior ICU Admission	Unadjusted Odds of prior ICU admission compared to reference category. ^a
	N=222	N=160 (72.1%)	N=62 (27.9%)	OR (95% CI), p-value
Atopic (sensitization to 1 allergen) [†]	82.6%	79.2%	91.2%	2.74 (1.01-7.45), p=0.049*
Mouse [‡]	54.1%	49.3%	66.1%	2.01 (1.05-3.83), p=0.035*
Cockroach	41.4%	38.3%	49.1%	1.56 (0.84-2.89), p=0.163
Cat	58.5%	58.0%	59.6%	1.07 (0.57-2.00), p=0.835
Dog	60.3%	58.5%	64.9%	1.32 (0.70-2.49), p=0.400
Timothy Grass	44.5%	42.7%	49.1%	1.30 (0.70-2.40), p=0.407
Aspergillus Mold	33.2%	30.9%	38.6%	1.40 (0.74-2.67), p=0.302
Alternaria Mold	37.6%	34.3%	45.6%	1.61 (0.86-3.01), p=0.138
Oak Tree	45.2%	43.0%	50.9%	1.38 (0.74-2.55), p=0.311
Ragweed	37.4%	35.5%	42.1%	1.32 (0.71-2.48), p=0.382
House dust mite	42.0%	39.2%	49.1%	1.50 (0.81-2.78), p=0.199
Number of + skin tests (range 0-10), mean (SD)	4.5 (3.4)	4.2 (3.4)	5.1 (3.3)	1.09 (0.99-1.19), p=0.080
Reported Environmental Exposures				
Mice in Home	48.2%	45.5%	54.8%	1.45 (0.81-2.63), p=0.215
Cockroaches in Home	32.0%	31.2%	33.9%	1.13 (0.60-2.11), p=0.704
Reported Smokers in Home	52.1%	54.1%	46.8%	0.74 (0.41-1.34), p=0.326
Detectable salivary cotinine (1.0 ng/ml)	57.9%	57.6%	58.6%	1.04 (0.56-1.93), p=0.895

^aPer one unit increase in variables evaluated on continuous scale[†]p<0.05,[‡]p<0.01: Distributional difference between prior ICU groups assessed for significance using chi-square test for categorical factors, and for continuous variable t-test when distribution normal and Mann-Whitney U test when departures from normality apparent.

* p<0.05, odds of prior ICU admission significantly differ between groups (per one unit increase in variable for continuous factor)

Table 3:
Patterns of Medication Use, described in relation to whether child had a prior ICU admission

Valid % or mean (SD) or median [IQR]	Overall	No Prior ICU Admission	Prior ICU Admission	Unadjusted Odds of prior ICU admission compared to reference cat. ^a
		N=160 (72.1%)	N=62 (27.9%)	OR (95% CI), p-value
Asthma Medication Fills Past 12 Months:[‡]				
No Controllers	27.9%	30.0%	22.6%	Reference
Monotherapy Controller Therapy	36.5%	40.6%	25.8%	0.84 (0.38-1.89), p=0.681
Combination Controller Therapy	35.6%	29.4%	51.6%	2.33 (1.11-4.92), p=0.026
Asthma Medication Prescription Fills Over 12 months Prior to Study Enrollment-Specific type[‡]				
No Controllers	27.9%	30.0%	22.6%	
Monotherapy- Inhaled Corticosteroid (ICS)	35.6%	40.0%	24.2%	
Monotherapy- Leukotriene Modifier (LTM)	0.9%	0.6%	1.6%	
Combination- ICS+LTM	23.9%	20.6%	32.3%	
Combination- ICS+Long Acting Beta Agonist (LABA)	1.8%	1.9%	1.6%	
Combination- ICS +LABA+LTM	9.9%	6.9%	17.7%	
Rescue Medication Fills				
Short Acting Beta Agonist (SABA) fills, median (IQR) [‡]	2.0 (1.0-4.0)	2.0 (1.0-4.0)	3.0 (1.0-5.0)	----
SABA,% 4 SABA Rx fills [‡]	32.4%	28.1%	43.5%	1.97 (1.07-3.62), p=0.029
Oral Corticosteroid (OCS) fills, median (IQR)	1.0 (0.0-2.0)	1.0 (0.0-2.0)	1.0 (0.0-2.0)	----
OCS % 2 OCS Rx fills	35.1%	33.8%	38.7%	1.24 (0.68-2.28), p=0.488
HEDIS AMR, Mean (SD)	0.45 (0.27)	0.44 (0.28)	0.48 (0.24)	1.05 (0.93-1.17), p=0.447
<0.50	47.7%	48.2%	46.4%	Reference
0.51-0.69	38.1%	37.6%	39.3%	1.09 (0.56-2.13), p=0.811
0.70	14.2%	14.2%	14.3%	1.05 (0.41-2.67), p=0.925

^aPer one unit increase in HEDIS AMR where value multiplied by 10 prior to input in logistic model (e.g. 0.10 transformed to 1.0 and 0.20 transformed to 2.0: a one unit increase on this scale indicates increase in odds with every 0.10 increase in HEDIS AMR)

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χ^2 p<0.05,

p<0.01: Distributional difference between prior ICU groups assessed for significance using chi-square test for categorical factors, and for continuous variable t-test when distribution normal and Mann-Whitney U test when departures from normality apparent.

Table 4:

Caregiver Psychosocial Factors Associated with Child Prior ICU Admission

Valid % or mean (SD) or median [IQR]	Overall	No Prior ICU Admission N=160 (72.1%)	Prior ICU Admission N=62 (27.9%)	Unadjusted Odds of prior ICU admission compared to reference category ^a OR (95% CI), p-value
Depression (CESD) Scale, mean (SD)				
CESD ≥ 16 (Depressive symptomatology)	12.6 (11.1)	12.8 (11.1)	12.0 (11.0)	0.99 (0.97-1.02), p=0.632
	30.5%	32.9%	24.2%	0.65 (0.33-1.27), p=0.208
Neighborhood Perception (1 good to 5 low), mean (SD)				
Neighborhood Perception:	2.9 (0.7)	2.9 (0.8)	3.0 (0.7)	1.08 (0.72-1.60), p=0.721
1 -2 (good perception)	28.0%	28.7%	26.2%	Reference
3 (average perception)	51.4%	50.3%	54.1%	1.18 (0.58-2.37), p=0.652
4-5 (below average perception)	20.6%	21.0%	19.7%	1.02 (0.43-2.45), p=0.960
Social Support Scale, mean (SD)				
	85.1 (18.5)	85.3 (17.6)	84.2 (20.6)	1.00 (0.98-1.01), p=0.675

^aPer one unit increase in variables evaluated on continuous scale^bHigher scores indicate good social support, poorer neighborhood perception, and more depressive symptomatology. Possible Scale Scores: Social Support [20-100], Depression (CESD) [0-60], and mean of neighborhood perception based on average across 4 subscales encompassing a total of 34 items ranges from 1-5.^cp<0.05,^dp<0.01: Distributional difference between prior ICUS groups assessed for significance using chi-square test for categorical factors, and for continuous variable t-test when distribution normal and Mann-Whitney U test when departures from normality apparent.^ep<0.05, odds of prior ICU admission significantly differ between groups (per one unit increase in variable for continuous factor

Odds of prior ICU admission with significant factors in unadjusted model forced into final model.

Table 5:

Valid % or mean (SD) or median [IQR]	Odds of prior ICU admission compared to reference category
	OR (95% CI), p-value
Income (<10 k vs. >=10 k per year)	2.25 (1.07-4.72), p=0.032
Mouse allergen (+ vs. -)	1.89 (0.90-3.97), p=0.093
Controller Therapy:	Reference
No controller therapy	1.28 (0.49-3.37), p=0.612
Monotherapy	2.63 (1.02-6.80), p=0.046
Combination Therapy	1.61 (0.75-3.46), p=0.224
SABA (>=4 vs. <4 in past year)	