Original Article

What Really Happens in the Home: The Medication Environment of Urban, Minority Youth

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What is already known about this topic? Urban minority youth with asthma have a disproportionately high burden of asthma morbidity and mortality.

What does this article add to our knowledge? The home medication environment of our high-risk pediatric cohort reveals lack of proper medications, devices, and a poor inhaler technique.

How does this study impact current management guidelines? This study encourages a frequent objective review of medications available in the home, reinforced inhaler technique training for children and caregivers, and highlights the need for multilevel interventions to help address adherence.

BACKGROUND: Asthma disproportionately affects minority youth. Understanding the home medication environment and its relation to medication adherence can shape interventions to improve health outcomes.

OBJECTIVE: The objective of this study was to describe the asthma medication environment in the homes of urban minority youth and to determine predictors of medication use and technique in this population.

METHODS: Baseline data from 2 cohorts of minority youth with asthma in Chicago were combined for cross-sectional analysis. Bilingual research assistants (RAs) collected data in the home. RAs asked caregivers and children to self-report medications using pictures and observed children's asthma medications and inhaler technique.

RESULTS: The sample contained 175 mainly Latino youth (85.6%) ranging from 5 to 18 years old. Most were on public insurance (80%) and had uncontrolled asthma by self-report (89.7%). Only 27.4% had a spacer, 74.9% had a quick relief medicine, and 48.6% had any controller medicine. RA observations of controllers agreed with children (36%) and parental self-report (42.3%) but did not match the specific observed controllers. Children reported less parental help with medications (43%) than their parents (58.1%). One child was able to properly demonstrate 100% of the inhaler steps and 35.6% achieved >70% of inhaler steps. A better medication technique was associated with having a controller ($b = 12.2$, SE = 3.0, $P < .0001$), quick reliever ($b = 8.05$, SE = 3.5, $P = .023$), and a spacer ($b = 9.3$, SE = 3.54, $P = .009$).

CONCLUSIONS: This rigorous evaluation of the home medication environment of high-risk youth demonstrated that many families lack critical medications, devices, and a technique for proper management of asthma. © 2016 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2016;■:■-■)

Key words: *Asthma; Pediatric; Health disparities; Inhaler technique; Cultural competency; Latino; Puerto Rican*

The burden of asthma is significant, with the national prevalence in 2010 reaching 8.5% of the US population.[1] This burden is not borne equally. African American and Puerto Rican children suffer disproportionately higher asthma prevalence and morbidity.[2] These disparities are salient in Chicago where nearly one-third of children with asthma reported having a life-threatening exacerbation and over half have sought emergency care.[3,4]

The Expert Panel Report 3 (EPR-3) guidelines site 4 components key to asthma management including pharmacologic therapy.[5] Medication nonadherence to inhaled corticosteroid therapy is common[6-10] and is linked to increased risk of asthma exacerbations.[11-15] Nonadherence is more likely to be seen in non-white populations.[11,16]

Interventions to improve medication adherence have mixed results.[17-28] Those studies that reported improvement in adherence were in small sample sizes using self-reported adherence that has been demonstrated to over-report actual medication

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Abbreviations used
BMI- Body mass index
CURA- Community United to Challenge Asthma
CURA 2- Community United to Raise Awareness: Asthma and Active Living
DPI- Dried powdered inhaler
EPR-3- Expert Panel Report 3
HFA- Hydrofluoroalkane inhaler
MDI- Metered dose inhaler
NHLBI- National Heart, Lung, and Blood Institute
RA- Research assistant

usage.[9,29-31] An improper inhaler technique is also common[32] and associated with severe asthma and exacerbations.[33] Interventions such as "Teach to Goal" have been successful in improving the inhaler technique,[34-37] but most of these have not been tested in children.

Clinicians currently rely on patients and their families to provide the medication usage information that informs their clinical decision making. The many layers of nonadherence[38] make it difficult for clinicians to determine where the breakdown in this process may be occurring. For this reason, we focused this analysis on defining the home medication environment in our predominantly Latino cohort of children and adolescents in Chicago. Our aims were to determine the accuracy of child and caregiver medication recall by comparing caregiver and child self-report to observation of medications in the home, to assess the actual medication technique, and to measure medication adherence.

METHODS

Design

A cross-sectional analysis of baseline data from 2 asthma intervention studies was performed. The original cohort, the Community United to Challenge Asthma (CURA, Clinical Trials ID NCT01065883 and NCT01061424), was a randomized controlled trial in Puerto Rican youth.[39-42] CURA recruited 51 elementary and 50 high school participants from December 2009 to January 2011.[39] Participants were between 5 and 18 years old, self-identified as Puerto Rican, and had uncontrolled and/or persistent asthma over the past year.[5,39] The second cohort, Community United to Raise Awareness: Asthma and Active Living (CURA 2), was a follow-up study for children with both asthma and obesity. Seventy-seven children were recruited from November 2011 to December 2013. The inclusion criteria were children between 5 and 12 years old, physician diagnosis of asthma, and body mass index (BMI) $\geq$85% predicted for age. Only one child per family could participate. Caregivers and children provided written informed consent and assent (when able). Institutional review board approval was obtained from Rush University Medical Center.

Measures

All data were collected by bilingual research assistants (RAs) in patient homes. Assessments were orally administered with the exception of the paper-and-pencil-based depression screening instrument.

Asthma medications. The RAs first showed caregivers color pictures of all the inhaled asthma medicines, prednisone, prednisolone, montelukast, and a nebulizer, and then asked what medications the child had used in the past 4 weeks. The child was shown the same pictures and asked the same question separately. Then the RAs asked to see all of the child's asthma medications. All nonexpired medications were recorded. We intended to measure adherence using electronic medication monitors (Doser CT, MediTrack, Inc., South Easton, Mass) based on the dosage prescribed by the children's provider; however, almost no participants had medication boxes or prescription labels indicating the prescribed dosing regimen. For metered dose inhalers (MDIs), electronic medication monitors were placed on the inhalers to document the number of times the inhaler was actuated daily and this was recorded, but no further calculations will be reported secondary to the uncertainty of the intended dose.[31]

Asthma medication technique. Children were asked to show exactly how they use their inhalers using their own inhaler or a demonstrator inhaler. Children with multiple devices were asked to demonstrate the technique for each. The 8 steps for determining the technique were composed of clinical guidelines[5] and experts in the field through the literature because no standard protocol exists.[43,44] RAs watched the children use the inhaler and marked whether they performed each of the 8 steps accurately. They received a point for each step they completed correctly, and 0 points for incorrect steps. We then calculated the percent correct of 8 steps. We also generated a variable called "better medication technique" that dichotomized the technique as correctly demonstrating 6 or more of the 8 steps (or greater than or equal to 75%).

Asthma control. The CURA cohort reported the Asthma Therapy Assessment Questionnaire where a score of 1 or greater indicated poor control over the past 4 weeks and a score of 0 indicated well-controlled asthma.[45] The CURA 2 cohort utilized the Childhood Asthma Control Test where scores of 19 or less indicated poor control over the past 4 weeks.[46] Asthma control was also assessed using the National Heart, Lung, and Blood Institute (NHLBI). EPR-3 guidelines clinical control cut points regarding daytime symptoms, nighttime symptoms, short-acting β_2-agonists, and missed activities.[5,47] "Not well controlled" in any of these categories caused the individual to be labeled as uncontrolled over the past 4 weeks. Participants were coded as uncontrolled if they indicated lack of control on any of the NHLBI control symptoms,[5] or reported emergency room visits, hospitalizations, or prednisone use over the past 12 months.

Other variables. Caregivers completed an acculturation scale.[48] Caregiver depressive symptoms were assessed using the Patient Health Questionnaire 9.[49-53] Child height and weight were measured by RAs and BMI was calculated using the Center for Disease Control and Prevention age- and sex-specific growth charts. In children, a BMI less than 85% was considered normal, greater than or equal to 85% but less than 95% was considered overweight, and 95% or greater was obese.

Analysis

Descriptive statistics were run for both continuous and categorical variables. Distributions of continuous variables were checked to assess normality. No transformations of the data were needed. Three participants were in both cohorts; their data from the second cohort (CURA 2) were dropped from the combined dataset.

Descriptive statistics were run by a cohort producing means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Correlations were run to check relationships between acculturation and the asthma medication