

Characteristics of Pediatric Emergency Revisits After an Asthma-Related Hospitalization



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Study objective: We identify and characterize factors related to subsequent emergency revisits among children hospitalized for asthma.

Methods: This population-based, prospective, observational cohort included children aged 2 to 16 years, hospitalized for asthma at an urban pediatric facility and followed for greater than or equal to 12 months. The primary outcome was asthma-related emergency revisit within 12 months of discharge. Revisits were identified by billing codes, respiratory chief complaints, and medications administered (eg, albuterol, systemic corticosteroids), dispensed, or prescribed. Predictors and covariates include demographic, socioeconomic, access, and environmental exposure variables collected during index admission. Multivariable logistic regression was used to evaluate the association between predictors and odds of asthma-related revisit.

Results: A total of 671 children were enrolled; the majority were boys (65%), aged 4 to 11 years (59%), black (59%), and publicly insured (73%). There were 274 patients (41%) who were treated for asthma-related emergency revisits within 12 months of the index admission. In adjusted models, younger children, black children, children with excellent reported access to primary care, and children with a history of inhaled steroids were more likely to experience emergency revisits. Low income, detectable cotinine levels, and traffic exposure did not independently predict revisit.

Conclusion: Asthma-related emergency revisit is common after hospitalization, with more than 40% of children returning within 12 months. Socioeconomic and exposure-related risk factors typically predictive of asthma morbidity were not independently associated with emergency revisit among children in this cohort. [Ann Emerg Med. 2017;70:277-287.]

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INTRODUCTION

Asthma is the most common chronic disease in pediatrics, affecting approximately 7 million children in the United States.¹ Annually, there are 670,000 emergency department (ED) visits for acute asthma exacerbations for children nationally.² Reasons for asthma-related ED utilization vary, but children more frequently present to the ED rather than to a primary care provider because of partly controlled or uncontrolled asthma,^{3,4} caregiver perception of acute severity,⁵ or lack of access to a medical home.⁶ Moreover, returning to the ED has been shown to be common after an initial emergency visit for an acute asthma exacerbation.^{7,8} In fact, asthma is the most common diagnosis for patients with greater than or equal to 4 emergency visits in a 12-month span.⁹ As many as 37% of children return to the ED within 6 months of their initial ED visit.^{10,11}

Children of minority race and those with public insurance, history of asthma-related ED visit or hospitalization, and suboptimal asthma control are more likely to visit (and revisit) the ED.¹²⁻¹⁹ However, many studies describing risks related to ED utilization and reutilization have minimal patient-level data beyond these basic factors, elements that may aid in the discovery of modifiable ways to reduce asthma morbidity.²⁰⁻²³ Detailed patient-level predictors, including environmental exposures to tobacco²⁴ or traffic,²⁵ access to primary care,²⁶ and specific financial and social hardships,²⁷ have been shown to affect a patient's risk of asthma-related rehospitalization after an index hospitalization. The effect of these measures on ED revisit after hospitalization is less clear. Additionally, all patients with ED visits do not have equally urgent symptoms; some could be categorized as truly urgent and

Editor's Capsule Summary*What is already known on this topic*

Most studies examining emergency department (ED) utilization for asthma are retrospective and do not have patient-level and environmental data.

What question this study addressed

What factors are associated with ED and urgent care utilization after an asthma hospitalization?

What this study adds to our knowledge

In this study of 671 children, socioeconomic status, access to primary care, and exposure-related risk factors typically predictive of asthma morbidity were not associated with ED revisit utilization.

How this is relevant to clinical practice

ED visits for asthma after hospitalization are common and may be related to severity of disease.

others nonurgent.²⁸ Traditional methods for identifying revisits (such as with *International Classification of Diseases, Ninth Revision [ICD-9]/ICD-10* codes) do not yield insight into this severity of illness on presentation.

Thus, we first sought to characterize specific patient-level characteristics, including environmental exposures, access to care, and hardships, with risk of subsequent emergency revisits among children with an asthma-related index hospitalization. Second, we sought to describe the type of asthma-related revisit (ie, acute exacerbation versus nonacute asthma related). Finally, given well-documented disparities by race (higher ED utilization by black children), we examined racial differences in frequency of emergency revisits and severity at presentation.

MATERIALS AND METHODS**Study Design and Selection of Participants**

The Greater Cincinnati Asthma Risk Study (GCARS) is a prospective population-based cohort study of children hospitalized for asthma and receiving oral steroids and β -agonists at Cincinnati Children's Hospital Medical Center (CCHMC) between August 2010 and October 2011.²⁷ For children aged 2 to 16 years, we evaluated emergency revisits subsequent to the index admission occurring during the following 12 months. Although GCARS enrolled children aged 1 to 2 years, we included in these analyses only patients older than 2 years to exclude any potential patients with bronchiolitis or nonasthma viral wheeze. Children were excluded from GCARS if the

inpatient physician thought a diagnosis other than asthma was more likely and removed them from the asthma clinical pathway. Children were also excluded if they had significant nonasthma respiratory or cardiovascular disease (eg, cystic fibrosis, congenital heart disease), if they resided outside of CCHMC's 8-county primary service area, or if their primary caregiver did not understand written or spoken English ($\approx 2\%$ of study sample). Further details on GCARS enrollment have been previously published.²⁷ GCARS was approved by the CCHMC institutional review board.

Setting

CCHMC is a tertiary care academic medical center with greater than or equal to 140,000 annual emergency visits to the ED and urgent care sites combined. The locations at which patients may seek emergency care include an urban ED, a suburban ED, and 5 urgent care sites; all sites share a single electronic health record. Initial treatment for asthma at all 7 locations is protocolized and aligned with National Heart, Lung, and Blood Institute recommendations.²⁰ Urgent care patients who require additional treatment are transferred to one of the 2 ED locations for continued outpatient care or admitted to CCHMC for inpatient care.

Outcome Measures

The primary outcome was any asthma-related emergency revisit (to any of the 7 locations) within 12 months of the patient's index hospitalization. Emergency revisits were included in the outcome if the patient was readmitted or discharged home. Revisits were classified as acute exacerbations or nonacute asthma-related revisits (defined below). We chose a period of 12 months because of the chronicity of asthma, as well as its seasonal variation. Therefore, all patients were at risk for an emergency revisit for an entire year (across all seasons). For patients with multiple asthma-related revisits, the first one was included in this analysis. Secondary outcomes included severity of illness on emergency revisit presentation and the total number of asthma-related emergency visits.

Revisit data were obtained through a review of the electronic medical record. We examined revisits to determine whether they were asthma related and whether they were acute or nonacute. Revisits with any of the following were examined: *ICD-9* code for asthma (493.XX) or wheeze (786.07), respiratory chief complaint, an albuterol order (administered, dispensed, or prescribed), or an order for systemic corticosteroids (administered or prescribed). We defined asthma-related emergency revisits (primary outcome) as those in which medications for asthma (either albuterol or systemic corticosteroids) were administered during the revisit or prescribed at discharge.

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