

Children and Adults With Frequent Hospitalizations for Asthma Exacerbation, 2012-2013: A Multicenter Observational Study

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What is already known about this topic? Earlier studies reported that many patients were frequently hospitalized for asthma exacerbation. Surprisingly, there have been no recent multicenter studies to characterize this patient population with high morbidity and health care utilization.

What does this article add to our knowledge? This multicenter study demonstrated that approximately 40% of the patients had frequent hospitalizations for asthma exacerbations; many of these patients did not receive guideline-recommended long-term controller medications or an evaluation by an asthma specialist.

How does this study impact current management guidelines? Our data call for new integrated strategies to prevent asthma hospitalizations, particularly in patients already hospitalized for asthma. Prevention of asthma hospitalizations remains a national priority for health policy and community action.

BACKGROUND: Earlier studies reported that many patients were frequently hospitalized for asthma exacerbation. However, there have been no recent multicenter studies to characterize this patient population with high morbidity and health care utilization.

OBJECTIVE: To examine the proportion and characteristics of children and adults with frequent hospitalizations for asthma exacerbation.

METHODS: A multicenter chart review study of patients aged 2 to 54 years who were hospitalized for asthma exacerbation at 1 of 25 hospitals across 18 US states during the period 2012 to 2013 was carried out. The primary outcome was frequency of hospitalizations for asthma exacerbation in the past year (including the index hospitalization).

RESULTS: The cohort included 369 children (aged 2-17 years) and 555 adults (aged 18-54 years) hospitalized for asthma

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Conflicts of interest: S. A. Nonas has received research support from the National Institutes of Health-National Heart, Lung, and Blood Institute (K08 grant, HL089178). S. Gabriel is employed by Novartis Pharmaceuticals Corporation. V. Herrera is employed by, and owns stock/stock options in Novartis Pharmaceuticals Corporation. C. A. Camargo Jr has received research support from Novartis and has received consultancy fees for asthma-related consultation from Glaxo-SmithKline, Meck, Novartis, and Teva. The rest of the authors declare that they have no relevant conflicts of interest.

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Abbreviations usedED- emergency department
ICS- inhaled corticosteroids

exacerbation. Over the 12-month period, 36% of the children and 42% of the adults had 2 or more (frequent) hospitalizations for asthma exacerbation. Among patients with frequent hospitalizations, guideline-recommended outpatient management was suboptimal. For example, among adults, 32% were not on inhaled corticosteroids at the time of index hospitalization and 75% had no evidence of a previous evaluation by an asthma specialist. At hospital discharge, among adults with frequent hospitalizations who had used no controller medications previously, 37% were not prescribed inhaled corticosteroids. Likewise, during a 3-month post-discharge period, 64% of the adults with frequent hospitalizations were not referred to an asthma specialist. Although the proportion of patients who did not receive these guideline-recommended outpatient care appeared higher in adults, these preventive measures were still underutilized in children; for example, 38% of the children with frequent hospitalizations were not referred to asthma specialist after the index hospitalization.

CONCLUSIONS: This multicenter study of US patients hospitalized with asthma exacerbation demonstrated a disturbingly high proportion of patients with frequent hospitalizations and ongoing evidence of suboptimal longitudinal asthma care. © 2015 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2015;3:751-8)

Key words: Asthma; Hospitalization; Inhaled corticosteroids; Asthma specialist; Multicenter study

Asthma is an important public health problem in the United States, affecting 26 million Americans in 2011.¹ Although several cost-effective preventive measures are available,² asthma exacerbation continues to account for a substantial proportion of this burden.³ Indeed, there were 372,000 asthma-related hospitalizations in 2012, with an estimated direct cost of more than \$2 billion annually.⁴ Hospitalizations for asthma exacerbation provide a unique perspective of asthma morbidity—a failure of longitudinal prevention-oriented management—because asthma exacerbation is theoretically preventable through high-quality preventive care.^{5,6}

To develop and implement preventive strategies effectively, it is critical to characterize patients at the highest risk—for example, patients with frequent hospitalizations for asthma exacerbations. In a previous multicenter study in the period 1999 to 2000 (University HealthSystem Consortium Asthma Clinical Benchmarking Project),⁷ we found that most children (53%) and adults (61%) hospitalized for asthma exacerbation had 2 or more (frequent) hospitalizations for asthma over a 12-month period. In more recent years, studies of inpatient children reported that 15% to 22% had frequent hospitalizations for asthma exacerbation.⁸⁻¹⁰ The apparent decline in the proportion of patients with frequent hospitalizations is promising. However, these recent studies were conducted within selected populations (eg, pediatric patients in a single academic center or in a single state);

therefore, the generalizability of their inferences is potentially limited. Despite the public health importance, there are no published multicenter efforts that comprehensively characterize this patient population with high morbidity and health care utilization.

In this context, to characterize patients with frequent hospitalizations for asthma exacerbation in the United States, we conducted a 25-center observational study of children and adults hospitalized for asthma exacerbation.

METHODS

Study design and setting

We performed a multicenter chart review study to characterize children and adults hospitalized for asthma exacerbation, as part of the Multicenter Airway Research Collaboration. This study, called Multicenter Airway Research Collaboration-37 Investigators, was coordinated by the Emergency Medicine Network, a collaboration with 234 participating hospitals.⁸ We recruited hospitals by primarily inviting sites that had participated in the University HealthSystem Consortium Asthma Clinical Benchmarking Project that evaluated patients hospitalized for asthma exacerbation during the period 1999 to 2000.¹¹⁻¹³ A total of 25 hospitals across 18 US states completed the current Multicenter Airway Research Collaboration-37 Investigators study (see [Table E1](#) and [Figure E1](#) in this article's Online Repository at www.jaci-inpractice.org). All patients were managed at the discretion of the treating physician. The institutional review board of each participating center approved the study.

Selection of participants

Using the *International Classification of Diseases, Ninth Revision, Clinical Modification* code 493.xx,⁹ each hospital identified all visits with a principal hospital discharge diagnosis of asthma during a 12-month period, between January 1, 2012, and December 31, 2013 (ie, each site used a 24-month window from which to select the 12-month study period). Inclusion criteria were hospitalizations for patients aged 2 to 54 years and a history of physician-diagnosed asthma before the index hospitalization. We excluded 1) hospitalizations for patients with a history of physician-diagnosed chronic obstructive pulmonary disease or cystic fibrosis; 2) transfer hospitalizations; 3) hospitalizations not prompted largely by asthma exacerbation, in the judgment of the site principal investigator (board-certified allergist/immunologist, pulmonologist, pediatrician, and/or emergency physician); and 4) repeat hospitalizations during the 12-month study period by the same individual. In the case of repeat hospitalizations, we included only the first randomly sampled hospitalization and defined it as the index hospitalization. We used this method to avoid systematic retention of the earlier (or later) hospitalization during the 12-month period that would result in overrepresentation of hospitalizations that occurred earlier (or later) in the 12-month period. These criteria were the same as in our earlier research on this topic.¹¹⁻¹³

Methods of measurement

Onsite chart abstractors reviewed 40 hospitalization medical records randomly selected by the Emergency Medicine Network Coordinating Center at Massachusetts General Hospital. All abstractors were trained with a 1-hour online lecture, followed by the completion of 2 practice medical records, which were evaluated with a "criterion standard." If a reviewer's accuracy was less than 80% per medical record, the reviewer was retrained.

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