



Editorial

High-risk asthma

Never give up



The burden of asthma in the United States remains high. A 2018 report states that 38.4% of children and 50% of adults with asthma report their asthma as uncontrolled as defined by the Expert Panel Report 3 guidelines according to the Centers for Disease Control and Prevention.¹ As of 2013, the cost of asthma in the United States was \$50.1 billion per year in direct medical costs and \$3.8 billion per year in loss of productivity.²

In the April issue of the journal, Bollinger et al³ examine the characteristics of underserved minority children with prior intensive care unit (ICU) admissions for asthma from a subanalysis of baseline data on 222 participants enrolled in an ongoing randomized controlled trial testing the effectiveness of emergency department (ED) and home-based environmental control interventions for children with frequent ED visits for asthma. They compared characteristics between participants with and without a prior history of an ICU admission. They concluded that children with a history of ICU admissions were twice as likely to live in extreme poverty, demonstrate atopy (particularly to mouse allergen), use combination controller therapy, and overuse albuterol.

The investigators recommended that practitioners query caregivers of children with asthma about previous ICU stays, ED visits, and hospitalizations to assess asthma control. In addition, 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 medication, adherence monitoring, and referral to an asthma specialist are also indicated for all children with uncontrolled asthma but are essential for children with prior life-threatening admissions.

This is an important retrospective evaluation of a population of patients at risk for a future life-threatening exacerbation. The observations bring to mind a 1985 report by the late Robert Strunk and colleagues at National Jewish Health that examined asthma mortality in a group of children who received prolonged residential care for their severe asthma.⁴ The children who died of asthma after discharge were more likely to be symptomatic at discharge, to not perceive symptoms well, to have depressive symptoms, to have a significant change in their prednisone dose before discharge, to be using inhaled steroids, and to have specific family characteristics. This study was a turning point in asthma management because it

prompted the development of a National Heart, Lung, and Blood Institute task force on asthma mortality, followed by the first US guidelines for the diagnosis and management of asthma, and subsequently a large commitment to National Institutes of Health research to improve the management of asthma.

The study by Bollinger et al³ is retrospective in nature with expected limitations in the amount of information available about current asthma control. However, the population evaluated by Bollinger and colleagues³ is at high risk based on several articles that reported increased risk of asthma mortality across the world, including in minority populations and those with low socioeconomic disadvantage, atopy, psychosocial concerns, and smoke exposure. In addition, children seen in the ICU are more likely to be readmitted to the hospital for asthma and to the ICU for asthma than children not seen in the ICU.⁵ Unfortunately, the low rate of specialty care for asthma in the population described in this article is consistent with previous studies of populations with similar demographics.⁶

The finding that children at high risk for asthma morbidity and mortality have improved asthma outcomes at decreased costs when seen by an asthma specialist led to the national guideline recommendation that children with poor asthma control should be seen by an asthma specialist.⁷ The asthma specialist faced with these challenging patients would seek to know more about the patient's past and current pulmonary function. Continued loss of pulmonary function over time would be an indicator of asthma progression, along with the number of prednisone courses and escalation of therapy. In addition, an assessment of relevant biomarkers, such as blood eosinophils, serum IgE level, sensitization to aeroallergens, and exhaled nitric oxide, would be helpful in assessing control and allergic airway inflammation and may be useful in predicting future asthma exacerbations.⁸ An assessment of the caregiver's understanding of asthma and medication adherence, based on pharmacy refills, would be important. Practitioners should also screen for social determinants of health and barriers to asthma care, such as transportation, medical insurance and access to care, food insecurity, and housing, that affect medical management.

On the basis of the clinical findings and screening results with at risk patients, treatment after an ICU visit should include a confirmation of the asthma diagnosis, treatment adjustments, adherence evaluation, asthma education, and assessment of the home and school environment combined with an evaluation of allergic sensitization. The Global Initiative for Asthma recently published a pocket guide for the diagnosis and management of difficult to treat asthma.⁹ The pocket guide provides important guidance on the medical workup and the management steps to consider for biologic

Disclosures: Dr Szeffler reported receiving payments to his institution from Aerocrine, AstraZeneca, Boehringer Ingelheim, Daiichi-Sankyo, GlaxoSmithKline, Genentech, Novartis, Propeller Health, Regeneron, and Sanofi and has received research support from GlaxoSmithKline. No other disclosures were reported.

Funding Sources: None.

<https://doi.org/10.1016/j.anai.2019.03.013>

1081-1206/© 2019 American College of Allergy, Asthma & Immunology. Published by Elsevier Inc. All rights reserved.

therapy. The choice of biologics is limited by the age of the patient based on approval status, the ability of the patient to attend the necessary visits for biologic administration, and the baseline level of adherence. This topic of cost-effectiveness of biologics was recently reviewed by Anderson and Szeffler.¹⁰ Of interest, a report by Hendeles et al¹¹ noted that omalizumab could be effective in a population of patients who were not adherent to their baseline medications. With the continuing introduction of potential new biologics, the ability to treat patients with severe and exacerbation-prone asthma is promising; however, the cost of these medications can also be prohibitive, necessitating optimal medical management before starting this form of treatment. Specialist treatment plans should also include information about resources for factors identified by the social determinants of health evaluation. Engaging the school and performing asthma home visits may be useful in ensuring that barriers are addressed and medications are administered appropriately at the correct time with the correct technique.

Monica J. Federico, MD
 Stanley J. Szeffler, MD
Breathing Institute
Children's Hospital Colorado
Department of Pediatrics
Section of Pediatric Pulmonary and Sleep Medicine
University of Colorado School of Medicine
 Aurora, Colorado
Stanley.Szeffler@childrenscolorado.org

References

- Centers for Disease Control and Prevention. Asthma Stats. Uncontrolled Asthma Among Persons With Current Asthma. https://www.cdc.gov/asthma/asthma_stats/uncontrolled_asthma.htm. Accessed March 7, 2019.
- Centers for Disease Control and Prevention. *Asthma Facts: CDC's National Asthma Control Program Grantees*; Updated July 2013. https://www.cdc.gov/asthma/pdfs/asthma_facts_program_grantees.pdf. Accessed December 31, 2018.
- Bollinger ME, Butz A, Tsoukleris M, Lewis-Land C, Mudd S, Morpew T. Characteristics of inner city children with life-threatening asthma. *Ann Allergy Asthma Immunol*. 2019;122:381–386.
- Strunk RC, Mrzake DA, Wolfson Fuhrmann GS, LaBrecque JF. Physiologic and psychological characteristics associated with deaths due to asthma in childhood: a case controlled study. *JAMA*. 1985;254:1193–1198.
- Tse SM, Samson C. Time to asthma-related readmission in children admitted to the ICU for Asthma. *Pediatr Crit Care Med*. 2017;18:1099–1105.
- Warman KL, Silver EJ. Are inner-city children with asthma receiving specialty care as recommended in national asthma guidelines? *J Asthma*. 2018;55:517–524.
- Bartter T, Pratter MR. Asthma: better outcomes at lower cost? the role of the expert in the care system. *Chest*. 1996;110:1589–1596.
- Hoch HE, Calatroni A, West JB, et al. Can we predict fall asthma exacerbations? validation of the seasonal asthma exacerbation index. *J Allergy Clin Immunol*. 2017;140:1130–1137.
- Global Initiative for Asthma. Difficult-to-Treat and Severe Asthma in Adolescents and Adult Patients: A GINA Pocket Guide for Health Professionals. November 2018. <https://ginasthma.org/severeasthma2018/>. Accessed February 16, 2019.
- Anderson III WC, Szeffler SJ. Cost-effectiveness and comparative effectiveness of biologic therapy for asthma: to biologic or not to biologic? [published online January 28, 2019] *Ann Allergy Asthma Immunol* <https://doi.org/10.1016/j.anai.2019.01.018>.
- Hendeles L, Khan YR, Shuster JJ, Chesrown SE, Abu-Hasan M. Omalizumab therapy for asthma patients with poor adherence to inhaled corticosteroid therapy. *Ann Allergy Asthma Immunol*. 2015;114:58–62.