Pediatric Insights

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An Update from the Division of Pulmonary Medicine, Allergy, and Immunology

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Affiliated with the University of Pittsburgh School of Medicine and ranked among the nation's best children's hospitals by *U.S. News & World Report*.

Children's Hospital of Pittsburgh of UPMC

Case Report: A Difficult-to-Treat Case of Asthma

Jeremy Landeo-Gutierrez, MD

Fellow, Division of Pulmonary Medicine, Allergy, and Immunology

Introduction

W.P. was first evaluated in our Pediatric Severe Asthma Clinic at age 13. He had a history of asthma, diagnosed when he was 7 years old, as well as eczema and allergic rhinitis. At the time of diagnosis, he had one to two asthma exacerbations per year, which were treated successfully with oral steroids as an outpatient, and he was well controlled on low-dose inhaled steroids (fluticasone 44 mcg, 2 puffs twice a day). However, his symptoms worsened progressively, and during the year prior to his presentation he had eight asthma exacerbations, two of them requiring admission to the inpatient unit and two to the intensive care unit. His known triggers were viral infections, exposure to tobacco smoke, exposure to dogs, and "shrimp smell." He also had developed exercise intolerance, even when just walking upstairs.

The Pediatric Severe Asthma Clinic at Children's Hospital of Pittsburgh of UPMC provides a dedicated space for pediatric patients with severe or difficult-to-treat asthma, taking a multidisciplinary approach that includes evaluation and management by a pediatric pulmonologist and a pediatric allergist. Our team's multifaceted evaluation and treatment of W.P.'s asthma was as follows.

Asthma

During his initial evaluation, pulmonary function testing showed a significant response to bronchodilators, with a 16 percent increase in FEV1. He also was found to have an increased exhaled nitric oxide at 22 ppb. Based on his history and these findings, his asthma therapy was stepped up to fluticasone 110 mcg, 2 puffs twice a day, and montelukast was added. In spite of this change, W.P. continued to have recurrent exacerbations. During his subsequent admissions, it was evidenced that he had poor compliance with his medications, and this was thoroughly addressed at each opportunity. Subsequently, his fluticasone dose was increased to 220 mcg, 2 puffs twice a day. Over the following months he was seen in the ED three times, and admitted on five occasions.

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At age 14, he was switched to a long-acting beta agonist and corticosteroid (fluticasone/salmeterol 115/21 mcg, 2 puffs twice a day). Control was still not achieved with this increase, and after two months his dose had to be increased to 230/21 mcg, 2 puffs twice a day. Over the next eight months, he had seven more admissions for asthma exacerbations including one admission to the intensive care unit.

By age 15, treatment with omalizumab was discussed and planned. However, insurance approval was challenging and denials had to be appealed on multiple occasions. Meanwhile, he was given a trial of intramuscular triamcinolone followed by chronic oral corticosteroids. This regimen decreased his ED visits and admissions for asthma exacerbations significantly (three admissions over the course of 10 months). Endocrinology was involved in his case for monitoring of possible adrenal insufficiency and other complications secondary to prolonged steroid use.

After diligent efforts by the Severe Asthma Clinic team, omalizumab was approved by W.P.'s insurance, and he received it shortly before his 16th birthday. After this intervention, his symptoms improved drastically, and he was able to be weaned off steroids within five months.

Allergy/Immunology

W.P. had a strong history of asthma symptoms triggered by smelling shrimp. Allergy testing was positive for high total IgE and increased IgE specific for shrimp, strawberries, dogs, cats, oak tree, white oak, June grass, short ragweed, and dust mite. Based on his poor response to traditional asthma therapies, less common causes for recurrent wheezing were investigated, such as Churg-Strauss syndrome and allergic bronchopulmonary aspergillosis. CBC, ANCA titers, and a chest CT were obtained, all of which were within normal limits. Avoidance of known allergens was emphasized in order to achieve better control of his atopy symptoms.

Obesity

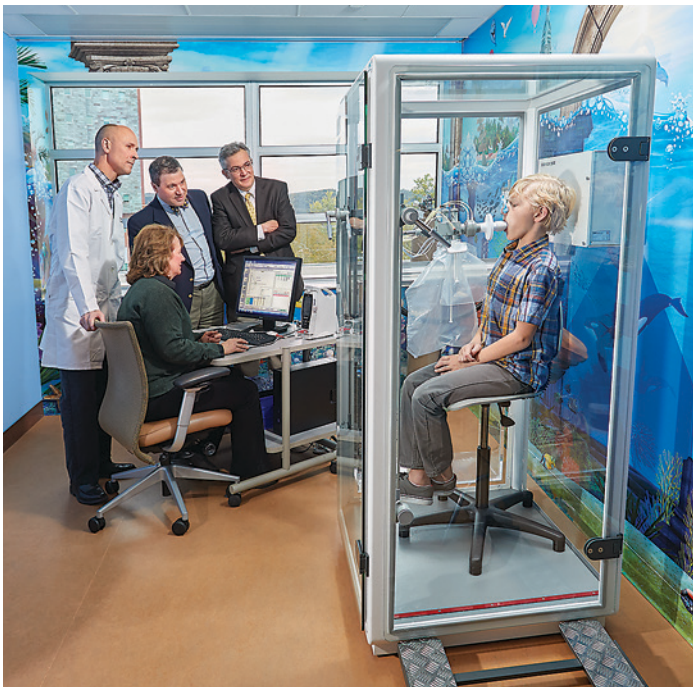
Upon his initial visit, he was found to be morbidly obese (BMI: 99th percentile), therefore, weight management and exercise were strongly encouraged. However, his uncontrolled asthma confined him to a sedentary lifestyle due to his significantly impaired exercise tolerance. In addition, his morbid obesity was likely an important contributing factor in his asthma symptoms. Based on persistent PFT findings consisting of a normal FVC with low FEV1 and low FEV1/FVC ratio, it was postulated that he may have dysanaptic alveolar growth compared to his airways. Once his asthma symptoms were controlled with the plan outlined above, he was able to engage in physical activities and was able to lose weight.

Socioeconomic

Early on in his course, lack of compliance was detected as a major challenge to control his asthma symptoms. Our team continued to stress the importance of medication compliance with each hospitalization and looked for possible limitations contributing to the issue. Refilling and picking up medications was identified as a barrier for adherence to treatment, so the pulmonology team, in coordination with the hospital outpatient pharmacy, arranged to send medications directly to W.P.'s home free of charge. Social work aided with transportation difficulties. Nevertheless, we continued to detect noncompliance, and W.P. persisted with recurrent asthma attacks that required hospitalizations in addition to missed outpatient appointments. A multidisciplinary effort involving the asthma team, child advocacy, and social work filed a report to Child Protection Services due to noncompliance and significant burden in W.P.'s life. Additionally, the Severe Asthma Clinic team advocated for months to get omalizumab covered for W.P., appealing several denials until the medication was finally approved.

Outcome

Within the first month of starting omalizumab, W.P. had a dramatic improvement in his symptoms. He began tolerating outdoor activities and exercise; he is now exercising five times a week and running up to three miles per day, and has restarted playing football in school. He denies recurrence of cough, shortness of breath, and chest tightness. Four months after starting omalizumab, he had lost almost nine pounds, he was no longer in need of albuterol, and he was weaned off of oral corticosteroids. He has continued to follow up with our team and has not had an ED visit or hospitalization for asthma in months. As presented, W.P. had severe asthma with a number of contributing medical and socioeconomic factors that were barriers to control of his disease. The comprehensive and personalized multidisciplinary care provided by our Pediatric Severe Asthma Clinic team has dramatically improved his asthma symptoms, lung function, and overall quality of life.



Doctors Mark Dovey, Daniel Weiner, and Juan Celedón, along with respiratory therapist Maria Lattanzi conduct a patient assessment in the pulmonary function testing laboratory.

Welcoming New Faculty Members

Franziska Rosser, MD, MPH, joined the division in June 2017. After graduating from the University of South Alabama College of Medicine, Dr. Rosser completed a residency in pediatrics at Greenville Hospital in Greenville, South Carolina, and a fellowship in Pediatric Pulmonary Medicine with the division at Children's Hospital of Pittsburgh of UPMC. She then joined the faculty of National Jewish Health in Denver, Colorado, before returning to Children's. Dr. Rosser is a member of the Pediatric Asthma Center, where she will continue her research on air pollution and asthma.

Mark Dovey, MD, joined the division in March 2017. Dr. Dovey obtained his medical degree from Duke University, and completed a residency in pediatrics at Johns Hopkins University and a fellowship in Pediatric Pulmonology at Boston Children's Hospital. Following completion of his training, Dr. Dovey has had a distinguished career as a clinician, educator, administrator, and leader in pediatric pulmonary medicine, most recently serving as vice-chair of Pediatric Clinical Services at Boston Medical Center and Boston University. Dr. Dovey currently serves as the clinical director for our division.

About the Pediatric Asthma Center at Children's Hospital of Pittsburgh of UPMC

Asthma is the most common chronic childhood disease in the United States, where approximately 8.3% of children (7 million individuals) are affected.

The Division of Pediatric Pulmonary Medicine, Allergy, and Immunology contains the Pediatric Asthma Center to conduct innovative research and provide state-of-the-art clinical care to children with asthma.

Led by **Juan C. Celedón, MD, DrPH**, division chief, the Pediatric Asthma Center conducts research on the role of genetics and epigenetics, diet and vitamin D, obesity, and stress on childhood asthma. This research is supported by the U.S. National Institutes of Health (NIH) as well as private foundations, and emphasizes the inclusion of underserved minority children, including Puerto Ricans and African-Americans.

As part of the Asthma Center, we have established a Difficult-to-Treat Asthma Clinic, led by **Erick Forno, MD, MPH**, a pediatric pulmonologist, and **Allyson Larkin, MD**, a pediatric allergist. The clinic employs a multidisciplinary approach to treating children who have asthma that is either severe and resistant to treatments, or is difficult to treat due to multiple factors such as adherence, environment, or comorbidities such as obesity.

Pediatric Asthma Center members include:

- John Alcorn, PhD
- Nadia Boutaoui, PhD
- Juan C. Celedón, MD, DrPH
- Wei Chen, PhD
- Mark Dovey, MD
- Erick Forno, MD, MPH
- Yueh-Ying Han, PhD
- Allyson Larkin, MD
- Michelle Manni, PhD
- Franziska Rosser, MD, MPH

The Difficult-to-Treat Asthma Clinic is located at the main campus of Children's Hospital. The Asthma Center also has seven clinics in the community throughout southwestern Pennsylvania to serve children with asthma.

For consults or referrals to the Pediatric Asthma Center, please call **412-692-LUNG (5864)**.

Awards and Accomplishments

Erick Forno, MD, MPH, received the prestigious Klosterfrau Award from the Wilhelm Doerenkamp-Foundation in April 2017. The Klosterfrau Award is an international award aimed to recognize researchers in basic science, pulmonology, and pediatrics whose work is focused on providing a better understanding of airway diseases in children. Dr. Forno also received the Robert B. Mellins, M.D. Outstanding Achievement Award from the Pediatrics Assembly of the American Thoracic Society (ATS) in May 2017. The annual Robert B. Mellins Award recognizes early to mid-career investigators for recent achievement in scholarship or research.

In April 2017, **Juan C. Celedón, MD, DrPH**, was elected as the ATS Secretary-Treasurer for 2017-2018. In 2020, he will become the first Latino-American and the first faculty member from the University of Pittsburgh to serve as ATS President since the founding of the society in 1905. Dr. Celedón also received the John M. Peters Award from the Environmental, Occupational and Population Health Assembly of the ATS in May 2017. This annual award is given for outstanding contributions to environmental health through leadership in research, education, or public health.

Children's Hospital of Pittsburgh of UPMC

4401 Penn Ave.
Pittsburgh, PA 15224

New CME Courses Available for Physicians

Visit **UPMCPhysicianResources.com** for the latest CME courses available for physicians, including:

Psychosocial Stress and Asthma

Presenter: Juan Celedón, MD, DrPH

Dr. Celedón reviews the epidemiology and management of psychosocial stress and asthma in children. Part I discusses ethnicity, epidemiology, stress and asthma. Part II involves epigenetics and bronchodilator response. Part III features PTSD, depression and asthma. Part IV talks about the role of ancestry and violence. This course is accredited for .75 AMA PRA Category 1 Credits™.

Select Presentations from the 2016 Lung Transplant Conference: Parts One and Two

Presenters: Lisa Carozza, RN, MSN, CCTC; Matthew Pipeling, MD; Silpa Kilaru, MD; Rachelle Zomak, RN, MS, CCTC; Joseph Pilewski, MD; Marissa Behning, PA-C, MPAS

Part one of the course features a discussion on topics in the transplant evaluation process, while part two centers on topics related to post-transplant management.

Recent Publications

Below is a selection of recent publications from Division faculty. A more complete list is available online at **UPMCPhysicianResources.com/Pediatrics** in the Pediatric Pulmonology section.

Sullivan L, Forno E, Pedersen K, Nielsen JG, Weiner DJ. Nitrogen Back-diffusion During Multiple-breath Washout With 100% Oxygen. *Eur Respir J.* 2017 Sep 9; 50(3).

Yan Q, Brehm J, Pino-Yanes M, Forno E, Lin J, Oh SS, Acosta-Perez E, Laurie CC, Cloutier MM, Raby BA, Stilp AM, Sofer T, Hu D, Huntsman S, Eng CS, Conomos MP, Rastogi D, Rice K, Canino G, Chen W, Barr RG, Burchard EG, Celedón JC. A Meta-analysis of Genome-wide Association Studies of Asthma in Puerto Ricans. *Eur Respir J.* 2017 May 1; 49(5).

Forno E, Sordillo J, Brehm J, Chen W, Benos T, Yan Q, Avila L, Soto-Quirós M, Cloutier MM, Colón Semidey A, Alvarez M, Acosta-Pérez E, Weiss ST, Litonjua AA, Canino G, Celedón JC. Genome-wide Interaction Study of Dust Mite Allergen on Lung Function in Children With Asthma. *J Allergy Clin Immunol.* 2017 Oct; 140(4): 996-1003.

Chen W, Wang T, Pino-Yanes M, Forno E, Liang L, Yan Q, Hu D, Weeks DE, Baccarelli A, Acosta-Perez E, Eng C, Han YY, Boutaoui N, Laprise C, Davies GA, Hopkin JM, Moffatt MF, Cookson WOCM, Canino G, Burchard EG, Celedón JC. An Epigenome-wide Association Study of Total Serum IgE in Hispanic Children. *J Allergy Clin Immunol.* 2017 Aug; 140(2): 571-577.

Puranik S, Forno E, Bush A, Celedón JC. Predicting Severe Asthma Exacerbations in Children. *Am J Respir Crit Care Med.* 2017 Apr 1; 195(7): 854-859.

Forno E, Weiner DJ, Mullen J, Sawicki G, Kurland G, Han YY, Cloutier MM, Canino G, Weiss ST, Litonjua AA, Celedón JC. Obesity and Airway Dysanapsis in Children With and Without Asthma. *Am J Respir Crit Care Med.* 2017 Feb 1; 195(3): 314-323.

About Children's Hospital of Pittsburgh of UPMC

Children's Hospital of Pittsburgh of UPMC is a leader in the treatment of childhood conditions and diseases, a pioneer in the development of new and improved therapies, and a top educator of the next generation of pediatricians and pediatric subspecialists.

Children's is consistently recognized for its research and clinical achievements, including ranking tenth among children's hospitals and schools of medicine (FY16) in NIH funding for pediatric research, and being named to the 2017-18 *U.S. News & World Report* Honor Roll of America's Best Children's Hospitals.