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## **Exercise-Induced Dyspnea in Children and Adolescents: If Not Asthma Then What?**

Helen Skolnick

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lustrated the complexity and clinical utility of contrasting adherence patterns.

**CONCLUSIONS.** Monitoring long-term controller medication adherence may be more predictive of morbidity than quick-relief medication use except in outlier cases, in which monitoring both medication types may be valuable for clinical and empirical purposes.

**REVIEWER COMMENTS.** Medication adherence has long been identified as a key factor in overall asthma outcome. For example, self-reporting quick-relief and long-term controller medication use, canister weighing, pharmacy records, and electronic monitoring have all been used to assess medication adherence. Of these methods, electronic monitoring, which is the most costly and technologically complex, is generally accepted as the most accurate method for monitoring adherence. Inadequate daily medication adherence has been widely documented in patients with asthma and has been linked to morbidity and increased health care costs. Although it was not surprising that nonadherence to long-term controller medications was common in this investigation, it was very interesting that no statistically significant relationship was found between adherence with quick-relief and long-term controller medication classes. For example, the investigators' hypothesis that quick-relief and long-term controller medication use would demonstrate an inverse relationship (eg, higher long-term controller medication use corresponding to lower reliance on quick-relief medications) was not confirmed. The investigators suggest that novel strategies to enhance appropriate medication use, such as better tracking the use of long-term controller medications and providing feedback regarding actual use, may be effective in improving adherence in asthma patients.

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### **Asthma as a Risk Factor for Invasive Pneumococcal Disease**

Talbot TR, Hartert TV, Mitchel E, et al. *N Engl J Med*. 2005;352:2082–2090

**PURPOSE OF THE STUDY.** To determine if asthma is a risk factor for invasive pneumococcal disease.

**STUDY POPULATION.** Patients 2 to 49 years of age in a Tennessee Medicaid program (TennCare) with >1 year of continuous enrollment during the study period (1995–2002). For each patient with invasive pneumococcal disease, 10 age-matched controls were chosen. A total of 11 counties in Tennessee with a population of 2.8 million participated in the study. Asthma was defined as  $\geq 1$  inpatient diagnoses (admission or emergency depart-

ment visit),  $\geq 2$  outpatient diagnoses, or use of asthma-related medications. High-risk asthma was defined as an admission for asthma, an emergency department visit, long-term use of oral steroid, or use of  $\geq 3$  short-acting  $\beta$  agonists per year.

**METHODS.** Invasive pneumococcal disease was defined as isolation of strep pneumonia from a normally sterile site (eg, blood, cerebrospinal fluid, pleural fluid, surgical aspirate, joint fluid, and/or bone). The organisms were serotyped.

**RESULTS.** A total of 635 patients with invasive pneumococcal disease and 6350 controls were identified. A total of 18% (114 patients) with asthma had an invasive infection compared with 8.1% (516 patients) in the control group. Patients with asthma had increased risk of invasive disease (odds ratio: 2.4; 95% confidence interval: 1.9–3.1). In patients with high-risk asthma, the annual risk for invasive disease was 4.2 of 10 000 compared with 2.3 of 10 000 in the low-risk asthma group and 1.2 of 10 000 in the control group.

**CONCLUSIONS.** Asthma is an independent risk factor for invasive pneumococcal disease.

**REVIEWER COMMENTS.** The risk of invasive disease did not depend on comorbid conditions or advancing age. This is the first study to show the association and, if upheld with further data, will significantly affect our recommended immunization strategy for patients with asthma.

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### **Exercise-Induced Dyspnea in Children and Adolescents: If Not Asthma Then What?**

Abu-Hasan M, Tannous B, Weinberger M. *Ann Allergy Asthma Immunol*. 2005;94:366–371

**PURPOSE OF THE STUDY.** Exercise-induced asthma (EIA) is the most commonly recognized cause of exercise-induced dyspnea (EID) in children and adolescents. However, EID in otherwise healthy children and adolescents may have other causes besides asthma. The purpose of this study is to report the outcome of evaluations for EID when other signs and symptoms of asthma were absent or there was no response to previous use of an inhaled  $\beta_2$  agonist.

**STUDY POPULATION.** One hundred forty-two patients, 6 to 21 years old (mean: 14 years), with EID were studied.

**METHODS.** In this retrospective study, investigators reviewed the results of all exercise tests performed in otherwise healthy patients with EID between 1996 and 2003. Physiologic measures assessed included preexer-

cise and postexercise spirometry with the addition of oxygen uptake, carbon dioxide production, continuous oximetry, and electrocardiogram monitoring during most tests. EIA was diagnosed if treadmill exercise resulted in reproduction of symptoms in association with a decrease in forced expiratory volume in 1 second of at least 15%. Endoscopy was performed if stridor and/or decreased maximal inspiratory flow were present. Criteria were established for restrictive abnormalities, physical conditioning, exercise-induced hyperventilation, and normal physiologic limitation.

**RESULTS.** EID was present in the subjects for an average of 30.2 months (range: <1 to 192 months) before evaluation, and in 98 patients the symptoms were attributed to asthma. Symptoms of EID were reproduced during exercise testing in 117 patients. EIA was identified as the cause of EID in only 11 of the 117. Seventy-four demonstrated only normal physiologic exercise limitation; 48 of the 74 had normal-to-high cardiovascular conditioning, and 26 had poor conditioning. Other diagnoses for reproducible EID included restrictive abnormalities in 15, vocal cord dysfunction in 13, laryngomalacia in 2, primary hyperventilation in 1, and supraventricular tachycardia in 1.

**CONCLUSIONS.** The diagnoses of EIA should be questioned as the etiology of EID in children and adolescents who do not have other symptoms of asthma and who do not respond to pretreatment with a  $\beta_2$  agonist.

**REVIEWER COMMENTS.** Although asthma is the most common cause of EID, this article demonstrates the important point that not all EID is caused by asthma. Patients who experience EID but not other signs or symptoms of asthma or who do not benefit from pretreatment with an inhaled  $\beta_2$  agonist clearly can benefit from a treadmill test with cardiac and respiratory physiologic monitoring. A large portion of these patients demonstrated normal physiologic limitation associated with reproduction of symptoms. Routine treatment of EID as asthma can lead to both unnecessary medication and frustration on the part of the patients and their families.

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### **Predictors of Primary Care Follow-up After a Pediatric Emergency Visit for Asthma**

Zorc JJ, Scarfone RJ, Li Y. *J Asthma*. 2005;42:571-576

**PURPOSE OF THE STUDY.** To identify predictors associated with primary care pediatrician (PCP) follow-up in children evaluated for acute asthma in a pediatric emergency department (ED).

**STUDY POPULATION.** Parents of children aged 2 to 18 years being discharged after asthma treatment in a pediatric ED.

**METHODS.** Parents were surveyed by coordinators and described their child's asthma history and perceived benefits and barriers to making a PCP follow-up visit. Bivariate tests and multivariable logistic regression were used to determine association with completion of a follow-up visit within 4 weeks of the ED visit.

**RESULTS.** A total of 278 subjects ( $n = 278$ ) were enrolled; 55% saw their PCP within 4 weeks of the ED visit. Baseline factors that were associated with an increased likelihood of follow-up included a recent hospitalization, >1 ED visit for asthma in the past year, the parent's assessment that the child had "very severe" asthma, and current daily use of a controller medication. Parental beliefs that taking daily asthma medications and finding out about the causes of asthma attacks were also associated with increased PCP follow-up rate. Parents were less likely to follow-up if they reported a lack of convenient appointments or prolonged waits in the PCP office. A multivariable model including clinical factors, parental beliefs, and the study intervention predicted the likelihood of follow-up.

**CONCLUSIONS.** Parental beliefs about asthma severity, the benefits of controlling asthma, and organizational barriers to seeing a PCP were associated with follow-up after a pediatric ED visit for asthma.

**REVIEWER COMMENTS.** Many children receive their first and subsequent follow-up visits for acute asthma attacks in the ED. Unfortunately, this is an inefficient and cost-prohibitive method of managing asthma. This study attempted to identify parental perceptions of their child's disease and the barriers to proper follow-up. These issues are paramount for the pediatrician caring for these children. Addressing parental concerns and removing barriers to follow-up can improve asthma control and allow for more cost-effective management and proper utilization of health care resources. Both the acute treating physician and practicing pediatrician can influence the possibility of appropriate follow-up and care.

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### **Use of Asthma Guidelines by Primary Care Providers to Reduce Hospitalizations and Emergency Department Visits in Poor, Minority, Urban Children**

Cloutier MM, Hall CB, Wakefield DB, Bailit H. *J Pediatr*. 2005;146:591-597

**PURPOSE OF THE STUDY.** To determine if a standardized city-wide asthma management program delivered by pri-

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