those without consisted of 7 VOCs (sensitivity: 79%; specificity: 100%). The nitric oxide fraction and lung function were not predictive for exacerbations.

CONCLUSIONS. VOC profiling from exhaled breath is able to predict exacerbations of childhood asthma.

REVIEWER COMMENTS. This longitudinal study is the first to analyze the ability of VOCs in exhaled breath to predict asthma exacerbations. The result indicates that a combination of 6 or 7 VOCs was able to predict exacerbations of childhood asthma both between and within patients with high sensitivity and specificity. The advantage of VOC analysis in exhaled breath is that sample collection is noninvasive and inflammatory markers are measured simultaneously. However, there was no mention of asthma severity classification. Therefore, it was not possible to explore the role of VOCs in different degrees of asthma severity. Biochemical origin and pathophysiological function of identified compounds in VOCs need to be clarified. In addition, validation studies in a larger population are needed to confirm the optimal combination of VOCs.

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Watcharoot Kanchongkittiphon, MD, PhD
Wanda Phipatanakul, MD, MS
Boston, MA

Childhood Asthma Hospitalizations in the United States, 2000-2009


PURPOSE OF THE STUDY. The goal of this study was to examine temporal trends in the US incidence of childhood asthma hospitalizations, in-hospital mortality, mechanical ventilation use, and hospital charges between 2000 and 2009.

STUDY POPULATION. This serial, cross-sectional analysis included a nationally representative sample of children hospitalized with acute asthma. The Kids Inpatient Database was used to identify children aged <18 years with asthma by using International Classification of Diseases, Ninth Revision, Clinical Modification, code 493.xx.

METHODS. Outcome measures were asthma hospitalization incidence, in-hospital mortality, mechanical ventilation use, and hospital charges. Temporal trends of each outcome, accounting for sampling weights, were analyzed. Hospital charges were adjusted for inflation to 2009 US dollars.

RESULTS. The 4 separate years (2000, 2003, 2006, and 2009) of national discharge data included a total of 592,805 weighted discharges with asthma. Between 2000 and 2009, the rate of asthma hospitalization in US children decreased from 21.1 to 18.4 per 10,000 person-years (13% decrease; $P_{\text{trend}} < .001$). Mortality declined significantly after adjusting for confounders (odds ratio for comparison of 2009 with 2000: 0.37 [95% confidence interval: 0.17–0.79]). In contrast, there was an increase in the use of mechanical ventilation (from 0.8% to 1.0% [28% increase]; $P_{\text{trend}} < .001$). Nationwide hospital charges also increased from $1.27 billion to $1.59 billion (26% increase; $P_{\text{trend}} < .001$); this increase was driven by a rise in the geometric mean of hospital charges per discharge, from $5940 to $8410 (42% increase; $P_{\text{trend}} < .001$).

CONCLUSIONS. Between 2000 and 2009, significant declines in asthma hospitalization and in-hospital mortality were noted among US children. In contrast, mechanical ventilation use and hospital charges for asthma increased significantly over this same period.

REVIEWER COMMENTS. This article is a very interesting analysis of trends in hospital mortality, mechanical ventilator use, hospital charges, and childhood asthma hospitalizations in the United States between 2000 and 2009. These data demonstrate that asthma hospitalizations and mortality declined significantly. There was an increase in mechanical ventilation use over this time period, which might reflect a more aggressive approach to management of severe asthma exacerbations in children. Although the results of this study suggest that progress has been made in reducing the impact of severe acute asthma in children in the United States, overall charges per discharge for asthma hospitalizations increased markedly; nationwide hospital charges increased by 26%. This increase most likely reflects more aggressive management of sicker patients. The large asthma burden in the United States presents an ongoing public health and health education challenge, and further studies are needed to find more cost-effective strategies and inpatient protocols to meet this challenge.

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John M. James, MD
Fort Collins, CO

Asthma Outcomes and Costs of Therapy With Extrafine Beclomethasone and Fluticasone


PURPOSE OF THE STUDY. The investigators sought to compare asthma outcomes and costs of extra-fine hydrofluorocalkane (HFA)-beclomethasone (QVAR) and fluticasone (Flovent HFA).

STUDY POPULATION. Patients aged 12 to 80 years with asthma were followed up for at least 1 year before (baseline year) and 1 year after (outcome year) the index date. Some patients received a first prescription of inhaled corticosteroids (ICS) as QVAR or Flovent on the index date. Other patients were receiving 1 of these 2 options as step-up therapy on the index date.
METHODS. This retrospective matched cohort study examined database markers of asthma control from a large US longitudinal health care claims database, matched on baseline demographic characteristics and asthma severity. The 3 coprimary outcome measures were composites of key elements of asthma control derived from the database. “Risk domain asthma control” included absence of hospital/emergency department attendance, prescription for acute course of oral corticosteroid, and lower respiratory tract infection requiring antibiotics or hospital admission for lower respiratory reason. “Overall control (risk and impairment)” incorporated use of a short-acting β-agonist of no more than 2 puffs daily. “Severe exacerbation” was defined as hospital admission or emergency department attendance for asthma or an acute course of oral steroids. Secondary outcome measures included 3 additional composite end points. “Treatment success” was defined as risk-domain asthma control plus no change in asthma therapy, such as increase in ICS dose, change in ICS or delivery device, or use of additional controller therapy. “Sensitivity analysis of treatment success” sought to exclude changes in therapy that could have been motivated by cost savings. The number of “respiratory-related hospitalizations and referrals” defined as unscheduled hospital admissions or emergency department attendance for lower respiratory tract reasons or planned hospital outpatient attendance for asthma, was determined.

RESULTS. After matching, there were 10 312 patients initiating ICS and 572 stepping up the ICS dose included in the analysis. Patients started on QVAR had significantly higher odds of achieving overall control. They also had a lower rate of respiratory-related hospitalizations or referrals than patients on Flovent. Other database outcome measures were similar in the 2 cohorts. Prescribed QVAR doses were lower (P < .001) than Flovent doses (320 vs 440 μg/d). Adjusted respiratory-related health costs were significantly lower for the QVAR group and represented annual savings of $390.

CONCLUSIONS. Asthma treatment outcomes were similar or better with QVAR prescribed at significantly lower doses and with lower costs than Flovent.

REVIEWER COMMENTS. The authors acknowledge that this study was not designed to evaluate the mechanisms behind the differences observed but speculate that the formulation characteristics for the HFA-beclomethasone pressurized metered dose inhaler are integral. We occasionally see fluticasone prescribed at inordinately high doses in children; these doses not only ignore the relatively flat dose–response curve for ICS but also likely have the systemic equivalence of several milligrams of prednisone per day. This study suggests that efficacy, cost, value, and, arguably, safety fall in favor of the beclomethasone product. Furthermore, given the smaller airway of the young child not included in this study population, the extra-fine particle size might magnify these benefits.
### Asthma Outcomes and Costs of Therapy With Extrafine Beclomethasone and Fluticasone

James R. Banks and Timothy Andrews

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