60.8%, \( P < .0001 \)) during the 4-year study period. Adherence reporting was similar between placebo and budesonide treatment groups. Only the “high-adherence” budesonide group was associated with improved outcomes (change in forced expiratory volume in 1 second before and after bronchodilator use), a finding that may have impacted the overall CAMP study findings.

CONCLUSIONS. Self-reported adherence data overestimated objectively measured adherence by 30%, making self-reported medication use misleading during clinical trials.

REVIEWER COMMENTS. This study adds to the evidence base that self-reporting of adherence is erroneous and may result in misleading outcome reporting in clinical trials. This study also provides information that can be useful to the practicing clinician regarding the use of objective, rather than self-reported, adherence during clinical decision-making when possible.


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Antibiotic Prescribing During Pediatric Ambulatory Care Visits for Asthma


PURPOSE OF THE STUDY. To determine how frequently antibiotics are prescribed during pediatric asthma visits without documented coexisting diagnoses that justify their use.

STUDY POPULATION. Pediatric patients <18 years of age seen in outpatient offices and emergency departments in the United States for asthma between 1998 and 2007.

METHODS. Data from the National Ambulatory Medical Care Surveys and the National Hospital Ambulatory Medical Care Survey were examined for patients seen for asthma in clinics and emergency departments. Each visit was assessed with regard to reason for visit and diagnoses (by using International Classification of Diseases, Ninth Revision, Clinical Modification codes), medications prescribed, physician specialty, participation of allied health professionals, patient demographics, and performance of asthma education (after 2001). Multivariable logistic regression models then were used to assess associations with the prescription of antibiotics.

RESULTS. Antibiotics were prescribed during 15.6% of 5198 ambulatory care visits for asthma without a coexisting diagnosis to justify treatment. This finding equates to ~1 million pediatric ambulatory patient visits per year in the United States, in which patients with asthma are treated with antibiotics without documentation of a reason for doing so. Macrolides were prescribed nearly 50% of the time, followed by aminopenicillins (26.3%) and cephalosporins (20.6%). Multivariate analysis revealed that antibiotics were prescribed more in the winter (odds ratio [OR]: 1.92; 95% confidence interval [CI]: 1.05–3.52), and when systemic steroids were also prescribed, the OR = 2.69 (95% CI: 1.68–4.3). Treatment in an emergency department was associated with decreased likelihood of antibiotic prescribing (OR: 0.48; 95% CI: 0.26–0.89), whereas in the office-based setting, asthma education during the visit was associated with reduced antibiotic prescribing (OR: 0.46; 95% CI: 0.24–0.86).

CONCLUSIONS. Approximately 1 of every 6 pediatric patients evaluated for asthma in an ambulatory care setting is prescribed antibiotics without a documented indication, which indicates a need for either better documentation or more education and interventions to prevent the unin- dicated use of antibiotics for asthma exacerbations.

REVIEWER COMMENTS. Although guidelines for asthma management do not support routine antibiotic therapy for asthma exacerbations, this study showed that it is a fairly common practice in ambulatory care settings. Educational programs to increase awareness of inappropriate antibiotic prescriptions should be developed. Previous publications have shown that multifaceted interventions, such as physician education, patient education, community-wide programs, and provider feedback are more likely to be successful than single interventions alone.


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Increased Risk of Pertussis in Patients With Asthma


PURPOSE OF THE STUDY. Pertussis infection remains a major public health problem with reported cases increasing more than 27-fold since 1976. The prevalence of asthma has also increased, with up to 17% of children affected. The purpose of this retrospective study was to determine if patients with asthma were at increased risk of pertussis.

STUDY POPULATION. This population-based, case-controlled study compared asthma history in adults and children with documented pertussis (positive polymerase chain reaction [PCR]) to that of matched controls suspected of having pertussis but with negative PCRs.

METHODS. Pertussis PCRs during a 2-year outbreak in Olmstead County, MN, were used to identify 223 pertussis-positive cases; 164 patients were eligible for inclusion. From a pool of 5537 pertussis-negative patients, 328 age- and sex-matched controls were identified. A previously validated formula was used to estimate the population attributable risk percentage of asthma for pertussis infections.
RESULTS. The rate of pertussis immunization was the same in both groups (65.2% cases versus 68.9% controls, \( P = .172 \)). Nearly 80% of cases were younger than 18 years old (mean = 13.9 years). Sixty-two (38%) patients with pertussis and 85 (26%) controls had asthma before the date of pertussis testing (odds ratio [OR] 1.83, \( P = .005 \)). On the basis of the adjusted OR, the population attributable risk percentage of asthma for the risk of pertussis was 17% for all subjects. Antibiotic use and family history of asthma approached, but did not reach, statistical significance between groups. After adjusting for those variables, a history of asthma before the index date of pertussis PCR was still significantly associated with the risk of pertussis (OR 1.73, \( P = .013 \)). Age stratification analysis showed that the association between asthma and increased risk of pertussis was present only in children and adolescents. The use of oral or inhaled corticosteroids did not affect pertussis risk.

CONCLUSIONS. Asthma is associated with an increased risk of pertussis. Given the high incidence of asthma, relatively low pertussis immunization rates, and the increased attributable risk of asthma for pertussis infection, patients with asthma should be a target group for primary pertussis vaccination and for appropriate boosters.

REVIEWER COMMENTS. It is possible that altered innate or acquired immunity and/or altered airway epithelium increase the risk of pertussis infection in patients with asthma. The authors were not able to assess asthma control, so they were unable to correlate asthma control with risk of pertussis infection. One can speculate that poorly controlled asthma with greater airway inflammation increases the risk of pertussis (and other airway infections). This study does not change the need to enhance overall immunization rates or the need to monitor and maintain asthma control carefully. It does, however, provide a little more incentive to do both.

Kit BK, Simon AE, Ogden CL, Akinbami LJ. *Pediatrics* 2012;129:62–69


STUDY POPULATION. Asthmatic individuals aged 1 to 19 years with current asthma as part of the National Health and Nutrition Examination Survey during 3 time periods: 1988 to 1994, 1999 to 2002, and 2005 to 2008.

METHODS. Cross-sectional analysis of the study population for use of preventive asthma medication (PAM), including inhaled corticosteroids, leukotriene receptor antagonists, long-acting \( \beta \)-agonists, mast-cell stabilizers, and methylxanthines.

RESULTS. In children with current asthma, there was an increase in the use of PAMs from 17.8% (SE: 3.3) in 1988 to 1994, to 34.9% (SE: 3.3) in 2005 to 2008 (\( P < .001 \)). Adjusting for age, gender, race/ethnicity, and health insurance status, the odds of PAM use were higher in 2005 to 2008 compared with 1988 to 1994 (adjusted odds ratio [aOR] = 2.6. 95% confidence interval [CI]: 1.5–4.5). A multivariate analysis over all 3 time periods showed lower use of PAMs among non-Hispanic black (aOR = 0.5, 95% CI: 0.4–0.7) and Mexican American (aOR = 0.6, 95% CI: 0.4–0.9) children compared with non-Hispanic white children. PAM use was lower in 12- to 19-year-olds compared with 1- to 5-year-olds and also in children who did not have health insurance compared with those who did have health insurance.

CONCLUSIONS. Between 1988 and 2008, the use of PAM increased among children with current asthma. Non-Hispanic black and Mexican American adolescents aged 12 to 19 years, and uninsured children with current asthma had lower use of PAM.

REVIEWER COMMENTS. This study demonstrates an increased use of PAMs in asthmatic children in 2008 vs 1988. Although several factors are likely at work, it seems likely that the National Asthma Education and Prevention Program asthma treatment guidelines, initially released in 1991, are a major reason for this result. These guidelines, and subsequent updates in 1997 and 2007, emphasize the importance of inflammation in the pathophysiology of asthma and the value of preventive medications in reducing adverse outcomes (eg, emergency room visits, hospitalizations, and the use of systemic corticosteroids). It is plausible that the growth of direct-to-consumer pharmaceutical advertising may also have augmented the use of PAMs. The authors also point out that the lower use of PAMs in non-Hispanic black and Mexican American asthmatic children may partially explain the increased risk for adverse outcomes in these patient groups.

MEDICAL THERAPIES

Daily or Intermittent Budesonide in Preschool Children With Recurrent Wheezing

PURPOSE OF THE STUDY. To compare the efficacy of daily low-dose inhaled glucocorticoids versus intermittent high-dose
Increased Risk of Pertussis in Patients With Asthma
Mitchell R. Lester
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