from physicians across the United States. Approximately 3500 physicians participate each 3-month period and provide information on patients they examine in 2 consecutive workdays. Information focuses on specific diagnoses and medications, not on patient adherence. This study analyzed the number of asthma visits (based on International Classification of Diseases, 9th revision, codes) and medications used to treat asthma each year from 1978 to 2002, primarily in an outpatient setting. Medications were classified as controllers (eg, inhaled corticosteroids) or relievers (eg, short-acting, $\beta_2$-receptor agonists).

**Results.** The annual number of patient visits for treatment of asthma doubled from 1978 (8.5 million) to 1990 (17.7 million) and then demonstrated a plateau, with a mean of 16 million cases per year, from 1991 to 2002. The treatment of asthma changed tremendously during the 25-year study period. Prescription rates for controllers increased; in 2001, controllers were prescribed more than relievers (83% vs 80%) for the first time. Prescriptions for relievers increased from 1978 to 1993 but decreased thereafter. From 1978 to 1988, prescriptions for inhaled corticosteroids remained at 8% with respect to the annual total of asthma visits. This number increased to 48% in 2002. The use of long-acting, $\beta_2$-receptor agonists alone peaked in 2000 and declined to 9% in 2002, most likely because of increased use in combination with inhaled corticosteroids (20% of visits). The use of leukotriene modifiers steadily increased after their release in 1997, to 24% in 2002, whereas xanthine use decreased to 2% and cromone use decreased to <1%. Oral corticosteroid use was constant at 20%. The number of medications was stable, at a mean of 2 per patient, during the past decade.

**Conclusions.** The study concluded that, although the number of asthma visits increased during the study period, the number of return visits for treatment of asthma decreased. Prescriptions for controller medications increased, whereas prescriptions for relievers decreased. This pattern suggests that asthma treatment is changing to be more consistent with current guidelines.

**Reviewers’ Comments.** Consensus guidelines for asthma are helpful for adequate diagnosis and treatment of this disease. Trends in asthma pharmacotherapy are changing, so that controller medications are prescribed more often, leading to decreased need for relievers and better control of asthma. This study did not include asthma-related visits to emergency departments or hospital-based clinics; therefore, more severe cases of asthma might not have been adequately analyzed.

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**ASTHMA MEDICATION USE AND DISEASE BURDEN IN CHILDREN IN A PRIMARY CARE POPULATION**


**Purpose of the Study.** To describe the use of asthma medications and the disease burden among children with persistent asthma and to estimate asthma control.

**Study Population.** A total of 658 children (3–15 years of age) with persistent asthma, drawn from private insurance claims and pharmacy databases, who were recruited for the Pediatric Asthma Care Patient Outcomes Research Team II study from 42 primary care practices in 3 urban locales were studied.

**Methods.** A single telephone interview with parents of eligible children was used to assess 1) classes of medications (controller and reliever) in use and frequency of use in the previous 4 weeks; 2) asthma symptoms during days, but not nights, in the previous 2 weeks; 3) visits to specialists, outpatient doctors, or emergency departments or hospitalizations; and 4) the existence and use of a written action plan.

**Results.** Of the children who participated, 68% had 0 to 4 symptom days in the previous 2 weeks, 16% had 5 to 9 symptom days, and 16% had 10 to 14 symptom days. Sixty-five percent had a healthcare visit in the previous 1 year; 23% went to an emergency department, 14% saw an asthma specialist, and 4% were hospitalized. Most children with frequent symptom days were receiving controller medications and used reliever medicines. Poor adherence to controller medications was common (40%), especially among those with few symptom days. Sixty-four percent of children with persistent asthma had excessive symptoms or high reliever medication use and were considered to have inadequately controlled conditions. Approximately one-third of these patients had not been prescribed controllers. Written care plans were received by 21% of patients, and the existence of a plan was not protective against inadequate control.

**Conclusions.** Inadequate asthma control, defined as frequent symptoms or high reliever medication use, was common even when controller medications were prescribed. Nonadherence to controller medications and over-reliance on reliever medications were common.

**Reviewers’ Comments.** This is an important study emphasizing that asthma control remains a significant problem for children. This study highlights 2 factors that contribute to poor asthma control, namely, lack of adherence to controller medications and lack of appropriate prescription of controllers. Younger age and being treated by an asthma specialist were associated with better asthma control. The study excluded important groups, including children <3 of age, children treated by a specialist, and patients with intermittent or severe persistent asthma. Patients themselves were not interviewed (only the parents were interviewed), which is a known limitation in adolescent studies. Surveyed controller and reliever use was not compared with actual prescription refills or mechanical dose-counting results. Nonetheless, this is another study suggesting that asthma among children is not well controlled and that we need to assist our patients with medication adherence and to make sure that patients with persistent asthma are prescribed controller medications.

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**DIAGNOSIS AND MANAGEMENT**

**EFFECTS OF EDUCATIONAL INTERVENTIONS FOR SELF-MANAGEMENT OF ASTHMA IN CHILDREN AND ADOLESCENTS: SYSTEMATIC REVIEW AND META-ANALYSIS**


**Purpose of the Study.** To determine the effectiveness of educational programs for the self-management of asthma among children and adolescents.

**Study Population.** Eligible studies were published, randomized, controlled trials of educational programs for the self-management of asthma among children and adolesc-
ASTHMA MEDICATION USE AND DISEASE BURDEN IN CHILDREN IN A PRIMARY CARE POPULATION
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Pediatrics 2004;114;530

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