

Asthma Management and the Allergist:

Better Outcomes
at Lower Cost

ACAAI American College
of Allergy, Asthma
& Immunology

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SUMMARY

Asthma, among the most common of chronic diseases, is difficult to manage. Despite dramatic advances in prevention, diagnosis and clinical treatments, the incidence of the disease has increased significantly in recent years and vast numbers of asthma patients – including a disproportionate number of children – do not receive adequate care to control their disease. As a result, much of the \$12.7 billion in annual costs for asthma is spent for expensive emergency care, hospitalizations and time lost from work – most of which could be avoided.

As asthma specialists, allergists have consistently shown that they can provide effective, economical asthma management.

Asthma patients under the care of an allergist have better outcomes at lower cost because of:

- Fewer emergency care visits
- Fewer hospitalizations
- Reduced lengths of hospital stays
- Fewer sick care office visits
- Fewer days missed from work or school
- Increased productivity in their work and personal lives
- Greater satisfaction with their care
- An improved quality of life

The purpose of this report is to review the current state of asthma care and its economic consequences and summarize the various studies from peer-reviewed medical journals that demonstrate the superior outcomes of allergist-provided care.

SCOPE OF THE ASTHMA EPIDEMIC

Asthma is a chronic inflammation of the lung's airways characterized by a chronic cough, shortness of breath or wheezing. In severe cases the airways contract and the patient cannot get enough air into the lungs. An estimated 17 million Americans, or about 6.4 percent of the population, have asthma. About 5 million of those affected by the disease are children, and a disproportionate number of the 5,000 people who die of asthma each year are under the age of 18. [1]

Curbing the asthma epidemic, preventing needless suffering and premature deaths, and controlling the runaway costs of treating the disease are top priorities of the nation's health care policymakers and the nation's allergists.



Impact of Asthma

The most recent surveillance survey conducted by the Centers for Disease Control and Prevention (CDC) reports that 26.7 million Americans have been diagnosed by a physician as having asthma at some time in their lives. Of these, 14.6 million said they had asthma or asthma-like symptoms in the year prior to the survey. African Americans are slightly more likely than Caucasians to have asthma, yet the death rate among blacks is nearly three times as high as among whites.

Annually, asthma accounts for approximately:

- 10.8 million physician or outpatient visits
- 478,000 hospitalizations
- 2 million emergency room visits
- 28 million missed school and work days [2]

According to the National Institute of Allergy and Infectious Diseases (NIAID), asthma deaths have increased steadily since the 1970s, when asthma accounted for 8.2 deaths per 100,000 population. By 1995, the rate had jumped to nearly 18 deaths per 100,000. [1]

The economic impact of asthma also is substantial. Direct health care expenditures such as physician visits, hospital and emergency room services, medications and other interventions are estimated to be \$7.4 billion. About \$3.2 billion of those direct costs are spent on asthma care for children and adolescents under the age of 18. [3,4] Indirect costs such as decreased worker productivity and days lost from work by adults who have asthma or care for children with asthma, and other losses are an estimated \$5.3 billion. [3]

Cost of Asthma Care

| Direct medical expenditures | Costs in \$M |
|-----------------------------------|-------------------|
| Hospital care | |
| Hospital inpatient care | \$2,054.6 |
| Hospital emergency care | 546.3 |
| Hospital outpatient care | 722.6 |
| Physician's services | |
| Physician inpatient care | 110.9 |
| Physician office visits | 742.7 |
| Prescriptions | 3,188.1 |
| <i>All direct expenditures</i> | <i>\$7,365.3</i> |
| Indirect costs | |
| School days lost | \$1,107.3 |
| Loss of work (outside employment) | |
| Men | 415.0 |
| Women | 1,128.2 |
| Housekeeping | 841.7 |
| Mortality | 1,813.9 |
| <i>All indirect costs</i> | <i>\$5,306.0</i> |
| All costs | \$12,671.3 |

Source: Weiss and Sullivan. *J Allergy Clin Immunol* 2001.

National Priority



In response to the alarming increase in asthma prevalence and the rapid rise in associated expenditures, an expert panel was convened by the NIH National Heart, Lung and Blood Institute (NHLBI) in 1991 to develop consensus guidelines for the care of patients with asthma. The guidelines were based on the latest clinical evidence contradicting conventional, conservative approaches to managing asthma. They support aggressive treatment to control the disease and avoid acute exacerbations. Clinical studies have shown that aggressive treatment can reduce deaths and emergency treatments, improve the quality of patients' lives and lower treatment costs. A primary objective of the guidelines, which were updated in 1997 and again in 2002, was to educate patients and physicians about new standards of care for treating asthma, and the special training, clinical expertise and support services required to control the disease.

The NIH Guidelines [5] call for aggressive therapy, ongoing and frequent interactions with medical personnel to monitor the disease, written treatment plans, and education and support services. Such measures have been shown to control the disease over the long term and prevent or significantly decrease the frequency of acute asthma attacks and the high costs of emergency room care, hospitalization, frequent physician interventions and time lost from work, school or other activities.

Building on the NIH Guidelines, allergists have developed practice parameters [6] and asthma disease management resources [7] that bring evidence-based guidelines into everyday practice.

Despite these best efforts, too many patients today are receiving outdated and substandard

care. Frequently their health care provider is not aware of the many advances in asthma disease management, including early intervention, precision diagnosis, environmental controls, the stepwise approach to aggressive therapy, patient education and, when appropriate, immunotherapy – regimens that are well known to the asthma specialist.

An analysis of treatments provided to more than 24,000 Medicaid asthmatics in Kentucky, for example, found that nonadherence to the NIH Guidelines was prevalent. Fewer than 40 percent of patients received a rescue medication and fewer than 10 percent of patients were regular users of inhaled steroids – treatment strategies recognized as standards of care in the guidelines. Further, nonadherence was associated with an increase in exacerbations of asthma that resulted in hospitalizations. [8]

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Another study of the outpatient management of asthma in a university tertiary care emergency department showed that overall compliance with consensus guidelines was poor. Only 28 percent of severe asthmatics were managed by an asthma specialist, “...far short of the 100 percent recommended by the guidelines.” [9]

Asthma management is a key component of the Healthy People 2010 objectives of the U.S. Department of Health and Human Services. The agency has declared asthma a national epidemic and called for Action Against Asthma, a strategic plan to assess current efforts to combat the disease and set priorities for the future. [10]

ASTHMA TREATMENT OUTCOMES

With their years of specialty training and clinical experience in asthma management, allergists are more likely than other physicians to know and follow the state-of-the-art treatments that improve outcomes and reduce costs, and adhere to practice guidelines that experts agree are the standard of care. This training and expertise also make allergists the experts in identifying offending allergy triggers and educating patients on avoidance tactics – essentials to the proper treatment of the disease since the majority of asthma is allergic asthma. Numerous clinical studies have concluded that specialists are more likely than non-specialists to manage asthma based on the latest clinical study findings, to identify and institute procedures to reduce allergy triggers for the disease, and to follow consensus guidelines developed by experts in the field. It is well documented that asthma care delivered under the supervision of an allergist results in improved outcomes and more effective use of health care resources. For example:

- A survey of 1,954 patients and their physicians (n=1,078) enrolled in 12 managed care organizations analyzed the relationship between physician specialty and treatment outcomes, using indicators from the NIH Guidelines as outcome measures. Asthma care provided by specialists, compared to care provided by generalists, was consistently associated with better patient outcomes across a range of relevant indicators.

The patients of allergists reported:

- Fewer hospitalizations and emergency room visits for asthma;
- Higher ratings for the quality of care;
- Fewer restrictions in activities because of asthma symptoms; and
- Improved physical functioning. [11]

- A study by Johns Hopkins University found that children enrolled in two managed care organizations were significantly less likely to be treated according to NIH Guidelines if their asthma was managed by a primary care physician, compared to disease management by asthma specialists. There were major differences between the care at all levels, with specialists receiving higher scores for the appropriate use of medications, patient education, assessment and monitoring of asthma, and control of risk factors that make a child's asthma worse. [12]
- A recent Canadian study underscored the problem of inappropriate medication use. Of 6,254 asthma patients age 65 or older who were hospitalized for asthma (n=2,495), 40 percent did not receive a prescription for inhaled steroid therapy, after follow-up of 90 days post-discharge. The patients of asthma specialists – including allergists – were significantly more likely to receive the recommended therapy compared to the patients of general physicians. [13]

Allergists were instrumental in developing the NIH Guidelines and other best practice recommendations for the management of asthma. Epidemiologists and clinicians who specialize in allergy and immunology are leaders in clinical research and education to improve understanding of complex disease processes, risk factors, genetic and environmental factors, and the pathophysiologic and immunologic characteristics of different subsets of asthma. [14]

Because of these benefits, many patients, physicians and other providers, as well as many managed care organizations strive to involve allergists in asthma care. When managed aggressively by a specialist, asthma need not be a life-threatening or disabling disease. In most patients, the condition can be controlled so that acute asthma attacks are avoided.

Hospitalizations

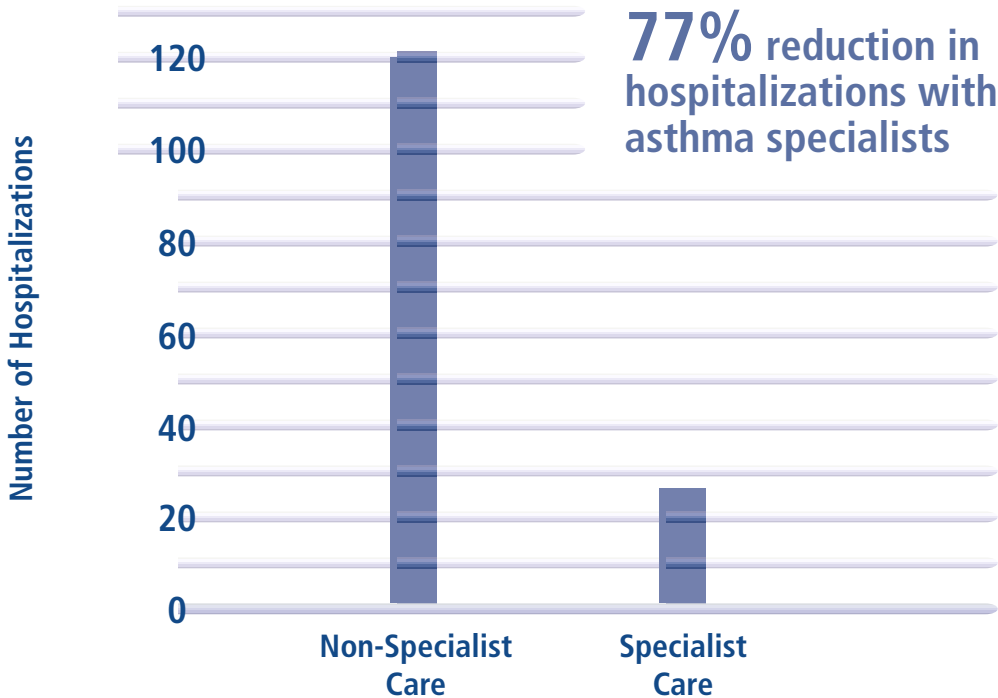
In one clinical study, hospital admissions decreased 67 percent and the average length of hospital stay declined 38 percent, from 4 days to 2.5 days, for patients with moderate-to-severe asthma after they were seen by an allergist. [15] In another study, care coordinated through an asthma center by a multispecialty team of experts resulted in an 89 percent decrease in hospital admissions. [16]

Among children studied in East Harlem in New York City, where the asthma mortality and morbidity rates are among the highest in the nation, patients who were not under the care of an allergist in an outpatient intervention program had 2.5 times more hospitalizations than children being cared for by specialists. [17] Another study of patients who required intubation for asthma found that an aggressive program of education, regular

outpatient visits with specialists and access to an emergency call service significantly reduced the number of inpatient hospitalizations. [18] A similar study of adults with moderate-to-severe asthma documented a 77 percent reduction in hospitalizations in the 12 months after the patients completed a course of outpatient treatment in a comprehensive asthma care center, compared to the rates of hospitalization in the six months prior to starting the program. [19]

Emergency Room Visits

Despite the availability of new therapies and medications that can prevent acute asthma episodes, many patients still require emergency health services to treat uncontrolled exacerbations of the disease. Clinical studies document that emergency room visits for asthma can be the result of poor disease



ASTHMA HOSPITALIZATIONS

Source: National Jewish Medical and Research Center. *Medical Scientific Update* 1998.

management. [20-21] Patients who are cared for by asthma specialists invariably require fewer emergency room visits. A study of a Kaiser Health Plan in San Diego compared treatment outcomes for patients who came to the emergency room with acute asthma symptoms. Patients who were referred to specialists experienced 50 percent fewer relapses requiring an emergency room visit than patients who continued to be treated by a primary care physician. [22]

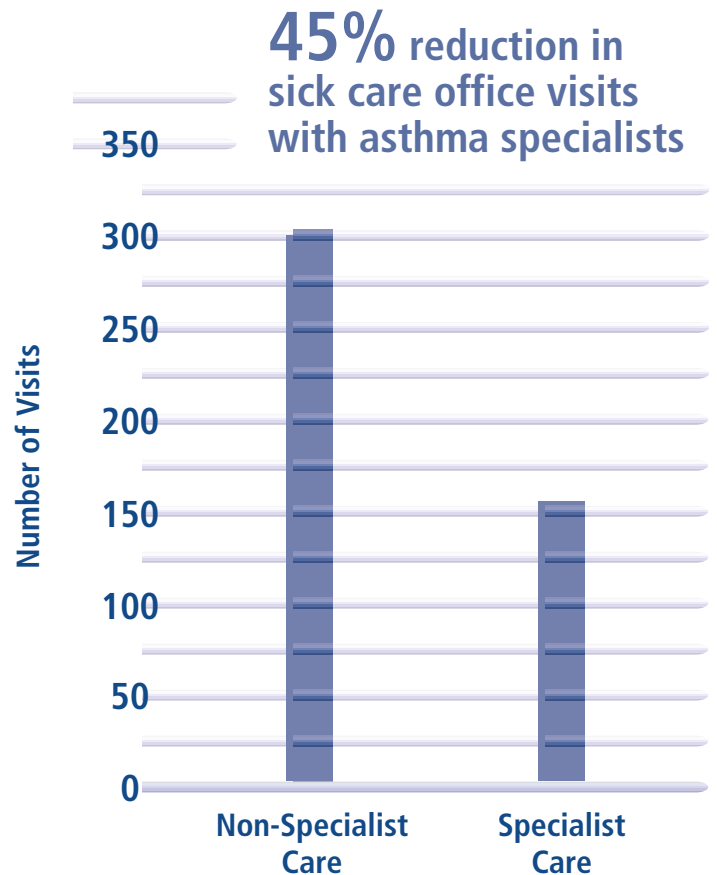
In one study of individuals with severe asthma, the average annual number of emergency room visits was 3.45 for each patient enrolled in a specialty allergy clinic, compared to 6.1 visits for patients who were not enrolled. [23] In another study, a 76 percent reduction in ER visits followed comprehensive treatment in a specialty allergy center. [16] Other findings:

- A decrease from 4 emergency room visits per year to none following short-term inpatient rehabilitation. [24]
- Aside from the risks of asthma attacks that are severe enough to send patients to the ER and the high cost of emergency room care, it also has been documented that the care delivered in some emergency rooms is of lesser quality than care delivered in an outpatient asthma clinic. A Louisiana study found that patients treated in an asthma clinic had fewer symptoms such as nighttime cough and wheezing, and had fewer emergency asthma attacks compared with patients who were routinely treated in the ER. [23]

Sick Care Office Visits

Annually in America, about 11 million physician office and outpatient clinic visits are for the treatment of asthma. [2]

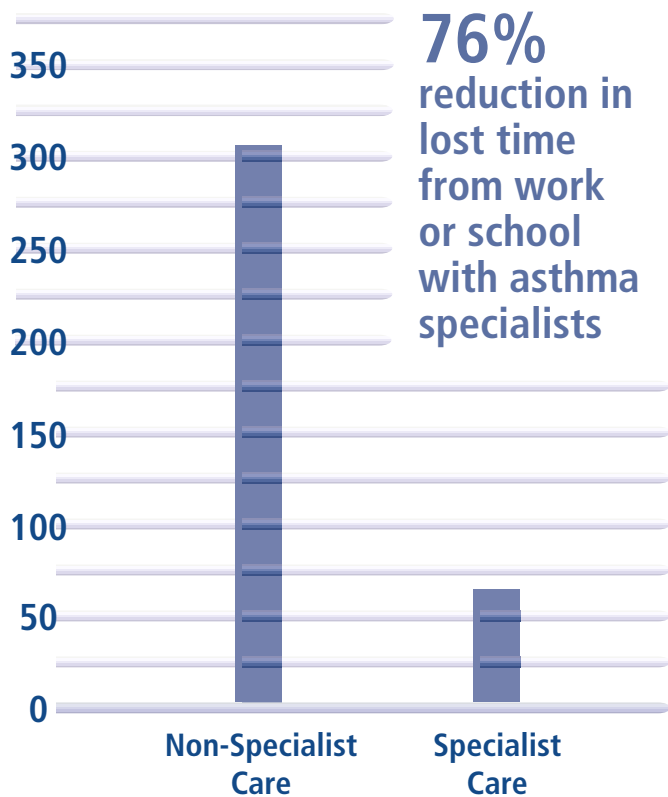
Supervision of care by an allergist can reduce the number of sick care office visits for asthma patients. A study of patients with moderate-to-severe asthma in a Kaiser Permanente health plan in Denver, for example, found sick care office visits were reduced by 45 percent in patients who received follow-up care by an allergist for at least one year. [15]



ASTHMA SICK CARE OFFICE VISITS

Source: Westley, et al. *Allergy Asthma Proc* 1997.

Number of Lost Days



LOST WORK/SCHOOL DAYS DUE TO ASTHMA

Source: McDonald, et al. American College of Chest Physicians Annual Meeting 1999.

Missed Days from Work or School

Aggressive management of asthma by an allergist also can reduce the number of work and school days missed because of asthma, a loss that has an estimated value of \$2.6 billion annually. [3]

One center reported that its adult patients averaged an estimated 80 percent reduction in missed work days, and children required approximately 65 percent fewer days off from school after receiving care in a multidisciplinary asthma center. [19]

In another study, an asthma management program combined with subspecialty care in the treatment of 50 patients with asthma reduced missed days from work or school from 310 to 73. [25]

Patient Satisfaction and Quality of Life

Patients who receive asthma care from an allergist experience improved emotional and physical well being, and they also are more satisfied with their physician and with the quality of their general medical care.

In a survey of nearly 400 patients treated in a large health maintenance organization, significant quality-of-life improvements were reported by patients treated by allergists, compared to those treated by generalists or in the emergency department. Improvements were seen in the areas of physical functioning, emotion, pain relief and general health. [26]

In a suburban private practice, patients were surveyed after the initiation of an asthma management program that followed the NIH Guidelines and was supervised by an asthma specialist. The patients reported significant improvements in their ability to participate in activities, their emotional well being and in the control of asthma symptoms. [27]

Patients who receive asthma care from an allergist experience improved emotional and physical well being, and they also are more satisfied with their physician and with the quality of their general medical care.

Despite all this, some health care plans still today place obstacles in front of patients seeking referral to an asthma specialist, even when referral to a specialist is recommended in the NIH Guidelines and other national consensus recommendations. [28-29] The result is conservative or sporadic treatment that may cause disease progression, airway remodeling and permanent damage to the lungs. It also is more likely to increase hospitalizations, emergency room visits and other high-priced interventions, and add to the number of days missed from work or school.

ASTHMA TREATMENT COSTS

Numerous studies have shown that aggressive management and treatment of asthma by an allergist not only produces better health outcomes, but also can reduce the total costs of the disease. One large, urban specialty asthma center, for example, estimates that specialty care reduces insurance claims for asthma-related services by at least 45 percent to as much as 80 percent. [19]

Former Surgeon General David Satcher has decried the alarming increase in costs. “Families and communities are paying more to treat asthma, while at the same time more people are dying from it,” he said.

In a study sponsored by the Asthma and Allergy Foundation of America, a 54 percent increase in the cost of asthma care was documented between 1985 and 1994 while, at the same time, deaths from the disease rose by 41 percent. The increased costs reflect a steep rise in medication costs, yet nine out of 10 prescriptions were for “rescue” medications to manage severe asthma attacks, rather than for inhaled steroids used to prevent such attacks. The study’s authors concluded that the results indicated that many patients were not being treated according to established guidelines. [30]

Even when asthma patients attend frequent clinic programs offering intensive specialty services, costs are saved in the long-term by reducing the number of emergency room visits and other acute care interventions. In one center, a savings of \$137 per patient per year

Failure to control asthma has a particularly high price: estimates are that more than 80 percent of all resources expended for asthma treatment is used by 20 percent of patients whose disease is not adequately controlled.

was realized among patients who made frequent, regular visits to a comprehensive allergy clinic, compared to patients who went less frequently to an emergency room for treatment of acute asthma symptoms. [23] Other research has documented that the services in specialty clinics result in a higher quality of care, including strategies to help patients control their disease and reduce the incidence of acute symptoms that require hospitalization or emergency room services. [31]

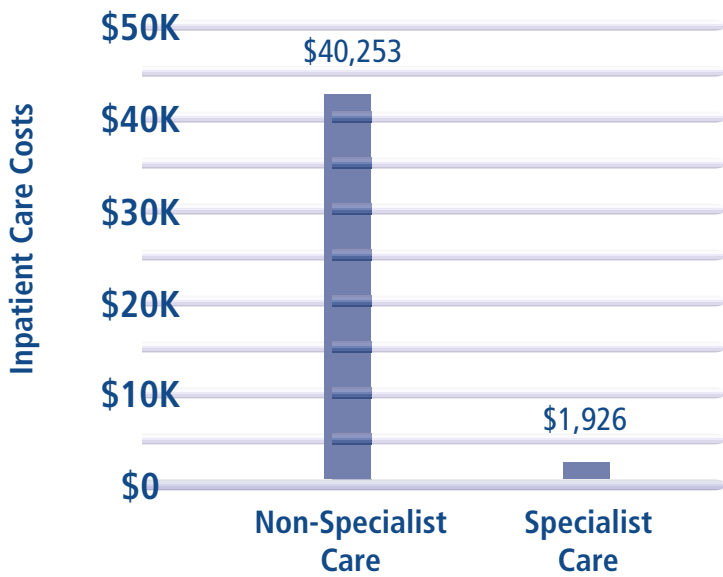
Failure to control asthma has a particularly high price: estimates are that more than 80 percent of all resources expended for asthma treatment is used by 20 percent of patients whose disease is not adequately controlled. [32] A study of more than 2,000 asthma patients participating in one managed care plan found that patients evaluated and followed by allergists required less utilization of resources for acute, uncontrolled disease than patients who are never seen by an allergist, or those seen but not actively followed. [33]

Hospitalizations

Asthma is responsible for 478,000 hospital admissions annually, which cost an estimated \$2 billion. [3] Patients under the care of allergists are hospitalized less often for asthma symptoms and have shorter lengths of stay, which can lower the cost of inpatient asthma care dramatically.

In a retrospective study of 70 patients with moderate-to-severe asthma, decreased hospitalizations following evaluation by an allergist contributed to an overall savings of \$145,500, or \$2,100 per patient. [15] In another study of patients requiring intubation for asthma, enrollment in an intervention program supervised by asthma specialists saw per-patient hospital costs reduced 95 percent from \$40,253 to \$1,926. [18]

95% reduction for inpatient care with asthma specialists



ASTHMA CARE HOSPITAL INPATIENT COST SAVINGS

Source: Doan T, et al. *Ann Allergy Asthma Immunol* 1996.

Yet another study of 125 patients showed that the number of hospitalizations decreased from 38 to 4, and the costs of inpatient care dropped from \$192,926 to \$20,308, after the patients were enrolled in a specialty allergy clinic. [16]

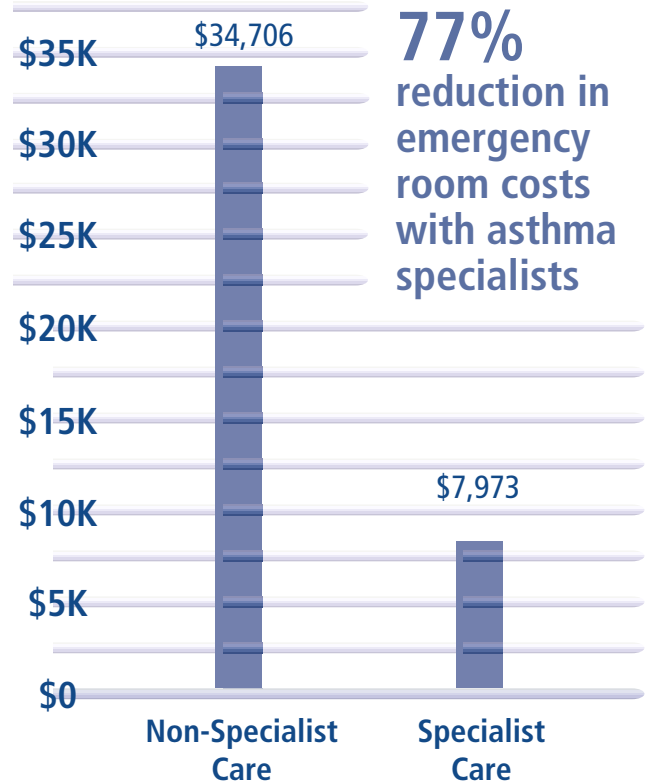
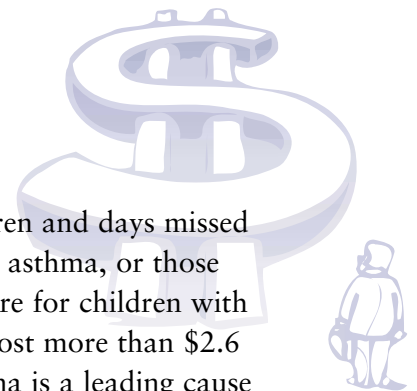
Emergency Room Visits

The cost of emergency room visits for asthma is estimated to be \$546 million annually. [3]

In a study of 207 asthma patients treated by specialists at one Midwest asthma center, reductions in hospitalizations and emergency room visits were substantial, representing an annual cost savings of \$2,714 per patient – more than \$560,000. [27] Another study reported a fall in emergency department visits from 74 to 17, and cost reductions of \$34,706 to \$7,973, for 125 patients after they enrolled in a specialty asthma clinic. [16]

Indirect Costs

Lost school days for children and days missed from work for adults with asthma, or those who must stay home to care for children with asthma, are estimated to cost more than \$2.6 billion annually. [3] Asthma is a leading cause of missed school days among children, causing an estimated 10 million absences each year. [10] In one survey of adults with asthma prior to enrollment in an asthma management program, a total of 194 days missed from work were reported by 78 patients. Care by an allergist or other asthma specialist has been shown to reduce lost days from work or school by 80 percent or more. [19]



77% reduction in emergency room costs with asthma specialists

ASTHMA CARE EMERGENCY ROOM COST SAVINGS

Source: Villanueva AG, et al. American College of Chest Physicians Annual Meeting 2000.

HOW ALLERGISTS ACHIEVE COST-EFFECTIVE OUTCOMES

Asthma patients receive added value when care is managed by an allergist. Specialty training, knowledge and experience enable the allergist to:

- accurately diagnose the disease, its types, subtypes and severity.
- identify the external factors, including allergens that trigger an asthma attack, and provide counseling on how to avoid those triggers.
- administer immunotherapy or “allergy shots” for allergic asthma to reduce sensitivity to allergy triggers.
- use current best practices to develop and implement an aggressive treatment plan that is tailored specifically to the needs of individual asthma patients.
- maintain disease control through detailed, multi-faceted treatment plans that include prevention, aggressive use of appropriate medications and other interventions to prevent asthma symptoms, ongoing patient education, and self-care strategies managed by the patient.

Aggressive Asthma Management: The New Standard of Care



Until 1991, it was the consensus of physicians that asthma therapy should be conservative and medications introduced one at a time, with dosage increases only when the condition worsened. Contrasted to this are the latest evidence-based guidelines stipulating that asthma should be diagnosed as early as possible and treated aggressively while it is still mild. Otherwise it may worsen and cause permanent scarring and irreversible remodeling of the lungs’ airways. [5]

The disease should be treated with multiple medications, if necessary, to control symptoms as soon as they appear. Allergists, with their extensive experience using these medications, are able to prescribe them properly for the individual patient. Aggressive therapy should be initiated at the onset to establish immediate control of symptoms; it then may be stepped down as the patient’s condition improves. An allergy history, physical exam and skin tests may be needed to identify factors triggering asthma exacerbations. Although the cost of the initial therapy may be high, it is outweighed by significant long-term health benefits and cost savings. [16]

A study of medical treatments for 1,574 patients enrolled in a managed care plan found that the best managers of asthma are specialists who tend to be very aggressive in ordering tests, and deploy the most resources in terms of office time and medical procedures. The study found that the costs of care were about the same or less than the care given by non-specialists, and outcomes and disease control were significantly improved for the patients treated by specialists. [34]



New Perspectives on Asthma

As more is learned about asthma, researchers are discovering that the disease is far more complex than previously thought and consists of several subtypes, such as allergic asthma, exercise-induced asthma, asthma related to bacterial or fungal infections and asthma in the elderly. Each type can have different symptoms or triggers, and each requires a different approach to diagnosis and treatment. Allergists, with extensive experience treating all forms of asthma, understand its complexities and know that it is essential to distinguish among different types. They can assess the severity of each case and develop case-specific treatment plans that have the greatest likelihood of success with individual patients.

The PCP [primary care physician] should have a consulting relationship with an allergy specialist who can perform any part of the initial evaluation for asthma or disease management that the PCP is not able to provide.”

Managed care organizations have an added motivation to optimize asthma management now that the National Committee for Quality Assurance has made the appropriate use of asthma medications a key indicator of managed care quality. [36]

Allergists...can assess the severity of each case and develop case-specific treatment plans that have the greatest likelihood of success with individual patients.

Primary care physicians also are demanding a greater say in selecting appropriate treatments and in referring patients to specialists when the disease is severe, atypical or requires specialized knowledge for optimum management. [37]

Growing Consensus for Specialty Care of Asthma

As asthma management becomes more sophisticated, health care plans are seeking a competitive edge through programs that optimize patient health education, prevention and aggressive up-front treatment to avoid severe flare-ups of any chronic disease. Programs that reduce participant turnover and enable managed care organizations to provide lifelong services are most successful at satisfying patients and reducing costs. In a review of health care trends prepared for *Managed Care Medicine*, [35] asthma management was chosen as a model for the new managed care. “Asthma is a health problem that pays large dividends if a proper front-end investment is made in patient education and preventive care,” the author noted. “. . . Such an intervention can significantly improve symptom control and reduce hospital and emergency room use

The Emerging Role of New Treatments and Preventions

Recent studies have focused on identifying risk factors that contribute to asthma or to the severity of the disease, as well as new approaches to treating or preventing asthma and its symptoms. For example:

- The majority of people who have asthma have allergic asthma, and the role that allergies play in the disease is gaining ever more attention. The first national Cooperative Inner-City Asthma Study, sponsored by NIAID, identified exposure to cockroaches and cockroach allergy as a major influence of the severity of asthma



in inner-city children ages 4 to 11. The study, which included more than 1,500 children and their families, also found that high levels of tobacco smoking by families and caregivers contributed significantly to the disease. [38] Allergists, with their specialized knowledge of the relationship between environmental pollutants and allergens and the disease and the mechanisms of allergic reactions, have the training and clinical experience to deal effectively with these factors.

- Allergists promote asthma self-management skills to assist people in eliminating or decreasing exposure to asthma “triggers.” [14]
- Specialists are more likely than generalists to follow established clinical care guidelines and can provide the most authoritative information to health care providers, families and other caregivers to optimize prevention and treatment strategies and decrease asthma severity. [8,9,39]
- A growing body of clinical research shows that immunotherapy, or “allergy shots,” often reduces patients’ sensitivity to the allergens that trigger asthma attacks and significantly reduces the severity of the disease. [40-41] Research also shows that immunotherapy can reduce the development of allergic asthma in children with seasonal allergies. [42] The asthma guidelines of the expert panel of the National Institutes of Health recommend that patients be referred to an allergist when immunotherapy is being considered. [5]
- Allergists are involved in clinical trials to test other promising techniques, such as the use of monoclonal antibodies to inhibit the inflammatory process that leads to asthma. Consequently they usually are the first clinicians to become aware of and implement proven new treatments.

WHEN TO REFER TO AN ALLERGIST

The NIH expert panel report [5] recommends that asthma patients be referred to a specialist when they:

- have difficulty achieving or maintaining control of their condition
- have had a life-threatening asthma attack
- are not meeting the goals of asthma therapy after three to six months of treatment, or are not responding to current therapy
- have symptoms that are unusual or difficult to diagnose
- have other conditions such as severe hay fever or sinusitis that complicate their asthma or its correct diagnosis
- need additional diagnostic tests to determine the severity of their asthma and what causes its symptoms
- require additional education or guidance in managing any complications of therapy, adhering to their treatment plan or avoiding asthma triggers
- are candidates for immunotherapy
- have severe, persistent asthma
- require continuous oral high-dose inhaled corticosteroid therapy, or have taken more than two bursts of oral corticosteroids in one year

The guidelines also recommend that children under the age of 3 with moderate or severe asthma, and children beginning daily, long-term therapy should see an asthma specialist.

The NIH Guidelines for referral to an asthma specialist are in general accord with guidelines developed by the American College of Allergy, Asthma and Immunology (ACAAI), the

American Academy of Allergy, Asthma and Immunology (AAAAI) and the Joint Council of Allergy, Asthma and Immunology (JCAAI), and are endorsed by the Allergy-Immunology Subsection of the American Academy of Pediatrics (AAP).

The guidelines [6] of these professional medical societies for the specialty of allergy, asthma and immunology further state that referral to a specialist is indicated when:

- the patient's asthma is unstable, or the response to therapy is limited, incomplete or very slow, and poor symptom control interferes with the patient's quality of life
- identification of allergens or other environmental factors which may be triggering the patient's disease is required
- co-existing illnesses or their treatments complicate the management of asthma
- the diagnosis of asthma is in doubt
- there is concern about side effects that have occurred or may occur with asthma medications
- the patient asks for a consultation

CONCLUSION

A substantial and growing body of published clinical data and other research demonstrate significant discrepancies in outcomes between asthma care that is managed by generalists without specialty training in the complexities of asthma, and disease management under the direction of an allergist who can add significant value to patient care.

An evidence-based review of the literature provides convincing documentation that aggressive management of asthma by a specialist improves outcomes for patients, lowers overall treatment costs for payers, and reduces the indirect costs to society. Specialty care results in fewer hospitalizations and other emergency interventions, fewer missed days from work or school, and significantly enhanced health and quality of life for those who suffer from asthma.

An evidence-based review of the literature provides convincing documentation that aggressive management of asthma by a specialist improves outcomes for patients, lowers overall treatment costs for payers, and reduces the indirect costs to society.

As more is learned about the mechanisms of asthma and new therapies are developed to control the severity and progress of the disease, the allergist will continue to play an important role in improving the health outcomes for patients with asthma.

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ABSTRACTS OF OUTCOME AND COST STUDIES

Abramson MJ, Puy RM, Weiner JM. Allergen immunotherapy for asthma. *Cochrane Database Syst Rev.* 2000;(2):CD001186.

Conclusion: Immunotherapy may reduce asthma symptoms and use of asthma medications.

Specific findings: A review of 54 trials was conducted to assess the effects of allergen-specific immunotherapy for asthma. Overall, patients receiving immunotherapy experienced a significant reduction in asthma symptoms and medication use compared to those randomized to placebo.

Bukstein D, Luskin A. Specialty influence on acute care resource utilization by asthma patients. *Ann Allergy Asthma Immunol.* 1998;80:106.

Conclusion: HMO patients with asthma whose care was followed by allergists required less utilization of resources for acute, uncontrolled disease than patients never seen by an allergist or those seen but not actively followed.

Specific findings: More than 2,000 patient charts were reviewed for asthma and chronic/recurrent respiratory disease. One group of patients was seen and followed by allergists, one group was seen by an allergist once but not followed and one group was seen only by primary care physicians. The group seen and followed by allergists had fewer hospitalizations, shorter lengths of hospital stay and fewer emergency department visits.

Dales RE, Kerr PE, Schweitzer I, et al. Asthma management preceding an emergency department visit. *Arch Intern Med.* 1992;152:2041-44.

Conclusion: A significant number of adults who required emergency care for asthma lacked adequate preexisting management strategies for dealing with their disease. The authors recommend that patients be screened by emergency physicians, and those with identifiable inadequacies in usual care be referred to physicians with expertise in asthma management.

Specific findings: A questionnaire was completed by 111 consecutive patients who came to the emergency department because of asthma. 25% of patients suffered sleep disturbance more than 15 days per month, had more than 14 days absent from work/school per year and previously had visited an emergency department twice in the past year. 69% had no effective plans to deal with an attack or had plans that were never discussed with a physician. Of 78% who reported that cigarette smoke aggravated their asthma, one-third were exposed to smoke at home.

Diette GB, Skinner EA, Nguyen TT, et al. Comparison of quality of care by specialist and generalist physicians as usual source of asthma care for children. *Pediatrics.* 2001;108(2):432-37.

Conclusion: Asthma care in children in two large managed care organizations was more likely to be consistent with national guidelines when a specialist was the primary provider.

Specific findings: A cross-sectional survey of 260 parents with children reviewed four domains of patient care including patient education, control of factors contributing to asthma symptoms, periodic physiologic assessment and monitoring, and proper use of medications. In all four domains, care was more likely to be consistent with guidelines when specialists provided care. Greatest differences for specialist versus generalist management were for use of controller medications, ever having a pulmonary function test, and having been told about asthma triggers and how to avoid them.

Doan T, Grammar LC, Yarnold PR, et al. An intervention program to reduce the hospitalization cost of asthmatic patients requiring intubation. *Ann Allergy Asthma Immunol.* 1996;76:513-18.

Conclusion: An intervention program that included education, specialist care, regular outpatient visits and access to an emergency call service significantly reduced the cost of asthma care in patients intubated for asthma.

Specific findings: In a study of nine patients, the mean total cost of care decreased from \$43,066 the year before the intervention to \$4,914 the year after. Inpatient hospitalization costs decreased from \$40,253 to \$1,926. The costs of emergency services, outpatient services and medicines did not change significantly.

Friday GA Jr, Khine H, Lin MS, Caliguiri LA. Profile of children requiring emergency treatment for asthma. *Ann Allergy Asthma Immunol.* 1997;78:221-24.

Conclusion: A subset of children who lack adequate asthma management to avoid expensive emergency services was identified. The authors concluded that there is a need to institute aggressive interventions to improve the quality of care for these patients and prevent costly emergency department visits.

Specific findings: 1,474 asthma patients who visited the emergency department of an academic children's hospital during a one-year period were prospectively studied. Of the total number of visits, 36% were by 16% of the children, who made repeat visits. Nearly 200 patients had been hospitalized in the preceding year. 44% of patients were referred for emergency care by primary care physicians, compared to 6.7% referred by allergy specialists.

Gaioni SJ, Korenblat-Hanin M, Fisher EB, Korenblat P. Treatment outcomes in an outpatient asthma center: retrospective questionnaire data. *Amer J Managed Care.* 1996 Sep;999-1008.

Conclusion: Aggressive treatment at an asthma center had a positive and significant impact on asthma health outcomes and health system cost savings.

Specific findings: 207 patients who had completed treatment at an asthma center in St. Louis for at least one year before the start of the study, responded to a questionnaire to assess outcomes. Treatment at the center resulted in a 78% reduction in hospitalizations, a 73% reduction in emergency room visits and a 48% reduction in unscheduled physician visits. Overall net savings in medical system use were estimated to be \$2,714 per patient per year, for a total savings of more than \$560,000. Other improvements included decreases in severe shortness of breath from 48% to 15%, frequent depressed mood from 32% to 13%, and severe interference with daily activities from 31% to 11%. Patients also noted an increase from 48% to 96% in knowledge of self care for asthma and from 21% to 78% in satisfaction with professional asthma care.

Keenan JM. Optimizing health: asthma management as a model for the new managed care. *Managed Care Med.* 1995 Nov-Dec;20-28.

Conclusion: Aggressive and consistent implementation of the new asthma management clinical guidelines is an excellent way for managed care organizations to optimize the health of their community of patients.

Specific findings: Asthma management is studied as a model to illustrate the individual and population benefits of optimizing health care. Based on a review of the available literature, the author concludes that implementation of intervention programs in compliance with existing guidelines will provide immediate and tangible clinical and cost benefits.

Legorreta AP, Christian-Herman J, O'Connor RD, et al. Compliance with national asthma management guidelines and specialty care: a health maintenance organization experience. *Arch Intern Med.* 1998;158:457-64.

Conclusion: Although the National Asthma Education Program expert panel guidelines for the diagnosis and management of asthma were initially published in 1991, a survey of a major California HMO found compliance with the guidelines low. The results showed that asthma specialists provided more thorough care than did primary care physicians in treating patients with asthma.

Specific findings: Survey data were analyzed for 5,580 asthma patients covered by Health Net in California in 1996. Of respondents with severe asthma, 72% reported having a steroid inhaler, but only 54% used it daily. Only 26% had a peak flow meter and only 16% used it daily. The patients of specialists were more likely to have a steroid inhaler and peak flow meter and to use them daily. Specialists also provided more patient education on how to prevent and control asthma attacks.

Mahr TA, Evans R. Allergist influence on asthma care. *Ann Allergy Asthma Immunol.* 1993;71:115-20.

Conclusion: Follow-up care by an allergist after hospitalization for asthma resulted in a decrease in subsequent hospitalizations and emergency room visits.

Specific findings: The retrospective study compared 83 patients who received asthma follow-up care by an allergist and 40 patients who received care from a non-allergist after hospitalization. 13% of patients who received follow-up care by an allergist were subsequently hospitalized, compared to 35% treated by non-allergists. 18% of the allergist patients had emergency room visits compared to the 47% treated by non-allergists. There were significant increases in use of all medications and devices in the group treated by allergists.

McDonald RJ, Cosmic M, Berchou K, et al. Effect of an asthma management program and subspecialty care on asthma outcomes and quality of life. Abstract presentation. American College of Chest Physicians annual meeting. Oct 1999.

Conclusion: Asthma outcomes and quality of life can be improved significantly by the combination of subspecialty care and an organized approach to asthma management based on the NIH guidelines applied in a private practice setting.

Specific findings: Data was collected upon admission and at a six-month follow-up for 50 patients in an asthma management program that included asthma education and a care plan based on NIH guidelines. Days missed from work or school were reduced from 310 to 73. Sick visits to the doctor were reduced from 132 to 43. Emergency room visits were reduced from 45 to 7. Hospitalizations were reduced from 7 to 1. Overall asthma-related quality-of-life score improved significantly from 4.41 to 5.37 (+0.96).

Mitchell JB, Khatustsky G, Swigonsky NL, et al. Impact of the Oregon Health Plan on children with special health care needs. Pediatrics. 2001;107(4):736-43.

Conclusion: Children with disabilities in managed care plans did not experience any more difficulty accessing needed specialty care than did those without special health care needs. Children with asthma, however, reported higher levels of unmet need.

Specific findings: Three groups of children, ages 1 to 17, were sampled: 205 children with disabilities who received Supplemental Security Income (SSI), 410 children with asthma and 351 children without special health care needs. Almost one-fifth of the children with disabilities and one-eighth of children with asthma were reported to be in fair or poor health. Access problems were rare, however a high proportion of children with asthma reported unmet needs for specialist care and children with asthma were not eligible for the same consumer protections afforded SSI children by Oregon. The authors concluded that if states want to enroll all children with special health care needs into managed care programs, they must develop mechanisms for identifying such children and ensuring that they receive medically necessary services.

Moller C, Dreborg S, Ferdousi HA, et al. Pollen immunotherapy reduces the development of asthma in children with seasonal rhinoconjunctivitis (the PAT-study). J Allergy Clin Immunol. 2002;109(2):251-56.

Conclusion: Immunotherapy can reduce the development of asthma in children with seasonal rhinoconjunctivitis.

Specific findings: 205 children ages 6 to 14 with moderate-to-severe hay fever symptoms were enrolled in the study. At the start of the study, none of the children reported an asthma diagnosis requiring daily treatment, however 20% of the children had mild asthma symptoms during the pollen season(s). Among those without asthma, the children actively treated with immunotherapy had significantly fewer asthma symptoms after three years as evaluated by clinical diagnosis.

Moore CM, Ahmed I, Mouallem R, et al. Care of asthma: allergy clinic versus emergency room. Ann Allergy Asthma Immunol. 1997;78:373-80.

Conclusion: The decreased morbidity of asthma and cost of care for the allergy clinic patients, compared to the emergency room patients, are likely due to the care given in the allergy-immunology clinic.

Specific findings: 50 emergency room patients and 25 allergy clinic patients were studied. The data showed no demographic or socioeconomic differences between the two groups. However, the clinic group had significantly less nocturnal cough, sleep interruption, missed school and emergency room visits resulting in an approximate average savings of \$137 per patient per year.

Moy JN, Grant EN, Turner-Roan K, et al. Asthma care practices, perceptions, and beliefs of Chicago-area asthma specialists. *Chest*. 1999;116:154S-162S.

Conclusion: Asthma specialists in the Chicago area are providing asthma care that is, in many ways, consistent with national guidelines. However, there also are important differences in asthma care between two subspecialty groups: allergists and pulmonologists. The effect of these differences on the management of persons with asthma is not known.

Specific findings: A cross-sectional survey was mailed to asthma specialists (allergists or pulmonologists) in the Chicago area. 113 eligible surveys were returned (response rate, 72.0%). 99% of the respondents indicated they would prescribe inhaled corticosteroids for patients 5 years of age and older with moderate persistent asthma, and 85.5% would prescribe them for patients younger than 5 years old. The respondents reported that 71.2% of their patients with moderate or severe persistent asthma were routinely given written treatment plans. The use of these plans was reported more frequently by allergists than pulmonologists (77.6% vs 58.9%, $p = 0.01$). Nearly half of the respondents were involved in the development of hospital-based asthma programs; fewer (14.9%) were involved in developing asthma programs for managed care organizations. A majority (63.4%) of the physicians had given a formal professional education presentation on asthma in the past year. A majority of the respondents who care for patients under managed care contracts reported that these patients have encountered barriers to access in seeking specialty care.

Nyman JA, Hillson S, Stoner T, DeVries A. Do specialists order too many tests? The case of allergists and pediatric asthma. *Ann Allergy Asthma Immunol*. 1997;79:496-502.

Conclusion: Allergists' test-intensive practice style is cost-effective.

Specific findings: 1,574 pediatric asthma cases in a large health plan were reviewed. The cases managed by allergists were no more costly than those managed by non-allergists, despite the fact that the allergists ordered significantly more tests and required more office visits than non-allergists. Patients treated by allergists experienced fewer hospitalizations and emergency room visits resulting in cost-savings due to improved outcomes and disease control.

Piecoro LT, Potoski M, Talbert JC, et al. Asthma prevalence, cost, and adherence with expert guidelines on the utilization of health care services and costs in a state Medicaid population. *Health Serv Res*. 2001 Jun;36(2):357-71.

Conclusion: A review of asthma prevalence and utilization of health services in a Kentucky Medicaid population found widespread nonadherence to the National Asthma Education Program expert panel guidelines associated with an increase in asthma exacerbations that resulted in hospitalizations.

Specific findings: Of 530,000 Medicaid recipients, 24,365 (4.6%) were identified as having asthma. Average annual asthma-related costs (\$616) accounted for less than 20% of total health care costs (\$3,645). Less than 40% of the patients received a prescription for a rescue medication, and fewer than 10% of the patients who received daily inhaled short-acting beta-2 agonists were regular users of inhaled steroids. This guideline nonadherence was associated with an increased risk of asthma-related hospitalizations.

Ross RN, Nelson HS, Finegold I. Effectiveness of specific immunotherapy in the treatment of asthma: a meta-analysis of prospective, randomized, double-blind, placebo-controlled studies. *Clin Ther*. 2000 Mar;22(3):329-41.

Conclusion: The findings of this meta-analysis support the conclusion that specific immunotherapy (SIT) is effective in a population of patients with allergen-triggered asthma.

Specific findings: Data were extracted from 24 studies of the clinical effectiveness of SIT in the treatment of asthma in 962 asthmatic patients with documented allergy. Immunotherapy was judged effective in 17 (71%) of the 24 studies, ineffective in 4 (17%), and equivocal in 3 (12%). Symptoms of asthma were more likely to improve in patients who received SIT than in patients who received placebo. Patients who received immunotherapy also were more likely to experience improved pulmonary function, protection against bronchial challenge and reduced need for medications.

Sin DD, Tu JV. Underuse of inhaled steroid therapy in elderly patients with asthma. *Chest*. 2001;119:720-25.

Conclusion: Despite their proven efficacy, inhaled steroids are underused in the elderly asthmatic population with patients of generalists less likely to receive the therapy than patients of specialists.

Specific findings: Of 6,254 Ontario, Canada, patients age 65 and older who experienced a recent acute exacerbation of asthma, 2,495 patients (40%) did not receive inhaled steroid therapy within 90 days of discharge from their initial hospitalization for asthma. Nonreceipt of inhaled steroid therapy was particularly prominent in the older patients with multiple comorbidities. Moreover, those who received care from primary care physicians also were less likely to receive inhaled steroid therapy, compared to those who received care from specialists.

Smith DH, Malone DC, Lawson KA, et al. A national estimate of the economic costs of asthma. *Am J Respir Crit Care Med*. 1997;156:787-93.

Conclusion: Future asthma research and intervention efforts directed at reducing hospitalization and providing better care for high-risk asthma patients could help to decrease health care resource use and provide cost savings.

Specific findings: Based on an analysis of the 1987 National Medical Expenditure Survey, the total estimated annual cost of asthma is \$5.8 billion, with hospitalization accounting for half of all expenditures. More than 80% of resources were used by 20% of the population. The estimated annual per patient cost for high-risk patients was \$2,584, compared to \$140 for the rest of the sample.

Sperber K, Ibrahim H, Hoffman B, et al. Effectiveness of a specialized asthma clinic in reducing asthma morbidity in an inner-city minority population. *J Asthma*. 1995;32:335-43.

Conclusion: An outpatient intervention program has been successful in reducing asthma morbidity in the high-risk minority community of East Harlem, N.Y.

Specific findings: A retrospective chart review of 84 patient records was conducted, and patients were divided into two groups: an intervention group that was followed by an allergist, and a nonintervention group followed by a primary care physician. Patients in the intervention group had fewer walk-in visits, emergency room visits and hospitalizations. Patients in the nonintervention group had no change in walk-in visits or hospitalizations, and an increase in emergency visits.

Taylor DM, Auble TE, Calhoun WJ, Mosesso VN Jr. Current outpatient management of asthma shows poor compliance with international consensus guidelines. *Chest*. 1999;116:1638-45.

Conclusion: The outpatient management of most asthma patients requiring emergency room care does not comply with national consensus guidelines and patient knowledge of asthma is poor.

Specific findings: 85 asthmatic patients requiring emergency room treatment for asthma were reviewed in a prospective, researcher-administered questionnaire. The majority of the patients were not managed in compliance with expert guidelines with 62% undertreated with medication and 87% having no written plan of action. Only 28% of the severe asthmatics were treated by asthma specialists, far short of the 100% recommended by the guidelines. Knowledge of the disease and proper medication use also was low.

Villanueva AG, Mitchell L, Ponticelli D, Levine AS. Effectiveness of an asthma center in improving care and reducing costs in patients with difficult-to-control asthma. Abstract presentation. American College of Chest Physicians annual meeting. Oct 2000.

Conclusion: A multidisciplinary team specializing in the treatment of patients with difficult-to-control asthma can effect substantial cost savings while improving quality of care.

Specific findings: A review of 125 patients receiving care in an asthma center (AC) found high patient satisfaction, a significant reduction in the ratio of inhaled beta agonist prescriptions filled to inhaled steroid prescriptions filled, large reductions in ER and hospital utilization and resultant decrease in cost. The number of ER visits was 74 before AC vs 17 after AC (76% reduction). The number of hospitalizations was 38 before AC vs 4 after AC (89% reduction). The mean cost of the initial AC visit was \$770. The cost of ER care totaled \$34,706 before AC vs \$7,973 after AC. The cost of inpatient care totaled \$192,926 before AC vs \$20,308 after AC.

Vollmer WM, O'Hollaren M, Ettinger KM, et al. Specialty differences in the management of asthma. A cross-sectional assessment of allergists' patients and generalists' patients in a large HMO. *Arch Intern Med.* 1997;157(11):1201-08.

Conclusion: Specialist care was found to be of benefit to asthma patients in a large HMO. The allergists' patients conformed more closely to national asthma management guidelines and reported better quality of life than did the patients of generalists.

Specific findings: Nearly 400 patients ages 15-55 with physician-diagnosed asthma were studied. Patients receiving their primary asthma care from an allergist were considerably more likely to report using inhaled anti-inflammatory agents, oral steroids and regular breathing medications to control their asthma. Allergists' patients were more likely to have asthma exacerbations treated in a clinic rather than an emergency room and reported significantly improved quality of life.

Weinstein AG, McKee L, Stapleford J, Faust D. An economic evaluation of short-term inpatient rehabilitation for children with severe asthma. *J Allergy Clin Immunol.* 1996;98:264-73.

Conclusion: Inpatient rehabilitation reduced asthma treatment and total medical charges over a follow-up period of four years. The costs of the rehabilitation were recouped before the end of the fourth year.

Specific findings: A 17-day inpatient rehabilitation and four-year follow-up of 59 severe asthmatic children significantly reduced hospitalization, emergency care and medical costs from the year prior to rehabilitation. Hospital days were reduced from 7 in the year prior to rehabilitation to 0 in the four years of follow-up; emergency room visits decreased from 4 to 0; and cost of treatment declined from \$11,503 to \$2,655 in the fourth year.

Weiss KB, Sullivan SD. The health economics of asthma and rhinitis. I. Assessing the economic impact. *J Allergy Clin Immunol.* 2001;107:3-8.

Conclusion: Cost-of-illness studies of asthma and allergic rhinitis suggest that these conditions represent a large burden to society, both nationally and internationally. The largest direct medical expenditure are medications, and indirect costs associated with the disease also are significant.

Specific findings: The economic burden of asthma and rhinitis are examined in terms of how resources are allocated to the care of persons with the conditions. In 1998, asthma in the United States accounted for an estimated \$12.7 billion dollars annually. Similarly, in 1994, allergic rhinitis was estimated to cost \$1.2 billion. Most of the costs for these conditions are attributed to direct medical expenditures, with medications emerging as the single largest cost component. Indirect costs also represent an important social effect. While cost-of-illness studies help to characterize the economic burden, comparative health economic studies evaluate the value of new and existing strategies for clinical care.

Westley CR, Spiecher B, Starr L, et al. Cost effectiveness of an allergy consultation in the management of asthma. *Allergy Asthma Proc.* 1997;18:15-18.

Conclusion: Referral to an allergist reduced the cost of asthma care by \$2,100 per patient.

Specific findings: The retrospective study evaluated the outcomes and treatment costs for 70 moderate-to-severe asthma patients treated in a Kaiser Permanente health plan in Denver. All patients were followed for at least one year by a primary care physician prior to evaluation and follow-up by a specialist for at least one year. Findings after an evaluation and follow-up with a specialist included a 67% decrease in the number of hospitalizations; a decrease in average hospital days from 4 to 2.5; a 45% decrease in sick care office visits; and a 56% decrease in emergency room visits. Estimated cost savings for the 70 patients were \$145,500.

Wu AW, Young Y, Skinner EA, et al. Quality of care and outcomes of adults with asthma treated by specialists and generalists in managed care. *Arch Intern Med.* 2001;161:2554-60.

Conclusion: Physicians' specialty training and self-reported expertise in treating asthma were related to better patient-reported care and outcomes in a managed health care setting.

Specific findings: A mail survey of 1,954 asthma patients and 1,078 physicians in 12 managed care organizations found significant differences for patients of specialists and experienced generalists compared with those of generalist physicians. Peak flow meter possession was reported by 41.9% of patients of generalists, 51.7% of patients of experienced generalists, and 53.8% of patients of pulmonologists or allergists. Outcomes were significantly better for patients of allergists compared to generalists with respect to canceled activities, hospitalizations and emergency department visits, quality-of-care ratings and physical functioning.

Zeiger RS, Heller S, Mellon MH, et al. Facilitated referral to asthma specialist reduces relapses in asthma emergency room visits. J Allergy Clin Immunol. 1991;87:1160-68.

Conclusion: Referral of patients with asthma to specialists after acute emergency room therapy reduced asthma emergency relapses and improved asthma outcomes. The reduction in emergency room relapses could lead to reduced hospitalizations over time.

Specific findings: The study of a Kaiser Health Plan in San Diego evaluated treatment outcomes of asthma patients who came to the emergency room with acute asthma symptoms. Compared were 149 patients who were referred to an asthma specialist and 160 who continued to be treated by a primary care physician. The patients treated by asthma specialists experienced 50% fewer asthma relapses requiring emergency room visits, a 75% reduction in the number of asthma episodes that awakened them at night, and greater use of inhaled corticosteroids and cromolyn.

Zeiger RS, Schatz M. Effect of allergist intervention on patient-centered and societal outcomes: allergists as leaders, innovators, and educators. J Allergy Clin Immunol. 2002;106(6)995-1018.

Conclusion: Allergist educators, comprising academic and practicing allergists, supported by allied health professionals, national associations and affiliated lay organizations, provide comprehensive education to fellows, residents, colleague physicians, media, the public and patients, and improve patient-centered and societal outcomes.

Specific findings: The authors review how atopic disorders, which afflict millions of Americans and hundreds of millions worldwide, are at epidemic levels with concomitant increases in morbidity and mortality. Allergy as a specialty is a major leader in developing effective strategies to confront this epidemic and allergists have made major contributions to the understanding of the risk factors, immunology, pathophysiology, immunomodulation, and prevention of atopic and immunologic disorders. Allergist epidemiologists and clinicians have helped develop and implement national and international guidelines in the recognition, management and prevention of asthma and rhinitis. Allergist clinical researchers are active in (1) outcomes research that demonstrates convincingly the value of allergy as a specialty in asthma, allergic rhinitis, anaphylaxis, drug and food allergy, and other atopic disorders; (2) National Institutes of Health clinical trials that will form the basis for the future treatment of asthma and allergic disease; and (3) pharmaceutical trials that evaluate new, effective and safe medication to treat atopic disease.

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