

The burden of allergic rhinitis

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ABSTRACT

Although formerly regarded as a nuisance disease, allergic rhinitis (AR) has a considerable effect on quality of life and can have significant consequences if left untreated. The total burden of this disease lies not only in impaired physical and social functioning but also in a financial burden made greater when considering evidence that AR is a possible causal factor in comorbid diseases such as asthma or sinusitis. Compared with matched controls, patients with AR have an approximate twofold increase in medication costs and 1.8-fold the number of visits to health practitioners. Hidden direct costs include the treatment of comorbid asthma, chronic sinusitis, otitis media, upper respiratory infection, and nasal polyposis. Nasal congestion, the most prominent symptom in AR, is associated with sleep-disordered breathing, a condition that can have a profound effect on mental health, including increased psychiatric disorders, depression, anxiety, and alcohol abuse. Furthermore, sleep-disordered breathing in childhood and adolescence is associated with increased disorders of learning performance, behavior, and attention. In the United States, AR results in 3.5 million lost workdays and 2 million lost schooldays annually. Patients struggle to alleviate their misery, frequently self-adjusting their treatment regimen of over-the-counter and prescription medications because of lack of efficacy, deterioration of efficacy, lack of 24-hour relief, and bothersome side effects. Ironically, health care providers overestimate patient satisfaction with therapy. Therefore, improvement in patient-practitioner communication may enhance patient adherence with prescribed regimens.

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Key words: Allergic rhinitis, asthma, nasal congestion, sleep disorders

Although allergic rhinitis (AR) is one of the most common chronic conditions in the United States, until recently it was regarded as more of a nuisance than a major disease. Data on the incidence and prevalence of AR are not collected in national health surveys conducted by the federal government such as the National Health Interview Survey and the National Health and Nutrition Examination Survey.¹ However, estimates suggest that AR affects up to 40 million Americans, and its prevalence is increasing.^{2,3} In ~50% of patients, symptoms are evident for >4 months of the year, and 20% of patients have symptoms for >9 months.

The symptoms of AR are not limited to the physical effects on the nose and eyes but also involve adverse consequences to quality of life, including psychological

well-being and the ability to learn and process cognitive input. One of the most common complaints related to AR is sleep disturbance, the consequences of which are more far-reaching than often is recognized.

The objective of this review is to provide an overview of the burden of AR, including physical symptoms, nonphysical symptoms, social aspects, and economic consequences of the disease and its treatment.

BURDEN OF PHYSICAL SYMPTOMS

The *Allergies in America* survey, completed in early 2006, was the largest survey ever conducted in a population with allergic nasal symptoms and has provided the first cohesive description of AR in a large population.¹ The survey was conducted by telephone interview and included 2500 adults with AR. All participants were ≥18 years of age; had been diagnosed with AR, nasal allergies, or hay fever; and were symptomatic or had been treated for nasal allergies within the last 12 months. Interview data from 300 doctors in direct patient care (adult primary care, allergy, and otolaryngology), 50 nurse practitioners, and 50 physician assistants were obtained in a parallel survey and included in the analysis.

Analysis of the *Allergies in America* data has strengthened the assertion that AR is a serious condition and

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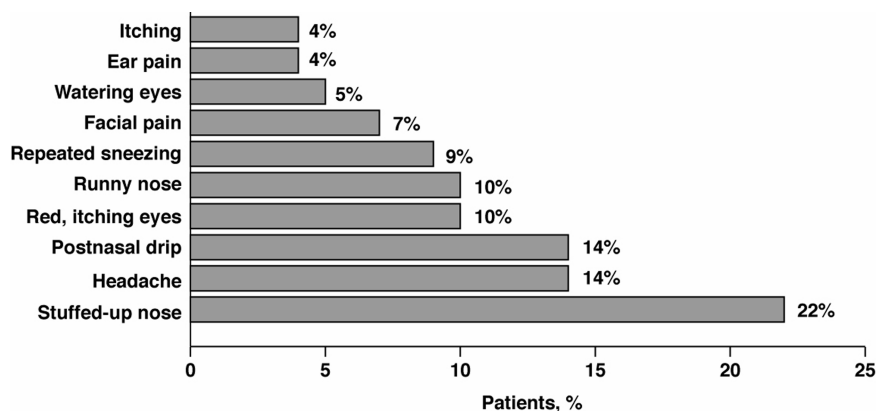


Figure 1. The most bothersome symptoms of nasal allergies. (Data are from Ref. 1, Executive Summary.)

has brought new insights to our understanding of the behavioral and psychosocial effects of AR. The majority (66%) of patients with nasal allergies indicated that AR has at least some effect on their daily lives, and 40% of patients described the effect on their daily lives as “a lot” or a “moderate amount.”^{1,4} In order of descending frequency, the physical symptoms reported as extremely or moderately bothersome by patients with AR were stuffed-up nose (78%), runny nose (62%), postnasal drip (61%), red itching eyes (53%), watering eyes (51%), repeated sneezing (51%), headache (51%), itching (46%), facial pain (43%), and ear pain (30%). Stuffed-up nose also was the symptom most frequently reported (22%) as the single most bothersome symptom (Fig. 1).¹

The symptoms of AR tend to be most prominent in the morning. In a separate online survey of 1000 adults with AR, 83% of participants reported having allergy symptoms at some time during the morning.⁵ Moreover, study participants indicated that the most severe symptom episodes occurred in the morning (49%), particularly on awakening (36%), compared with symptoms in the afternoon (26%), evening (18%), or at night (7%). Among participants who experienced allergy symptoms on first awakening, 42% had symptoms that were severe to extremely severe.⁵ Nasal congestion was the most common symptom (85%), followed by sneezing, runny nose, and itchy/watery eyes (all >50%). Regardless of the severity, the vast majority of patients who were symptomatic on first awakening (96%) were affected psychologically by their symptoms, including more fatigue, irritability, frustration, and self-consciousness, with less energy, motivation, alertness, and ability to concentrate. Symptoms lingered for the rest of the day in 74% of patients and were related to “not looking their best” (67%) and “not getting things done” (62%). Furthermore, employed participants with symptoms on first awakening found that they had trouble concentrating when first at work (53%) or even took a sick day from work because of their symptoms (22%).

BURDEN OF NONPHYSICAL SYMPTOMS

Quality of Life

Recent surveys estimate that ~38% of patients with AR have coexisting asthma and 78% of patients with asthma have AR.^{6,7} Once thought to be distinct and separate disease entities, evidence suggests that AR and asthma may be described as a continuum of inflammation that involves one common airway.⁸ Therefore, it is not surprising that in many ways AR and asthma, chronic diseases of the upper and lower airways, respectively, affect quality of life in a similar fashion. The Medical Outcomes Study Short-Form Health Survey with 36 items (SF-36), a standardized and validated generic instrument for the assessment of quality of life, was administered in two separate studies to 111 patients with moderate to severe perennial AR and 252 patients with asthma of variable severity.^{9,10} Evaluation of the SF-36 health concepts indicated a statistically significant impairment of quality of life in both studies ($p < 0.0007$ to $p < 0.0001$), and the actual profile of health-concept scores was strikingly similar. In the SF-36, a high score is consistent with a positive health status, with the maximum score for each health concept being 100. The results showed that the mean score for physical functioning was slightly higher in patients with AR compared with patients with asthma (89 versus 80, respectively) and slightly lower in patients with AR for social functioning (73 versus 84, respectively), suggesting that the effect of asthma on physical functioning is somewhat more severe than AR and that the effect of AR on social functioning is somewhat more severe than asthma (Fig. 2). Results for the other seven health concepts evaluated by the SF-36 (energy/fatigue, general health perception, role limitations–physical, role limitations–emotional, mental health, pain, and change in health) were not too dissimilar between the AR group and the asthma group.

The Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) is a disease-specific instrument for evaluation of quality-of-life problems that occur as a result

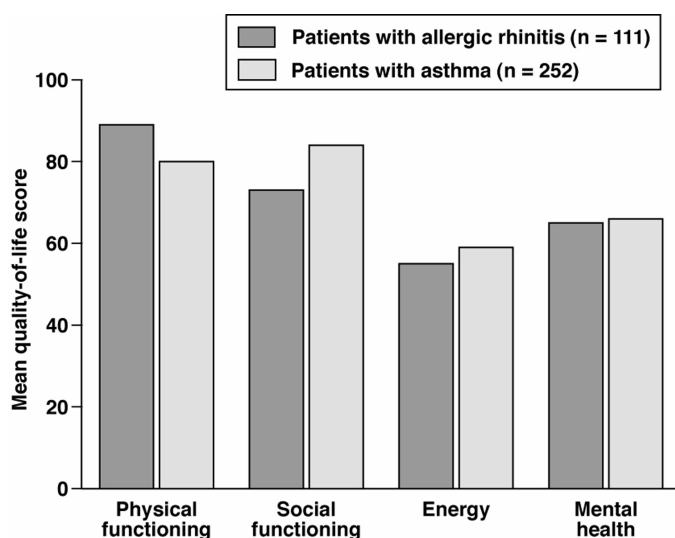


Figure 2. Effect of AR and asthma on quality of life. (Adapted with permission from Refs. 9 and 10.)

of nose and eye symptoms. A lower score indicates a better quality of life (Juniper E: www.qoltech.co.uk/Rhinocon.htm; last accessed April 14, 2006). In the *Burden of Allergic Rhinitis* study, a population-based cross-sectional survey of 15,000 households, analysis of 7069 RQLQ responses with complete data from a total of 9822 responses revealed that individuals with AR had substantially higher scores (1.6 overall) than non-sufferers (0.2 overall) in all five domains—activities, practical problems, nose symptoms, eye symptoms, and other symptoms.¹¹

Effect of AR on Patient Emotions

The *Allergies in America* survey provided an opportunity for patients with AR to describe their quality of life during the allergy season through emotional parameters.¹ Four of five allergy sufferers said that they frequently (44%) or sometimes (36%) felt tired during the allergy season. Almost two-thirds of patients reported that they frequently (29%) or sometimes (36%) felt miserable. A similar majority said that they frequently (26%) or sometimes (38%) felt irritable. Other common feelings reported by allergy sufferers included depression (frequently, 13%; sometimes, 23%) and embarrassment (frequently, 8%; sometimes, 15%).

Sleep Disturbance

Nasal obstruction is associated with sleep-disordered breathing.^{12,13} It has been estimated that up to 57% of adult patients and up to 88% of pediatric patients with AR have sleep problems.^{14–16} The *Burden of Allergic Rhinitis* study revealed that compared with normal controls, patients with AR have less adequate sleep quality as measured by the sleep-problems index or the sleep-adequacy scale. Furthermore, patients

with AR experience an approximate 10-fold increase in the number of microarousals during sleep that are attributable to disordered breathing, upper airway resistance, and increased nasal discharge.¹⁷ However, in addition to the daytime fatigue that results from poor sleep, there is a dimension of the associated symptom of daytime somnolence that appears to be related to AR itself and not to impairment of nocturnal sleep.¹⁸ Decreased cognitive functioning also has been independently associated with AR.¹¹

Sleep disturbance has a profound effect on mental health, including increased psychiatric disorders, depression, anxiety, and alcohol abuse.^{19,20} Moreover, sleep-disordered breathing in childhood and adolescence is associated with increased disorders of learning performance, behavior, and attention.^{21,22} An independent study also indicated that AR adversely affects childhood learning.²³

BURDEN ON SOCIAL INTERACTION

AR affects home life for ~34% of patients.²⁴ Children with AR may experience isolation within the family because the presence of allergens prevents them from participating in family activities such as picnics on the grass, playing with pets, or going on camping trips.²⁵ At school, these children may have emotional disturbances because of learning impairment associated with AR and/or because the activity limitations imposed by allergens disrupt their ability to fully integrate with their peers. Because neither one of these outcomes is uniquely associated with AR, parents may not recognize the issues affecting their children, thereby broadening the communication gap between the parent and child. Moreover, parents sometimes complicate the situation by becoming anxious, overprotective, or even hostile toward the child. In the process, siblings may be deprived of proper attention and develop their own emotional disturbances or harbor resentment.

The social effect of AR is not confined to the family. The Patient Voice Allergy Survey, a postal mail survey conducted by the European Federation of Allergy and Airways Diseases Patients' Associations, evaluated the effect of AR on personal interactions. Responses were analyzed from 3562 patients with AR. Meeting friends in a bar or restaurant was reported by more than one-third of patients to be affected by AR "frequently" (23%) or "all of the time" (15%). The analysis also showed that in approximately one-third of patients, AR impeded their visits to friends' houses "frequently" (25%) or "all of the time" (8%; European Federation of Allergy and Airways Diseases Patients Associations (EFA): www.efanet.org/activities/documents/AllergysummaryreportFinaldata220605-onsitea.doc; last accessed May 22, 2006).

In a separate study, for 1948 individuals who completed the RQLQ, three parameters that commonly

characterized the influence of AR on the patients' social perspective were embarrassment (70%), frustration (72%), and practical problems (98%), including the inconvenience of carrying tissues, the need to rub the nose or eyes, and blowing one's nose repeatedly.²⁶ Apparently, the symptoms of AR tend to have a negative effect on daily activities, whether they are treated or not. A Harris Interactive survey of 4000 patients found that symptoms of AR that affected patients' daily routines despite treatment included restlessness (82%), awakening feeling tired (87%), and awakening feeling congested (93%; Medscape Medical News: www.medscape.com/viewarticle/411727; last accessed March 24, 2006). These symptoms impaired patients' ability to concentrate on tasks (54%), spend time outdoors (73%), and perform physical activities such as exercise and sports (63%). In short, the activities that an adult patient with AR would like to be able to do include items that nonsufferers often take for granted, such as being able to focus at work, taking children to the park, going out without a pocketful of tissues or a handkerchief, wearing contacts instead of eyeglasses, and going out on a date without the embarrassment of a sneezing, red nose.

BURDEN OF MEDICATIONS

Current Medication Use

When experiencing nasal allergy symptoms, patients often use two to four medications at the same time (New survey suggests patients want fast, long relief of allergy symptoms. www.prnewswire.com; last accessed March 22, 2006). Results of the *Allergies in America* survey suggest that more patients with AR use over-the-counter (OTC) medications for their nasal allergies than prescription medications.¹ More than one-half (53%) of the patients said that they had used an OTC medication to relieve their symptoms within the last 4 weeks, and less than one-half (45%) had used a prescription medication. More than one-third (36%) had used a prescription nasal spray, and other types of prescription medications had been used by 22% of patients. Almost one-third (31%) of AR patients had not taken any medication.

Limitations of Allergy Medications

Intranasal corticosteroids have been the gold standard for symptom control in AR for >10 years.²⁷ Clinical studies show that intranasal corticosteroids are superior to antihistamines in the treatment of AR because they are significantly more effective at relieving nasal blockage, discharge, itch, and postnasal drip.²⁸ However, apart from formal clinical trials, patients report problems with efficacy of this class of drugs and perhaps do not fully understand the appropriate use of these medications. Although many (59%) patients say

Table 1 **Severity of commonly reported side effects of allergy medicines**

Side Effect	Patients (%) <i>n</i> = 2500	
	Extremely Bothersome	Moderately Bothersome
Drying feeling	12	22
Dripping down throat	13	20
Drowsiness	12	21
Headaches	12	13
Bad taste	7	15
Burning	7	11

Source: Data from Ref. 1, Executive Summary.

that they experience relief from symptoms within ≤1 hour of administration, some (4%) report that they experience symptom relief only after 1 week.^{1,29} Furthermore, only 15% of patients find that current intra-nasal steroids provide relief of all symptoms, and 48% of patients find that these drugs do not provide 24-hour symptom relief.^{1,29}

With regard to nasal allergy medications in general, more than one-half (55%) of patients experienced a loss of effectiveness over time in one or more of the nasal allergy products that they used, even though they were taking the medication as prescribed.¹

Satisfaction with Medications

A large proportion of patients are not “very satisfied” with their medications, and ~60% expressed an interest in finding a new allergy medication (New survey suggests patients want fast, long relief of allergy symptoms. www.prnewswire.com; last accessed March 22, 2006).¹ Common side effects of allergy medicines that are “extremely” or “moderately” bothersome include drying feeling (34%), dripping down the throat (33%), drowsiness (33%), headaches (25%), bad taste (22%), and burning (18%; Table 1).¹ Attributes of a prescription allergy medication that were considered to be important by patients who participated in the Harris Interactive survey (*n* = 1214) included should provide long-lasting relief (88%), should work within 30 minutes (85%), and should be steroid free (51%; New survey suggests patients want fast, long relief of allergy symptoms. www.prnewswire.com; last accessed March 22, 2006).

The patient's perception of drug efficacy, including the onset of action, duration of therapeutic effect, and tolerability of side effects, all have a direct influence on whether the patient will continue to use the treatment or not. The majority (61%) of patients who stopped taking a nasal allergy medication did so because of a characteristic of the medication and not because of a

change in their condition.¹ The most common reasons cited for stopping a prescription medication included lack of efficacy (37%), effectiveness began to wear off (35%), lack of 24-hour relief (32%), and bothersome side effects (25%).

BURDEN OF COMORBIDITY

AR has been associated with a number of coexisting conditions, including asthma, sinusitis, upper respiratory infection, otitis media with effusion (OME), and nasal polyposis.³⁰ Furthermore, there is evidence to suggest that failure to properly control AR may predispose patients to some of these conditions, especially asthma. By increasing the number and/or severity of symptoms, comorbidities add weight to all levels of burden on the patient, including an amplification of the financial cost related to the management of more than one disease.

Surveys report that 38% of patients with AR have coexisting asthma, and as many as 78% of patients with asthma also have AR.^{6,7} Asthma and AR are often thought of as conditions that characterize different points on a continuum of inflammation within one common airway.⁸ Evidence suggests a common pathophysiology for these allergen-induced disorders, and this perspective is supported by the observation that treatment of AR reduces the incidence and severity of asthma.^{31–35} Furthermore, allergy also has been linked as a contributing factor in 40–80% of cases of chronic sinusitis.³⁰ Approximately 21% of children with nasal allergies experience OME, and nasal allergy in children with an OME has a range of 35–50%.^{36,37} The peak season for eustachian tube problems in allergic children coincides with the peak ragweed and mold season.³⁸ In patients with AR, an allergen challenge induces expression of the receptor for 90% of human rhinoviruses, increasing the susceptibility for an upper respiratory infection.³⁰ In turn, rhinovirus infection can accentuate the pattern of airway reactivity in patients with AR.^{39,40} Although the link between AR and nasal polyps is considered controversial, it is noteworthy that the recurrence rate of polyps in allergic individuals is higher than for persons who are without allergy.⁴¹ These associations imply that treatment of AR may preempt the overall incidence of comorbidity and simultaneously diminish the potential financial burden on the patient and health care resources.

ECONOMIC BURDEN

AR ranks fifth among chronic conditions in the United States in terms of the overall economic burden of illness (average medical, absenteeism, short-term disability, and presenteeism costs of \$271 per eligible employee per year).⁴² The direct costs of AR include physician office visits, laboratory tests, medication,

and allergen immunotherapy.⁴³ A 1996 study of the economic burden of AR found that for patients with AR, the annual number of billing encounters with any health professional was 1.8-fold that of matched controls ($n = 15,872$), and the annual expenditure for these services was 1.6-fold greater for AR patients.⁴⁴ Overall annual cost of medication for patients with AR was twice that of matched controls. In addition to the overt costs of AR, hidden direct costs include the treatment of asthma, upper respiratory infection, chronic sinusitis, otitis media, and nasal polyposis, all of which occur at an increased incidence in patients with AR.

Indirect costs of AR such as absenteeism and presenteeism (decreased productivity while at work) are also substantial. AR results in impaired productivity and/or missed work in 52% of patients.^{1,43} Self-estimated patient productivity is ~95% when asymptomatic compared with 72% when symptomatic.^{1,4} In a recent survey of 8267 U.S. employees, 55% of the employees experienced AR symptoms for an average of 52.5 days, were absent from work for 3.6 days/year because of their condition, and were unproductive 2.3 hours/workday when experiencing symptoms. The mean total productivity (absenteeism and presenteeism) losses for AR were \$593/employee per year.⁴⁵ In total, AR results in an estimated 3.5 million lost workdays and 2 million lost schooldays.⁴⁶ On any given day, ~10,000 children are absent from school because of AR.² Depending on a child's age, absence from school also may affect parents' productivity or absence from work.

PHYSICIAN BURDEN

Physicians and patients do not share the same vantage point on a patient's condition and, therefore, do not necessarily have the same perspective on disease management. However, successful health planning and symptom control depends strongly on mutual accord. Results of the *Allergies in America* survey uncovered a number of dissimilarities between patients and health care providers.¹ These disparities suggest that disease management could benefit from strategic improvement in communication between patient and practitioner. For example, only 56–58% of patients were "very satisfied" with management of their disease. In contrast, 65–81% of health practitioners reported that all or most of their patients were very satisfied with management. A similar disparity was seen with respect to satisfaction with intranasal corticosteroid treatment: 75% of patients said that they were at least somewhat satisfied with intranasal corticosteroid treatment, compared with practitioners who said that 96–100% of their patients were at least somewhat satisfied (Fig. 3).^{1,47} Only 55% of patients said that they got their money's worth from prescription medicines,

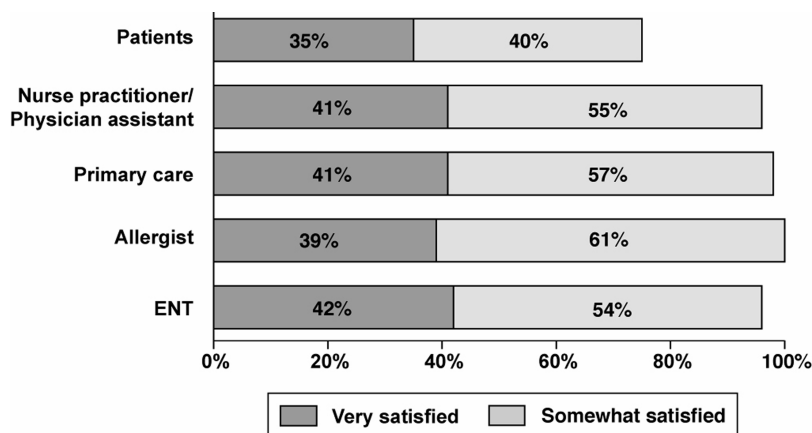


Figure 3. Patient and practitioner satisfaction with intranasal corticosteroids. (Data are from Ref. 1, Executive Summary.)

but practitioners said that 82–91% of their patients got their money's worth from prescription medications.¹

In terms of patient compliance, the majority of patients (70–86%) reported that they followed their health practitioner's advice at least most of the time, and 32–41% said that they followed the advice all the time.¹ In contrast, practitioners indicated that <1% of patients followed their advice all the time and also noted that a maximum of 70% of their patients followed advice most of the time.^{1,47}

CONCLUSIONS

A substantial burden comes with the increasing prevalence of AR.² Nasal congestion, the most frequent and bothersome symptom of AR, profoundly affects quality of life, largely by undermining the restorative power of sleep.^{1,16} Poor-quality sleep leads to daytime drowsiness, fatigue, indecision, and significant impairment in learning and cognition.^{20,21} As a result, adults become moody, less efficient, and more likely to experience work-related injury; children are prone to be shy and also may become depressed, anxious, or fearful (Mullins R: www.allergycapital.com.au/Pages/QOL.html; last accessed March 22, 2006). Consequently, work and school absenteeism escalate.⁴⁶

Currently available nasal allergy medications used to treat AR often are disappointing because they do not work long enough to provide 24-hour symptom relief.¹ Consequently, there is a need for nasal allergy medications that provide complete 24-hour symptom relief that is sustained over time. Health care providers tend to overestimate patient satisfaction with therapy, and this situation may create a breach of patient confidence in management. In the end, patients often are nonadherent with prescribed regimens and make frequent medication changes, which may result in a lack of improvement in AR symptoms. Improvement in patient-practitioner communication and increased knowledge of AR may improve management of this disease.

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