An Investigation of Allergic Rhinitis, Asthma, and Medication Use in a Privately Insured Population

by Jodi Crystal-Peters, Cheryl Neslusan, and Amy White

OBJECTIVE: To provide further evidence of the link between asthma and allergic rhinitis.

DESIGN: A retrospective analysis using medical and pharmacy claims data from 1994 and 1995. Prevalence rates of asthma and allergy and the mean number of prescription claims for these patients were calculated. Patients with both asthma and allergic rhinitis, asthma only, and those with allergic rhinitis only were compared.

PATIENTS: Patients with allergic rhinitis or asthma in the 1994 MarketScan file, with a diagnosis of allergic rhinitis or two or more non-sedating antihistamine prescriptions or two or more nasal inhaled steroid prescriptions during the year. Asthma patients were identified by an asthma diagnosis and the presence of at least one beta-agonist prescription, or in the absence of an asthma diagnosis, by two or more beta-agonist prescriptions during the year. The final study population excluded those under 12 or over 60 years of age, who did not have prescription drug data in 1994 and 1995, and who were not continuously enrolled in 1995.

RESULTS: Asthma was more prevalent in the allergic rhinitis population

(10%) than in the general population. In addition, the rate of allergic rhinitis in the asthmatic population (44%) was much higher than the rate of allergic rhinitis in the overall population (11%). On average, patients with both conditions had approximately 30% more asthma prescriptions (10.9) than did those with asthma alone (8.4). Likewise, patients with both conditions also had approximately 31% more allergic rhinitis prescriptions (4.62) than did those with allergic rhinitis alone (3.52).

CONCLUSION: The increase in medication use by people with both asthma and allergic rhinitis lends support to the idea that nasal inflammation is a marker for increasing dysfunction of the entire respiratory tract. Given the increased prevalence of these diseases, effective aggressive treatment would benefit a large segment of the population. As the link between allergic rhinitis and asthma continues to be established, it is probable that treatments for one condition could alleviate the coexisting condition.

KEYWORDS: Allergic rhinitis, asthma, drug therapy, disease prevalence, retrospective claims data

J Managed Care Pharm 2001; 287-91

Authors

JODI CRYSTAL-PETERS, B.A., is Associate Director, The MEDSTAT Group, Washington, DC; CHERYL NESLUSAN, Ph.D., is Associate Director, ICOM Health Economics, Johnson & Johnson; AMY WHITE, M.S., is Manager, The MEDSTAT Group.

AUTHOR CORRESPONDENCE: Jodi Crystal-Peters, The MEDSTAT Group, 4301 Connecticut Ave NW, Suite 330, Washington, DC 20008; Tel.: 202-719-7800; Fax: 202-719-7801; E-mail: JODI.PETERS@MEDSTAT.COM.

ACKNOWLEDGMENT: Funding for this study was provided by Integrated Therapeutics Group, Inc., a subsidiary of Schering-Plough.

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Allergic rhinitis is the most common allergic disorder. The incidence of this condition has increased in recent years.^{1,2} Asthma diagnoses have also increased worldwide for several decades.² Although allergic rhinitis and asthma commonly occur together, clinicians have yet to determine the exact link between them. Evidence supporting a relationship between asthma and allergic rhinitis has been widely reported in the clinical literature.¹ Both diseases share a number of possible risk factors, including family history, allergic sensitization, adjuvant factors, and lifestyle factors.²

A study by Pedersen of patients with both allergic rhinitis and asthma examined the years elapsed from the onset of one disease until the development of the other.³ This study found that 75% of patients with both diseases experienced onset of the second disease within two years of the first. Other studies have suggested that rhinitis frequently precedes asthma and that upper airway dysfunction may be a predictive factor for subsequent development of lower airway disease.⁴ Whether rhinitis is the first manifestation of respiratory allergy for a patient who may eventually have asthma, or whether nasal disease plays a direct role in causing asthma, has not been determined. Wright et al. studied allergic rhinitis in children under six years of age and found that having physician-diagnosed allergic rhinitis during the first year of life increased the chance of having a later asthma diagnosis.⁵ Another opinion holds that allergic rhinitis and asthma exist on a continuum of inflammation involving one common airway, rather than considering them as separate diseases.⁶

Although the prevalence of asthma in the general population is 3%–5%, asthma affects far greater proportion of patients diagnosed with allergies. Recent evidence suggests that asthma incidence in people with allergic rhinitis ranges from 21%–58%.^{7,8} The variation in rates is explained in part by differences in the populations studied and in how allergic rhinitis is defined. Estimates of allergic rhinitis incidence in asthmatics appear to be quite high, ranging from 71%–86%.^{7,9} Allergic rhinitis seems to be more common among asthmatics than is asthma among people with allergic rhinitis. In a review paper on allergic rhinitis and asthma, Yawn and colleagues note that the prevalence of allergic rhinitis in asthma patients differs among those diagnosed with seasonal as opposed to perennial allergic rhinitis.¹ Only 6% of asthmatics had perennial allergic rhinitis alone, whereas 24% had seasonal allergic rhinitis alone. Twenty-two percent of asth-

matics had both forms of the condition.

Some studies have suggested that appropriate treatment of allergic rhinitis may alleviate symptoms of asthma. Pharmacotherapy for allergic rhinitis may increase airway caliber and decrease bronchial hypertension. For example, Grant et al. found that asthma symptoms improved in allergic rhinitis patients treated with an antihistamine in comparison to patients who did not receive treatment.¹⁰ In their examination of the effects of intranasal corticosteroids in patients with chronic perennial allergic rhinitis and mild asthma, Henriksen and Wenzel found that four weeks of therapy significantly reduced both rhinitis and asthma symptoms.¹¹ Welsh et al. found that allergic rhinitis patients receiving intranasal corticosteroids also experienced improved lower airway symptoms attributed to asthma.¹² Watson and colleagues found that intranasal corticosteroids therapy reduced both rhinitis and asthma symptoms even though less than 2% of the drug was deposited in the lower airways.¹³

The purpose of this study is to provide further evidence that a link exists between asthma and allergic rhinitis. First, we compared the prevalence of allergic rhinitis and asthma in the MarketScan population to each disease population (all asthmatics and all persons with allergic rhinitis) to determine whether either condition is more prevalent in those individuals already suffering from the other condition. Second, we compared condition-specific medication use for people having allergic rhinitis only or asthma only to those with both conditions. If asthma and allergic rhinitis are related, it may be that persons with both conditions have more complex upper and lower airway involvement and thus need to use more medications to successfully manage their symptoms.

Study Methods

Data

The analytical file used in this study was constructed from the 1994 and 1995 MarketScan Private Pay Fee-for-Service databases. These files contain data on more than four million covered lives per year. Indemnity type insurance as well as noncapitated managed care plans are represented. Included in these databases are diagnosis, procedure, provider, benefit plan, and payment information from medical claims for nearly 200 large, self-insured employers located throughout the United States. (Plan-specific benefits information was available for only a subset of individuals in this study and so was not incorporated in the analyses.) Data from employees and their dependents are included. Outpatient prescription drug data—National Drug Code (NDC), copayment, deductible, total payment, and other elements—are available for roughly one million members per year.

Study Population and Analytical Variables

To construct the study sample, we first identified patients with

allergic rhinitis or asthma in the 1994 MarketScan file. A patient was considered to have allergic rhinitis if they had a diagnosis of allergic rhinitis (477.x) or two or more nonsedating antihistamine prescriptions or two or more nasal inhaled steroid prescriptions during the year. Asthma patients were identified by an asthma diagnosis (493.x) and the presence of at least one beta-agonist prescription, or in the absence of an asthma diagnosis, by two or more beta-agonist prescriptions during the year. (*International Classification of Diseases*, 9th Revision, Clinical Modification [ICD-9-CM] codes used to identify asthma and allergic rhinitis are available upon request.) To arrive at our final study population, we excluded persons who were under 12 or over 60 years of age, who did not have prescription drug data in 1994 and 1995, and who were not continuously enrolled in 1995. Note that continuous enrollment was identified using the MarketScan enrollment file, and a claims-based proxy. For those who did not have enrollment data, we checked to see if they had any service claims during the first and last quarters of 1995. If this criterion was met, we assumed that the patient was continuously enrolled. Patients with a diagnosis of chronic obstructive pulmonary disease also were excluded.

For each patient in the sample, we constructed a count of the number of prescription drug claims during 1995 for various asthma and allergy medications. For allergy treatment, we grouped prescriptions into two categories, nonsedating antihistamines (NSA) or nasal inhaled steroids (NIS). Medications examined for the treatment of asthma were beta-agonists, inhaled steroids, oral steroids, theophylline, and cromolyn. Sedating antihistamines were excluded because many are sold over-the-counter and thus would not be represented by pharmacy claims.

Methods

Using the definitions noted above, we calculated overall prevalence rates for asthma and allergic rhinitis in the 1994 MarketScan database. The initial prevalence rates were calculated on the entire 1994 database and were not limited to those persons who were continuously enrolled. After applying the exclusion criteria to the analytic file, we compared the percentage of patients in each of the three mutually exclusive subsamples by age grouping and gender type. To determine whether differences exist along these dimensions between the three groups, associated F-tests of significance were calculated. Mean medication use was then examined. The overall mean number of asthma drug claims for patients with asthma alone was compared to the mean numbers of such claims in those with both conditions. We also compared the overall mean number of allergic rhinitis drug claims for patients with allergic rhinitis alone to the mean numbers of such medications in those with both conditions. These calculations examined whether there were differences in the mean number of claims by drug type (beta-agonists, inhaled steroids, oral steroids, theophylline, or

TABLE 1 Descriptive Statistics for Age Groups and Gender, by Illness Category

	Asthma Only		Rhinitis Only		Asthma and Rhinitis		<i>p</i> value *
	N	%	N	%	N	%	
Age Group							
12-17	1,225	20.55	4,002	9.38	1,011	18.30	0.000
18-34	1,268	21.28	7,566	17.72	996	18.03	0.000
35-44	1,223	20.52	11,896	27.87	1,414	25.59	0.000
45-54	1,456	24.43	13,424	31.45	1,526	27.62	0.000
55-60	788	13.22	5,798	13.58	578	10.46	0.000
Gender							
Male	2,475	41.53	15,578	36.49	1,967	35.60	0.000
Female	3,445	57.80	27,026	63.31	3,534	63.96	0.000
Not reported	40	0.67	82	0.19	24	0.43	0.070
Total	5,960	43.41	42,686	16.36	5,525	40.24	

**P* values were calculated using an *F*-test from the ANOVA procedure.

cromolyn for asthma, and NSA or NIS for allergic rhinitis) across the groups of patients with one of the conditions versus the group with both conditions. Pair-wise comparisons of means were tested with *t*-tests.

†† Results

Prevalence Rates

Approximately 2.5% of the overall MarketScan population had asthma in 1994. Asthma was more prevalent in the allergic rhinitis population (10%) than in the general population. In addition, the rate of allergic rhinitis in the asthmatic population (44%) was much higher than the rate of allergic rhinitis in the overall population (11%). After limiting the sample to only those persons who were continuously enrolled in 1995, the final study population consisted of 54,171 individuals: 5,525 with both allergic rhinitis and asthma, 42,686 with allergic rhinitis alone, and 5,960 with asthma alone.

Table 1, this page, presents the numbers and percentages of patients in each subgroup in the final study population by age category and gender. An ANOVA procedure revealed that the age composition of patients differed significantly among the three study groups ($p < .001$). Those with both asthma and allergic rhinitis clustered in the middle-age groups, with 53.2% between 35 and 54 years in age; the age distribution was similar among those with allergic rhinitis alone. Asthmatics, how-

ever, were divided relatively evenly across all age groups. The distribution of gender was also statistically different across the three subsamples ($p < .001$), although in all cases women comprised the majority of the samples.

Medication Use

Tables 2, page 290, and 3, page 290, present the average number of claims for asthma and allergic rhinitis medications by drug type. Table 2 compares the mean number of asthma medications for patients with asthma alone and for those with both asthma and rhinitis. The mean number of asthma-medication claims was significantly higher for those with both conditions than for those in the asthma-only category. This finding was consistent for men and women across all age groups. Of the 5,525 patients with both asthma and rhinitis, 93% had at least two asthma prescriptions; of the 5,960 people with asthma alone, 91% filled at least two prescriptions for asthma drugs. Overall, those with both conditions had approximately 30% more prescriptions for asthma medications during 1995 than persons with asthma alone.

Although there were statistically significant differences in the types of asthma medications between people with asthma alone and those with both conditions, the mean number of claims appears to be similar. As explained above, the identification criteria for asthma included at least one prescription for beta-agonists; thus, every participant had at least one asthma

drug claim. Therefore, the fact that in 1995 the greatest number of average claims was found among the beta-agonists, at 5.4 claims per asthma/rhinitis patient versus 5.1 claims per asthmatic, is not unexpected. The second largest category of prescriptions was inhaled steroids, prescribed at an average of two claims per asthma/rhinitis patient compared to one claim per asthmatic. Inhaled steroids are intended through regular use to decrease symptom frequency for patients with chronic asthma.¹⁴ Both inhaled steroids and cromolyn are intended for long-term control of mild, persistent asthma. Both groups of study participants filled less than one prescription claim for cromolyn per year on average. They also had less than one claim on average for oral steroids, which are indicated for more severe and persistent asthma. There were more claims for theophylline, a bronchodilator used for long-term asthma control. On average, patients with both asthma and rhinitis had 1.4 prescription claims during the study period, while patients with asthma alone had 1.3 theophylline claims.

Table 3 presents the mean number of allergic rhinitis medications by asthma status. Patients with asthma alone or with both conditions had approximately 31% more allergic rhinitis prescriptions on average than the rhinitis-only patients. Of the 5,525 asthmatics having rhinitis, 84% submitted at least one claim for an allergy drug and 75% submitted two or more claims. The proportion with one claim was slightly smaller among people with rhinitis alone, about 80%. In total, asthma and allergic rhinitis patients had an average of 4.6 prescriptions for allergic rhinitis in 1995 versus 3.5 prescriptions on average for the rhinitis-only patients. People having both asthma and allergic rhinitis also had significantly more NSA and NIS prescriptions than did patients with rhinitis alone.

†† Discussion

This study provides further evidence of the substantial link between allergic rhinitis and asthma. The high prevalence of allergic rhinitis among asthmatics observed in these data is consistent with results from recent studies, and the rate of asthma among persons with allergic rhinitis was notably higher than in the general population.^{3, 5, 7, 8} These findings lend support to the view that certain upper and lower airway conditions considered to be separate diseases should be understood instead as different points on a continuum of airway inflammation.⁶

Because incidence and prevalence rates for both diseases have been increasing, effective treatment for both diseases would benefit a large segment of the population. As the link between allergic rhinitis and asthma continues to be established, it is probable that treatments for one condition could alleviate the coexisting condition.

The prevalence of allergic rhinitis (10.7%) in our insured population falls within the 9%–20% rates previously reported for the U.S. population as a whole.¹ The prevalence rate of asthma (2.5%) is lower, however, than the 4%–6 % rate estimated

TABLE 2 Mean Number of Claims for Various Asthma Medications for Patients with Asthma, by Presence of Comorbid Allergic Rhinitis

	Asthma Only		Asthma and Allergic Rhinitis		<i>p</i> value *
	Mean	Std Dev	Mean	Std Dev	
Beta-agonists	5.11	5.56	5.40	5.87	0.007
Inhaled steroids	1.04	2.41	1.86	3.19	0.000
Oral steroids	0.58	1.56	0.76	1.66	0.000
Theophylline	1.25	3.21	1.44	3.41	0.002
Cromolyn	0.37	1.52	0.75	2.18	0.000
Total	8.35	9.49	10.21	10.88	0.000

**P* values are the result of a *t*-test comparison.

TABLE 3 Mean Number of Claims for Various Types of Allergic Rhinitis Medications for Patients with Allergic Rhinitis, by Presence of Comorbid Asthma.

	Rhinitis Only		Asthma and Allergic Rhinitis		<i>p</i> value *
	Mean	Std Dev	Mean	Std Dev	
Nonsedating antihistamines	2.26	2.88	2.69	3.43	0.000
Nasal-inhaled steroids	1.26	2.23	1.93	2.90	0.000
Total	3.52	3.76	4.62	4.70	0.000

* *p* values are the result of a *t*-test comparison.

for the U.S. population.¹⁶ The disparity in asthma rates has several potential causes. Asthma prevalence varies by age, race and ethnicity, family income, urbanization, and birth weight, among other characteristics.¹⁷ Our data represent employees of large firms and their dependents, a group that is wealthier than average and more likely to be older, white, and urban than the general population. In addition, rising asthma prevalence during the 1990s suggests that estimates from 1994–1995 will be lower than those from more recent years.

In this study, patients with both asthma and allergic rhinitis appear to have a significantly greater number of prescription

drug claims for asthma and allergy medications on average than do those with only one of the conditions. Similarly, Halpern found that patients with symptomatic rhinitis had more asthma medications, especially more inhaled and supplemental corticosteroids, than did the general population.¹⁵ As postulated by Corren, the increase in the use of asthma medications in patients with co-occurring conditions may indicate that these patients have increased asthma severity.⁴ This study reveals, however, that patients with both conditions also have higher utilization of allergic rhinitis medications, lending support to Corren's alternative explanation that nasal inflammation is a marker for increasing dysfunction of the entire respiratory tract.

Because we did not adjust the claims for the number of days supply per prescription and cannot verify that patients adhered to their treatment regimens, however, it is important to interpret these data with caution.

Medications that can be purchased without a prescription are often used in the treatment of allergic rhinitis. Individuals with this condition who use only over-the-counter medications cannot be identified in the MarketScan database if they did not have a doctor's visit for their allergies. As a result, there may be individuals in the asthma-only subsample who have allergic rhinitis who were not identified for this study.

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