

## Targeted Intervention Programs: Creating a Customized Practice Model to Improve the Treatment of Allergic Rhinitis in a Managed Care Population

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### **Abstract**

**Objective:** To develop an intervention program to improve health outcomes among patients with allergic rhinitis in a managed care environment.

**Study Design:** The Episodes of Care® (EOC) team at Lovelace Health Systems selected allergic rhinitis for an intervention program because it was identified as one of the top 10 reasons for visits to primary care clinics. The intervention program was based on a multidisciplinary team process designed to create a customized provider and patient education program to alter inconsistencies or deficiencies in the treatment of allergic rhinitis.

**Patients and Methods:** The EOC team researched literature and current practices and then identified inconsistencies in diagnostic and treatment patterns. Based on this research, the team developed guidelines and a provider education program. Intervention strategies were structured around decision points in a treatment protocol. More than 500 patients were monitored throughout the allergy season by using written and telephone surveys, symptom diaries, and encounter data. Measurable outcomes were established for provider and patient behavior. Patient outcomes were derived from a preventive behavior index and administrative data reporting usage of 5 classes of medication.

**Results:** Approximately 50% of providers altered their practice patterns as a result of the intervention program. Patient outcomes showed a decrease in the

use of rescue medications, particularly antibiotics, and an increase in preventive measures in the treatment group compared with the control group.

**Conclusion:** The EOC model resulted in positive changes in provider and patient behavior. The multidisciplinary approach resulted in broad provider participation.

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Like many managed care organizations, Lovelace Health Systems in New Mexico is searching for ways to meet the needs of patients while controlling costs. As part of an ongoing effort to improve overall patient health, the Lovelace System has created a unique process to reengineer diagnostic and treatment practices and improve patient health and satisfaction through extensive research on complex, costly, and chronic diseases. The Episodes of Care® (EOC) program at Lovelace was established in 1993 as an ongoing process to study diseases, identify practice intervention points, create practice recommendations, and measure patient outcomes. EOC models are developed for diseases for which there is potential for improvement in treatment and outcomes.

In 1996, Hoechst Marion Roussel, Inc, a pharmaceutical research company, collaborated with the Lovelace Health System to develop the concept of an EOC model to improve the treatment of allergic rhinitis. The company's interest in the EOC process was based on a similar objective to study common, chronic diseases. Its goal is to establish research partnerships with organizations such as Lovelace for the benefit of patients.

The choice of rhinitis was based on general research indicating that allergic rhinitis affects from 10% to 20% of the population of the United States

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and is increasing in prevalence.<sup>1,2</sup> The EOC team found that within the Lovelace clinic system rhinitis and its related sequelae command a substantial portion of outpatient resources. In every primary care clinic across the system, sinusitis or allergic rhinitis was ranked within the top 10 diagnoses for total visits.<sup>3</sup> Respiratory problems related to rhinitis (eg, asthma, otitis media, bronchitis, pharyngitis, upper respiratory infections) dominated rankings as well. These diseases have been shown to have costly, direct effects on medical expenses and indirect costs due to lost productivity.<sup>4</sup> Although rhinitis generally is not viewed as a serious disease, its prevalence and relation to illnesses associated with high morbidity, such as asthma, made it an appropriate topic for consideration by the EOC team and Hoechst Marion Roussel.

### Developing Targeted Intervention Programs

The final objective of a targeted intervention program is to improve patient health through outcomes-based practice recommendations or guidelines. The process by which this objective is obtained is complex. It requires the participation of providers from all disciplines within the system to effect any significant improvement in patient health. The philosophy of the EOC team is to gather input from all disciplines to encourage a consistent approach to diagnosis and treatment—an approach also customized to the Lovelace patient population.

To create a program that would successfully change diagnostic and treatment patterns to improve patient outcomes for allergic rhinitis, the EOC team first had to review existing practice patterns, paying particular attention to problem areas and treatment variations within the system. Using information about current practices and results, the EOC team identified areas where treatment could be improved, developed specific strategies for improvement, and then developed materials and support programs designed to encourage providers to follow new recommendations about differential diagnosis and treatment options. A necessary component of the success of these recommendations was broad provider input and participation in the process of developing new treatment recommendations. The EOC team encouraged participation in the intervention program by creating numerous opportunities for provider education and feedback. Finally, the team continually assessed whether the new model was accepted by healthcare providers and whether this acceptance resulted in measurable changes in treatment practices and patient outcomes. Continual

improvement of the program, based on patient outcomes and provider feedback, is part of the EOC process and is integral to program acceptance and ultimately to improvements in patient health.

The objectives of this paper are to describe the process of creating an outcomes-based, targeted intervention model for allergic rhinitis and to report the results of its implementation on provider practices and patient care within a managed care environment.

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### ... METHODS ...

#### Episodes of Care Team

Selecting team members from different disciplines is integral to the success of the EOC process. This multidisciplinary approach has two primary objectives: (1) to broaden the perspective of the team members towards various approaches to diagnosis and treatment and (2) to create a sense of ownership and responsibility towards the program and to encourage the involvement of all providers who care for patients. To fulfill these objectives for the allergic rhinitis program, the EOC team was represented by members from the following disciplines at Lovelace: a family practice physician, a licensed practical nurse, a nurse-practitioner, and an internist (primary care); an allergist, an ear, nose, and throat (ENT) specialist, and a multidisciplinary physician who represented allergy, primary care, and internal medicine (specialist care); the pharmacy director; a measurement consultant; and a managerial support representative. In addition, support was provided by various members of the medical records and office support staff, as needed.

In addition to the team members from various disciplines within the Lovelace system, scientific and managed care specialists from Hoechst Marion Roussel contributed to the development of the EOC program through collaboration during the conceptual stage and ultimately through research funding. The relationship between Lovelace and Hoechst Marion Roussel was seen as beneficial to each organization, as Lovelace uses EOC programs to improve overall patient health, and Hoechst Marion Roussel's Medical Affairs Department participates in ongoing research on many disease states for the educational benefit of providers and ultimately to improve patient outcomes. Both organizations wished to explore the impact on resources of treating rhinitis in a managed care system. Hoechst Marion Roussel scientists in the fields of health out-

comes research, epidemiology, and medical research participated in development of processes for gathering data about provider practices and outcomes measurement and provided clinical expertise related to allergic rhinitis.

The EOC team began by conducting a thorough medical literature search to identify existing treatment guidelines for allergic rhinitis and supportive material for developing an effective intervention program. They also began the process of identifying treatment patterns within the Lovelace system, focusing on treatment variation and identifying problem areas such as poor patient awareness of allergy patterns and inconsistent medication recommendations by providers. The team chose to focus on primary care clinics, the first point of treatment in the Lovelace system. The steps for identifying current treatment practices are described here in more detail.

### Identifying Variations in Current Practice

The team reviewed existing treatment practices within the Lovelace system to create a baseline understanding of current care and to identify variations in treatment practices. Two methods were used. First, the team asked a trained observer to solicit medical advice from a blinded sample of midlevel, family practice, pediatric, and internal medicine providers. (The classification "midlevel" includes nurse-practitioners and physician assistants.) In addition, the observer called each primary care practice and asked for an appointment to determine the amount of time it would take to obtain treatment from each clinic. Access to care ranged from telephone advice to scheduled appointments in the clinic at any point from the same day of the call to 3 months from the call.

To further explore the presence of variation in standard rhinitis treatment, a focus group was convened to discuss perceptions about current care and opportunities for improvement. The group consisted of Lovelace providers from practices within the system, including physicians, physician assistants, and a nurse-practitioner. A trained, impartial facilitator, unknown to the participants, guided the focus group in discussion about areas of suspected variation, attitudes about treatment, and the efforts of EOC teams in general.

The focus group was helpful in identifying areas of similarity and variation in practice and attitude. On the positive side, providers were generally comfortable treating allergic rhinitis. They did not consider treatment to be difficult or controversial, and they generally agreed that a single visit for diagnosis was

adequate as long as a thorough patient history and minor examination were conducted. However, during the discussion, contradictions about standard treatment emerged. For example, despite the group's confidence in correctly diagnosing and treating allergic rhinitis, participants indicated that they put less emphasis on correct diagnosis and more emphasis on selecting the right medication for a patient. In addition, the group indicated that verbal counseling of the patient was the primary focus of a clinic visit. But when discussing treatment failures, participants mentioned repeatedly that poor patient compliance with medication and failure of the patient to anticipate seasonal allergy patterns were contributing factors. These comments suggested that patient counseling was not having an impact on patient compliance. Participants agreed that inadequate time for patient counseling was a problem and indicated an interest in patient intervention strategies to improve compliance.

Another contradiction was that, despite the recognition of poor patient compliance patterns, return visits and requests for referrals to allergy specialists were initiated by patients rather than providers. Follow-up contact with the patient was not part of current primary care treatment protocol. Patients who did not get adequate relief of their symptoms initiated return visits or requests for specialist referrals, believing that an allergist could provide more effective treatment through immunotherapy. Without clear criteria or financial disincentives, providers generally referred patients with various degrees of need to specialists.

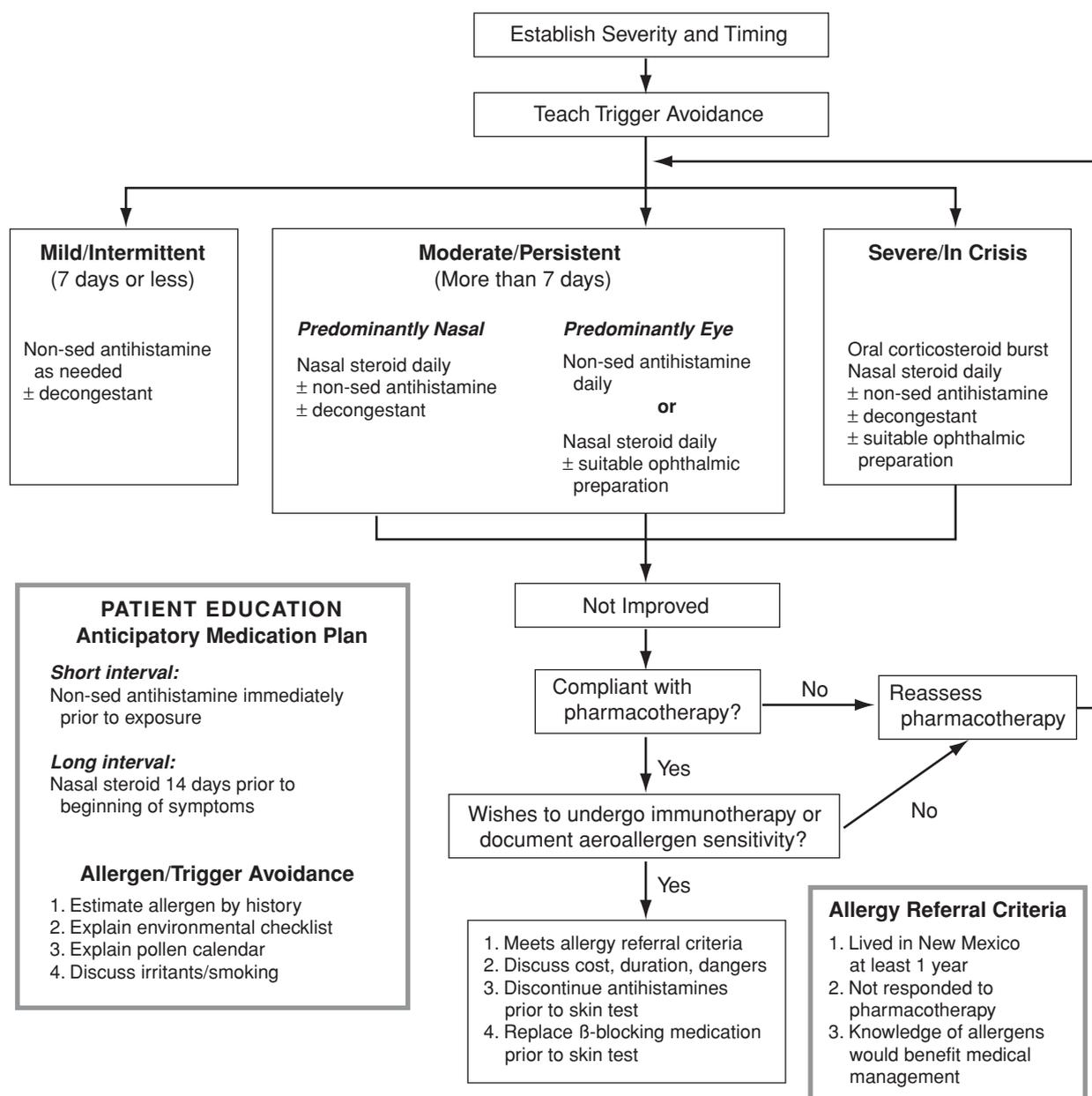
One of the greatest variations in treatment occurred in prescribing practices. The recommendations for pharmaceutical treatment of allergic rhinitis varied widely, from a trial of over-the-counter (OTC) antihistamines to use of nasal steroids alone. None of the pharmaceutical recommendations were duplicated across a sample of 8 primary care providers.

Overall, the trained observer's findings and the results of the focus group pointed to significant variation in current primary care practices within the Lovelace system and potential problems, including the following:

- Inadequate preventive medication
- Inability of patients to anticipate the onset of allergic symptoms
- Inconsistent medication recommendations across the system
- Need for patients to understand and comply with medication instructions
- Need for patient counseling tools and additional time to counsel

- Need for simplified practice guidelines
- Overuse of antibiotics
- Overuse and inappropriate use of corticosteroid injections
- Need for precise diagnosis of rhinitis, including nonallergic rhinitis
- Use of sinus films instead of more precise computed tomography (CT) scans to evaluate chronic symptoms

**Figure 1.** Allergic Rhinitis Treatment Algorithm Based on Diagnosis and Treatment Decision Points\*



Non-sed = nonsedating

\*Use with differential diagnosis matrix, rhinitis treatment chart, and allergic rhinitis medication recommendations, as appropriate.

- Misuse of prescription and OTC medications by patients

### Creating a Customized Intervention Program

The inconsistencies identified by the observer and in the focus group validated the need for an intervention plan for patients with allergic rhinitis. The EOC team decided that the intervention plan would include practice guidelines to address problem areas related to clinical diagnosis, decision making, and patient education. To encourage use of the guidelines, the team would attempt to tailor them to primary care practices in the Lovelace system. A structured education and implementation plan also would be developed to encourage use of the new guidelines by providers.

After reviewing the problem areas, 4 provider education guidelines were developed by the team to address specific, targeted intervention points such as accuracy in diagnosis, appropriate medication use, and guidelines for referrals to allergy or ENT specialists. Figure 1 presents the allergic rhinitis treatment algorithm, and Tables 1 through 3 present the differential diagnosis matrix, medication recommendations table, and rhinitis treatment chart, respectively.<sup>5</sup>

The materials were designed to contain decision points only when there was some uncertainty or variation in current care and to pertain only to the common allergic rhinitis patient. For example, the allergic rhinitis treatment algorithm addressed the problem of inconsistencies in prescribing practices by recommending standard first-line therapy with nonsedating antihistamines for mild, intermittent exposure. This was done to address multiple symptoms, such as nasal and eye symptoms, and to prevent sedative side effects linked to first-generation antihistamines. In addition, because diagnosis skills were identified as a problem area, the differential diagnosis matrix was created separately from the algorithm. The rhinitis treatment chart was developed to encourage more effective use of medications; one recommendation is to use saline nasal sprays more frequently to keep membranes hydrated, thus reducing symptoms or preventing exacerbations. In addition, the rhinitis treatment chart was designed to provide specific guidelines for referral to allergy or ENT specialists and to encourage efficiency by indicating when CT scans should be ordered in preparation for a first visit to a specialist.

Finally, to address the problem of poor patient compliance, several types of patient education materials were introduced to providers. A regional pollen

calendar based on data provided by the City of Albuquerque was offered, along with brochures produced by Lovelace that covered general information about allergies and listed questions to ask the provider. Materials sponsored or produced by Hoechst Marion Roussel included an environmental checklist and patient education tear-off sheets covering information about specific allergens as well as allergy symptoms and treatments. A brochure about local plants, the pollen they produce, and how to landscape for reduction of pollen was produced by the New Mexico State University Cooperative Extension Service. The objectives of the EOC team in their selection of materials were to educate patients about environmental control, anticipation of symptom onset, use of preventive medication, treatment compliance, and appropriate therapy based on diagnosed symptoms.

### Implementation

Several formats were used to educate providers about the customized guidelines and patient education materials, including 1-hour lunchtime presentations at each clinic, followed by informal discussion. The focus group had emphasized the importance of using continuing education formats, so continuing education credits were provided for physicians and allied healthcare providers. Attendance was monitored, and those providers who did not attend were sent handout materials from the presentation as well as accredited self-instruction materials. Clinic visits and verbal reminders at monthly staff meetings were used to reinforce adoption of the new guidelines and education materials. Although no penalty existed for failure to adhere to guidelines, providers were informed by voice mail that their behavior was being monitored, an incentive that originated with this project. Patient education materials also were made available through the pharmacy, in waiting rooms, in the exam room, at nursing stations, and through direct mail.

### Patient Selection

Ten primary care clinics were selected, matched by specialty, and then randomized to either the treatment or the control condition. Matched sites had similar case mixes, as measured by the proportion of patients visiting the clinic in the previous year with the diagnosis of asthma or with allergic rhinitis. A random sample of patients then were enrolled from each of the 10 clinics, maintaining proportions of the total available population represented in that clinic. Final samples, stratified by matched clinic,

included internal medicine (37%), pediatrics (3%), and family practice (60%). Potential allergic rhinitis cases were identified by using billing data and *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) coding indicating that the patient either had been seen for allergic rhinitis at the primary care clinic, had met a prescription drug profile for treatment of allergic rhinitis symptoms, or was scheduled for allergen skin testing. These criteria then were validated by chart review of a sample of patients. After consent

was received from assigned primary care providers and potential patients, 502 patients were enrolled from randomized control and treatment clinics.

The intervention designed by the EOC team was implemented solely at treatment sites, and only the patients in treatment clinics were provided with patient education materials developed by the EOC team. Professional staffing remained stable throughout the course of this study; however, patients were free to transfer their care to a different site, a practice that was considered rare. In 2 cases, family

**Table 1.** Differential Diagnosis Matrix\*

Rule Out in This Order →	Upper Respiratory Infection	Sinusitis (Bacterial)	Atypical Facial Pain	Medicamentosa Condition	Structural Abnormality <sup>†</sup>	Rhinitis Sicca	Allergic Rhinitis	Other Rhinitis <sup>‡</sup>
Congested (full, stuffy)	X	X		X	X		X	X
Obstructed air flow	X	X		X	X		X	X
Sneezing	X						X	X
Itching							X	
Dryness						X		
Seasonal							X	
Unilateral					X			
Discharge								
Clear, thin	X			X			X	X
Purulent		X						
Bloody/minor nosebleed				X		X		
Thick								X
Facial pain								
Focal		X						
Diffuse			X					
Medication/hormonal <sup>§</sup>				X				
Septal deformity/polyps					X			
Turbinates hypertrophied	X				X		X	
Family history of atopy							X	

Shaded columns indicate conditions that do not respond to antibiotic therapy.

\*Patients may concomitantly exhibit symptoms from different disease categories.

<sup>†</sup>Polyps, septum, foreign body, turbinates, adenoids, choanal atresia, tumor, granuloma, ostiomeatal.

<sup>‡</sup>Vasomotor, idiopathic, nonallergic rhinitis with eosinophilia syndrome (NARES), occupational, food, emotional, atrophic.

<sup>§</sup>Pregnancy, puberty, hypothyroidism, acromegaly, antihypertensives, decongestant abuse, aspirin, cocaine, nonsteroidal anti-inflammatory drugs, topical ophthalmic β-blockers, chlorpromazine, oral contraceptives.

members were enrolled at competing treatment and control sites and were dropped from the final sample. Contamination of treatment and control groups, although possible, was considered negligible.

### Intervention Outcomes

The outcome indicators were defined to determine whether implementing new treatment guidelines would result in measurable changes during the fall allergy season of 1996. The team selected indicators that would be of interest to various participants in the healthcare delivery system, including health plan administrators, physicians and other healthcare providers, employers, and patients. The indicators discussed in this paper include those measuring impact on provider practice patterns and subsequent effects on patient behavior.

Data collection instruments for both treatment and control populations included a patient enrollment survey for self-assessment of disease severity and general health before the start of allergy season. In addition, all patients were given diaries to record symptoms and medication habits for a 28-day period surrounding their estimated allergy peak. Three telephone surveys were conducted: a baseline measurement before the allergy season (time 1), measurement during the peak allergy season (time 2), and

measurement after the first seasonal frost (time 3). The telephone survey included questions about quality of life, work productivity, and activity impairment taken from standardized survey instruments,<sup>6-8</sup> as well as questions about behavior changes and patient satisfaction. Indicators that were available at multiple times, such as the telephone surveys, were subjected to repeated measures of longitudinal analyses, using both within-subject and between-group comparisons. Indicators that were available only at a single time, such as the self-assessment survey, were used for between-group comparisons.

In addition to data collection from patients, doctors, pharmacists, physician assistants, and nurse-practitioners were surveyed for anonymous feedback about the new treatment. A total of 63 providers (52% return rate) responded by mail 2 months after the end of the allergy season, which was 5 months after the educational programs.

## ... RESULTS ...

### Practice Changes Among Providers

The anonymous survey was designed to elicit feedback on program efficacy, printed materials, practice patterns, and knowledge and comfort level in treating rhinitis. Of the 63 survey respondents,

**Table 2.** Allergic Rhinitis Medication Recommendations

Medication	Itching, Sneezing	Discharge	Blockage	Impaired Smell	Prophylaxis
Nasal corticosteroids	+++	+++	++	+	++
Oral decongestant	-	-	++	-	-
Oral antihistamines	+++	++	±	-	+
Nasal decongestant (3-7 days maximum)	-	-	+++	-	-
Nasal sodium cromoglycate	+	+	±	-	+
Oral corticosteroids (short course with caution)	+++	+++	+++	++	-
Ipratropium bromide	-	+++	-	-	-

Key: - indicates not effective; ±, questionably effective; +, minimally effective; ++, moderately effective; and + + +, maximally effective.

Source: Adapted from reference 5.

60% represented family practice and 47% were physicians. More than half of the respondents indicated one or more positive changes, and chi-square tests indicating proportions of positive changes for each item did not differ significantly by practice area (family practice, internal medicine, and specialty) or clinic site.

Providers were asked if, as a result of the intervention program and adoption of the new practice

guidelines, they (1) replaced sinus X-rays with screening CT scans, (2) ensured referral criteria for allergy consultation, (3) prescribed more nasal steroids, (4) counseled patients about allergens, or (5) reduced use of antibiotics for noninfectious cases. Items were rated on a 3-step scale from "yes" to "no." As noted, about 50% of all participating providers reported positive changes in their practice patterns. However, in reporting reduced use of antibiotics, 79%

**Table 3.** Infectious and Noninfectious Rhinitis Treatment Chart\*

Infection	Atypical Face Pain	Medicamentosa Condition	Structural Abnormality	Rhinitis Sicca	Allergic Rhinitis	Other Rhinitis
<p><i>Viral</i> Refer to Lovelace URI guideline</p>	<ul style="list-style-type: none"> <li>• NSAID</li> <li>• Oral decongestant</li> <li>• Saline nasal spray hourly while awake</li> </ul>	<p><i>Hormonal, other medications</i></p> <ul style="list-style-type: none"> <li>• Alter pharmacotherapy</li> <li>• Saline nasal spray hourly while awake</li> </ul>	<p><i>Consider ENT referral</i></p> <ul style="list-style-type: none"> <li>• Check medical profile for previous CT imaging studies</li> <li>• Order a screening CT scan if no previous studies exist</li> </ul>	<ul style="list-style-type: none"> <li>• Saline nasal spray hourly while awake</li> <li>• Humidifier (optional)</li> </ul>	<p><i>Use all practice guidelines as appropriate*</i></p>	<ul style="list-style-type: none"> <li>• Counsel on avoidance of irritants</li> <li>• Counsel on smoking cessation</li> <li>• Nasal steroids</li> <li>• Ipratropium bromide (Atrovent)</li> <li>• Saline nasal spray hourly while awake</li> </ul>
<p><i>Bacterial</i> Refer to Lovelace sinusitis guideline</p>	<p><i>Consider ENT referral</i></p> <ul style="list-style-type: none"> <li>• Check medical profile for previous CT imaging studies</li> <li>• Order a screening CT scan if no previous studies exist</li> </ul>	<p><i>Decongestant abuse</i></p> <ul style="list-style-type: none"> <li>• Discontinue decongestant</li> <li>• Saline nasal spray hourly while awake</li> <li>• Nasal steroid for 3 weeks</li> <li>• Oral steroid burst<sup>†</sup></li> <li>• Determine and treat provocation of initial rhinitis</li> </ul>				

CT = computed tomography; ENT = ear, nose, and throat; NSAID = nonsteroidal anti-inflammatory drug; URI = upper respiratory infection.

\*Use noninfectious rhinoconjunctivitis treatment plan, differential diagnosis matrix, and allergic rhinitis medication recommendations as appropriate.

<sup>†</sup>Oral prednisone burst recommended dosage is 20-mg tablets to be taken either once daily for 7 days; or twice daily for 2 days, followed by once daily for 5 days.

of nurse-practitioners and physician assistants noted positive changes, whereas only 27% of their physician counterparts did ( $\chi^2 = 9.75, P = 0.008$ ). Because baseline practices were not verified by encounter data, the difference may have reflected preexisting adherence by physicians to antibiotic guidelines. The "other" category of practice pattern changes included alterations in medication recommendations, increased patient counseling, and reductions in referrals to the allergist.

Two survey items, program quality (rated on a 5-step scale) and usefulness (rated on a 3-step scale), were weighted equally and summed to form an overall measurement of effectiveness, with potential scores from 0 to 10. Nurse-practitioners and physician assistants rated overall program effectiveness significantly higher (mean = 9.6, SD = 0.6) than did physicians (mean = 8.3, SD = 1.8) ( $t = 2.8, df = 33, P = 0.009$ ).

About one third of providers surveyed rated printed provider materials as very important in improving their ability to diagnose and treat patients more effectively. The allergic rhinitis treatment algorithm, differential diagnosis matrix, and medication recommendations table were rated especially effective. Patient education materials also were rated somewhat useful; the region-specific pollen calendar designed to help patients anticipate local pollen patterns was rated especially useful. Table 4 presents the relationship between satisfaction with and use of printed materials and overall program effectiveness, as determined by survey evaluations.

Survey results indicated that attendees who rated program effectiveness higher also were more likely to have made changes in patient counseling and antibiotic recommendations, in addition to generally improving all areas of practice (Table 5). This correlation was mediated by the finding that nurse-prac-

tioners and physician assistants, who were more likely to alter antibiotic use, also were more likely to value the program. When asked about their current comfort level in treating allergic rhinitis, more than 70% of respondents rated themselves as very comfortable, the highest rating on a 3-step scale. However, respondents were slightly less confident in their knowledge about allergic rhinitis, with just over 60% rating themselves as very knowledgeable. Knowledge and comfort correlated slightly ( $P = 0.06; r = .26$ ) with increased use of nasal steroids, indicating a link between therapeutic confidence and updated knowledge about medications. This relationship was echoed in survey annotation, where almost 60% of the open-ended comments referred to some aspect of medication.

### Patient Behavior Modification

*Disease Severity.* A total of 373 patients, 190 from control sites and 183 from treatment sites, completed the symptom diary during the 28 days predicted to be the patient's peak exposure time to allergens. The EOC team used symptom scores to

**Table 4.** Printed Materials: Satisfaction and Relationship With Overall Program Effectiveness

Printed Materials	Correlation*	Respondents Using and Liking the Item	
		No.	%
Pollen calendar	.42	41	68.3
Allergy brochure	.24	33	55.0
Rhinitis treatment chart	.35	26	44.8
Medication recommendations table	.46	24	42.1
Differential diagnosis matrix	.53	23	41.8
Plants and pollen brochure	.33	25	41.7
Allergic rhinitis treatment algorithm	.50	22	38.6
Postcard reminder	.31	7	12.7

\*Pearson product-moment correlation with overall program effectiveness.

measure whether patients in the treatment group, who were given education materials and counseling as part of the intervention program, were able to change their behaviors to affect disease severity. Scores were derived from each of 5 symptom classes: nasal congestion and stuffy nose (Nasal); sneezing (Sneezy); runny nose (Runny); itchy nose, palate, or throat (Itchy); and itchy, watery, red eyes (Eye). Mean scores were computed on a 5-step scale (0 = absent to 4 = very severe). Nasal congestion symptoms were rated highest (mean = 1.6, SD = 0.8) by all patients for the 28-day period, with sneezing rating lowest (mean = 1.0, SD = 0.7). The fall allergy season during this period was considered unusually mild for the region, so scores were atypically low.

*Preventive Behavior.* In addition to measurement of symptom scores, patients were contacted by telephone 3 times during the study and asked to report whether they had performed any of 11 preventive tasks used to gauge behavior changes. Preventive tasks included following advice regarding medication use, premedicating, and implementing several environmental control behaviors such as limiting exposure to pets. A total score was comprised of the unweighted sum of positive

responses to the 11 items, resulting in potential scores of 0 (no positive action) to 11 (maximum positive action).

Examination of mean scores at the 3 times of measurement relative to allergy season showed that patients in the treatment group generally made greater attempts to control their allergen exposure (Figure 2). A repeated-measures analysis of covariance model, adjusting scores at times 2 and 3 by preintervention scores at time 1, was used to compare groups because treatment subjects appeared positively biased at time 1. Averaged adjusted group means were significantly different ( $F = 4.3, P = 0.038$ ), with parameter estimates indicating the effect was driven by differences at time 2 ( $t = 2.44, P = 0.015$ ). A decline in preventive behavior at time 3 was anticipated, as this was postallergy season.

*Medication Use.* Five classes of medications were examined as indices of changes in patient behavior. Antibiotics and oral steroids were considered rescue medications and were presumed to be associated with treatment of respiratory infections or control of allergy and asthma symptoms when other treatments failed. A decline in the use of rescue medications would indicate success in controlling potential sequelae of poorly controlled allergies.

Conversely, antihistamine and nasal anti-inflammatory medications were promoted by the EOC team for premedication in anticipation of allergy triggers. A rise in the use of these medications would indicate that more patients were using them preventively. Finally, OTC cough and cold remedies and antihistamine/decongestant combinations also were included in the overview of medication use, but were rarely captured through pharmacy billing.

Prescription claims were examined for 498 patients who remained enrolled in the health plan throughout the study period. When comparing data from the 1995 fall allergy season with data from the 1996 season, during which this study was undertaken, a noticeable trend

**Table 5.** Practice Change: Frequency and Relationship With Overall Program Effectiveness

Practice Change	Correlation*	Respondents Reporting Positive Change	
		No.	%
Prescribe more nasal steroids	.19	43	79.6
Increase time counseling patients	.37	41	70.7
Reevaluate allergy referral criteria	.33	33	63.5
Order more screening CT scans	.31	31	59.6
Reduce use of antibiotics	.41	29	53.7
Other	.24	19	38.0

CT= computed tomography.

\*Pearson product-moment correlation with overall program effectiveness.

emerged. Control subjects increased their use of rescue drugs by 4.7% and reduced their use of preventive medications by 4.8%. Conversely, the treatment group decreased use of rescue drugs by 5.8% and increased use of preventive medications by 5.9%. The decrease in use of rescue medications and increase in use of preventive medications directly reflects the study goal of improving patient outcomes.

*Patient Satisfaction.* During the 3 telephone surveys of the treatment and control groups, patients were asked to rate their satisfaction with treatment and control of their allergies. During the baseline survey, the treatment group indicated less satisfaction with the healthcare system than the control group but became more satisfied as the allergy season progressed. At the completion of the study, both the treatment and control groups expressed satisfaction with their allergy care "most of the time."

... DISCUSSION ...

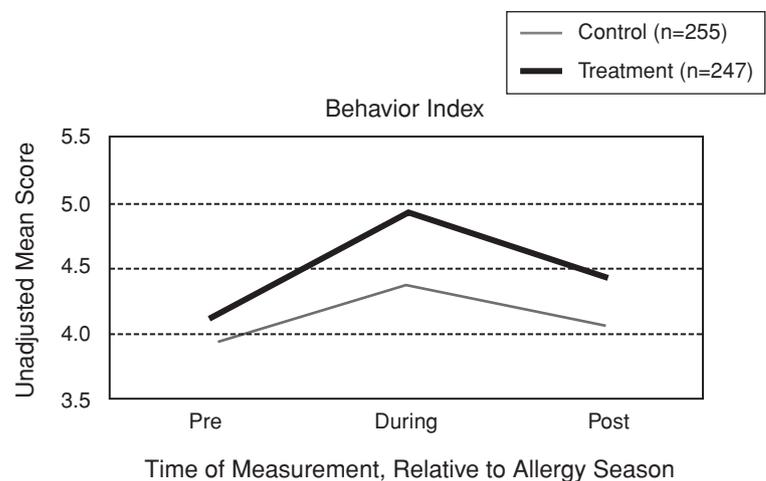
The outcomes of this study are significant for several reasons. First, the positive results of the intervention program in influencing provider and patient behavior were evident despite an unusually mild allergy season. It is likely that the low pollen count affected baseline and final symptom scores compared with the more typical 1995 fall allergy season. Nevertheless, behavior changes by patients resulted in measurable improvement in patient outcomes in the treatment group through the decreased use of rescue medications, particularly antibiotics. Ideally, further study during peak tree allergy periods during the spring, the primary allergy season in New Mexico, would be of value in verifying the results presented here and perhaps would show more marked differences between the treatment and control groups.

Study results indicate that improved patient outcomes can result from a simple intervention model such as the EOC. The intervention model successfully influenced providers to alter their diagnostic, treatment, and prescribing habits and to use the support materials provided to them. The key to the success of the EOC approach lay in the development of an evidence- and con-

sensus-based intervention program designed by a multidisciplinary team. Specifically, content was thoroughly researched and based on evidence of specific needs and decision points in the diagnosis and treatment process. This approach also included specific, measurable outcomes. However, team members also relied on their daily experience in diagnosis and treatment and on the regional perspective developed from disease trends seen in their own patient population.

The EOC team's knowledge of provider expectations regarding the intervention process was also an extremely important factor in the success of its implementation. As an example, providers indicated an interest in using guidelines only if they were concise. The allergic rhinitis treatment algorithm (Figure 1) was contained on a single page, yet it was thorough enough to distinguish between eye and nasal symptoms. That distinction alone could have consequences for selection of treatment options. Feedback from providers indicated that they appreciated the brevity and conciseness of the guidelines, as well as the fact that the guidelines were structured around decision points. Feedback was positive from midlevel disciplines as well as physicians, which is important because nurse-practitioners and

**Figure 2.** Patient Behavior Index Showing Greater Attempts to Alter Behavior or Control Allergens in the Treatment Group at the 3 Times of Measurement\*



\*Index could range from 0 (no positive action) to 11 (maximum positive action).

physician assistants provide much of the primary care in the Lovelace system. These providers were most likely to alter antibiotic-prescribing habits based on the intervention program, resulting in reduced use of antibiotics, a specific and positive improvement in patient care. Overall, results showed that about 50% of providers across all disciplines changed their prescribing behavior as a result of the intervention program. Based on these results, the EOC team believes that continued use of this intervention program to alter provider practices and patient behavior could result in additional positive outcomes in patient care. The value of the EOC team involvement is in providing an organized effort to educate and remind providers about the intervention program and the support materials available to them.

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... CONCLUSION ...

In conclusion, as managed care systems continue to move toward the use of standardized practice guidelines, the authors believe the Lovelace EOC intervention process can be a useful model for constructing effective diagnostic and treatment practices based on population-specific, measurable outcomes. Although many managed care organizations produce practice guidelines for their providers, there is little information about whether these guidelines are implemented widely. The EOC team believes a targeted, customized approach using decision points based on evidence of improved outcomes is a promising way to increase the use of guidelines within managed care systems. Although the Lovelace EOC model was customized to its own patient population, the basic methodology could be adapted by other systems and similarly customized to different patient populations, organizational structures, and regional needs. With recent press charges that the managed care industry tends to focus on healthcare cost reduction at the expense of altering practice patterns,<sup>9</sup> Lovelace's successful implementation of guidelines with the stated goal of improving patient outcomes is encouraging for both patients and the healthcare industry as a whole.

Long-term study is needed to determine whether intervention programs such as this one could increase patient response enough over time to

remove allergic rhinitis as one of the top 10 complaints in the primary care clinic. Similar study of the economic impact of this disease is also worth attention. We invite similar healthcare plans to provide more data about the usefulness of outcomes-based intervention programs for the benefit of patient health and the managed care industry.

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