Evaluation and Treatment of Respiratory Infections: Does Managed Care Make a Difference?

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BACKGROUND. Primary care physicians frequently use antibiotics for nonindicated conditions and conditions for which antibiotics have not been shown to be effective. The intention of this study was to determine whether shifting the costs from the insurer to physicians in a staff model health maintenance organization (HMO) influenced antibiotic prescribing.

METHODS. A random sample of patients in whom upper respiratory infections (URIs) (n=334) or acute bronchitis (n=218) were diagnosed within a 12-month period was selected from a large multispecialty group practice whose population was predominantly fee-for-service (FFS) and from a staff model HMO. Detailed chart reviews were performed to verify the diagnosis and note secondary diagnoses, identify whether an antibiotic or other medication was prescribed, assess whether diagnostic testing was performed, and determine the specialty of the clinician.

RESULTS. After excluding patients seen with sinusitis, otitis media, or streptococcal pharyngitis, 334 patients with URIs and 218 patients with acute bronchitis remained for analysis. For URIs, antibiotic prescribing was higher in the HMO population than in the FFS group (31% vs 20%, *P*=.02). In patients with acute bronchitis, HMO patients were also more likely to have an antibiotic prescribed, but the difference was not statistically significant (82% vs 73%, *P*=.11). Further analyses showed that while HMO physicians were more likely to prescribe antibiotics, they were less likely to prescribe other medications for acute bronchitis or use diagnostic tests for evaluation of patients with URIs or bronchitis.

CONCLUSIONS. Shifting costs from insurer to physicians through managed care appears to reduce diagnostic testing for URIs and acute bronchitis, but does not decrease excessive use of antibiotics and may actually increase antibiotic use for URIs.

KEY WORDS. Respiratory infections; antibiotics; health maintenance organizations; fee-for-service plans; health care costs. *(J Fam Pract 1997; 44:572-577)*

Although upper respiratory infections (URIs) and acute bronchitis are caused by viruses in the vast majority of cases,[1-3] antibiotic use for these conditions is widespread[4-6] despite little evidence of effectiveness.[7-10] Several studies have demonstrated that physicians prescribe antibiotics for approximately 60% of patients with simple colds[6] and for an even higher percentage of patients with acute bronchitis.[5,11] The overprescribing of antibiotics and other unindicated medications for URIs and acute bronchitis can add a significant cost to the care of these patients. By one estimate, unindicated drug prescribing for URIs accounts for 26% of all medical expenditures for a cold.[12] Furthermore, antibiotic use for unindicated reasons has been hypothesized as a primary cause of the emergence of antibiotic-resistant bacteria.[13-15] Antibiotic use is also not benign; side effects of antibiotics occur relatively frequently and often necessitate prescribing of a second antibiotic or additional care.[16,17]

Since one of the principles of managed care is shifting the risk of expenses from insurers to physician organizations, we hypothesized that physicians practicing in staff model health maintenance organizations (HMOs) would be more pru-

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dent with antibiotic prescribing for URIs and acute bronchitis. Other studies have shown that HMO patients have lower hospital admission rates, fewer hospital days per admission, and fewer expensive diagnostic tests or procedures than patients enrolled in fee-for-service (FFS) plans.[18] While these previous studies have focused on expensive, low-volume services, it could be hypothesized that if managed care principles were applied to primary care practices, a reduction in unindicated antibiotic prescribing would follow.

The intention of this study was to assess antibiotic prescribing by physicians working in a traditional FFS environment and in a staff model HMO. In addition to examining antibiotic prescribing, we also wished to determine if failure to prescribe an antibiotic was associated with subsequent increases in costs through additional patient visits. If patients who did not receive antibiotics were more likely to return for additional visits, the managed care organization could view antibiotic prescribing as cost-effective even if not indicated.

METHODS

Two organizations were recruited to serve as sites for the study. One organization was a staff model HMO with an enrollment of over 15,000 prepaid members including Medicaid recipients. Members had no co-payment for visits or prescriptions. The second organization was a multispecialty clinic with a large FFS population. Although a prepaid health product was under development by the organization, it was not instituted at the time of the study. Medicaid recipients in the county where the second organization functioned were not enrolled in a managed care plan. The two organizations were separated by 100 miles, and did not have any of the same members on their provider panels.

The group model HMO in this study took full risk for all costs associated with patient care. There was no pharmacy subcapitation, for example, that would relieve the clinician and organization of risk for that portion of the patient's care. Clinicians in this group received quarterly feedback about patients' satisfaction with their care and utilization of hospitalization resources. No specific feedback was provided regarding the use of medications and laboratory resources in the outpatient setting. No clearly identified compensation or withholding of compensation was tied to the use of pharmacy or laboratory supplies; however, a portion of the clinician's overall compensation of the physician was contingent on the financial performance of the group as a whole.

Physicians in the FFS group were compensated based on a productivity model that did not include pharmaceutical use. The group did not monitor laboratory or pharmacy use and provided no feedback to clinicians about the use of these resources or the use of hospital resources.

To generate a random sample of patients for the study, each organization produced a list of all patients seen during the 12 months between May 1, 1995, and April 30, 1996, with an ICD-9-CM diagnosis code of 466.0 (acute bronchitis) or 460.0 (acute nasopharyngitis/common cold), or any diagnosis code with the root 465 (acute upper respiratory infection of multiple or unspecified sites). Using a random number generator, 180 encounters with ICD-9-CM code 466 and 166 encounters with codes 460 or 465 were selected at each site. The sample size was based on a power calculation showing that a 20% decrease in the managed care environment that would be statistically significant at $P<.05$ and with a power of 80% would require 165 patients per diagnosis per group, assuming that antibiotic prescribing in this population was similar to the 75% reported elsewhere.[5]

Retrospective chart reviews were performed by trained chart abstractors for all encounters that included the diagnosis of URI (ICD-9 codes 460 or 465) or acute bronchitis (ICD-9 code 466) after May 1, 1995. If a second visit with the diagnosis of URI or bronchitis had taken place within 30 days after the first visit for this condition, the second visit was treated as part of the same episode and not as a new condition.

Data abstracted included the primary diagnosis (URI or acute bronchitis) and all secondary diagnoses; use of an antibiotic, antihistamine, decongestant, bronchodilator, or other medication; diagnostic tests performed at that visit; specialty of provider; and chronic medical conditions. The chronic medical conditions included were those that might increase the risk of pulmonary infection, ie, asthma, chronic obstructive pulmonary disease, noncured cancer, diabetes mellitus, renal failure, use of immunosuppressive medications, and infection with human immunodeficiency virus. Subsequent notes were then reviewed to determine whether antibi-

TABLE 1

Comparisons of Study Populations in Health Maintenance Organization (HMO) and Fee-for-Service (FFS) Groups

Patient Characteristics	HMO Group (n=245)	FFS Group (n=307)	*P* Value
Male sex (%)	123 (50)	135 (44)	0.14
Mean age, y (SD)	20.8 (21.4)	22.6 (21.9)	0.67
Chronic problems* (%)	19 (8)	20 (7)	0.57
Provider specialty (%)			<.001
Family practice	104 (42)	102 (33)	
Pediatrics	19 (8)	115 (37)	
Internal medicine	69 (28)	71 (23)	
Nurse practitioner/ physician assistant	53 (21)	19 (6)	

*Asthma, chronic obstructive pulmonary disease, noncured cancer, diabetes mellitus, renal failure, use of immunosuppressive medications, and infections with human immunodeficiency virus.

otics were started or changed within the next 10 days or whether the patient returned within the next 30 days with the same or any other respiratory complaint, and the diagnosis for that complaint.

Data were analyzed using Epi Info Version 6.0.[19] Continuous data were compared using the *t* test while categorical data were compared with the chi-square test. Statistical significance was defined as $P<.05$. Logistic regression analyses were performed using True Epistat software.[20]

RESULTS

From the initial sample of 720 patients (360 at each site), 19 were excluded at the HMO site and 41 were excluded at the FFS site because their charts could not be located or their physician visit occurred before May 1, 1995. This left a sample of 341 patients in the HMO group and 319 in the FFS group.

When we examined secondary diagnoses, we found that in addition to a URI or bronchitis, a significant number of patients in both groups had additional diagnoses that could have warranted antibiotic therapy. These included otitis media (79 in the HMO group and 8 in the FFS group), sinusitis (16 in the HMO group and 4 in the FFS group), and streptococcal pharyngitis (1 in the HMO group). To focus only on patients who had no other diagnosis for which antibiotic treatment would be considered appropriate, these patients were excluded from further analysis. This left a final sample of 245 in the HMO group and 307 in the FFS group.

Table 1 shows comparisons of the two groups based on demographic variables, clinical conditions, and specialty of the provider whom they encountered. The patients in the two groups were similar, except that the HMO group had a greater proportion of visits to family physicians than the FFS group.

When we examined the treatment of URIs, we found that patients seen in the HMO were more likely to have antibiotics prescribed than those seen in the FFS setting (Table 2). When we grouped and compared narrow-spectrum, low-cost antibiotic agents (including amoxicillin, penicillin, erythromycin, and sulfamethoxazole/trimethoprim) with broad-spectrum, more expensive drugs (amox-

TABLE 2

Treatment of Upper Respiratory Tract Infections and Acute Bronchitis in Health Maintenance Organization (HMO) and Fee-for-Service (FFS) Groups

Condition and Treatment	HMO Group No. (%)	FFS Group No. (%)	*P* Value
Upper respiratory infection			
Number	151	183	
Antibiotic prescribed	47 (31)	37 (20)	.02
Type of antibiotic			.93
Narrow-spectrum/ low cost	32/47 (68)	26/37(70)	
Broad-spectrum/ high cost	13/47 (32)	11/37(30)	
Antihistamine prescribed	12 (8)	12 (7)	.62
Decongestant prescribed	27 (18)	22 (12)	.29
Other prescription	23 (15)	29 (16)	.88
Acute bronchitis			
Number	94	124	
Antibiotic prescribed	77 (82)	90 (73)	.11
Type of antibiotic			.02
Narrow-spectrum/ low cost	50/77 (65)	42/90(47)	
Broad-spectrum/ high cost	27/77 (35)	48/90(53)	
Antihistamine prescribed	7 (7)	7 (6)	.59
Decongestant prescribed	21 (22)	14 (11)	.03
Bronchodilator prescribed	14 (15)	38 (31)	.007
Other prescription	21 (15)	38 (16)	.17

icillin/clavulanic acid, all cephalosporins, quinolones, azithromycin and clarithromycin), we found no difference in antibiotic use by expense class. When we examined the use of other medications for patients with URIs seen in the HMO compared with the FFS group, we found no statistically significant difference in the prescribing of antihistamines, decongestants, or other medications.

For patients with acute bronchitis, antibiotic prescribing in both the HMO and FFS group was much higher than for patients with URIs (Table 2). Again, patients in the HMO group were more likely to receive antibiotics than those in the FFS group, but the difference was not statistically significant. We did find, however, that patients seen in the HMO setting were more likely to receive less expensive, narrow-spectrum antibiotics compared with FFS patients. In addition, FFS patients were less likely to have decongestants prescribed for acute bronchitis, and more likely to have bronchodilators prescribed for their bronchitis symptoms.

Because the specialties of the physicians in the two groups differed, and because other evidence suggests that antibiotic use differs by age group,[5] a logistic regression model was employed to adjust the effect of the site of care (HMO or FFS) for potential interspecialty and differences in the patient populations. Using antibiotic prescribing as the independent variable, and site of care, physician specialty, and patient age (categorized as a dichotomous variable consisting of patients less than 18 years of age and adults) as dependent variables, the adjusted odds ratio for HMO patients receiving antibiotics for URIs was 2.35 (95% confidence interval [CI] 1.29 to 4.28, P=.005). The adjusted odds ratio for antibiotic use in the HMO for patients with acute bronchitis was 1.73 (95% CI 0.83 to 3.58), which remained not statistically significant (P=.14).

In addition to examining medication use for URIs and acute bronchitis, we also examined the use of diagnostic testing for patients with these conditions. Table 3 shows that patients in the HMO group were significantly less likely than FFS patients to have diagnostic tests performed during their visit. In particular, FFS physicians were more likely to take throat cultures for patients with colds and order chest x-ray films for patients with acute bronchitis.

Finally, we wanted to determine whether patients in the HMO were more likely than FFS patients to return for an additional visit with respiratory complaints within the next 30 days. For patients with URIs, 32 (21%) patients seen in the HMO returned for a follow-up visit, compared with 50 (27%) patients in the FFS group (P=.20). The rate of follow-up for the HMO group did not differ from that of the FFS group based on whether the patient received an antibiotic (17% vs 22%, P=.59) or not (23% vs 29%, P=.31). Similar results were obtained for acute bronchitis: 21% of HMO patients returned within 30 days as compared with 25% in the FFS group. Again, there were no significant differences between HMO and FFS groups based on whether an antibiotic was prescribed for the patient (21% for HMO vs 28% for FFS, P=.59) or not (41% vs 24%, P=.19).

TABLE 3

Use of Diagnostic Tests for Upper Respiratory Tract Infection and Acute Bronchitis in Health Maintenance Organization (HMO) and Fee-for-Service (FFS) Groups

Condition and Tests	HMO Group	FFS Group	*P* Value
Upper respiratory infection			
Number	151	183	
Test performed (%)	2 (1)	33 (18)	<.001
Types of tests*			
Throat culture	0	29	
Chest x-ray	0	4	
Monospot	2	0	
Spirometry	0	1	
Acute bronchitis			
Number	94	124	
Test performed (%)	4 (4)	26 (21)	<.001
Types of tests*			
Throat culture	0	3	
Chest x-ray	0	14	
Sinus x-ray	0	4	
Spirometry	0	6	
Complete blood count	3	4	
Other	2	3	

* Total types of tests may be more than total number of patients tested since patients may have had more than one test.

DISCUSSION

These data suggest that managed care organizations have been successful at reducing primary care costs by limiting diagnostic testing, but have not reduced the prescribing of antibiotics for unindicated reasons. In neither URI nor acute bronchitis episodes were patients in the HMO group less likely than those in the FFS group to receive antibiotics.

Patients seen in the HMO setting appeared more likely to receive antibiotics, although there is some suggestion that providers tended to prescribe less expensive drugs for acute bronchitis. Since the HMO provided no direct feedback to clinicians about their antibiotic use and did not tie direct compensation to the use of medications, it might be reasonable to expect that clinicians in the HMO have no incentive to limit medication prescribing.

Evidence has continued to accumulate that changing physicians' practice patterns is greatly dependent on the physicians' having an accurate knowledge of their practices. A method that has shown particular utility in influencing physician behavior is the profiling of physician practice patterns and providing feedback on the physician's performance.[21,22] Profiles are useful in providing information on medical practice because they focus on patterns of practice rather than instances of care, and they provide information on a practice pattern within the context of a group or a norm. Feedback on an individual's performance can focus on a comparison with one's peers or with a clear norm or standard of performance.[23]

Although feedback on performance has been shown to be effective for changing behavior,[22] several factors seem to influence its likelihood of effectiveness. First, physicians must be able to act on the information that is given. Second, feedback is more successful when used in combination with other interventions such as financial incentives and education.[24-26] In the HMO used in this study, feedback to physicians is provided about referrals and admissions, but not about other practice characteristics. Focusing on reducing high-cost services is a common tactic to reduce costs in a managed care setting. This study suggests that attention to lower cost but high-volume services such as antibiotic use for viral respiratory conditions might also result in significant cost savings if patient and provider behaviors can be changed.

While it is tempting to explain the antibiotic-prescribing finding by the lack of feedback to clinicians, the same set of circumstances was also true for laboratory utilization. The use of laboratory resources, however, was lower in the HMO group than in the FFS group. This suggests that two forces may be at work: one force may be influencing antibiotics prescribing, while the other influences laboratory use. The clinicians in the HMO were acutely aware of the need to limit resource use since their total compensation was contingent on the overall financial success of their group; but they also had an incentive to increase patient satisfaction, since this was monitored. If clinicians believed that feedback from patients who did not receive antibiotics would have a negative impact on the clinician's patient-satisfaction rating, they might have prescribed antibiotics more willingly while still trying to reduce costs by avoiding unnecessary laboratory tests. This observation may underscore the tension between cost-effective medical care and patient satisfaction. In some cases, as in the use of antibiotics for unindicated conditions, physicians may find themselves torn between two different incentives.

Physicians' perception that patients want antibiotics may not be correct, however. Previous evidence shows that patients do want some treatment for their symptoms, but not necessarily antibiotics.[27,28] Physicians may misinterpret patient desires, as was shown in a survey of patients and providers in which physicians were very poor at predicting which patients wanted antibiotic therapy for their colds.[29] Additionally, studies suggest that prescribing antibiotics just because patients seem to want them is not associated with increased satisfaction with care.[28,29]

A second finding of this study is that physicians prescribe antibiotics at a relatively low rate for URIs as compared with acute bronchitis. This finding confirms findings in other studies with respect to URI[6, 30,31] and acute bronchitis.[5,11] This difference could be due to differential coding by physicians of the symptoms of URI as acute bronchitis because antibiotic use has been argued for the latter condition.[32,33] Some authors have argued that this "coding creep" to justify antibiotic use is the result of physicians' acquiescing to patient expectations for antibiotics.[34]

These results should be interpreted within the limitations of the study. This study examined only one managed care setting and may not be indicative of other groups. As noted above, this managed care organization provided no individual tracking of antibiotic prescribing by providers at the time of the study. Without organizational knowledge of resource use, providers were under no pressure to limit their utilization of antibiotics. Second, the study relied on adequate documentation of treatment rendered by the provider. Differences between

the groups in the completeness of their medical records could have skewed the results, but there is no evidence to suggest that one group was either better or worse at documenting antibiotic prescriptions. Finally, because of frequent coding of URIs and acute bronchitis in conjunction with other respiratory tract illnesses for which antibiotics could have been justified, the power of the study to detect differences in antibiotic prescribing for acute bronchitis was low. Thus, the lack of a statistically significant difference in antibiotic prescribing between the HMO and FFS patients with acute bronchitis should be interpreted cautiously.

In summary, this study does not support the hypothesis that patients in the managed care setting are less likely to receive antibiotics for URIs or acute bronchitis. HMO patients are less likely to have diagnostic tests performed for their respiratory tract illnesses and appear more likely to receive antibiotics than FFS patients. Further, whether patients receive antibiotics or not, HMO patients appear no more likely to return for additional visits for respiratory symptoms during the ensuring month than patients in the FFS practice.

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