

## Pharmacoeconomic Impact of Appropriate Clinical Pathways

*Based on a presentation by N. Stephen Ober, MD, MBA*

### **Presentation Summary**

Dr. Ober is president and chief executive officer of Synergy Health Care, Inc, based in Waltham, Massachusetts. In response to the concerns of managed care organizations, provider groups, and hospital systems, Synergy Health Care has worked with these entities to evaluate their antibiotic use data and help them determine effective clinical pathways for antimicrobial use.

The program, called the Respiratory Infection Management System (RIMS), aims to develop a comprehensive profile on the total cost of care in the treatment of adult respiratory infections. The company has completed a similar program involving peptic ulcer disease treatment for 35 different organizations. These programs aim to help the practicing physician at the point of care.

**T**here are several reasons why healthcare concerns of various types are seeking guidance on antibiotic use for respiratory infections, according to N. Stephen Ober, MD, president and chief executive officer of Synergy Health Care, Inc. First, a review of the literature does not offer other than the most basic guidelines. In addition, the prevalence of respiratory infections is great; in most healthcare organizations, it is the number one reason for office visits. Resistance is becoming an even more pressing problem, so adjunctive therapies and concern that respiratory infection patients simply seem to be sicker these days also play a role.

"Industry-wide, there have been great programs focusing on diabetes, hypertension, depression, and other high-cost chronic conditions, but respiratory infections have been somewhat ignored,

even though they are conditions for which a utilization program could have a great deal of impact because of prevalence alone," Dr. Ober said. "Both patients and physicians are confused over the appropriate treatment for bronchitis, sinusitis, pharyngitis, and pneumonia."

Large utilization analyses, such as those recently conducted by Synergy Health Care, may offer new insights into how to link antibiotic usage with medical costs in respiratory infection treatment.

### **Physician Behavior**

The few antibiotic usage studies that are available provide somewhat shocking information on antibiotic use in respiratory infections. For example, one study indicated that 66% of bronchitis patients receive antibiotics (Figure 1).<sup>1</sup> "This is seen as terrible," Dr. Ober said, "but is it? Many physicians misquote this

study when they state that an antibiotic should never be used in the clinical settings involved, but that is not true. If all bronchitis patients were cultured, we might have more helpful guidelines, but

that is not cost effective. The challenge then is to try to develop better tools to make physicians' decision making easier."

In another study conducted in the United Kingdom, 75% of 1089 adult lower respiratory infection patients were treated with antibiotics in a primary care setting. There were 115 general practice physicians involved. Among the patients who received an antibiotic, in only one third of the cases did the physician say an antibiotic was definitely needed based on symptoms, signs, patient history, resistance patterns, or physician expertise. However, in two thirds of the cases the physician reported not knowing whether an antimicrobial was really needed.<sup>2</sup>

"Physicians reported that they prescribed an antibiotic because the patient demanded it, they did not have enough time to deal with the patient, the patient was older, and other interesting reasons," Dr. Ober said. "We can see from the few studies examining physician behavior that prescribing antibiotics is not often done for reasons that are supported by clinical analyses."

Patient behavior and expectations can be another major factor in inappropriate antibiotic use. "Patients can be very demanding, and they often have preconceived notions of how they should be treated when they present with a respiratory infection," Dr. Ober added (Figure 2).<sup>3</sup>

"Consumerism in healthcare is probably at an all-time high. There is access to the Internet, and we now direct advertising to the consumer, which prompts patients to demand certain products, including antibiotics, from their physicians. Direct advertising to the consumer can have a very powerful influence on patient behavior and expectations, and clinicians face it on a daily basis," Dr. Ober said.

### Initial Analysis

With these obvious antibiotic usage problems in mind, Synergy Health Care conducted its first Respiratory Infection

**Figure 1.** Patterns of Antibiotic Use Clearly Show Some Potentially Inappropriate Use

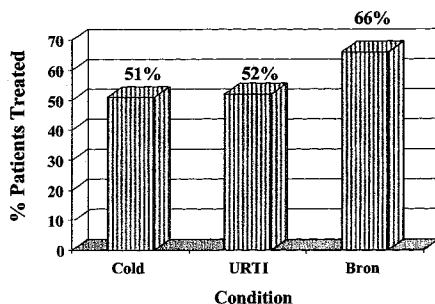
- National Ambulatory Medical Care Survey (1992)
- 1,529 office-based physicians; 28,787 patient visits
- DX: colds, URTI, bronchitis

*Associated with Increased Antibiotic Use:*

- Female
- Rural location

*Unassociated with Increased Antibiotic Use:*

- Age
- Geographic region
- Physician specialty
- Payment source



Source: Gonzales R, Steiner JF, Sande MA. *JAMA* 1997;278:901-904. Copyright © 1997. American Medical Association

**Figure 2.** Lack of Knowledge of Role of Antibiotics

Patient survey: Knowledge of upper respiratory tract infections  
 Diagnosis: upper respiratory tract infections  
 961 patients  
 Results

- 72%: seek care after 5 days of cough, sore throat, nasal discharge
- 61%: find antibiotics effective for cough, sore throat, clear nasal discharge
- 79%: find antibiotics effective for discolored nasal discharge

Factors that increase use of antibiotics and care services

- Medicaid recipients
- Past use of an antibiotic for an upper respiratory tract infection
- Higher education (discolored nasal discharge only)

Factors that decrease use of antibiotics and care services

- Higher education

Source: Mainous AG III, Zoorob RJ, Oler MJ, Haynes DM. *J Fam Pract* 1997;45(1): 75-83. Reprinted by permission of Appleton & Lange, Inc.

Management System (RIMS) data analysis, with the aim of developing goals that could be incorporated into an antibiotic utilization plan for respiratory infection. A large claims database from a 280,000-member managed care plan was searched for antibiotic use in influenza, colds, upper respiratory infections, tonsillitis, bronchitis, and sinusitis. The data analysis revealed a high incidence of inappropriate antibiotic usage. "We found that three fourths of the antibiotics prescribed were for inappropriate indications," Dr. Ober explained (Figures 3 and 4).

Armed with this information, objectives for a clinical use plan were developed. The managed care organization (MCO) involved was most concerned with guidelines for bronchitis and sinusitis, because these conditions are the most prevalent and have the fewest literature reports on which to rely. Furthermore, the MCO had no data on usage for bronchitis and sinusitis.

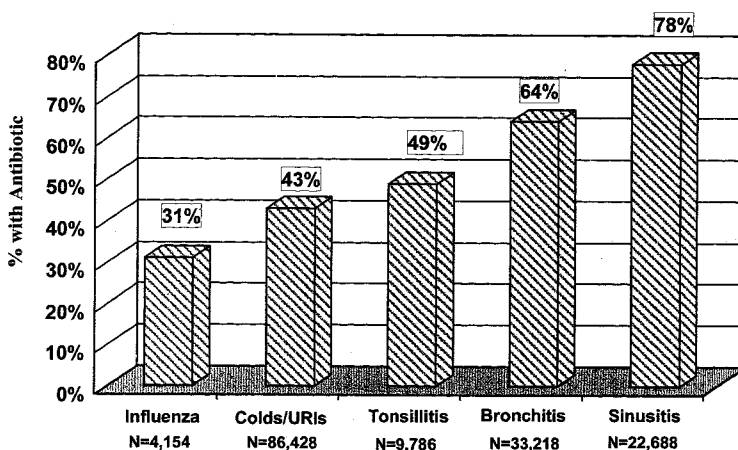
"One goal became to quantify the difference in the total cost of care between patients with these conditions who were treated with an antibiotic and those who were not," Dr. Ober said. Other goals were to determine differences in comorbidity between treated and untreated patients, to identify classes of patients for whom intervention is appropriate, to identify ways to optimize treatment using different antibiotics and adjunctive therapies, and to ultimately develop a predictive model and treatment guidelines.

### Pilot Program Design

One year of pharmacy claims data from a 280,000-member independent practice association (IPA) health plan were evaluated in an effort to compare costs between patients who had received no antibiotics, first-line antibiotics, or second-line antibiotics for sinusitis or bronchitis during the year. All patients included had to have been at least age 18 years, enrolled in the health plan for the entire 1-year period, and had made at least one office visit related to this condition.

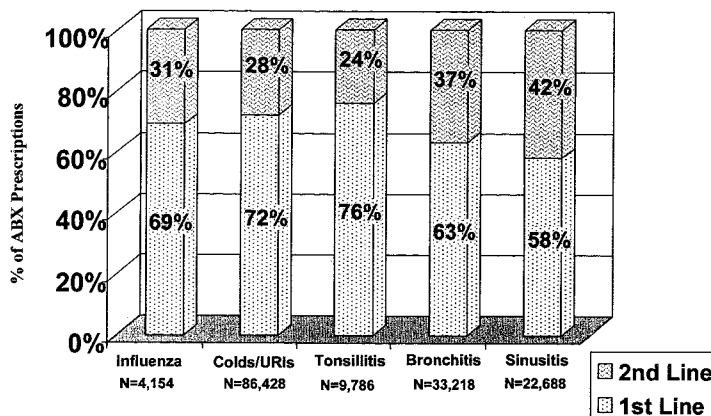
The Clinical Classifications for Health Policy and Research (CCHPR) system, which categorizes the more than 14,000 *International Classification of Diseases, ninth revision, Clinical Modification*

**Figure 3.** Antibiotic Use in Respiratory Tract Infections: Percentage of Episodes with Antibiotic Prescriptions



Source: Synergy Health Care, Inc. 1998.

**Figure 4.** Antibiotic Use Patterns: Second-Line Drugs Used to a Greater Extent for Sinusitis and Bronchitis



Source: Synergy Health Care, Inc. 1998.

(ICD-9CM) codes into 262 clinically relevant conditions and groups, was used to evaluate the claims data. This information was then used to define an episode of sinusitis or bronchitis. "Traditionally," Dr. Ober explained, "an episode was defined by experts estimating the amount of time an average patient with one of these conditions was sick. This didn't make sense to us, because there are patients who are sick for long periods and those who are sick for short periods. What we wanted to know is what makes a patient healthier in the shortest amount of time."

Therefore, a search of the claims data was made to determine all the services consumed by patients with these diagnoses. "As long as they are still consuming services, they are still sick," Dr. Ober noted. The information was then fine-tuned to determine comorbidity scores for each patient.

"We believed that all this information would be useful in developing guidelines for appropriate treatment strategies," Dr. Ober continued. "Patients carry a past medical history with them. We needed to develop a tool so that a physician with an elderly diabetic patient who has chronic heart failure and respiratory complaints could decide, for

example, whether such a patient might do better with immediate antibiotic use. A patient with none of these problems may do better without an antibiotic."

### Cost Analysis

The claims analysis determined the prevalence of bronchitis to be 9.5% and that of sinusitis to be 6.8% among the health plan's 280,000 members. "It should be noted that these percentages reflect huge numbers of patients with these conditions. Although organizations looking to improve the quality of care and outcomes through disease management programs may deal with 400 heart failure patients or 1000 diabetics in their population, it is a much more daunting task to develop a comprehensive plan for 26,000 bronchitis patients who experienced 33,000 episodes a year," Dr. Ober explained.

Approximately 78% of sinusitis patients and 64% of bronchitis patients had been treated with antibiotics. Furthermore, patients with more than one episode during the year tended toward greater comorbidity, longer episode lengths, and, of course, greater total costs. Dr. Ober noted that the cost figures reflected the total cost of all medical and pharmacy services related to the illness (Table 1).

The analysis also revealed that of the total costs for bronchitis and sinusitis, only 15% was the result of pharmacy costs and of that only half was attributable to antibiotic usage. "These patients were using inhalers, cough medicines, antihistamines, and very expensive nonsedating antihistamines as often as they used antibiotics. Therefore, it seems that some organizations may be missing the boat by trying to shave costs off the antibiotic piece of the pie, which only amounts to 8% of the total cost," Dr. Ober explained, raising the question, "are they shaving the right piece of pie?"

**Table 1.** Episode Frequency Analysis

Sinusitis					
Episode Frequency	No. of Patients	Average Severity	Average Comorbidity	Average Length of Episode	Average PE Amount
1	16,132	20.7	8.5	20.7	\$304
2	2,278	33.6	20.5	42.7	\$667
3	449	64.3	47.3	64.3	\$1,743
Bronchitis					
Episode Frequency	No. of Patients	Average Severity	Average Comorbidity	Average Length of Episode	Average PD
1	21,730	34.4	16.4	18.5	\$394
2	3,709	69.4	34.4	38.7	\$884
3	833	104.9	62.7	57.4	\$1,279

PE = per episode.

Source: Synergy Health Care, Inc. 1998.

**Prescribing Tendencies**

The antibiotic usage for sinusitis and bronchitis noted in the database analysis was further evaluated to determine what proportion of patients were receiving first-line and second-line agents. First-line agents included amoxicillin, all penicillins, the erythromycins, and the sulfonamides. Second-line agents included the second-generation macrolides, augmentin, ceftin, and cefaclor. Ceclor and the quinolones were not evaluated because of limited data.

The first observation was that physicians prescribed differently for patients with various comorbidities and past histories of previous episodes. For such patients, there was a higher proportion of second-line antibiotic use. This group of patients, not surprisingly, also had a longer average duration of sinusitis episodes.

Another observation was that patients who received no antibiotic therapy had a higher total cost of care than patients who were treated with first-line agents. "These patients had a higher overall medical utilization," Dr. Ober said. "We don't know why those who received no antibiotics had more physician visits and used more medical services." The average cost per episode for patients taking no antibiotics was \$353 compared with \$250 for those who received first-line agents and \$847 for those who received second-line agents. Results for bronchitis treatment were proportionally similar to those for sinusitis, with the cost per bronchitis episode being \$504 for patients without antibiotic therapy, \$480 for those receiving first-line drugs, and \$944 for those taking second-line agents.

However, when prescribing patterns were analyzed to determine which comorbidities had the most influence on the cost of care, it was found that there simply was no pattern. "It is as if physicians were just not certain of what to do," Dr. Ober said. "Meanwhile, the cost of care was higher for those with comorbid burdens. This led us to try to determine how to provide some infor-

mational guidelines on how to treat these diseases in the hope of affecting the whole utilization of care profile.

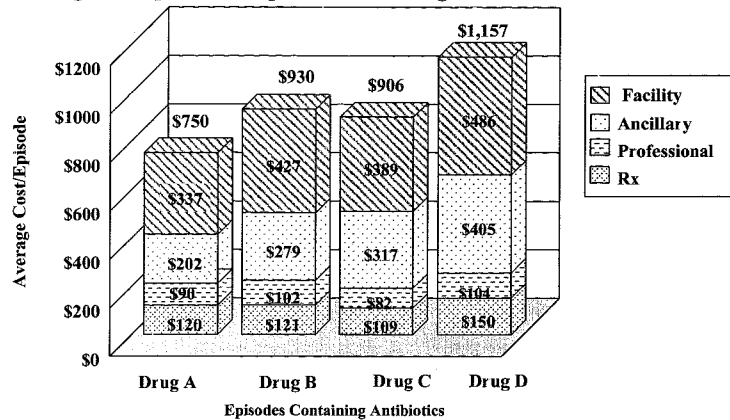
"We found that 2% of the patients consumed 23% of all the costs associated with sinusitis. For the healthcare plan, this was a total of \$10 million," Dr. Ober said.

Because the use of second-line agents had already been shown to consume much of the cost, these agents were evaluated further. Researchers found that there was a definite difference in total care cost, depending on which second-line agent was prescribed (Tables 2 and 3). "There were more ancillary services required by patients who were treated with certain agents, but there was not a large difference between antibiotics in the amount of purely professional services consumed," Dr. Ober explained. However, the use of macrolides as second-line agents was associated with lower costs compared with other second-line agents.

The use of prescription decongestants was examined as well. "Pa-

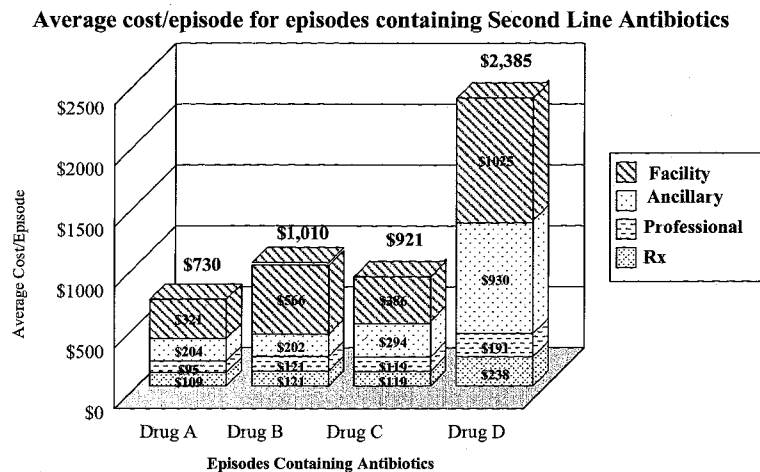
**Table 2. Major Cost Components of Sinusitis**

**Average cost/episode for episodes containing Second Line Antibiotics**



Source: Synergy Health Care, Inc. 1998

**Table 3.** Major Cost Components of Bronchitis



Source: Synergy Health Care, Inc. 1998

tients who received both an antibiotic and a decongestant for sinusitis had a lower cost of care,” Dr. Ober said. “There was less utilization and fewer office visits and ancillary services. Additional cost analyses for prescription anti-tussive use in bronchitis revealed that these agents only slightly optimized treatment.

“We also found distinct regional differences in the way physicians prescribe certain medications,” Dr. Ober continued. “I think as we go to the next step and develop treatment guidelines for these conditions we will have to take these differences into account to successfully implement disease management programs.”

**Guideline Development**

“We have seen how comorbidities and adjunctive therapies can influence the total cost of care, and it seems that among antibiotics of the same class the total cost of care can differ, because of differences in failure rates, resistance patterns, minimum inhibitory concentrations, or simply because of physician

behavior,” Dr. Ober said. “Our challenge is to take this RIMS data and put it into a context so as to fashion tools that physicians can use.”

... DISCUSSION ...

After his presentation, Dr. Ober responded to colleagues’ questions.

*Question: Why did you classify certain drugs as first-line agents and other drugs as second-line agents?*

*Dr. Ober:* That was empiric and based somewhat on definitions already in use by the healthcare plan. Typically, the inexpensive agents such as erythromycin and penicillin were first-line agents, and although there is a spectrum of action issue with these agents, the reality is that if an agent is cheap it is used first.

*Question: Did you determine how many patients who were not initially given an antibiotic may have turned up in the emergency room, even if they only presented themselves to get an antibiotic that the physician would not prescribe? Such an event drives up the cost of care very rapidly.*

*Dr. Ober:* We have some data on that, but we haven’t isolated it yet.

*Question: Are you comfortable with the validity of the length of episode determinations made in patients who are not getting antibiotics as opposed to the length in those who are receiving antibiotics? It seems that you can define the length of an episode better when you know the last day of antibiotic therapy. How was the length determined in those who were not receiving medication?*

*Dr. Ober:* There were other parameters used, such as office visits. There was probably some variation in episode

length determinations that was the result of not having a fixed parameter, such as the last day of therapy.

*Question: Why would a patient with acute bronchitis who was on ceftin require so much more care than a patient on clarithromycin? What is the pathophysiological reason for that?*

*Dr. Ober:* It may be related to patients with atypical organisms that are not covered by one agent or another. Atypical infections drive up the cost astronomically. Hospitalization data for each drug also should be evaluated. One or two hospitalizations at more than \$1000 a day in a particular drug group could have skewed the whole cost analysis. I think hospitalization was a big driver of cost.

*Question: Do you think there would be a difference in the cost of care for either sinusitis or bronchitis between atypical and typical organisms, irrespective of the number of annual episodes, whether first- or second-line agents were used, and regardless of severity or comorbidity? Does one particular parameter influence the cost of care?*

*Dr. Ober:* Absolutely. We don't have a good prospective study that measures such a cost. I think that if such data could be captured it would answer a lot of questions and provide a number of tools for physicians to use. Right now, physicians are doing some pretty extreme things as far as prescribing in an effort to fight resistance, which leads to overutilization.

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— N. Stephen Ober, MD

*Question: I think more prospective-type studies are needed, because with this data you don't know whether you're comparing apples and oranges. For example, how many patients who were diagnosed with sinusitis in this analysis actually had sinusitis? There are some physicians who call every cold sinusitis and immediately prescribe an antibiotic. So I think this has to be taken with a grain of salt.*

*Dr. Ober:* I agree that until we have data from prospective studies, which can be very expensive to conduct, we will not have those answers. On the other hand, it must be remembered that these kinds of retrospective analyses are what healthcare organizations use to make decisions. The bottom line may be that these retrospective analyses show tremendous overutilization. Although I don't believe these analyses will definitively show how to treat a certain patient, they can be helpful in giving physicians suggestions on how to make better prescribing decisions.