

## The Diagnostic and Treatment Approach to Two Common Conditions by the Physician Members of a Community Health Maintenance Organization

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### **Abstract**

We retrospectively collected data from one community managed care organization on all ambulatory care patients initially diagnosed with pneumonia or acute bronchitis from October 1, 1992, to March 31, 1993, and from November 1, 1993, to January 31, 1994. We considered treatment to be successful when patients did not return for any related service within 15 days of initial diagnosis. We identified 2,490 episodes of illness, 85.7% which were acute bronchitis and 14.3% which were pneumonia. Overwhelmingly, physicians approached these conditions empirically (no diagnostic test); just 8.6% of patients had a diagnostic test during the 15-day episode of illness. Two-hundred twenty-nine of the episodes (9.2%) were apparently related to initial diagnosis, as they occurred during the 15-day period. More branded prescriptions (vs. generic) were dispensed during these related episodes. One patient was hospitalized and 19 patients used the emergency room either for first or subsequent visits. Empiric treatment is associated with effective diagnosis and therapy in ambulatory care patients with acute bronchitis and pneumonia. It remains unclear, however, if this strategy is the most cost-effective or if it leads to the most effective utilization of services.

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In this era of managed care, research and commentary emphasize excess diagnostic and treatment intervention and the resulting overuse of resources, especially expensive technology. There is a large worldwide base of literature, for example, which documents a wide variation in use of services among comparable populations.<sup>1</sup> Research also shows that a large proportion of healthcare services does not meet

criteria for their use.<sup>2,3</sup> Lack of controlled clinical efficacy data, varying indications, payment and organizational incentives, physician education level, age, and specialty, and individual patient and payer attributes have been proposed as reasons for this "inappropriate care."<sup>4</sup> Counter-detailing of pharmaceuticals,<sup>5</sup> practice guidelines, and clinical protocols have been proposed as methods for reducing utilization and minimizing inappropriate care. Definitive diagnosis prior to therapy is also recommended.<sup>6</sup>

Ironically, however, physicians also substantially under-treat, ie, they do not provide enough care to patients even when evidence from randomized, controlled trials clearly shows large and cost-effective (or even cost-saving) health benefits.<sup>7</sup> Underuse of thrombolytic therapy following acute myocardial infarction, which leads to unnecessary mortality, is a glaring example.<sup>8</sup>

The goal of this study is to better understand the diagnostic and treatment approaches community physicians use to address two common diagnoses in the ambulatory care setting, pneumonia and acute bronchitis, and to assess the success of these approaches based on the rate of return visits and associated services. We also assessed physicians' generic- and branded-drug prescribing patterns.

### ... SUBJECTS AND METHODS ...

We retrospectively reviewed data from a 175,000-member health maintenance organization (HMO) from two time periods in which the majority of pneumonia or acute bronchitis diagnoses (ICD-9 CM codes 466.0, 482.9, 486, and 490) were made: October 1, 1992, to March 31, 1993 and November 1, 1993, to January 31, 1994. We reviewed these diagnostic codes for all resources and services used during the entire episode of care. This health plan is both an insurer and full-service provider that offers salary, traditional and capitated (at-risk) payment to its physicians. Patients receive nearly all of their care from the plan's physi-

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cians, and patients choose their own primary care physicians. There is little out-of-plan service use in this largely rural region.

We collected data using the plan's existing computerized database, which we knew from past experience contained valid and reliable information. The database tracked individuals by their unique patient identifier at each encounter and for each service, and we were able to determine inpatient hospital care, ambulatory care, emergency room care, and outpatient pharmaceutical prescriptions dispensed for each patient. Patients who had a pneumonia or acute bronchitis diagnosis for any service during the month before the first study month were deleted; patients accrued in the last study month were followed until the end of the next month. Data from both study periods were combined into one set, as there were no important differences in patient and physician populations or treatments between data sets.

Success was defined simply as no services provided for the same or other study diagnosis during the 15 days following initial diagnosis. A panel of physicians created this definition, as they felt that 95% of persons presenting with similar symptoms more than 15 days after initial diagnosis were likely to have a new illness. Since diagnosis was not included in the pharmaceutical record, any prescription for a study medication filled within two days of the physician visit was assumed to be for the study diagnosis. Since we expected that a large proportion of care would involve antibiotics, we categorized all antibiotics into 12 unique pharmaceutical groups for analysis.

Failure was defined as return visit(s) plus any related service such as antibiotic prescription dispensed and/or diagnostic test for one of the study diagnoses or any similar infectious process, such as influenza or otitis media, during the 15 post-diagnosis days. We did not collect data on bronchodilator use because bronchodilators are also commonly used for asthma and other pulmonary conditions. We did not attempt to judge physician behavior or determine its appropriateness in relation to best available evidence.

We grouped the following services into single episodes of illness: all services for each initial study diagnosis, services for each subsequent diagnosis indicating an infectious process during the 15 days following initial diagnosis, and a prescription dispensed for another antibiotic during the 15 days following initial diagnosis. A patient could have more than one episode of illness during the study period, but each episode was counted separately as an initial diagnosis provided care was separated by at least 15 days.

We constructed a logistic regression model to test possible effects of independent variables—including patient age, gender, primary diagnosis for the visit, all other diagnoses, diagnostic tests, medications, and physician—on failure of initial diagnosis and/or treatment. Episodes of illness and individual patients were entered into the logistic regression model.

... RESULTS ...

We identified 2,490 separate episodes of illness in 1,981 children and adults. Slightly more (53.6%) were female. Pneumonia was diagnosed in 14.3% of patients, and bronchitis was diagnosed in 85.7% of patients. Children aged 0 years to 14 years comprised 21.5% of the study population, and 5.5% were 65 years of age or older. Among patients who had more than one episode of illness, 71% were 0 years to 14 years of age and an additional 15.2% were 65 years of age or older. Just over 52% of these patients were male.

Physicians overwhelmingly treated empirically (without prior diagnostic testing) at the first and subsequent visits. Only 6.8% of patients (n = 170) had an x-ray or laboratory test at any visit, and of these patients, 14% had multiple comorbid conditions such as heart or pulmonary disease. Those diagnosed with pneumonia were more likely to have an x-ray than those with bronchitis (Table 1). It is possible that diagnosis was made after x-ray; otherwise, diagnosis was not an indicator of type or quantity of service used. Most physician visits for initial diagnosis and subsequent visits (67%), irrespective of diagno-

**Table 1.** Distribution of Resources Used by Diagnosis (n=2,490)

Resources	Bronchitis (%)	Pneumonia (%)	n
Office Visit ≤ 10 min	27.8	9.2	626
Office Visit ≥ 15 min	56.6	18.2	1,273
X-ray	3.6	24.1	163
Laboratory	0.2	0.6	7
Emergency Room Visit	0.8	0.3	19
Hospitalization	0.0	0.0	1
<b>n =</b>	<b>2,133</b>	<b>357</b>	<b>2,490</b> <b>(100%)</b>

sis, lasted 15 minutes or longer (Table 1). Only 19 patients used the emergency room (Table 1).

All 2,490 separate episodes of illness led to at least one dispensed antibiotic prescription (mean number of antibiotic prescriptions dispensed per episode: 1.1; range: 1-3). Physicians dispensed 51 types of antibiotics (330 regimens), 72.4% of which were generic. Antibiotics dispensed by diagnosis are shown in Table 2.

Two-hundred twenty-nine of the episodes (9.2%) took place within 15 days of initial diagnosis. A few patients returned more than once within the 15 days after initial diagnosis. Physicians prescribed an antibiotic to all patients who returned during this time (mean number of antibiotic prescriptions dispensed per episode: 1.5; range: 1-3), 65.6% of which were generic. Only one of these patients (with pneumonia) was hospitalized. A prior diagnostic test was not associated with a lower rate of return during the 15-day period.

Branded, high-cost, broad-spectrum antibiotics were dispensed more frequently during return visits; 16.5% of all patients received branded antibiotics at initial visit as compared with 34.4% at return visits. There was an observable but insignificant trend toward use of amoxicillin/clavulanate potassium (Augmentin) in children and other branded pharmaceuticals in the elderly, especially for those with multiple comorbid conditions.

The logistic regression model showed only one variable to be predictive of failure (ie, return visits within the 15-day period). Females were more likely to return than males ( $P = 0.04$ ).

... DISCUSSION ...

There are a number of explanations for this greater than 90% success rate for the diagnosis and treatment of pneumonia and acute bronchitis in this study population. Physicians are expert in diagnosis of these common conditions without prior testing. All antibiotic treatments work equally well in these circumstances, regardless of the specific diagnosis. Further, these condi-

tions are self-limiting and are very likely to remit even without intervention.

If a primary objective in treating such self-limiting conditions is to make the patient feel better, then these physicians were successful. By focusing on empiric treatment and using diagnostic tests mainly for those who returned, these physicians also seemed to use the most cost-effective strategy. While we did not measure directly patient perceptions, it is reasonable to infer that patients who did not return for additional physician visits felt better. We believe this is an important outcome of medical care.

The high number of medication regimens ( $n = 330$ ), however, may mean that many physicians are not educated in proper antibiotic use. These physicians may have 'micromanaged' pharmacologic therapy based on the largely unsupported belief that unique patient characteristics necessitate specific antibiotic regimens.

We could not assess any effect of the physician reimbursement structure on outcome, since a majority of physicians were paid through a combination of methods. Physicians were salaried or paid through both discounted fee-for-service and/or at-risk capitation structures. Depending on the patient's specific

**Table 2.** Study Diagnoses and Medications Dispensed

Medication	Bronchitis (%)	Pneumonia (%)	n
Amoxicillin trihydrate/penicillin	32.9	14.8	755
Amoxicillin trihydrate/clavulanate potassium	2.7	10.9	97
Trimethoprim/sulfamethoxazole	3.1	1.4	71
Clarithromycin	6.8	8.7	176
Cefaclor	4.7	4.2	116
Cephalexin	2.7	1.1	61
Ciprofloxacin	1.2	1.1	30
Doxycycline monohydrate	2.7	0.3	58
Erythromycin	37.8	34.7	930
Loracarbef	4.5	21.0	171
Cefixime	0.8	1.7	24
Cefpodoxime proxetil	0.0	0.0	1
<b>Total</b>	<b>2,133</b>	<b>357</b>	<b>2,490 (100%)</b>

contract, physicians also served as gatekeepers. In addition, few physicians treated a relatively large number of patients. Nevertheless, all used resources at about the same rate regardless of payment or patient-contract status. We attribute this to the culture of the managed care plan, in which a collegial relationship is emphasized, provider education is stressed, and confidential feedback on individual and group physician practice is frequent.

We made several assumptions when assessing these data. We assumed patients made an initial visit to the physician because of symptoms, returned because symptoms did not resolve, and did not return because symptoms resolved. We believe these assumptions are reasonable, because it is unlikely that these patients sought care outside this geographically isolated HMO. We were unable to uncover any member visits paid to other providers outside this system.

There are a number of study limitations. This study involved one managed care organization in one rural geographic region. There is potential for bias due to the empiric nature of these physicians' diagnostic approaches as well as our definition of "success." The potential for overdiagnosis, and subsequent treatment success, leads to overestimation of the benefits of empiric treatment. This is simply because the patient may have a condition that is not affected by the prescribed antibiotic, yet it resolves on its own. Additionally, we defined "success" as no additional medical care even though diagnoses were not confirmed in the overwhelming majority of cases and medications have no proven effect in the case of acute bronchitis. We did not assume that a specific medical intervention was related to "success."

It is important to note, however, that while diagnostic testing (eg, x-ray or sputum culture) would have reduced potential misclassification, it would have introduced its own bias in that we would have been unable to objectively measure real physician practices in a community practice. Separate, controlled studies to measure the cost-effectiveness of initial tests for conforming the diagnosis of acute bronchitis and pneumonia may be helpful, as would a controlled comparison of treatment targeted to a specific organism with empiric treatment.

Additionally, if an initial diagnosis did not lead to another service or another similar infectious disease diagnosis/antibiotic prescription, we were unable to determine if the initial diagnosis was incorrect. For example, if pneumonia was the initial diagnosis, the

patient returned within 15 days, and the physician issued an unrelated diagnosis such as carcinoma of the lung, we would have counted the initial diagnosis a success and the second visit with the new diagnosis as unrelated. The fact that any prescription for a study medication filled within two days of the physician visit was assumed to be for the study diagnosis may have introduced some bias into the study, since some prescriptions could have been for other unrecorded diagnoses. Although the data system only collected dispensed (not prescribed) treatments, we do not know if patients complied with prescribed treatments.

In conclusion, for common respiratory tract disease in this managed care plan, physicians appear to be "successful" with initial empiric treatment and seem to be appropriately judicious in their use of services.

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