Public Beliefs and Use of Antibiotics for Acute Respiratory Illness

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OBJECTIVE: To better understand public beliefs and use of antibiotics for acute respiratory illnesses.

DESIGN: Cross-sectional telephone survey.

PARTICIPANTS: Three hundred eighty-six adult members (aged 18 years or older) of a group-model HMO in the Denver metropolitan area.

MEASUREMENTS AND MAIN RESULTS: Two hundred seventy-three (70%) of the respondents reported that antibiotics were beneficial for bacterial respiratory illnesses, 211 (55%) reported that antibiotics were beneficial for viral respiratory illnesses, and 82 (21%) reported that antibiotics were beneficial for bacterial but not for viral illness. Multivariate regression analysis identified consulting an advice nurse (odds ratio [OR] 2.9; 95% confidence interval [CI] 1.7, 5.3), ever being told by a provider that antibiotics were not needed for a respiratory illness episode (OR 2.0; 95% CI 1.2, 3.6), having a chronic medical condition (OR 2.0; 95% CI 1.0, 3.9), and believing antibiotics to be helpful for viral (OR 2.5; 95% CI 1.3, 4.7) or bacterial (OR 2.6; 95% CI 1.2, 6.7) respiratory illnesses to be independently associated with antibiotic use for respiratory illnesses during the previous year. There was a trend toward lower previous antibiotic use among those believing antibiotics to be helpful for bacterial illness but not for viral illness.

CONCLUSIONS: A lack of understanding about antibiotic effectiveness exists in the community. Increased previous antibiotic use among those believing antibiotics to be effective for viral illnesses suggests that improvements are needed in communications to patients and the public about antibiotic appropriateness.

KEY WORDS: antibiotic treatment; acute respiratory illness; patient knowledge; attitudes; physician-patient relationship. *J GEN INTERN MED* 1999;14:658-662.

Acute respiratory illnesses (ARIs) are among the most frequent conditions treated in ambulatory practice.¹ Because most ARIs (e.g., colds, flu, and bronchitis) have a viral origin, treatment of these conditions with antibiotics

is rarely warranted.²⁻⁴ Nevertheless, antibiotics are frequently prescribed for ARIs,⁵⁻⁷ despite evidence that curtailing unnecessary antibiotic use can significantly decrease antibiotic resistance among community pathogens.⁸⁻¹¹ Therefore, ARIs are prime targets for interventions aimed at reducing unnecessary antibiotic use.

Antibiotic prescribing for ARIs can be influenced by patients' expectations and demands for antibiotic treatment.¹²⁻¹⁵ As a result, education of patients and the public is an important strategy for reducing antibiotic use in the ambulatory care setting.^{11,16} Little is known about patients' understanding of the necessity and appropriateness of antibiotic therapy. For example, patients may be confused if explanations of antibiotic effectiveness employ terms such as "virus" or "bacteria," although these terms are likely to be used in encounters with the health care system and with other sources of health information.¹⁷ It is also not known if correctly understanding that antibiotics are effective against bacteria but not viruses affects the use of antibiotics for respiratory illness.

We surveyed a community-based population of adults in an effort to describe experiences and beliefs regarding antibiotic effectiveness, and to evaluate the association between experiences, beliefs, and use of antibiotics for ARIs.

METHODS

We conducted a computer-assisted telephone survey of adults (aged 18 years or older) residing in the Denver metropolitan area during October and November 1997 who were members of a group-model HMO. Subjects were selected by a two-stage process of randomly selecting first households with telephone numbers and then an eligible adult within each household.

Interviewers asked participants about their knowledge of antibiotic effectiveness, use of antibiotics for respiratory illness, experiences with advice seeking and with the health care system, and sociodemographic information including age, gender, race, ethnicity, marital status, and educational level. Interviewers also asked if the participants had children aged 5 years or younger. Being a parent of young children was hypothesized to be important because the higher incidence of ARIs among the youngest age groups would lead to greater contact with the health care system regarding antibiotic treatment. Scripting of the antibiotic belief questions was as follows: (a) "How often do antibiotics help you get better if you have a viral respiratory illness such as the common cold or the flu?" and (b) "How often do antibiotics help you get

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better if you have a bacterial respiratory illness such as pneumonia or strep throat?" Questions assessing antibiotic experiences and use in the past year were prefaced by asking subjects to relate their answers to "respiratory illnesses including colds, flu, or bronchitis." Antibiotic experiences that might influence antibiotic beliefs were measured, including (a) frequency of consulting advice nurses or self-care manuals, (b) previously having been prescribed antibiotics thought to be unnecessary, and (c) having ever been told by a provider that antibiotics were unnecessary. To control for differences in beliefs and use resulting from chronic or immune-compromising conditions, subjects were asked if they had a chronic lung, kidney, liver, or heart disease such as asthma or emphysema, if they had cancer or AIDS, or if they were receiving treatments such as radiation or chemotherapy. The survey was not administered to adults who were unable to communicate in English.

We used χ^2 tests to identify factors related to prior antibiotic use for respiratory illness. Variables reaching statistical significance at the $p = .05$ level were entered into multivariate logistic regression models to confirm independence of associations. All regression analyses controlled for age, gender, race or ethnicity, education, marital status, and parental status. Results of the multivariate analyses are reported as odds ratios (ORs) with corresponding 95% confidence intervals (CIs). All analyses were performed using the SAS statistical application program (release 6.12, copyright 1989–1998 by SAS Institute, Cary, NC).

RESULTS

Of 430 households contacted, 400 (93%) had an eligible adult who agreed to participate and completed interviews. Three hundred eighty-six surveys (90%) were included in the analysis after excluding responses from those who had received a recent educational mailing about treatment for colds, flu, and bronchitis. Respondents were primarily female, married, and white, and had at least a high school education (Table 1). About one half reported they consult advice nurses, and about one third reported they consult self-care manuals, at least some of the time, when they have a respiratory illness. Nineteen percent reported having a chronic or immune-compromising condition.

Adults reported more frequently that antibiotics were helpful at least some of the time for a bacterial respiratory illness (70%) than for a viral respiratory illness (55%). Among respondents completing both belief questions, 21% believed that antibiotics were helpful for bacterial illnesses and not helpful for viral illnesses. Women, those consulting advice nurses and self-care manuals, those with a chronic condition, and those who had been told that antibiotics were unnecessary were more likely to have used antibiotics for a respiratory illness during the previous year. Believing that antibiotics are effective

against viral illnesses and believing them effective against bacterial illnesses were each positively associated with previous antibiotic use. Responses to these two belief questions were combined to create a dichotomous variable (believing antibiotics to be effective for bacterial illnesses but not viral illnesses), which demonstrated a nonsignificant trend toward association with decreased antibiotic use ($\chi^2 = 2.59$, $df = 1$, $p = .11$). Age, race/ethnicity, education, marital status, and parental status were not significantly associated with antibiotic use.

We performed multivariate logistic regression analyses to identify which factors were independently associated with previous antibiotic use for respiratory illness. We found that consulting an advice nurse, having been told by a provider that antibiotics were not necessary, and self-report of a chronic medical condition remained independently associated with greater previous antibiotic use for respiratory illnesses after controlling for sociodemographic characteristics (Table 2). Believing antibiotics are helpful for bacterial illnesses and believing antibiotics are helpful for viral illnesses were also independently and positively associated with prior antibiotic use (Hosmer-Lemeshow goodness-of-fit = 7.71, $df = 8$, $p = .46$). Believing antibiotics are helpful for bacterial illness but not viral illness was entered into a separate but otherwise similar model. In this model (Hosmer-Lemeshow goodness-of-fit = 5.41, $df = 8$, $p = .71$), believing antibiotics are helpful for bacterial illness but not viral illness was associated with decreased antibiotic use, but the association did not reach statistical significance at the $p = .05$ level (adjusted OR 0.61; 95% CI 0.3, 1.2).

DISCUSSION

Although nearly all adults in our study recognized the terms "viral" and "bacterial," 55% believed antibiotics are beneficial for viral respiratory illnesses "such as the common cold or the flu." This is consistent with previous research showing that 30% to 69% of patients report antibiotics are helpful for colds or other upper respiratory infections.^{13,14,18} A greater proportion of our study participants (72%) believed that antibiotics are helpful for bacterial respiratory illnesses. However, this belief did not necessarily indicate an accurate understanding of antibiotic effectiveness as two thirds of those responding positively to the bacterial question also responded positively to the viral question. We also found that previous use of antibiotics for a respiratory illness was associated with believing antibiotics to be effective for viral illness or for bacterial illness. A 1997 study by Mainous et al. similarly found that "usually using" antibiotics and believing antibiotics to be effective for symptoms of upper respiratory infection were significantly and positively associated.¹⁹ Our finding of a positive association between previous antibiotic use and beliefs was independent of experiences with the health care system (i.e., advice nurse consultation or communication with a provider about antibiotic necessity) that

**Table 1. Characteristics of the Study Population
(n = 386 adults)**

Characteristic	n (%)
Sociodemographic factors	
Age, years (median, 45; range, 18–96)	
18–44	185 (48)
45–64	129 (33)
65+	69 (18)
Female gender	250 (65)
Race/ethnicity	
White	314 (81)
Hispanic	58 (15)
Other	9 (2)
Marital status	
Married	249 (64)
Widowed, divorced, or separated	84 (22)
Single	51 (13)
Education, highest level completed	
Less than high school	24 (6)
High school	142 (37)
Any college	179 (46)
Any graduate school	40 (10)
Parent of young children (≤5 years old)	66 (17)
Experiential and other factors	
Consults with an advice nurse for respiratory illnesses at least some of the time	184 (48)
Consults with a self-care manual for respiratory illnesses at least some of the time	135 (35)
Ever prescribed an antibiotic (for a respiratory illness) thought to be unnecessary	25 (6)
Ever told by a provider that antibiotics were not needed for a respiratory illness episode	107 (28)
Has a chronic medical condition	72 (19)
Ever used a leftover antibiotic for a respiratory illness	89 (23)
Antibiotic effectiveness beliefs	
Believes antibiotics are helpful for <i>viral</i> respiratory illnesses at least some of the time*	211 (55)
Believes antibiotics are helpful for <i>bacterial</i> respiratory illnesses at least some of the time†	272 (70)
Believes antibiotics are helpful for <i>bacterial but not viral</i> respiratory illnesses*†	82 (21)

*Viral illness description included the examples “common cold” and “the flu.”

†Bacterial illness description included the examples “pneumonia” and “strep throat.”

would be expected to educate patients that viral infections are not proper indications for antibiotic use.

Nonetheless, education of patients and the public has been shown to be an important component of interventions in the management of ARI. For examples, it has been shown to be effective in reducing office visits for colds,²⁰ as well as reducing antibiotic prescribing for uncomplicated acute bronchitis in adults.¹⁶ Receiving information about illness and treatment is highly desirable to patients.^{21,22} In 1992 Sanchez-Menegay et al. showed that patients are particularly satisfied when they understand

the choices providers make regarding treatment regimens.²³ In the case of respiratory illness and antibiotics, patients in one study were more satisfied with a provider engaging them in discussion of their illness and treatment than with the receipt of a prescription for antibiotics, even when antibiotics were expected.¹³

Despite patients' desire for information, it remains unclear how well they understand illness and treatment explanations, which inevitably require some use of medical terminology. Studies of lay knowledge of medical terms have shown that patients frequently hold understandings that differ from those of clinicians.^{24,25} Similarly, our results indicate that communications using the terms “virus” and “bacteria” will require improved strategies for enabling patients to make distinctions about antibiotic effectiveness. For example, the advice nurse's script for upper respiratory infection used at the time of this study included instructing the patient that “[this] is a viral infection of the airway passages . . . Colds cannot be cured by antibiotics. Hoarseness, dizziness, and sneezing are more often associated with viral infection than bacterial.” This script indirectly assumes that the patient understands that antibiotics are effective against bacterial illness but not viral illness. This may explain, in part, why we found advice nurse consultation and previous antibiotic use to be related in our study. However, the experiential factors found to be associated with previous antibiotic use (advice nurse consultation, having been told by a provider that antibiotics were unnecessary, having a chronic medical condition) may also be markers of increased health-seeking behavior and, in turn, of more strongly held beliefs or expectations regarding antibiotic use for respiratory conditions. In a set of related analyses (data not shown), we found that advice nurse consultation and having been told by a provider that antibiotics were not necessary were more frequent among respondents believing antibiotics are effective for both viral and bacterial infections. Although not statistically significant, it was encouraging to find a trend toward decreased previous antibiotic use among those correctly believing that antibiotics are helpful for bacterial respiratory illness but not viral illness.

Avoiding altogether the use of viral and bacterial terminology might be an effective approach to education about antibiotic treatment. It may be preferable to explain antibiotic effectiveness in terms of associations with specific illnesses (i.e., “illness labeling”), teaching patients and the public, for example, that antibiotics are appropriate for conditions such as “pneumonia” but not for conditions such as “chicken pox.” In parallel research involving the same study population, we found that adults were less likely to believe antibiotics were necessary when acute illness characterized by a cough with phlegm was labeled “chest cold” as opposed to “bronchitis.”²⁶

This study has several limitations. It used a cross-sectional study design and relied solely on self-report, which in turn relies on the recall abilities of participants. Another limitation is that the quality of experiences with

Table 2. Factors Independently Associated with Self-Reported Use of Antibiotics for a Respiratory Illness Within the Past Year, Identified by Multivariate Analysis*

Factor	Parameter Estimate	Standard Error	Adjusted Odds Ratio (95% Confidence Interval)
Experiences			
Consulting an advice nurse at least some of the time	1.076	.30	2.93 (1.65, 5.32)
Having ever been told by a provider that antibiotics are not needed for a respiratory illness episode	0.603	.29	2.02 (1.15, 3.55)
Having a chronic medical condition	0.695	.34	2.00 (1.03, 3.90)
Antibiotic beliefs			
Thinking antibiotics are helpful at least some of the time for viral respiratory illnesses [†]	0.909	.32	2.48 (1.34, 4.70)
Thinking antibiotics are helpful at least some of the time for bacterial respiratory illnesses [‡]	0.970	.45	2.64 (1.15, 6.70)

*Multivariate logistic regression model controlled for age, race/ethnicity, sex, marital status, education, and parental status (goodness-of-fit $p = .46$).

[†]Viral illness description included the examples "common cold" and "the flu."

[‡]Bacterial illness description included the examples "pneumonia" and "strep throat."

health care system components was not examined in depth. For example, details about the communications with providers regarding antibiotic necessity were not assessed beyond whether subjects had ever been told that antibiotics were not needed for an illness. The generalizability of our findings may also be limited by studying members of an HMO. Bias may have been introduced into the results owing to features of this health plan, such as ready access to telephone advice by nurses and pharmacy benefits, or because of demographic characteristics. However, age, race/ethnicity, gender, education, and marital status were controlled for in all multivariate analyses, and no significant relation between demographics and use of antibiotics for respiratory illnesses was found.

In summary, individuals in the community frequently do not understand that antibiotics are effective against bacteria but not viruses. We found previous antibiotic use to be greater among those believing antibiotics are effective for both bacterial and viral illnesses and among those seeking or receiving advice from health professionals. These findings suggest that communications about antibiotic appropriateness between health professionals, patients, and the public require greater attention.

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