Treatment of Acute Bronchitis in Adults
A National Survey of Family Physicians

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BACKGROUND. The purpose of this study was to determine how family physicians in the United States treat acute bronchitis in an otherwise healthy adult.

METHODS. A 33-item questionnaire on the diagnosis and treatment of acute bronchitis was mailed to a random sample of 500 physicians who are members of the American Board of Family Practice.

RESULTS. Thirty-two of the 500 sampled physicians could not be located by mail; 265 of those who received the questionnaire responded. The response rate was 57% (265/468). Sixty-three percent of responding physicians indicated that antibiotics are their first choice of treatment for the otherwise healthy, nonsmoking adult with acute bronchitis. The decision to use antibiotics as the first choice of treatment did not vary by physician's sex, age, years in practice, practice location, practice type, or percentage of HMO patients. Only 6% of responding physicians reported using β_2 agonist bronchodilators as their first choice of treatment. Physicians in this study stated that they prescribe an antibiotic 75% of the time in treating nonsmoking patients with acute bronchitis (first choice or otherwise). If the patient is a smoker, physicians reported that they prescribe antibiotics 90% of the time ($F=110.25$; $df=1$; $P >.0001$). Physicians reported that for patients who smoke it takes longer for coughs to totally resolve and longer for them to return to a normal activity level than for nonsmokers.

CONCLUSIONS. Family physicians report that antibiotics are their most common treatment for acute bronchitis in the otherwise healthy adult. Previous clinical trials have shown only marginal improvement in symptoms when patients with this condition are treated with an antibiotic. With antibiotic resistance emerging as a major global health problem, it is essential that other methods of treatment be evaluated.

KEY WORDS. Acute bronchitis; antibiotics; family practice; survey; physicians, family. *(J Fam Pract 1998; 46:469-475)*

A cute bronchitis in the otherwise healthy adult is one of the most common medical problems encountered in primary care. It is a self-limiting, generally viral-mediated clinical syndrome characterized by cough and sputum production and accompanied by upper respiratory tract and systemic manifestations of infection. The duration of this condition is variable, with cough lasting more than 3 weeks in 50% of patients and more than 4 weeks in 25% of patients.[1]

The prevalence of acute bronchitis peaks in the winter and is much less common in the summer. Viral infection is generally considered to trigger the majority of episodes. A wide variety of viruses have been implicated in the etiology of acute bronchitis, including rhinovirus, respiratory syncytial virus, parainfluenza virus, influenza virus, adenovirus, and enterovirus. *Chlamydia pneumoniae* (TWAR) and *Mycoplasma pneumoniae* account for approximately 10% to 15% of cases.[2-5] Other bacterial pathogens are uncommonly isolated.

The treatment of acute bronchitis in the otherwise healthy adult remains controversial. Primary care and respiratory medicine textbooks recommend providing symptomatic relief, only prescribing antibiotics in severe cases.[6-11] Clinical trials suggest that antibiotics provide only marginal relief of symptoms[1,12-18] and that β_2 agonist bronchodilators may be a more effective treatment.[19-22] General practitioners surveyed in Australia and the Netherlands report that they use an antibiotic more than half the time in treating patients with acute bronchitis.[23,24] Physicians in Kentucky treating Medicaid patients with acute bronchitis also use antibiotics more than half of the time.[25]

The purpose of this study was to determine how family physicians in the United States treat acute

bronchitis in the otherwise healthy adult. Only the results related to the treatment of acute bronchitis are included in this article; findings related to diagnosis are reported elsewhere.[26]

METHODS

A questionnaire concerning the diagnosis and treatment of acute bronchitis was mailed to 500 family physicians in January 1996. The list of physicians was generated by selecting a random sample from the 1995 Directory of the American Board of Family Practice.[27] Before the first mailing, the survey instrument was pilot-tested for clarity, usefulness, and face validity. A cover letter explaining the study and a pre-stamped return envelope were included with the questionnaire. Second and third mailings were sent to nonresponders.

The 33-question survey instrument consisted of six demographic questions, 13 questions concerning diagnosis, and 14 questions about treatment of acute bronchitis in an otherwise healthy adult. This article focuses on the findings related to the treatment questions. Physicians were asked seven questions regarding their standard treatment of acute bronchitis in a nonpregnant, nonsmoking patient with no evidence of sinusitis, systemic symptoms, or history of asthma or chronic obstructive pulmonary disease. Three of the questions were repeated for a similar patient who smoked. Physicians were also asked how long it generally takes for cough to totally resolve and for the resumption of normal activities in the average nonsmoking patient with acute bronchitis and no other complicating factors. The same question was asked with regard to the patient who smokes.

For this study, a difference of .10 between two proportions was considered to be clinically significant. This size difference translates into an effect size of $h = .20$ for the Difference in Proportions Test (DIP).[28,29] A sample size of 350 would provide a power of .84. Since most variables were categorical, the chi-square test was expected to be the most frequently used statistical test. For chi-square tests of 9 df, a sample size of 180 provides a power of .82 to detect a medium effect size, $w = .30$.[29] On the basis of this information, a sample size of 500 was selected.

ANALYSIS

Descriptive statistics on the demographic variables consisted of counts and percentages for the nominal and ordinal variables. Years of practice was a continuous variable and the standard measures of central tendency and dispersion were computed. The demographic variables were most often used as grouping variables. Responses with either nominal or ordinal variables were compared with chi-square tests. Other tests used in this situation were the DIP and the Gradient in Proportions Test.[30] In all cases the P value was adjusted for multiple comparisons by the conservative Bonferroni adjustment. Some responses were continuous variables, but there was no statistical evidence that these variables were normally distributed. Descriptive correlation coefficients were obtained for certain pairs of variables.

RESULTS

Thirty-two physicians could not be located by mail; 265 of those who received the questionnaire responded. The response rate was 57% (265/468). Data from physicians who were either retired or practicing in another specialty (n=10) were not included in the analysis. Responses of the remaining 255 physicians were analyzed, for a net response rate of 56% (255/458). Not all physicians responded to each question; thus, the number (n) varies.

Responding physicians have been in practice an average of 12.9 years (standard deviation = ±1.1). Sixteen percent of respondents are female, 68% male, and 16% did not answer the question. Fifty-one percent of respondents reported that they practice in an urban setting, and 44% described their practice location as rural. Physicians' age, practice type, and the percentage of the practice composed of health maintenance organization (HMO) patients are displayed in Table 1.

Sixty-three percent of physicians stated that antibiotics are their first choice of treatment for the nonsmoking patient. Only 6% chose β_2 agonist bronchodilators as their first choice (Table 2). There were no statistically significant differences in the selection of antibiotics as the first choice of treatment by age or sex of the physician, years in practice, practice type or location, or percentage of HMO patients.

Surveyed physicians reported that they prescribe an antibiotic 75% of the time (first choice or otherwise) in treating nonsmoking patients with acute bronchitis. If the patient smokes, physicians reported that they prescribe antibiotics 90% of the time

TABLE 1

Demographics of Family Physicians Responding to a Questionnaire Regarding the Treatment of Acute Bronchitis

Characteristic	No. (%)
Age, y	
≤ 35	28 (11)
36 to 45	140 (56)
46 to 55	59 (23)
≥ 56	26 (10)
Practice Type	
Solo	28 (11)
Small single-specialty*	83 (33)
Large single-specialty†	51 (20)
Multispecialty	44 (17)
Academic	30 (12)
Other	17 (7)
Percentage of HMO Patients in Practice	
≤ 20	103 (41)
21 to 40	67 (27)
41 to 60	53 (21)
61 to 80	13 (5)
≥ 80	14 (6)

*Small single-specialty practices have 2 to 4 physicians.
†Large single-specialty practices have 5 or more physicians.

TABLE 2

Physicians' First Choice of Treatment for a Nonsmoking Adult Patient with Acute Bronchitis

Treatment Choice*	Number (%)
Antibiotic	161 (63)
Prescription cough suppressant or expectorant	37 (15)
Over-the-counter symptomatic relief medications	29 (11)
β2 agonist bronchodilators	15 (6)
Other	7 (3)
No treatment	5 (2)

*Clinical scenario: First choice of treatment for a nonpregnant, nonsmoking adult patient with acute bronchitis and without sinusitis, systemic symptoms or history of asthma/chronic obstructive pulmonary disease.

DISCUSSION

Antibiotics are the primary treatment used by family physicians in providing care to otherwise healthy adults with acute bronchitis. If the patient smokes, the likelihood of receiving a prescription for an antibiotic significantly increases. Some antibiotics, such as amoxicillin, whose efficacy have not been studied in a controlled, randomized clinical trial, are commonly used for acute bronchitis. β2 Agonist bronchodilators are rarely used as the first choice of treatment. Most physicians prescribe treatment of some kind as their first choice (84%); very few recommend no treatment (2%) or the use of over-the-counter medications (11%) as their first choice.

These findings replicate previous studies.

(F=110.25; df=1; P >.0001). Respondents reported that they prescribe β2 agonist bronchodilators 25% of the time for nonsmoking patients, and 41% of the time for patients who smoke.

Amoxicillin and erythromycin are the two antibiotics most commonly prescribed by responding physicians for the nonsmoking patient. If the patient smokes, a newer macrolide or trimethoprim/sulfamethoxazole was reported to be used as often as erythromycin and amoxicillin (Table 3).

Physicians reported that it takes longer for cough to totally resolve in patients who smoke than in patients who do not smoke. Smokers also take longer to return to a normal activity level. Fifty-nine percent of physicians reported that cough generally lasts more than 7 days in the nonsmoking patient with acute bronchitis. If the patient smokes, 88% of physicians reported that the cough lasts more than 7 days; 48% reported that it lasts more than 14 days. Eighty-five percent of physicians say that it generally takes 7 days or less for a nonsmoker to return to normal activity. If the patient smokes, 41% of physicians reported that it takes more than 7 days to achieve a normal activity level (Table 4).

TABLE 3

Responding Physicians' First Choice of Antibiotic, If an Antibiotic is Prescribed

Antibiotic	Nonsmoking Patient No. (%)	Patient Who Smokes No. (%)
Amoxicillin	101 (40)	59 (23)
Erythromycin	89 (35)	56 (22)
Newer macrolides*	25 (10)	49 (19)
TMP/SMX†	20 (8)	46 (18)
Tetracycline	11 (4)	17 (7)
Cephalosporin	6 (2)	25 (10)
Other	2 (1)	2 (1)

* Azithromycin or clarithromycin.
†TMP/SMX denotes trimethoprim/sulfamethoxazole.

TABLE 4

Responding Physicians' Perceptions About the Duration of Cough and Time to Return to Normal Activity for Otherwise Healthy Adults with Acute Bronchitis

Duration	Cessation of Cough			Return to Normal Activity		
	Nonsmokers, %	Smokers, %	P*	Nonsmokers, %	Smokers, %	P*
< 2 days	0	0	NS	21	6	<.001
3 to 7 days	41	12	<.001	64	53	<.005
8 to 14 days	49	40	NS	13	30	<.001
>14 days	10	48	<.001	2	11	<.001

* Differences in Proportion Test

Mainous and colleagues[25] evaluated antibiotic use in otherwise healthy adults with acute bronchitis in a Medicaid population in Kentucky. They reported that 61% of patients were prescribed an antibiotic only, and 3% received a β2 agonist bronchodilator as the only medication. Fourteen percent of patients received both, with a total of 75% of patients receiving antibiotics. This is similar to our findings that physicians report using antibiotics in 75% of nonsmoking patients and 90% of patients who smoke. Mainous et al[25] also found that penicillins were the most commonly used antibiotics, being prescribed for 37% of patients. The use of β2 agonist bronchodilators was similar to the use reported in our study, with 3% of the Kentucky physicians prescribing a β2 agonist only and 6% of responding physicians in our study reporting a β2 agonist as their first choice of treatment. A higher use of antibiotics was seen in rural physicians in Kentucky. Rural physicians responding to our study did not report a higher use of antibiotics than physicians in an urban setting.

Meza and colleagues[23] reported that in Australia antibiotics were used in more than half of patients with acute bronchitis, with amoxicillin being the most commonly used (28%). Similar trends are seen in the Netherlands, where Verheij et al[24] reported that general practitioners prescribed an antibiotic in more than 65% of encounters with patients with acute bronchitis.[24]

Our findings, supported by other studies,[23-25] suggest that the traditional treatment of otherwise healthy adults with acute bronchitis includes the use of an antibiotic, usually amoxicillin, in the majority of patients, with an even greater use of antibiotics in general and broad spectrum antibiotics in particular in the patient who smokes. Is there evidence to support these treatment strategies?

IS THERE EVIDENCE TO SUPPORT THE AMOXICILLIN CHOICE?

Data from our study and previous reports[23,25] indicate that amoxicillin is one of the most commonly used antibiotics for otherwise healthy adults with acute bronchitis. To date, placebo-controlled, randomized clinical trials have not evaluated the use of amoxicillin for acute bronchitis. The theoretical coverage for potential bacterial pathogens is minimal. Amoxicillin is not effective for treatment of atypical bacteria such as *M pneumoniae* or *C pneumoniae* or potential β-lactamase-producing respiratory pathogens such as *Haemophilus influenzae* or *Moraxella catarrhalis*. Amoxicillin is still effective against pneumococcus, though the incidence of penicillin-resistant pneumococcus is increasing.[31-34] There is no evidence to support the continued use of amoxicillin in the treatment of acute bronchitis in an otherwise healthy adult.

ARE ANTIBIOTICS PROVEN EFFECTIVE?

Potential bacterial respiratory pathogens are rarely cultured in patients with acute bronchitis. Approximately 40% of patients with a history of a productive cough can produce a sputum sample, of which approximately one third have purulent sputum by liberal criteria (≥ 5 WBC/HPF).[14,15] Dere[36] reported that of 2218 patients with acute bronchitis and microscopically purulent sputum (≥25 WBC/HPF, ≤10 epithelial cells/HPF), only 21% had a culture positive for *Streptococcus pneumoniae*, *H*

influenzae, M catarrhalis, or *Haemophilus parainfluenzae.* Gaillat[36] reported a similar finding in 529 patients with acute bronchitis and visibly purulent sputum: 22% had one of the four organisms. Extrapolating from this data, a patient with acute bronchitis and a history of a productive cough will have a potential bacterial pathogen that can be cultured only 2% to 3% of the time. Atypical bacteria, including *M pneumoniae* and *C pneumoniae,* are uncommon causes of acute bronchitis, accounting for 10% to 15% of the cases of acute bronchitis.[2-5] King and Muncie[37] suggest that the prevalence may be underestimated because of difficulties in testing for *M pneumoniae.*

The effectiveness of antibiotics in the treatment of acute bronchitis is controversial. Of the eight randomized clinical trials we found that compared antibiotic with placebo, three show marginal symptom improvement with antibiotics.[15,17,18] In seven of the studies, erythromycin or doxycycline was used; both are effective against both *M pneumoniae* and *C pneumoniae.* King et al[18] reported that patients treated with erythromycin returned to work 1 day earlier than patients treated with placebo. Use of erythromycin did not affect the frequency of cough, sense of well-being, or chest congestion. In contrast, Williamson[1] reported that patients treated with placebo returned to work 1 day earlier than those treated with doxycycline. Notably, King reported that patients with *M pneumoniae* received no greater benefit with the use of erythromycin than the other patients.

Patients treated with placebo are no more likely to experience poor clinical outcomes than patients treated with antibiotics. Of the 756 total patients treated in the eight clinical trials, five patients treated with an antibiotic and 6 patients treated with placebo were reported to have worsened.[1,12-18] Of those 11 patients, three from each group was subsequently given a diagnosis of pneumonia; none required hospitalization.

In all of the randomized clinical trials, subanalysis demonstrates that smoking and nonsmoking patients do not respond differently to antibiotics.[1,12-18] In addition to the lack of evidence that antibiotics significantly change the outcome of otherwise healthy patients with acute bronchitis, universal treatment with erythromycin is not cost effective. In a cost-effective analysis, Hueston[38] reported that treating only those patients with a cough that had not resolved in 30 days is the favored strategy rather than empiric treatment of all patients with acute bronchitis or initial screening for *M pneumoniae* or *C pneumoniae.*

Finally, the indiscriminate use of antibiotics in the treatment of acute bronchitis will adversely affect the population by contributing to the growth of antibiotic resistance. The rapid emergence of multidrug-resistant respiratory pathogens is a critical global health issue.[39-42] The rate of community-acquired, penicillin-resistant *S pneumoniae* continues to increase worldwide, including in the United States, Canada, and Europe.[31-34] During 1994 and 1995, 23.6% of outpatient isolates of *S pneumoniae* collected in 30 different medical centers were resistant to penicillin.[34] Ten percent of isolates were resistant to erythromycin, azithromycin, or clarithromycin. Resistance of *S pneumoniae* to cephalosporins, tetracyclines, and trimethoprim/sulfamethoxazole is also growing.[31-34]

The link between the widespread use of antibiotics in the community and the growth of antibiotic resistance in respiratory pathogens has been established. In a recent Finnish study (1992), 16% of 10,000 group A streptococcus isolates from outpatients were erythromycin-resistant, increased from 5.4% in 1988.[43] The proportion of isolates resistant to erythromycin clearly increased with local erythromycin use by outpatients.

STUDY LIMITATIONS

In evaluating the generalizability of this study, three potential biases or limitations related to the survey methodology need to be considered. First, a possible selection bias could result by having nonresponders who are different from responders. Since the demographics of the responders in this study are similar to the demographics of physicians in the American Board of Family Practice, however, and the responders and nonresponders have a similar geographic distribution, we are confident that our sample is representative of the target population. Second, the response rate was lower than the sample size calculation. A larger response rate would likely have improved the power of some of the statistical analyses. Thus, there may be some differences in the population of physicians that were not detectable in this sample. Third, the literature indicates that in physician surveys, there is a tendency toward overreporting the adherence to clinical and

laboratory guidelines when this information is compared with notes in the medical record or patient self-reports. In our study, the cover letter specified that we were conducting a survey to examine common practices in the medical management of acute bronchitis; that is, there were no right or wrong answers. There are also no clearly established guidelines for either diagnosing or treating this illness that could have influenced what physicians reported.

CONCLUSIONS

Bacteria are uncommon causes of acute bronchitis in otherwise healthy adults. Treatment for bacterial infection has not been conclusively shown to benefit patient outcomes, and no treatment does not increase the likelihood of a poor outcome. In light of the growing crisis of antibiotic-resistant respiratory pathogens and the lack of evidence for significantly changed outcomes with the use of antibiotics, antibiotics should not be used as the primary treatment for acute bronchitis. Other methods of treatment need to be further evaluated. Early studies evaluating the use of β_2 agonist bronchodilators are promising,[22-24] but larger clinical trials are necessary to determine their effectiveness.

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