

Letters

RESEARCH LETTER

Antibiotic Prescribing to Adults With Sore Throat in the United States, 1997-2010

Among adults seeking care with sore throat, the prevalence of group A *Streptococcus* (GAS) infection—the only common cause of sore throat requiring antibiotics—is about 10%.¹ Penicillin remains the antibiotic of choice. Penicillin is narrow-spectrum, well-tolerated, and inexpensive, and GAS is universally susceptible to penicillin.

We previously found that the antibiotic prescribing rate for adults making a visit with sore throat dropped from about 80% to 70% around 1993.² Since then, the Centers for Disease Control and Prevention and others have continued efforts to reduce inappropriate antibiotic prescribing.³⁻⁵ To measure changes in antibiotic prescribing for adults with sore throat, we conducted a cross-sectional analysis of ambulatory visits in the United States.



Editor's Note

Methods | The National Center for Health Statistics institutional review board approved the protocols for the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS), including a waiver of the requirement for patient informed consent.

The NAMCS and NHAMCS are annual, nationally representative, multistage probability surveys of ambulatory care in the United States⁶ that collect information on physicians and practices as well as visit-level data, including patient demographics, reasons for visits, diagnoses, and medications. Each visit in the NAMCS/NHAMCS is weighted to allow extrapolation to national estimates.

For the years 1997 to 2010, we included “new problem” visits by adults 18 years or older with a primary reason for visit of throat soreness or pain (*Reason for Visit* code 1455) who made a primary care or emergency department (ED) visit. We excluded patients with injuries, immunosuppression, or concomitant infectious diagnoses. There were 8191 sampled sore throat visits meeting the inclusion criteria. We identified and

Table. Visit Characteristics and Prescribing of Antibiotics to Adults With Sore Throat in the United States, 1997-2010

Characteristic	Patient Visits, % (n = 8191 ^a)	Visits With Antibiotic Prescribed, % ^b	P Value ^c
Patient age, y			
18-44	71	63	.005
45-64	22	55	
≥65	7	47	
Sex			
Women	65	57	.001
Men	35	66	
Race/ethnicity			
White	84	60	.45
Black	11	60	
Other	5	52	
Insurance			
Private	65	60	.001
Medicare	7	57	
Medicaid	9	47	
Self-pay/other ^d	19	66	
Specialty/setting			
Primary care	82	61	.003
Emergency department	18	55	
Region			
Northeast	20	57	.04
Midwest	27	62	
South	35	64	
West	18	53	
Rural/urban			
Rural	17	60	.98
Urban	83	60	

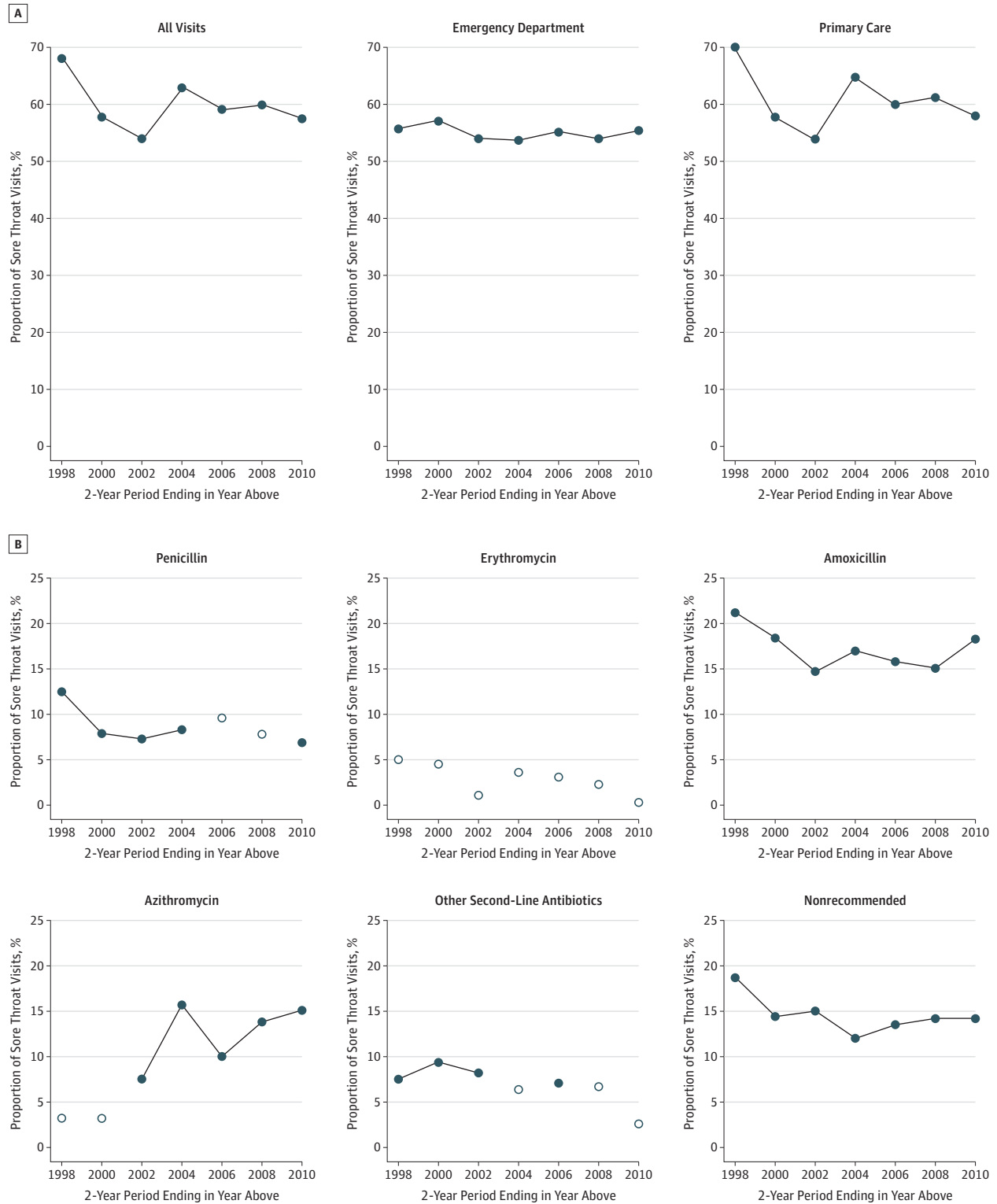
^a A total of 8191 sampled sore throat visits representing 92 million (95% CI, 85-100 million) estimated sore throat visits.

^b Data reported as the proportion of patients with sore throat in each category (row percentage) who received any antibiotic.

^c Survey-weighted Pearson χ^2 test.

^d Self-pay/other insurance fell into 3 categories: self-pay (66% of category), missing (18%), and other (14%).

Figure. Antibiotic Prescribing to Adults With Sore Throat in the United States, 1997-2010



A, Antibiotic prescribing for all sore throats, primary care practices, and emergency departments (EDs). For linear trends, $P = .31$ for all sore throat visits; $P = .35$ for primary care visits; and $P = .75$ for ED visits. B, Antibiotic prescribing by antibiotic class. Each open circle represents an estimate below the threshold of reliable measurement. Other second-line antibiotics were first-generation

cephalosporins, clarithromycin, and clindamycin. The most commonly prescribed nonrecommended antibiotics were cephalosporins (37% of category), penicillin/ β -lactamase combinations (27%), and fluoroquinolones (13%). For trends, $P = .27$ for penicillin; $P < .001$ for azithromycin; $P = .33$ for amoxicillin; and $P = .37$ for nonrecommended antibiotics.

classified antibiotics as penicillin, amoxicillin, erythromycin, azithromycin, other second-line antibiotics, and all other antibiotics.

We calculated standard errors (SEs) for all results using the *survey* package in R, version 2.11.1 (R Project), combining data into 2-year periods, and clearly indicating when estimates were below the threshold of reliable measurement (<30 sampled visits or a relative SE > 30%).

Results | Between 1997 and 2010, the 8191 sampled sore throat visits represented 92 million estimated visits by adults to primary care practices and EDs in the United States (Table). Sore throat visits decreased from 7.5% of primary care visits in 1997 to 4.3% of visits in 2010 ($P = .006$). There was no change in the proportion of sore throat visits to EDs: 2.2% in 1997 and 2.3% in 2010 ($P = .18$). Physicians prescribed antibiotics at 60% of visits (95% CI, 57%-63%). The overall national antibiotic prescribing rate did not change (Figure). Penicillin prescribing remained stable at 9% of visits. Azithromycin prescribing increased from below the threshold of reliable measurement in the 1997-1998 measurement period to 15% of visits in the 2009-2010 period.

Discussion | Our analysis has limitations. First, we do not have clinical data to know if individual antibiotic prescriptions are appropriate. Second, the NAMCS/NHAMCS does not capture patients managed outside of clinic or ED visits. Third, several of our 2-year estimates were below the threshold of reliable measurement.

Antibiotic prescribing to patients who are unlikely to benefit is not benign. All antibiotic prescribing increases the prevalence of antibiotic-resistant bacteria. The financial cost of unnecessary antibiotic prescribing to adults with sore throat in the United States from 1997 to 2010 was conservatively \$500 million. However, antibiotics might have been up to 40-times more expensive. For individuals, antibiotic prescribing leads to patients developing diarrhea in 5% to 25% of cases; at least 1 in 1000 patients visits an ED for a serious adverse drug event.

In conclusion, despite decades of effort, we found only incremental improvement in antibiotic prescribing for adults making a visit with sore throat. Combining our previous and present analyses, the antibiotic prescribing rate dropped from roughly 80% to 70% around 1993 and dropped again around 2000 to 60%, where it has remained stable.² This still far exceeds the 10% prevalence of GAS among adults seeking care for sore throat. The prescription of broader-spectrum, more expensive antibiotics, especially azithromycin, was common. Prescribing of penicillin, which is guideline-

recommended, inexpensive, well-tolerated, and to which GAS is universally susceptible, remained infrequent.

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1. Wessels MR. Clinical practice: streptococcal pharyngitis. *N Engl J Med*. 2011;364(7):648-655.

2. Linder JA, Stafford RS. Antibiotic treatment of adults with sore throat by community primary care physicians: a national survey, 1989-1999. *JAMA*. 2001;286(10):1181-1186.

3. Centers for Disease Control and Prevention. Get Smart: Know When Antibiotics Work. <http://www.cdc.gov/getsmart/>. Accessed August 13, 2013.

4. Cooper RJ, Hoffman JR, Bartlett JG, et al; American Academy of Family Physicians; American College of Physicians-American Society of Internal Medicine; Centers for Disease Control. Principles of appropriate antibiotic use for acute pharyngitis in adults: background. *Ann Intern Med*. 2001;134(6):509-517.

5. Shulman ST, Bisno AL, Clegg HW, et al. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2012;55(10):1279-1282.

6. Centers for Disease Control and Prevention, National Center for Health Statistics. National Health Care Surveys. <http://www.cdc.gov/nchs/dhcs.htm>. Accessed August 9, 2013.