Published in final edited form as:

Otolaryngol Head Neck Surg. 2013 May ; 148(5): 852–859. doi:10.1177/0194599813479768.

Variations in Antibiotic Prescribing of Acute Rhinosinusitis in United States Ambulatory Settings

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Abstract

Objective—To identify variations in antibiotic treatment of acute rhinosinusitis (ARS) on a national level.

Study Design—Cross-sectional study of a national database.

Setting—Otolaryngology and primary care ambulatory settings.

Subjects and Methods—A nationally representative sample of adult outpatient visits was extracted from the National Ambulatory Medical Care Survey and National Hospital Ambulatory Care Survey data for 2006 to 2009. Antibiotic prescriptions associated with ARS were tabulated. Statistical analyses were conducted to identify variations in antibiotic prescribing by patient and physician characteristics.

Results—Antibiotics were prescribed in $82.3\% \pm 2.6\%$ of 18.7 million visits for ARS (mean age, 46.2 years; 65.9% female). The ratio of primary care physician (PCP) to otolaryngologist (ENT) ARS visits was 18.6:1. Antibiotic prescription rates were inversely related to increasing age

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Author Contributions

Stephanie Shintani Smith, provided the original study conception and design, acquired the data set from the CDC and ran all analyses with consultation from Min-Woong Sohn and Dr Evans, interpreted data with the discussion and agreement of all the coauthors, drafted the initial article, and provided final approval of the version to be published; **Robert C. Kern**, provided mentorship for the conception and design of this study, provided specific expertise on the significance of the objectives and relevant limitations of the study design, revised the manuscript critically for intellectual content, and gave final approval of the version to be published; **Rakesh K. Chandra**, provided substantial contributions to initial study conception and design based on his recommended significance of the objectives, assisted with interpretation of data, revised the manuscript critically for important intellectual content, and provided final approval of the version to be published; **Bruce K. Tan**, provided substantial contributions to conception and design and to data interpretation, revised the manuscript critically for important intellectual content, and provided final approval of the version to be published; **Charlesnika T. Evans**, provided substantial contributions to conception and design with regard to methodology for large data set analysis and interpretation of data, revised the manuscript critically for important intellectual content with particular attention to presentation of results, and provided final approval of the version to be published.

groups of 18 to 39, 40 to 64, and 65 years (87.8%, 81.2%, and 71.0%, respectively; $P = .02$). Physicians in general medicine outpatient departments, internal medicine, and family medicine were more likely to prescribe antibiotics compared with ENTs (adjusted odds ratio [OR], 7.9 [95% confidence interval (CI), 3.5–17.8]; 6.9 [2.5–19.2]; and 3.9 [2.0–7.7], respectively). The most commonly prescribed antibiotics were azithromycin, amoxicillin, and amoxicillin/clavulanate acid (27.5%, 15.5%, and 14.6%, respectively). The ENTs selected broad-spectrum antibiotics more often than PCPs (94.3% vs 75.7% of visits with antibiotics were broad-spectrum agents; $P = .01$).

Conclusion—Antibiotics were prescribed frequently despite recent consensus guidelines that discourage antibiotic use in mild cases. Furthermore, antibiotic prescription was more likely for younger patients and in primary care settings. This highlights the need to promote awareness of practice guidelines.

Keywords

acute rhinosinusitis; NAMCS; NHAMCS; antibiotics; health services research

Acute rhinosinusitis (ARS) is among the most common conditions encountered by primary care providers (PCPs), with an estimated prevalence of 6% to 15%¹ and 20 million cases of acute bacterial rhinosinusitis occurring annually in the United States.² A growing body of evidence suggests that antibiotics do not confer a distinct clinical advantage in the vast majority of ARS cases,^{1,3–5} and antibiotics are not recommended for most patients with mild cases of uncomplicated acute rhinosinusitis according to major consensus guidelines.^{6–12} However, previous studies show that antibiotics are prescribed in 82% to 88% of patient visits for acute sinusitis, suggesting a substantial degree of antibiotic use.^{13–15}

The practice of treating uncomplicated ARS with antibiotics has 3 fundamental limitations. First, bacterial infections are thought to complicate a small proportion of cases.^{6,7,16} Second, excessive antibiotic use is associated with consequences to individuals, including allergic reactions and medication side effects. Third, excessive antibiotic use is associated with consequences to society as a whole, in the form of unnecessary costs and increasing bacterial resistance.¹⁷

With the clinical and fiscal tolls of inappropriate antibiotic prescribing in mind, the goal of this study was to analyze on a national level the overall utilization of antibiotic treatment for ARS and identify variations by provider specialty. Information regarding prescribing patterns could direct efforts to improve the quality and quantity of prescribing.

Methods

Data Sources

We used data from the National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS) Outpatient Department (OPD) component for 2006 to 2009. These surveys are conducted annually by the US Department of Health and Human Services to provide national objective information on utilization and provision of ambulatory care.

The NAMCS data are based on patient visits to community health centers and nonfederal office-based physicians. The sample is drawn using a multistage probability design involving primary sampling units, physicians within units, and visits within practices. A standardized encounter form is recorded by the physician or staff for a random sample of visits during a 1-week period. In total, 3319 to 3540 providers and 28,741 to 32,778 patient visits were sampled annually, with a mean unweighted survey response rate of 60.4%.

The NHAMCS OPD data are based on patient visits to ambulatory services in hospital outpatient departments of noninstitutional, nonfederal general, and short-stay hospitals. The sample is drawn using a multistage probability design involving geographically defined areas, hospitals within areas, and clinics and visits within OPDs. A standardized encounter form is recorded by the physician or staff for a random sample of visits during a 4-week reporting period. In total, 1025 to 1223 clinics and 31,505 to 34,473 patient visits were sampled annually, with a mean unweighted survey sampling response rate of 72.3%.

In both surveys, data are weighted to represent national data. Encounter forms include records of physician and patient demographics, symptoms, procedures, diagnoses, and prescriptions. Information for up to 3 diagnoses and 8 medications is converted by data entry staff into *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* codes and Multum Lexicon Drug Database (Cerner Multum, Inc, Denver, Colorado) codes. Quality control for medical and drug coding operations involved a 2-way 10% independent verification procedure.

Inclusion Criteria and Definitions

The NAMCS and NHAMCS files were combined in a single database. The study sample included outpatient visits to otolaryngology (ENT), internal medicine, family medicine, or general medicine physicians made by adults 18 years or older who received a primary, secondary, or tertiary diagnosis of ARS (*ICD-9-CM* code 461.x).

Primary care physicians were defined as internal medicine, family medicine, or general medicine physicians. Beta-lactamase-inhibiting penicillins, second- to fourth-generation cephalosporins, quinolones, azithromycin, and clarithromycin were classified as broad-spectrum agents, a classification strategy consistent with previous investigations.^{18,19}

Statistical Analysis

Accounting to the survey's multistage sampling design, weights were incorporated into logistic regression models and descriptive estimates. Descriptive data are presented as mean $\pm$ standard error of the estimate. All estimates were considered if they had a relative standard error of 30% or less and were based on 30 or more records, per reliability standards of the National Center for Health Statistics. The patient visit was the unit of analysis. Survey strata with 1 sampling unit were centered at the grand mean.

The total number and ratio of PCP to ENT visits for ARS visits were calculated. Differences in patient demographics across physician specialty groups were compared using global uncorrected χ^2 tests. When the survey item for number of chronic conditions was blank ($n =$

13), the number of chronic conditions was set to 0. Imputed values for race and ethnicity were used for missing race or ethnicity items.

Visits that resulted in the prescription of more than 1 antibiotic class ($n = 42$) were considered as a single observation, with the broader-spectrum antibiotic considered for analyses, with the exception of cases when aminoglycosides were prescribed ($n = 4$), for which a review of the survey record was performed to determine the mode of administration. In cases when an aminoglycoside was deemed to most likely be a topical agent (topical neomycin, $n = 1$; gentamicin ophthalmic, $n = 1$; tobramycin in a patient with diagnoses of acute conjunctivitis in addition to ARS, $n = 2$) and another class of antibiotic was also prescribed at the visit, the other class of antibiotic was included in the analysis.

The number and proportion of visits associated with antibiotic prescriptions and the proportion of broad-spectrum antibiotics were calculated in total and by specialty. Differences in prescribing by antibiotic class were analyzed across specialties, as well as across ENTs and PCPs, using F tests to analyze mean age and number of chronic diseases and unadjusted χ^2 tests to compare proportions for age category, sex, race, ethnicity, geographic region, category of number of chronic diseases, median household income group, and expected source of payment.

Multiple logistic regression was used to evaluate the proportion of visits associated with antibiotic prescriptions using odds ratios and 95% confidence intervals. Covariates in initial models were determined a priori according to clinical relevance, including age, sex, race (white, black, other), ethnicity (Hispanic or Latino, not Hispanic or Latino), geographic region (North, South, East, West), number of chronic conditions (0, 1–2, 3), physician specialty, expected source of payment, and median income in the patient's zip code. Variables statistically significant at the $P < .05$ level or that modified the association between specialty and outcome by more than 10% were retained in the final model.

Statistical analyses were performed using STATA statistical software (Version 12.0; StataCorp, College Station, Texas). Two-tailed P values $< .05$ were considered significant in analyses except when correcting for multiple testing, in which case the P value was divided by the number of groups tested to set the statistically significant P value. This study was determined to be exempt from review by the Institutional Review Board of Northwestern University.

Results

Acute rhinosinusitis accounted for an estimated 18.7 ± 2.0 million visits to a PCP or ENT physician, based on an unweighted total of 881 visits. The ratio PCP to ENT visits was 18.6:1. There were significant differences in the number of chronic diseases of patients seen by internal medicine, general medicine OPD, family medicine, and ENT (1.4, 0.8, 0.7, and 0.4 respectively; $P < .01$). Other sociodemographic characteristics were similar for all groups (Table 1).

Primary care physicians and ENT physicians prescribed antibiotics in $82.3\% \pm 2.6\%$ of ARS visits. Antibiotic prescription rates were inversely related to increasing age groups of 18 to

39 years, 40 to 64 years, and 65 years and older (87.8%, 81.2%, and 71.0%; $P = .02$) (Table 2). Other sociodemographic characteristics did not have significant associations with antibiotic prescriptions.

Physician specialty was significantly associated with antibiotic prescribing (Figure 1), with PCPs prescribing more often than ENTs (83.8% vs 54.8%; $P < .001$). Multivariable logistic regression analyses controlling for age and number of chronic diseases were consistent with unadjusted analyses. General medicine OPDs, internal medicine, and family medicine physicians were significantly more likely to prescribe antibiotics for ARS compared with ENTs (odds ratio [OR], 7.9 [95% confidence interval (CI), 3.5–17.8], 6.9 [2.5–19.2], and 3.9 [2.0–7.7], respectively) (Table 2).

Macrolides were the most commonly prescribed antibiotic class, followed by penicillins, quinolones, second/third-generation cephalosporins, and miscellaneous antibiotics (Table 3).

There were no statistically significant variations in antibiotic selection between specialties. Although not statistically significant at a P value $< .01$ when correcting for multiple testing, PCPs were more likely to prescribe amoxicillin more frequently (15.9% vs 3.0%; $P = .02$) and less likely to prescribe quinolones (19.2% vs 37.3%; $P = .03$).

Broad-spectrum agents were prescribed in $62.8\% \pm 3.7\%$ of ARS visits and $76.3\% \pm 5.0\%$ of ARS visits when antibiotics were prescribed (Figure 1). When comparing individual specialty groups, there were no significant differences in rates of broad-spectrum prescribing. However, relative to all antibiotics, ENT physicians selected broad-spectrum antibiotics more often than PCPs (94.3% vs 75.7% of all visits with antibiotics were broad-spectrum agents; $P = .01$).

Discussion

This study demonstrates 3 principal findings. First, antibiotics continue to be widely prescribed to treat ARS. Second, when physicians prescribe antibiotics for ARS visits, they choose broad-spectrum antibiotics in the majority of cases. Third, there are significant variations in antibiotic prescribing for ARS by physician specialties and patient age. To our knowledge, these variations have not been previously described on a national level.

Although major consensus guidelines recommend against antibiotic treatment for uncomplicated mild ARS,^{6–11} physicians prescribed antibiotics in 82.3% of visits for ARS. This is stable compared with results from a similar study in which antibiotics were prescribed in 82.7% of ARS visits from 1999 to 2002¹⁴ and a recent study in which antibiotics were prescribed in 83% from 2000 to 2009,¹⁵ confirming that a substantial degree of antibiotic overuse persists. Presumably, the only value of antibiotics in the treatment of ARS is for that subgroup with secondary bacterial infection. However, the prevalence of bacterial infection in patients with clinically diagnosed ARS is not well defined, given the difficulty distinguishing viral from bacterial infection without invasive sinus-puncture studies.²⁰ Physical findings, including color of nasal discharge,¹⁷ do not reliably predict whether ARS is of bacterial origin. Nasal endoscopy supports a diagnosis of bacterial ARS if purulence is observed in the middle meatus or sphenoethmoidal recess, but

most PCPs do not have access to this diagnostic modality.¹ Imaging modalities are not sufficiently specific for bacterial infection^{6,21,22} or cost-effective.^{23,24} European guidelines published this year diagnose acute bacterial rhinosinusitis (ABRS) by the presence of 3 or more of the following: discolored discharge, severe local pain, fever, elevated C-reactive protein or erythrocyte sedimentation rate, and worsening of symptoms.¹ Current US guidelines^{6–12} provide less objective diagnostic criteria for ABRS and may partly explain why clinicians readily prescribe antibiotics for patients with ARS symptoms.

Recent studies question whether antibiotics have any value in mild cases of ABRS.³ In a Cochrane review, there was 80% improvement rate in placebo arms compared with 90% improvement rates in antibiotic arms,⁴ demonstrating that a large percentage of ARS resolves spontaneously. Meta-analyses comparing antibiotic treatment with placebo show only a modest improvement rate of 7% to 14% with antibiotics⁵ and that 15 patients with rhinosinusitis-like complaints would have to be given antibiotics before an additional patient was cured.²⁵ Most of the trials included in these meta-analyses selected patients using inclusion criteria that increased the likelihood of ABRS rather than viral sinusitis, such as positive radiographic findings.⁵

The persistent high rate of prescribing antibiotics for ARS is likely multifactorial, reflecting cultural, economic, and microbiologic considerations.^{26,27} Patient desire for a tangible product of a clinical encounter, physician desire to satisfy patient demand and clinical throughput demands, and lack of information on behalf of the patient^{28,29} or the physician influence prescribing.²⁷ The most defensible rationale for the persistently high rate of antibiotic prescription for ARS is concern for the rare but devastating occurrence of septic,¹ ophthalmologic, intracranial complications due to spread of bacterial infections beyond the sinuses. The incidence of intracranial complications of ARS has decreased 4-fold compared to the preantibiotic era,^{30–32} suggesting that antibiotics do have a role in preventing complications. However, recent studies suggest that ARS complications occur regardless of treatment in the modern era.^{33,34} In a multicenter study³³ of patients with ARS complications, the majority of patients were started on antibiotics (59%) prior to admission, with similar complication rates in patients treated with and without antibiotics. Further studies clarifying which ARS patients are at risk for complications are warranted.

The only sociodemographic determinant associated with antibiotic prescribing in this study was age, and prescribing rates were particularly lower for adults 65 years and older. Regarding antibiotic utilization for respiratory tract infections in general, some previous studies have shown lower antibiotic prescribing rates for persons older than 65 years with respiratory tract infections,^{35,36} whereas others have not.³⁷ The findings in this study may reflect awareness of possible higher ARS complication rates in young males.^{38–40} Despite the fact that comorbidities that increase risk of infectious complications are more common in advanced age, antibiotics were prescribed less often for older patients. This finding suggests that antibiotics are overprescribed for younger adults.

Traditionally, once a decision is made to treat ARS with antibiotics, amoxicillin has been recommended as first-line treatment for adults.^{6,41} The recent Infectious Diseases Society of America (IDSA) clinical practice guideline strongly recommends amoxicillin-clavulanate as

empiric therapy.¹¹ Macrolides are not recommended due to high resistance rates (~30%) among *Streptococcus pneumoniae*,¹¹ and studies demonstrate increased risk of cardiovascular death associated with macrolides,^{42,43} including azithromycin.⁴⁴ This study demonstrates that in a preponderance of cases, physicians do not select antibiotics based on guideline recommendations, and azithromycin was the most commonly prescribed antibiotic for ARS. These findings are consistent with those recently reported by Fairlie et al.¹⁵ Some deviations from recommendations are likely appropriately influenced by resistance patterns. Pharmaceutical marketing campaigns,²⁷ lack of familiarity, disagreement, and inertia of previous practice may be barriers to guideline adherence.⁴⁵

Specialty care is frequently criticized for high expenditures relative to primary care. Ironically, desire to reduce diagnostic testing creates pressures that favor costly heavy antibiotic use.²⁷ In this study, PCPs prescribe antibiotics more frequently than ENT specialists, despite the strong possibility that the vast majority of cases in the primary care setting are mild. In previous studies of variations in treatment of chronic rhinosinusitis (CRS), PCPs were found to prescribe antibiotics more frequently than ENTs,⁴⁶ and regional variations were identified in patient demographics, diagnosis, and management of CRS.⁴⁷

We hypothesize that variations may be explained partially by greater dissemination of rhinosinusitis guidelines within the ENT specialty and by referral bias. ENTs may see more referred patients who have improved spontaneously or with previously prescribed antibiotics. This may also reflect specialists' ability to employ culture-directed therapy and access enhanced diagnostic modalities (eg, nasal endoscopy). When ENTs prescribe antibiotics, they more often select broad-spectrum coverage. This may be explained in part by some referred patients' failure to respond to previously prescribed antibiotics.

In CRS, upfront computed tomography (CT) scanning has been shown to be more cost-beneficial than empiric medical therapy for initial management in the otolaryngology clinic.⁴⁸ Recent authors suggest that objective evidence by endoscopy or CT be obtained if antibiotics are to be given for prolonged duration, recommending a "moratorium for the widespread practice of a prolonged course of empiric antibiotics in patients with presumed CRS."⁴⁹ Drawing a parallel to CRS, objective evidence by endoscopy or imaging may prove to be cost-effective for suspected ARS in the otolaryngology outpatient setting. Previous analyses slightly favor guideline-based treatment from a societal perspective; however, sensitivity analyses were based on different antibiotics and wide estimates of ABRs prevalence and symptom duration.²⁴ An updated cost-benefit analysis for mild ARS that includes nasal endoscopy utilization may be warranted.

Limitations of this study should be noted. Data were based on *ICD-9-CM* codes for ARS and may reflect miscoding or misdiagnosis. Furthermore, data units of analyses were patient visits, rather than patients, based on survey design. Hence, prevalence estimates cannot be determined on a per-patient basis. Duration and severity of symptoms were not recorded in the database; therefore, one cannot draw conclusions regarding the validity of decisions to prescribe antibiotics. Nevertheless, the data reflect prescribing patterns for patients with ARS diagnoses.

Future studies including an analysis of the cost burden of ARS, clarification of the prevalence of bacterial infection in ARS, and characterization of which ARS patients benefit from antibiotics are warranted. The opportunity to observe the decision-making process for a number of standardized patients might characterize the process by which these remarkable variations arise.

Conclusions

Antibiotics are prescribed frequently for ARS, particularly in younger patients and primary care settings, despite recent consensus guidelines that discourage antibiotic use in mild cases. These variations should be of high relevance to policy makers, patients, and clinicians, with implications for payment for quality.

Acknowledgments

We thank Jane Holl, MD, director of the postdoctoral fellowship in Health Services Research, for mentorship and contributions to design and Min-Woong Sohn, who provided statistical support for analyses, specifically with regard to implementing survey weights, at the Northwestern University Center for Healthcare Studies.

Disclosures

Competing interests: Stephanie Shintani Smith received travel support for a presentation at the 2011 Sinus Forum from the Foundation for Innovation, Education and Research in Otorhinolaryngology (FIERO). Charlesnika T. Evans received funding as a co-investigator from Merck for a research study unrelated to this study.

Sponsorships: None.

Funding source: Agency for Healthcare Research and Quality. Research for this article was done in large part while Dr Smith was a postdoctoral fellow at the Center for Healthcare Studies, supported by an institutional award from the Agency for Healthcare Research and Quality, T-32 HS 000078 (principal investigator Jane L. Holl, MD, MPH). The funding organization did not have a role in study design or conduct; collection, analysis, or interpretation of the data; or writing or approval of the manuscript.

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Figure 1. Antibiotic prescribing for acute rhinosinusitis visits in ENT and primary care. OPD, hospital-based outpatient department.

Table 1

Characteristics of subjects with acute rhinosinusitis seen in ENT and primary care clinics.

	Total (N = 881)	ENT (n = 75)	Family Medicine (n = 259)	Internal Medicine (n = 84)	General Medicine OPD (n = 463)	P Value
Estimated No. of weighted visits	18,740,912	955,390	10,526,012	5,290,205	1,969,305	
Age, y	46.2 ± 0.8	47.1 ± 2.3	44.6 ± 1.1	50.6 ± 1.8	42.7 ± 1.2	.31
Sex, % female	65.9 ± 2.6	62.7 ± 5.9	67.2 ± 3.3	63.1 ± 5.9	68.0 ± 2.8	.68
Race, %						.32
White	86.1 ± 1.9	91.3 ± 3.7	88.5 ± 2.3	81.1 ± 4.3	84.2 ± 3.3	
Black	10.1 ± 1.5	3.8 ± 2.5	8.5 ± 2.2	12.9 ± 3.0	14.2 ± 3.2	
Other	3.8 ± 1.4	4.9 ± 2.9	3.0 ± 1.1	6.0 ± 4.3	1.6 ± 0.9	
Ethnicity, %						.095
Hispanic or Latino	12.4 ± 2.3	10.4 ± 3.7	15.8 ± 4.0	8.0 ± 2.6	6.7 ± 2.4	
Region, %						.23
Northeast	10.1 ± 2.5	8.7 ± 3.4	9.1 ± 4.1	14.0 ± 3.3	5.5 ± 1.9	
Midwest	25.8 ± 3.7	27.4 ± 8.3	27.3 ± 4.4	15.0 ± 3.7	46.1 ± 7.7	
South	48.2 ± 5.0	54.7 ± 7.6	47.1 ± 5.1	56.5 ± 9.2	29.8 ± 8.2	
West	15.9 ± 2.8	12.2 ± 4.4	16.5 ± 3.4	14.5 ± 4.9	18.6 ± 7.8	
No. of chronic diseases	0.92 ± 0.09	0.41 ± 0.13	0.74 ± 0.11	1.41 ± 0.16	0.82 ± 0.12	<.01
Median household income in patient's zip code						.21
Unknown	5.7 ± 1.4	1.9 ± 1.3	7.3 ± 2.2	3.9 ± 1.9	3.5 ± 1.0	
Quartile 1 (below \$32,793)	15.6 ± 2.6	4.7 ± 2.1	14.5 ± 2.8	15.9 ± 4.9	26.4 ± 6.7	
Quartile 2 (\$32,794–\$40,626)	28.1 ± 3.2	34.8 ± 10.0	28.3 ± 4.4	27.8 ± 5.1	25.0 ± 5.3	
Quartile 3 (\$40,627–\$52,387)	25.0 ± 3.2	26.8 ± 6.3	28.5 ± 4.1	20.1 ± 5.5	18.5 ± 4.2	
Quartile 4 (\$52,388 or more)	25.6 ± 2.7	31.8 ± 9.4	21.4 ± 3.5	32.4 ± 6.4	26.6 ± 5.4	
Expected source of payment						.13
Blank/unknown	2.5 ± 1.0	0	3.2 ± 1.7	1.3 ± 1.0	2.5 ± 1.0	
Private insurance	71.7 ± 2.8	83.9 ± 6.6	78.0 ± 2.9	60.5 ± 7.0	71.7 ± 2.3	
Medicare	13.2 ± 2.4	9.8 ± 4.5	9.0 ± 2.0	2.4 ± 7.7	13.2 ± 2.4	
Medicaid/SCHIP	5.9 ± 1.1	6.3 ± 3.6	5.1 ± 1.5	6.2 ± 2.4	5.9 ± 1.1	
Worker's compensation	0.3 ± 0.2	0	0	0	0.3 ± 0.2	
Self-pay	4.3 ± 1.1	0	6.0 ± 3.0	6.0 ± 3.0	4.3 ± 1.1	

	Total (N = 881)	ENT (n = 75)	Family Medicine (n = 259)	Internal Medicine (n = 84)	General Medicine OPD (n = 463)	P Value
No charge/charity	0.4 ± 0.2	0	0.4 ± 0.3	0	0.4 ± 0.2	
Other	1.7 ± 0.7	0	1.2 ± 0.6	2.2 ± 2.0	1.7 ± 0.7	

Data are presented as weighted estimates of the mean or percentage ± standard error.

Abbreviations: ENT, otolaryngology; OPD, hospital-based outpatient department; SCHIP, State Children's Health Insurance Program.

Table 2

Antibiotic prescribing for acute rhinosinusitis in ENT and primary care clinics.

	% of Weighted Visits with Antibiotic Prescribed	Unadjusted <i>P</i> Value	Adjusted Odds Ratio (95% CI), <i>P</i> Value
Provider specialty			
Otolaryngology (ENT)	54.8		1 [Reference]
Family medicine	81.9	<.001	3.94 (2.02–7.72), <.001
Internal medicine	85.4	.002	6.88 (2.47–19.17), <.001
General medicine OPD	89.9	<.001	7.88 (3.49–17.76), <.001
Age category, y			
18–39	87.8		1 [Reference]
40–64	81.2	.06	0.63 (0.95–1.14), .13
65	71	.008	0.35 (0.15–0.82), .02
Sex			
Female	81.2		
Male	84.6	.37	
Race			
White	82		
Black	84.4	.74	
Other	84	.88	
Ethnicity			
Hispanic or Latino	90.4		
Not Hispanic or Latino	81.2	.14	
Geographic region			
Northeast	76.4		
Midwest	82.3	.45	
South	83.6	.42	
West	81.1	.65	
No. of chronic diseases			
0	84.3		1 [Reference]
1–2	82.3	.67	0.81 (0.39–1.68), .6
3	73.9	.14	0.54 (0.22–1.34), .18
Median household income ^a			
Unknown	26.1		
Quartile 1 (below \$32,793)	11.2	.091	
Quartile 2 (\$32,794–\$40,626)	19.1	.45	
Quartile 3 (\$40,627–\$52,387)	15.8	.24	
Quartile 4 (\$52,388 or more)	20	.51	
Expected source of payment			
Blank/unknown	16.6		
Private insurance	16.4	.98	
Medicare	25.5	.42	

	% of Weighted Visits with Antibiotic Prescribed	Unadjusted <i>P</i> Value	Adjusted Odds Ratio (95% CI), <i>P</i> Value
Medicaid/SCHIP	17.2	.96	
Worker's compensation	0	.62	
Self-pay	16.2	.97	
No charge/charity	0	.48	
Other	24.4	.67	

Abbreviations: OPD, hospital-based outpatient department; SCHIP, State Children's Health Insurance Program.

^a In patient's zip code.

Table 3

Antibiotics prescribed for acute rhinosinusitis in ENT and primary care clinics.

	Total Unweighted Visits	Total Weighted Visits	Total Proportion, %	ENT, %	PCP, %	P Value
Macrolides	223	5,000,000	32.3 ± 3.8	20.7 ± 5.9	32.7 ± 3.9	.11
Penicillins						
Amoxicillin	134	2,400,000	15.5 ± 4.2	3.0 ± 2.3	15.9 ± 4.4	.02
Amoxicillin/clavulanic acid	98	2,200,000	14.6 ± 2.8	18.4 ± 7.0	14.4 ± 2.8	.59
Quinolones	130	2,900,000	19.8 ± 2.8	37.3 ± 9.8	19.2 ± 2.8	.03
Second/third-generation cephalosporins	85	1,500,000	10.1 ± 1.6	18.0 ± 7.9	9.9 ± 1.6	.20
Miscellaneous ^a	65	1,200,000	7.8 ± 1.6	26.5 ± 2.7	8.0 ± 1.6	.27
Total broad-spectrum ^b	531	1,200,000	76.3 ± 5.0	94.3 ± 3.6	75.7 ± 5.1	.01

Abbreviations: ENT, otolaryngology; PCP, primary care physician.

^aFirst-generation cephalosporins, trimethoprim-sulfamethoxazole, lincomycins, and tetracyclines.

^bBeta-lactamase-inhibiting penicillins, second- to fourth-generation cephalosporins, quinolones, azithromycin, and clarithromycin were classified as broad-spectrum agents.