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Association between antibiotic prescribing and visit duration among patients with respiratory tract infections

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Abstract

Time constraints have been suggested as a potential driver of antibiotic overuse for acute respiratory tract infections. In this cross-sectional analysis of national data from visits to offices and emergency departments, we identified no statistically significant association between antibiotic prescribing and the duration of visits for acute respiratory tract infections.

Antibiotics are inappropriately prescribed in at least 28% of ambulatory care visits in the United States, and acute respiratory tract infections (ARTIs) are the most common diagnoses for which antibiotics are prescribed.[1] Although time constraints have been suggested as a potential driver of antibiotic overuse for ARTIs, prior studies have not demonstrated a clinically significant association between antibiotic prescribing and shorter visit duration.[2–5] These studies were performed >15 years ago, included a limited set of diagnoses, and were restricted to office settings. Our objective was to determine whether antibiotic prescribing was independently associated with visit duration using more recent data in patients diagnosed with any ARTI in either offices or emergency departments (EDs).

Methods

Data source and participants

We performed a cross-sectional analysis of data from the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS), which are annual surveys of nationally representative samples of visits to office-based physicians and EDs, respectively, conducted by the National Center for Health Statistics.

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Sampling weights are used to generate nationally representative estimates from surveyed visits.

Visits between 2014 and 2016 were included for patients with ARTIs. ARTIs were defined based on *International Classification of Diseases Ninth and Tenth Revision* (ICD-9 and ICD-10) codes using a previously described classification scheme.[1] ARTIs included otitis media, sinusitis, pharyngitis, tonsillitis, nonviral pneumonia, and miscellaneous viral infections (viral pneumonia, nasopharyngitis, influenza, ARTI not otherwise specified). Visits were excluded if a concomitant diagnosis warranting antibiotics (eg, urinary tract infection) was assigned or if the patient was referred to the emergency department (from an office) or was admitted to the hospital (from an office or ED).

Duration of the visit

For office visits, visit duration was defined using a field in the survey labeled “time (in minutes) spent with the physician.” This information was documented by medical staff and did not include time spent in the waiting room or with a nurse.

For visits to EDs, visit duration was defined as the time spent in the exam room, calculated as the total time spent in the ED minus the time spent in the waiting room. Visits >150 minutes were excluded from the analysis because the duration of these outliers was likely related to factors other than the decision to prescribe antibiotics.

Outcomes and analysis

The primary outcomes were the mean visit duration and the proportion of visit durations in each quantile, compared between patients who received antibiotics and those who did not. Comparing medians was not possible while considering all components of the multistage probability sample.

Means were compared using the *t* test, and proportions were compared using the χ^2 test. To adjust for potential confounding, we performed multivariable linear regression analyses with visit duration as the dependent variable and antibiotic prescription as an independent variable. Separate models were performed for visits to offices and EDs. Covariates in the models included patient age, sex, race or ethnicity, US Census region, insurance status, specific ARTI diagnosis, and whether an advanced practice clinician (eg, a nurse practitioner or physician’s assistant) provided care. The model for visits to offices also included variables both for physician specialty and whether the visit involved the primary care provider. The model for visits to EDs included the triage acuity score and the wait time, both of which are proxies for illness severity. In the model for visits to offices, the dependent variable (visit duration) was log-transformed to better approximate the normal distribution.

All analyses were performed using Stata version 14 software (StataCorp, College Station, TX) and accounted for all aspects of the multistage probability sampling design. The approval of our institutional review board was not required given that these data are deidentified and publicly available.

Results

In total, 9,698 visits for ARTIs comprised our study sample, which represented an estimated 86,322,906 visits per year (95% CI, 78,657,118–93,988,694). The median patient age was 22 years (IQR, 5–53), and 91.8% (95% CI, 90.2%–93.1%) of visits occurred in offices. The most common diagnoses were miscellaneous viral infections (46.5% of visits; 95% CI, 43.4%–49.6%) and sinusitis (19.4% of visits; 95% CI, 17.4%–21.5%). Antibiotics were prescribed in 51.5% of visits (95% CI, 48.6%–54.5%).

In offices, the mean visit duration was 20.1 minutes (95% CI, 19.2–21.1) when antibiotics were not prescribed and 19.8 minutes (95% CI, 18.7–20.9) when antibiotics were prescribed ($P = 0.59$). In EDs, the mean visit duration was 68.6 minutes (95% CI, 64.6–72.6) when antibiotics were not prescribed and 64.5 minutes (95% CI, 61.2–67.7) when antibiotics were prescribed ($P = .05$). Figure 1 shows the distribution of visit durations to offices and emergency departments, stratified by whether antibiotics were prescribed.

Table 1 shows results from multivariable linear regression. Antibiotic prescribing was not independently associated with the visit duration in offices (change in visit duration, −0.2 minutes; 95% CI, −1.2 to 0.9) or in EDs (change in visit duration, −1.7 minutes; 95% CI, −6.8 to 3.4).

Discussion

We found that in this nationally representative sample of ambulatory care visits, prescribing antibiotics for ARTIs was not independently associated with shorter visit durations in offices or EDs.

Our findings are similar to previous investigations in offices evaluating a more limited set of viral ARTIs conducted in the early 2000s.[4,5] Additionally, a recent study of telemedicine encounters found that the visit duration was 20 seconds longer when antibiotics were prescribed for ARTIs—a finding that was statistically but not clinically significant.[6] Our study adds to this literature by including visits to EDs, where a high proportion of visits for ARTIs are associated with inappropriate antibiotic prescribing.[7] In addition, whereas prior investigations focused on viral upper respiratory tract infections for which antibiotics are definitively not indicated, we included a broader set of acute respiratory tract infections for 2 reasons. First, inclusion of a broader set of acute respiratory tract infections (eg, otitis media and sinusitis) makes our results more relevant to updated guidelines, which suggest that withholding immediate antibiotic therapy (eg, “watchful waiting”) may be a safe strategy for the initial management of these conditions.[8,9] Second, studying a broader set of diagnoses makes our results robust to diagnosis code shifting, whereby visits for viral ARTIs are potentially labeled as bacterial infections (eg, sinusitis) to justify antibiotic prescribing.

The limitations of this study include the inability to confirm the accuracy of the assigned diagnosis codes or the exact proportion of the visit duration that was dedicated to discussion of or decisions about antibiotic prescribing. In addition, we were not able to control for factors such as the clinician’s overall workload or level of fatigue, which may also to contribute to inappropriate prescribing.[10] For these reasons, our findings should be

interpreted at the systems level rather than in the context of any individual clinician or encounter. Finally, since the data were collected between 2014 and 2016, our results do not reflect any potential practice changes since that time.

In summary, visit duration was not associated with whether antibiotics were prescribed in this nationally representative sample of visits for ARTIs to offices and EDs. Our findings suggest that at a systems level, factors other than time constraints may be more responsible for antibiotic overuse for ARTIs.

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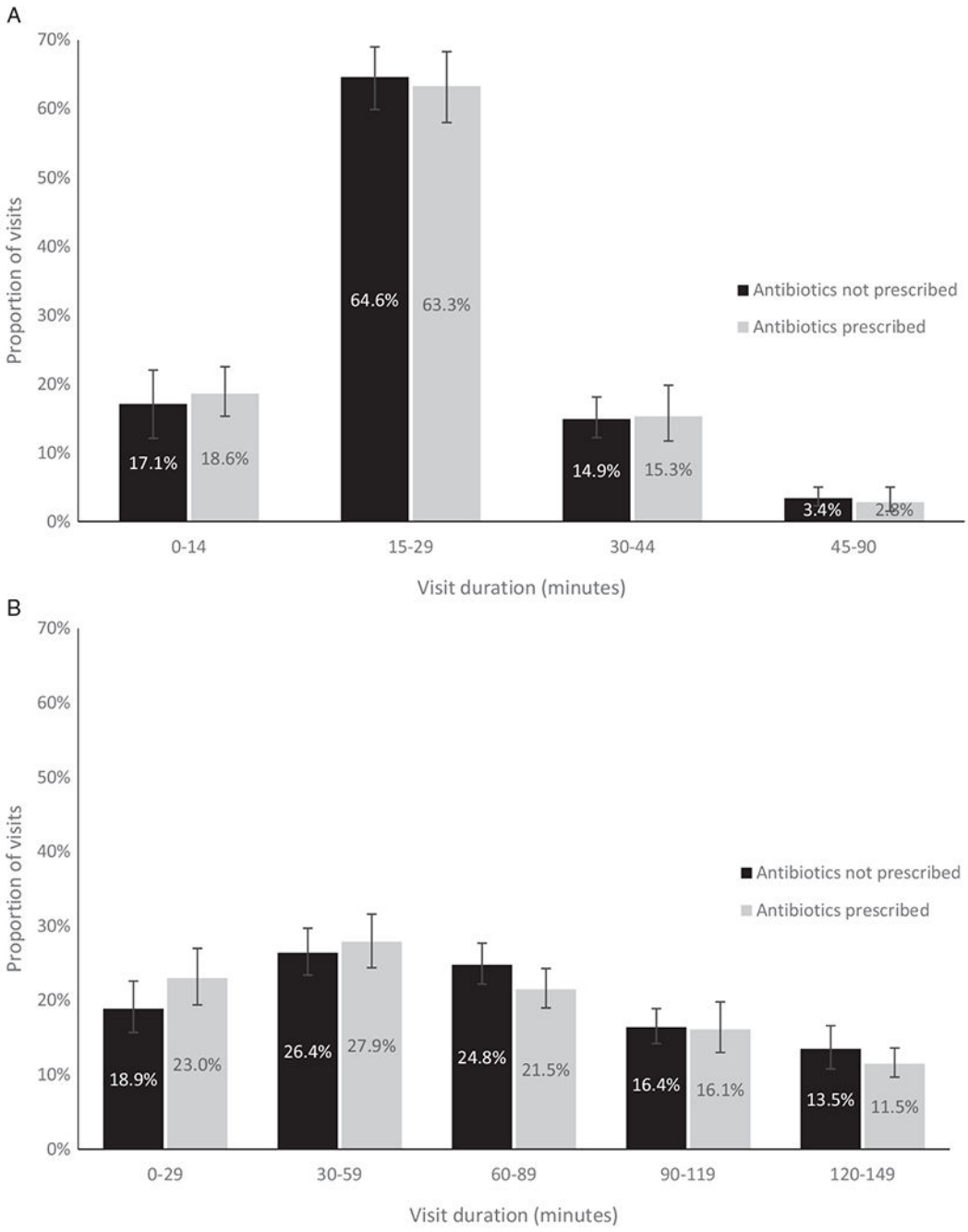

Figure 1.

Distribution of visit durations in offices and emergency departments, stratified by whether antibiotics were prescribed. Distribution of visit durations in offices (A) and emergency departments (B), stratified by whether antibiotics were prescribed. There were no statistically significant differences between those prescribed antibiotics and those not prescribed antibiotics in the proportion of patients in each category of visit duration in offices ($p = 0.85$ based on chi-square test) or emergency departments ($p = 0.19$).

Table 1.

Factors associated with visit duration in offices and emergency departments

	Coefficient (95% CI)	
Characteristic	**Offices**	**Emergency Departments**
Antibiotics prescribed	−0.2 (−1.2 to 0.9)	−1.7 (−6.8 to 3.4)
Age (years)		
0-17	1.00	1.00
18-39	−0.3 (−1.6 to 1.2)	−0.4 (−5.9 to 5.1)
40-65	1.8 (0.3 to 3.3)	11.1 (4.2 to 18.0)
≥65	1.2 (−0.6 to 3.3)	15.7 (5.9 to 25.5)
Male sex	0.5 (−0.4 to 1.5)	4.7 (0.2 to 9.2)
Race/ethnicity		
Non-Hispanic White	1.00	1.00
Non-Hispanic Black	2.5 (0.8 to 4.4)	6.3 (0.2 to 12.4)
Hispanic	2.9 (0.9 to 5.0)	7.0 (−2.2 to 16.1)
Non-Hispanic/other race	−0.7 (−2.0 to 0.7)	5.1 (−7.9 to 18.1)
US Census Region		
Northeast	1.00	1.00
Midwest	−2.6 (−4.0 to −1.0)	−3.8 (−14.2 to 6.6)
South	−3.1 (−4.8 to −1.3)	−5.9 (−16.0 to 4.2)
West	−2.0 (−3.5 to −0.2)	−8.4 (−18.1 to 1.4)
Insurance status		
Private	1.00	1.00
Public	1.1 (−0.2 to 2.5)	−1.7 (−7.5 to 4.2)
Other/self-pay	0.0 (−2.4 to 2.8)	−2.8 (−9.7 to 4.1)
Diagnosis		
Miscellaneous respiratory	1.00	1.00
Purulent AOM	−0.8 (−2.1 to 0.5)	−13.9 (−21.4 to −6.4)
Sinusitis	−0.6 (−1.8 to 0.7)	−9.4 (−21.7 to 3.0)
Pharyngitis/tonsillitis	0.8 (−0.8 to 2.7)	−5.2 (−11.6 to 1.1)

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Characteristic	Coefficient (95% CI)	
	Offices	Emergency Departments
Nonviral pneumonia	3.0 (0.5 to 5.9)	21.2 (8.5 to 33.9)
Advanced care clinician (i.e., nurse practitioner or physician'	2.4 (−0.1 to 5.1)	−0.8 (−8.0 to 6.4)
Specialty		
Pediatrics	1.00	
Family/general practice	0.2 (−1.6 to 2.2)	
vInternal medicine	−0.3 (−2.4 to 2.0)	
vOther	1.7 (−1.0 to 4.8)	
PCP visit	0.9 (−0.5 to 2.4)	
Wait time (per minute)		0.0 (−0.1 to 0.0)
Triage acuity score (per point)		−9.5 (−14.3 to −4.8)