

**BRIEF RESEARCH REPORT**

General Medicine

# Antibiotic and antitussive prescribing among urgent care and emergency department visits for respiratory diagnoses in a large health system

Marina Zakharevich MD<sup>1</sup> | Matthew A. Kippenhan MD<sup>1</sup> | Alice Lu BS<sup>2</sup> |  
D. Mark Courtney MD, MSCI<sup>3</sup> | Danielle M. McCarthy MD, MS<sup>1,4</sup> |  
Howard S. Kim MD, MS<sup>1,4</sup>

<sup>1</sup>Department of Emergency Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA

<sup>2</sup>Institute for Public Health and Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA

<sup>3</sup>Department of Emergency Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, USA

<sup>4</sup>Center for Health Services and Outcomes Research, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA

**Correspondence**

Howard S. Kim, MD, MS, Department of Emergency Medicine, Northwestern University Feinberg School of Medicine, 211 E. Ontario St, Ste 200, Chicago, IL 60611, USA.  
Email: [howard.kim@northwestern.edu](mailto:howard.kim@northwestern.edu)

**Meetings:** This work was presented at the American College of Emergency Physicians Research Forum 2021 in Boston, MA.

**Funding information**

Davee Foundation

**Abstract**

**Objective:** Urgent care centers (UCs) commonly evaluate patients with respiratory infections, and patients increasingly prefer UCs to emergency departments (EDs) because of their customer-centric approach. The aim of this study is to describe antibiotic and opioid prescribing among UC and ED visits with respiratory diagnoses.

**Methods:** This is a cross-sectional study of visits to 7 EDs and 6 UCs in the greater Chicago area. We included visits from July 1, 2017, to June 30, 2019, with a primary diagnosis of upper or lower respiratory infection. We describe the proportion of visits resulting in an antibiotic or antitussive prescription as well as the most frequently prescribed medications in these categories. We also describe the demographic and clinical characteristics of visits.

**Results:** Of 9134 ED visits, 32.9% were prescribed an antibiotic and 14.4% an antitussive (6.6% opioid). Of 41,380 UC visits for respiratory diagnoses, 57.9% were prescribed an antibiotic and 25.0% an antitussive (9.3% opioid). The most frequently prescribed antibiotics among ED and UC visits were penicillins (36.6% and 44.5%, respectively) and macrolides (44.1% and 35.3%, respectively). The most commonly prescribed opioid was codeine (55.6% and 91.0%, respectively). Median waiting room time was 16 and 5 minutes for ED and UC visits, respectively; median length of stay was 178 and 41 minutes, respectively.

**Conclusions:** Antibiotics and antitussives, including opioids, are frequently prescribed for ED and UC visits with non-bacterial respiratory diagnoses. These findings suggest greater attention to the appropriateness of antibiotic prescribing in both settings and the incorporation of specific guidance on codeine products in opioid-prescribing guidelines.

Supervising Editor: Nicholas Johnson, MD.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *JACEP Open* published by Wiley Periodicals LLC on behalf of American College of Emergency Physicians.

**KEYWORDS**

antibiotic, antitussive, cold, cough, immediate care, prescribing, upper respiratory infection, urgent care

## 1 | INTRODUCTION

### 1.1 | Background

Urgent care centers (UCs) are an increasingly common service context for patients to seek care for low-acuity conditions. Their use has increased by 119% in recent years, whereas emergency department (ED) use has decreased by 36%.<sup>1</sup> It has been theorized that patients prefer UCs over EDs or doctor's offices because they offer the convenience of shorter wait times<sup>2</sup> and provide care for about one tenth of the cost compared with the ED.<sup>3</sup> Furthermore, same-day appointments are often unavailable in primary care. Patients rate UCs significantly higher than EDs, with greater satisfaction relating to customer service and receipt of prescriptions.<sup>4</sup> Because of this customer-centric approach, it has been suggested that UCs are a substantial source of unnecessary antibiotic prescribing.<sup>5</sup>

Unnecessary antibiotic prescribing, most commonly for upper respiratory infections such as sinusitis and pharyngitis,<sup>5,6</sup> has been targeted as low-value care in recent years. One study found that less than half of antibiotic prescriptions for acute respiratory conditions were appropriate according to 2011 guidelines.<sup>6</sup> In response, the American College of Emergency Physicians partnered with the Choosing Wisely campaign in 2014 to recommend against prescribing antibiotics for sinusitis, citing antibiotic resistance and reduction of avoidable health-care costs.

### 1.2 | Importance

Opioid medications, particularly codeine, may also be prescribed for relief of cough symptoms from respiratory conditions despite limited evidence of efficacy.<sup>7</sup> However, no study has yet evaluated whether opioids are prescribed within UC settings in a similar manner to antibiotics, despite the recent rise in UC use and patient preference for customer-centered care. This is an important knowledge gap to address given that the opioid epidemic continues to be a national concern and multiple studies have shown an association between opioid prescribing and long-term opioid use and outcomes.<sup>8,9</sup> Substantial rates of opioid prescribing within UC and ED settings, particularly for antitussive products such as codeine, may point to the need to include specific guidance on prescribing opioids for cough relief in existing prescribing guidelines.

### 1.3 | Goal of this investigation

The purpose of this study is to describe the rates of antibiotic and antitussive prescribing among UC and ED visits with upper or lower respi-

ratory diagnoses. We focus on UC and ED visits because of their acute, unscheduled nature.

## 2 | METHODS

### 2.1 | Study design and setting

We conducted a cross-sectional study of unscheduled visits for upper and lower respiratory infections at 7 EDs and 6 UCs in a large health system in the greater Chicago, Illinois, area from July 1, 2017 to June 30, 2019. The 6 UCs have a combined annual visit volume of >157,000 visits (mean, 22,000 visits/UC), with 3 locations in downtown Chicago and 3 locations in outlying suburbs. UCs are typically staffed by 1 physician and 2 advanced practice provider (APPs; including physician assistants and nurse practitioners); physicians are not routinely involved in patient visits evaluated by APPs but are available for consultation if needed.

### 2.2 | Selection of participants

We included all UC visits and all discharged ED visits with a primary diagnosis of upper or lower respiratory infection based on previously used International Classification of Diseases, Tenth Revision (ICD-10) codes (see the Supplementary Appendix).<sup>5,10</sup> We excluded diagnoses indicating a bacterial etiology (eg, bacterial pneumonia, streptococcal pharyngitis) given our focus on inappropriate antibiotic prescribing. This study was approved by the Northwestern University Institutional Review Board.

### 2.3 | Data collection

The Northwestern Medicine health system launched a unified electronic health record (Epic) in March 2018; before this, EDs used a different electronic health record vendor (Cerner), whereas UCs used a legacy version of Epic. Data from all electronic health record versions and eras are compiled in a unified database in the Northwestern Medicine Enterprise Data Warehouse (EDW). We extracted clinical visit information from the EDW using structured query language; we then cleaned, collated, and coded these raw data in Microsoft Excel version 16.6 for analysis in Stata version 14.2. We performed data checks and visualizations across all variables to ensure that all ED and UC visits were included across the study period.

### The Bottom Line

Patients with respiratory tract infections commonly seek care at urgent care centers (UCs) and emergency departments (EDs). Most of these infections are caused by respiratory viruses, although antibiotic prescription is common. In a cohort of 9134 ED and UC patients with non-bacterial respiratory infections, 33% were prescribed an antibiotic and 14% an antitussive. Greater attention to antimicrobial stewardship in this population is warranted as are future investigations focused on identifying patients who might benefit from antimicrobial treatment.

## 2.4 | Measurements

We described demographic characteristics (age, sex, race, ethnicity, primary insurance, major comorbidities) and visit characteristics (Emergency Severity Index [ESI] triage score, waiting room time, total length of stay) using proportions, means, or medians as appropriate. ESI scores were assigned by ED triage staff at patient check-in; ESI scores are not used at UC visits. Waiting room time and length of stay were calculated by subtracting the electronic time stamps for patient check-in from room assignment and patient departure, respectively. We obtained exact prescribing data on the first 3 medications prescribed.

## 2.5 | Outcomes

We tabulated prescribing data for UC and ED visits to describe the proportion of visits receiving an antibiotic or antitussive medication, including opioids, benzonatate and other topical anesthetics, dextromethorphan, and guaifenesin. If an antitussive contained both an opioid and a non-opioid (eg, codeine/guaifenesin), we attributed it solely to the opioid category. We also characterized the proportion of visits prescribed oseltamivir given the clinical overlap between influenza and respiratory infection symptoms.

## 2.6 | Analysis

We present prescribing data as proportions with 95% confidence intervals (CIs) for descriptive purposes. All analyses were performed using Stata version 14.2.

## 3 | RESULTS

### 3.1 | Characteristics of study patients

There were 50,514 unscheduled visits with an upper or lower respiratory diagnosis from July 1, 2017, to June 30, 2019 (n = 9134 ED,

**TABLE 1** Demographic and visit characteristics

	Emergency department	Urgent care
Visits, N	9134	41,380
Age, years, median (IQR)	40 (22–60)	43 (33–56)
Female sex, %	62.8	65.4
Race, %		
White	64.1	75.0
Black	27.4	7.7
Hispanic/Latino ethnicity, %	19.7	7.0
Insurance, %		
Commercial	36.7	77.1
Medicaid	36.3	2.3
Medicare	22.4	12.1
Self-pay	4.6	8.5
Comorbidities, %		
Coronary artery disease	11.7	4.6
COPD	34.6	23.4
Diabetes	17.0	6.1
Hyperlipidemia	27.0	23.2
Hypertension	35.6	20.7
Cerebrovascular accident	6.3	2.2
Waiting room time, minutes, median (IQR)	16 (6–55)	5 (2–13)
Length of stay, minutes, median (IQR)	178 (115–272)	41 (29–60)
Prescriptions, % (95% CI)		
Antibiotics	32.9 (31.9–33.8)	57.9 (57.4–58.3)
Any antitussive <sup>a</sup>	14.4 (13.7–15.1)	25.0 (24.6–25.4)
Opioid	6.6 (6.1–7.1)	9.3 (9.0–9.6)
Benzonatate/topicals <sup>b</sup>	6.5 (6.0–7.0)	16.0 (15.6–16.3)
Dextromethorphan/guaifenesin	1.6 (1.3–1.8)	0.9 (0.8–1.0)
Oseltamivir <sup>c</sup>	58.9 (56.5–61.1)	71.0 (69.4–72.5)

CI, confidence interval; COPD, chronic obstructive pulmonary disease; IQR, interquartile range.

<sup>a</sup>Some visits were assigned multiple antitussives, so the sum of individual antitussive types exceeds the whole.

<sup>b</sup>Benzonatate and topicals include benzonatate, benzocaine, and lidocaine.

<sup>c</sup>Oseltamivir prescription proportions are for visits diagnosed with influenza only.

n = 41,380 UC). The median patient age of ED and UC visits was 40 years (interquartile range [IQR], 22–60 years) and 43 years (IQR, 33–56 years), respectively. The majority of patients were female (62.8% and 65.4%) and White (64.1% and 75.0%) in both ED and UC contexts. ED patients had a higher prevalence of all comorbidities compared with UC patients (Table 1). The waiting room time for ED and UC visits was 16 minutes (IQR, 6–55 minutes) and 5 minutes (IQR, 2–13 minutes), respectively; total lengths of stay were 178 minutes (IQR,

**TABLE 2** Specific antibiotics and opioids prescribed

	Emergency department	Urgent care
Antibiotic prescribed, N	3002	23,944
Penicillin, n (%)	1100 (36.6)	10,771 (44.5)
Macrolide, n (%)	1324 (44.1)	8447 (35.3)
Tetracycline derivatives, n (%)	176 (5.9)	3445 (14.4)
Cephalosporin, n (%)	125 (4.2)	594 (2.5)
Fluoroquinolone, n (%)	139 (4.6)	354 (1.5)
Clindamycin, n (%)	90 (3.0)	53 (0.5)
Opioid prescribed, N	599	3859
Codeine, n (%)	333 (55.6)	1622 (91.0)
Hydrocodone, n (%)	222 (37.1)	337 (8.7)
Tramadol, n (%)	33 (5.6)	10 (0.3)

115–272 minutes) and 41 minutes (IQR, 29–60 minutes), respectively. The median ESI of ED visits was 3 (IQR, 3–4), with 84.0% of visits scored at 3 or higher.

The most common diagnoses among ED visits were lower respiratory tract diagnoses (41.6%), upper respiratory tract diagnoses (26.4%), influenza (18.7%), and cough (13.2%). The most common diagnoses among UC visits were upper respiratory tract diagnoses (61.6%), lower respiratory tract diagnoses (20.9%), influenza (7.6%), and cough (10.0%).

### 3.2 | Main results

One third of ED visits (32.9%; 95% CI, 31.9%–33.8%) and nearly two thirds of UC visits (57.9%; 95% CI, 57.4%–58.3%) were prescribed an antibiotic. The most common antibiotics prescribed among ED and UC visits were penicillins (36.6% and 44.5%, respectively; Table 2), macrolides (44.1% and 35.3%), and tetracycline derivatives (5.9% and 14.4%). Among visits for influenza, 58.9% of ED visits (95% CI, 56.5–61.1) and 71.0% of UC visits (95% CI, 69.4–72.5) were prescribed oseltamivir.

A total of 14.4% of ED visits (95% CI, 13.7%–15.1%) and 25.0% of UC visits (9% CI, 24.6%–25.4%) were prescribed an antitussive, and 6.6% of ED visits (95% CI, 6.1%–7.1%) and 9.3% of UC visits (95% CI, 9.0%–9.6%) were prescribed an opioid. The most frequent opioids prescribed among both ED and UC visits were codeine (55.6% and 91.0%, respectively) and hydrocodone (37.1% and 8.7%, respectively).

## 4 | LIMITATIONS

This study has several limitations. First, although we theorize that antibiotics and opioid antitussive prescriptions were inappropriate for these diagnoses, electronic health record data do not contain sufficient contextual information to determine the appropriateness or necessity of these prescriptions. Similar to many electronic health record

elements, ICD-10 codes serve a primary billing rather than clinical purpose. As such, ICD-10 codes provide limited ability to differentiate between viral and bacterial etiologies of respiratory infection. For example, although some codes (eg, J02 acute pharyngitis) contain specific subcodes that allowed us to exclude bacterial etiologies (eg, J02.0 streptococcal pharyngitis), others do not (eg, J01 acute sinusitis). This likely reflects the lack of rapid diagnostic testing for bacterial sinusitis as there currently exists for streptococcal pharyngitis given that the vast majority of acute sinus infections are viral in etiology. Second, although we juxtapose ED and UC findings in this descriptive study, patients may not actually perceive these contexts as competing options when seeking care for minor respiratory infections. Finally, although our study incorporated 7 diverse EDs and 6 UCs, our focus on a single health system in the greater Chicago area may limit the generalizability of our results.

## 5 | DISCUSSION

In this study of 7 EDs and 6 UCs in a large urban health system, antibiotics and antitussives were frequently prescribed for upper and lower respiratory diagnoses. We found that nearly 33% of ED visits and 58% of UC visits were prescribed an antibiotic, which is notable given our focus on upper and lower respiratory infections typically associated with viral etiologies. These numbers exceed those reported in a recent national study by Palms et al, in which antibiotic prescription claims for ED visits was nearly 25% and UC visits 46% in a comparable set of respiratory diagnoses.<sup>5</sup> However, Palms et al excluded patients who had recent outpatient antibiotic fills and evaluated claims for filled prescriptions rather than written prescriptions, which may partly explain the discrepant findings. In a study of ED opioid prescriptions using prescription monitoring program data, 20% of prescriptions went unfilled.<sup>11</sup>

To our knowledge, this is the first study to describe antitussive prescribing among unscheduled visits for respiratory diagnoses. We found that >14% of ED visits and 25% of UC visits were prescribed an antitussive medication, most commonly opioids or topical anesthetics such as benzonatate. The most frequent opioid prescribed was codeine, consistent with known formulations for cough relief, such as guaifenesin–codeine or promethazine–codeine. Although the use of codeine is discouraged in children and breastfeeding mothers, no opioid-prescribing guidelines currently discuss the use of opioids as antitussives.<sup>12</sup> If these study findings are confirmed in other settings or a nationally representative sample, we recommend that future guidelines address the prescribing of opioids as an antitussive among adults, particularly given the questionable efficacy of codeine for cough relief.<sup>7</sup> Although codeine is considered a weak opioid, all opioids carry a risk of direct and indirect harm through unintentional overdose or instigation of long-term use.<sup>9</sup>

In addition, we found that 59% of ED visits and 71% of UC visits diagnosed with influenza were prescribed oseltamivir. This finding is notable given the lower incidence of serious comorbidities among UC visits and the limited efficacy of oseltamivir in reducing time to alleviation of symptoms and its associated gastrointestinal adverse effects.<sup>13</sup>

These findings should be viewed as exploratory given that influenza diagnoses comprised only a portion of the total visits evaluated in this study ( $n = 4856$ ) and should be confirmed in a larger and more diverse data set. Future areas of study should explore clinician and patient motivations for prescribing and receiving oseltamivir to better understand this trend.

A strength of our study design was the focus on the electronic medical record as the primary data source rather than administrative claims data. This allowed us to report on prescribed, rather than filled, medications, which better reflect clinician attitudes and behaviors relating to symptom control rather than patient desire or ability to fill medications. This data source further allowed us to capture key operational metrics, such as waiting room time and length of stay. Consistent with prior research, we found that both waiting room time and length of stay were shorter for UC visits compared with ED visits, supporting the theory that patients prefer UCs because of the greater convenience.<sup>2,4</sup> In the setting of more frequent antibiotic and antitussive prescribing, patients might also prefer UCs because of the greater emphasis on prescribing medications consistent with a retail-based approach to health-care.

Although we present data from both ED and UC visits, these data are intended to be descriptive rather than statistically comparative as we would expect that prescribing rates might differ between these 2 contexts given their distinct patient populations. Indeed, we found that UC visits reflected a higher prevalence of White and insured patients with a lower burden of major comorbidities. Some differences in patient characteristics could be explained by varying operational procedures at EDs and UCs. For example, UCs collect patient insurance information at check-in and routinely provide information on patient copay obligations, which may discourage uninsured patients from completing the check-in process. EDs, on the other hand, are mandated by law to provide a medical screening exam to all individuals and must refrain from making any remarks that might be interpreted as linking the provision of services to patient insurance or ability to pay. To what extent the resulting differences in patient characteristics account for the observed differences in antibiotic and antitussive prescribing is unclear and outside of the scope of the current study design.

In conclusion, we found that antibiotic and antitussive medications are frequently prescribed in both ED and UC visits for respiratory diagnoses, with codeine products comprising the majority of opioid antitussive prescriptions. If our findings are confirmed in other diverse settings, future revisions of opioid-prescribing guidelines should specifically address the prescribing of opioids for antitussive indications. Furthermore, the high rate of antibiotic prescribing for respiratory infections, despite established guidelines recommending against routine prescribing, suggests that additional efforts at optimizing prescribing may be warranted.

#### ACKNOWLEDGMENT

This work was supported by the Davee Foundation.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Howard S. Kim conceived and designed the study, obtained research funding, and supervised data collection, cleaning, analysis. Alice Lu collected the data. Marina Zakharevich cleaned the data and drafted the manuscript; all authors contributed substantially to its revision. Matthew A. Kippenhan, D. Mark Courtney, and Danielle M. McCarthy provided advice on study design and data interpretation and analysis. Howard S. Kim takes responsibility for the article as a whole.

#### REFERENCES

1. Poon SJ, Schuur JD, Mehrotra A. Trends in visits to acute care venues for treatment of low-acuity conditions in the United States from 2008 to 2015. *JAMA Intern Med.* 2018;178:1342-1349.
2. Mehrotra A. The convenience revolution for treatment of low-acuity conditions. *JAMA.* 2013;310:35-36.
3. Ho V, Metcalfe L, Dark C, et al. Comparing utilization and costs of care in freestanding emergency departments, hospital emergency departments, and urgent care centers. *Ann Emerg Med.* 2017;70:846-857 e843.
4. Agarwal AK, Mahoney K, Lanza AL, et al. Online ratings of the patient experience: emergency departments versus urgent care centers. *Ann Emerg Med.* 2019;73:631-638.
5. Palms DL, Hicks LA, Bartoces M, et al. Comparison of antibiotic prescribing in retail clinics, urgent care centers, emergency departments, and traditional ambulatory care settings in the United States. *JAMA Intern Med.* 2018;178:1267-1269.
6. Fleming-Dutra KE, Hersh AL, Shapiro DJ, et al. Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011. *JAMA.* 2016;315:1864-1873.
7. Kinkade S, Long NA. Acute bronchitis. *Am Fam Physician.* 2016;94:560-565.
8. Bohnert AS, Valenstein M, Bair MJ, et al. Association between opioid prescribing patterns and opioid overdose-related deaths. *JAMA.* 2011;305:1315-1321.
9. Barnett ML, Olenski AR, Jena AB. Opioid-prescribing patterns of emergency physicians and risk of long-term use. *N Engl J Med.* 2017;376:663-673.
10. Yadav K, Meeker D, Mistry RD, et al. A multifaceted intervention improves prescribing for acute respiratory infection for adults and children in emergency department and urgent care settings. *Acad Emerg Med.* 2019;26:719-731.
11. Kim HS, Heard KJ, Heard S, Hoppe JA. Opioid prescription fill rates after emergency department discharge. *Am J Health Syst Pharm.* 2016;73:902-907.
12. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain—United States, 2016. *JAMA.* 2016;315:1624-1645.
13. Jefferson T, Jones M, Doshi P, Spencer EA, Onakpoya I, Heneghan CJ. Oseltamivir for influenza in adults and children: systematic review of clinical study reports and summary of regulatory comments. *BMJ.* 2014;348:g2545.

#### AUTHOR BIOGRAPHY



**Marina Zakharevich, MD**, is an incoming PGY-1 resident at the Stanford Emergency Medicine Residency.

**SUPPORTING INFORMATION**

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Zakharevich M, Kippenhan MA, Lu A, Courtney DM, McCarthy DM, Kim HS. Antibiotic and antitussive prescribing among urgent care and emergency department visits for respiratory diagnoses in a large health system. *JACEP Open*. 2022;3:e12741.  
<https://doi.org/10.1002/emp2.12741>