Infection Control & Hospital Epidemiology (2023), **44**, 736–745
doi:10.1017/ice.2022.164

SHEA

Original Article

Antibiotic stewardship to reduce inappropriate antibiotic prescribing in integrated academic health-system urgent care clinics

Dharmesh Patel MBA, CNMT, R.T.(N)(ARRT)[1], Teresa Ng[2], Lubna S. Madani MD[3], Stephen D. Persell MD, MPH[4,5,7], Mark Greg PharmD[6], Phillip E. Roemer MD[4,7], Sonali K. Oberoi OTR, MHA[7] and Jeffrey A. Linder MD, MPH[4,5,7]

[1]Quality and Patient Safety, Northwestern Medical Group, Chicago, Illinois, [2]Population Health Analytics, Northwestern Medicine, Chicago, Illinois, [3]Division of Immediate Care, Northwestern Medical Group, Chicago, Illinois, [4]Division of General Internal Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois, [5]Center for Primary Care Innovation, Institute for Public Health and Medicine, Northwestern University Feinberg School of Medicine, [6]Ambulatory Pharmacy, Northwestern Medicine, Chicago, Illinois and [7]Northwestern Medical Group, Chicago, Illinois

Abstract

Objective: To develop and implement antibiotic stewardship activities in urgent care targeting non–antibiotic-appropriate acute respiratory tract infections (ARIs) that also reduces overall antibiotic prescribing and maintains patient satisfaction.

Patients and setting: Patients and clinicians at the urgent care clinics of an integrated academic health system.

Intervention and methods: The stewardship activities started in fiscal 2020 and included measure development, comparative feedback, and clinician and patient education. We measured antibiotic prescribing in fiscal years 2019, 2020, and 2021 for the stewardship targets, potential diagnosis-shifting visits, and overall. We also collected patient satisfaction data for ARI visits.

Results: From FY19 to FY21, 576,609 patients made 1,358,816 visits to 17 urgent care clinics, including 105,781 visits for which stewardship measures were applied and 149,691 visits for which diagnosis shifting measures were applied. The antibiotic prescribing rate decreased for stewardship-measure visits from 34% in FY19 to 12% in FY21 (absolute change, −22%; 95% confidence interval [CI], −23% to −22%). The antibiotic prescribing rate decreased for diagnosis-shifting visits from 63% to 35% (−28%; 95% CI, −28% to −27%), and the antibiotic prescribing rate decreased overall from 30% to 10% (−20%; 95% CI, −20% to −20%). The patient satisfaction rate increased from 83% in FY19 to 89% in FY20 and FY21. There was no significant association between antibiotic prescribing rates of individual clinicians and ARI visit patient satisfaction.

Conclusions: Although it was affected by the COVID-19 pandemic, an ambulatory antimicrobial stewardship program that focused on improving non–antibiotic-appropriate ARI prescribing was associated with decreased prescribing for (1) the stewardship target, (2) a diagnosis shifting measure, and (3) overall antibiotic prescribing. Patient satisfaction at ARI visits increased over time and was not associated with clinicians' antibiotic prescribing rates.

(Received 26 February 2022; accepted 12 June 2022; electronically published 13 July 2022)

Inappropriate antibiotic use leads to increased bacterial resistance, increased risk of *Clostridioides difficile* infections, other antibiotic-related side effects, and increased costs. Antibiotics prescribed in ambulatory settings account for an estimated 80%–90% of human antibiotic use.[1] Furthermore, up to 50% of ambulatory antibiotics may be unnecessary, and ambulatory antibiotics account for >60% of antibiotic costs.[2,3]

Ambulatory urgent-care clinics and their clinicians may face challenges in antibiotic prescribing. Urgent care practices may see patients of higher acuity than primary care clinics. They may lack an existing relationship with patients, may see patients who do not have regular access to primary care, and may not have a mechanism for effective patient follow-up.[4] Urgent care practices have higher antibiotic prescribing rates than other ambulatory sites of care.[5–8]

Patient satisfaction is of particular concern at urgent care practices, which compete with each other and other sites of care based on convenience and patient experience.[9] Although studies of whether antibiotic prescribing is associated with higher patient satisfaction have been mixed,[7,10–16] patient satisfaction is a frequent reason clinicians cite for inappropriate antibiotic prescribing.[17,18]

To measure, monitor, and improve ambulatory antibiotic prescribing, our health system formed an ambulatory antibiotic stewardship committee in 2018. Due to relatively high antibiotic prescribing and a perception of injudicious antibiotic prescribing in urgent care, we focused interventions on our urgent care practices. Interventions implemented in fiscal year 2019 (FY19) focused on improving antibiotic use for non–antibiotic-appropriate diagnoses, but we were also concerned about diagnosis shifting

Corresponding author: Email jlinder@northwestern.edu

PREVIOUS PRESENTATION: We presented these findings as a poster (poster number P123) at the Vizient Connection Summit 2021, November 16-17, 2021, in Las Vegas, Nevada, and submitted as an abstract to the *American Journal of Medical Quality*.

Cite this article: Patel D, *et al.* (2023). Antibiotic stewardship to reduce inappropriate antibiotic prescribing in integrated academic health-system urgent care clinics. *Infection Control & Hospital Epidemiology*, 44: 736–745, https://doi.org/10.1017/ice.2022.164

(ie, an increase in the number of related antibiotic-appropriate diagnoses), overall antibiotic prescribing, and maintaining patient satisfaction.[19]

Methods

Setting and organization

Northwestern Medicine is an integrated academic healthcare system in the Chicago area that includes 13 hospitals, 481 outpatient locations, and 23 urgent care clinics, also known as "Northwestern Medicine Immediate Care Centers." Of the urgent care clinics, 17 were open and operational continually from FY19 to FY21 and are included in this analysis; 6 additional urgent care clinics opened between the beginning of FY19 and the end of FY21. The Northwestern Medicine fiscal year begins on September 1.

These urgent care clinics are overseen by 1 operational unit, Northwestern Medical Group (NMG), and they span 4 different regions in our area: central, north, west, and northwest. Each urgent care clinic is staffed with physicians and advanced practice professionals (APPs)—advanced practice nurses and physician assistants. The urgent care practices have their own urgent-care quality committees.

The Northwestern Medicine Ambulatory Antimicrobial Stewardship Committee (AASC) was established in FY18 comprising physician champions from primary care, infectious diseases, and urgent care, as well as the population health pharmacy director, practice managers, and quality improvement leaders.

Clinician survey

To help plan stewardship activities, we created and administered a survey to practicing clinicians between December 2019 and January 2020. We asked, "What do you believe to be the most common reasons why physicians/APPs prescribe antibiotics for viral respiratory diagnoses?" Respondents could choose 1 or more of the following responses: (1) fear of receiving a poor postvisit patient satisfaction score; (2) patient perception of the value of clinic visit; (3) to treat superimposed secondary bacterial infections; and (4) to instruct the patient to wait and fill if the symptoms worsen. Via an urgent-care listserv, we sent the survey to 93 physicians and APPs; responses were anonymous.

Measures

Stewardship measures

Based on Healthcare Effectiveness Data and Information Set (HEDIS) measures, we developed our own non–antibiotic-appropriate prescribing measures.[20] The committee created and validated the acute respiratory infection (ARI) stewardship measures in 2018. We developed 4 stewardship measures that we combined into "stewardship target visits" (Table 1). The 4 stewardship measures were antibiotic prescribing (1) for upper respiratory tract infections for children aged 3 months to 17 years, (2) for pharyngitis with negative *Streptococcus* (ie, strep) test for children aged 3–17 years, (3) for pharyngitis with negative strep test for adults aged ≥18 years, and (4) for URI, acute bronchitis, influenza for adults aged ≥18 years. For this article, we have combined the data for all 4 measures and labeled them "stewardship measures."

Encounter diagnoses are chosen by the treating clinician based on *International Classification of Diseases, Tenth Clinical Modification* (Appendix 1.A online). Adult patients with multiple stewardship-qualifying diagnoses documented in the same encounter were be included in 2 different measures. For instance, adult patients with pharyngitis and negative strep test and either URI, acute bronchitis, or influenza were included in 2 measures. The stewardship measures only included in-person and synchronous video or telephone encounters with clinicians and diagnoses did not have to be the primary diagnosis.

Patients were excluded from measures if they had a competing infectious diagnosis (Appendix 2 online) and/or comorbid condition history (Appendix 3 online). We used multiple code sources, including HEDIS, to identify competing diagnoses and comorbid conditions. For all measures, we excluded patients with a competing, antibiotic-appropriate diagnosis based on the scheme from Chua et al[2] documented 30 days prior through 7 days after the date of the encounter. For the adult acute bronchitis, URI, and influenza measure, we excluded patients with a comorbid condition such as chronic infections, chronic lung diseases, cancer, or immunosuppression documented 12 months prior through the date of encounter.

Diagnosis shifting measure

Because we were concerned that clinicians might try to evade the stewardship measures by shifting their diagnosis selection, adding comorbid diagnoses, or adding antibiotic-appropriate diagnoses, we developed a "diagnosis shifting measure" (Table 1 and Appendix 1.B online). The diagnosis shifting measure included visits with any of the following codes: stewardship measure codes omitting exclusions for competing diagnoses or comorbid conditions (to detect whether clinicians were evading the measure by adding competing or comorbid diagnoses), potentially antibiotic-appropriate codes (eg, sinusitis, otitis media), antibiotic-appropriate codes (eg, pneumonia), and nonspecific codes (eg, cough, fever, other respiratory disorders).

All-antibiotic measure

To observe the impact of stewardship interventions on overall antibiotic prescribing in urgent care clinics, we measured antibiotic prescribing regardless of diagnosis or visit type.[19] Patients were not excluded from the all-antibiotic measure for competing diagnosis and/or comorbid condition history.

Antibiotics

We used a custom grouping within our electronic health record containing all antibiotics based on generic name. Antibiotics prescribed in the same encounter as the diagnoses were included in the numerator.

Patient satisfaction

We examined patient satisfaction with clinicians for visits that met the stewardship measure criteria (ie, had a diagnosis of URI, pharyngitis with a negative strep test, acute bronchitis, or influenza). We sent a patient satisfaction survey to all patients with available e-mail or mobile phone numbers after their urgent care visit. The survey asks questions about satisfaction with the location and with the clinician. We calculated the annual satisfaction rate for each clinician as the proportion of patients who ranked the clinician a 9 or 10 on a 1–10 scale divided by the number of satisfaction survey respondents. We also compared individual clinicians' antibiotic prescribing rate with their satisfaction rate.

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

Table 1. Stewardship, Diagnosis Shifting, and All-Antibiotic Prescribing Measure Definitions

Measure Name	Measure Description	Measure Detail	Numerator	Denominator	Exclusions
Stewardship measures					
URI, child	Monthly prescription rate of antibiotics for upper respiratory infection (URI) in children	Percentage of encounters for patients aged 3 months–17 years with a diagnosis of URI who were prescribed an antibiotic during the office visit or urgent care visit	Antibiotic prescribed during the same encounter as the diagnosis	Encounter for patients aged 3 months–17 years at the time of encounter Diagnosis of upper respiratory infection (URI)	Ophthalmic route Patients with a competing antibiotic-appropriate diagnosis 30 d prior through 7 d after the visit
Pharyngitis, child	Monthly prescription rate of antibiotics for children with diagnosis of pharyngitis and tested negative for *Streptococcus*	Percentage of encounters for patients aged 3–17 years with a diagnosis of pharyngitis and had negative strep test result who were prescribed antibiotic during the office visit or urgent care visit	Antibiotic prescribed during the same encounter as the diagnosis	Encounter for patients aged 3–17 years at the time of encounter Diagnosis of pharyngitis and tested negative for *Streptococcus*	Ophthalmic route Patients with a competing antibiotic-appropriate diagnosis 30 d prior through 7 d after the visit
Pharyngitis, adults	Monthly prescription rate of antibiotics for adults with diagnosis of pharyngitis and tested negative for *Streptococcus*	Percentage of encounters for patients aged ≥18 years with a diagnosis of pharyngitis and had negative strep test result who were prescribed antibiotic during the office visit or urgent care visit	Antibiotic prescribed during the same encounter as the diagnosis	Encounter for patients aged ≥18 years at the time of encounter Diagnosis of pharyngitis and tested negative for *Streptococcus*	Ophthalmic medication route Patients with a competing antibiotic-appropriate diagnosis 30 d prior through 7 d after the visit
Acute bronchitis, URI, and influenza, adults	Monthly prescription rate of antibiotics for acute bronchitis, URI, influenza in adults	Percentage of encounters for patients aged ≥18 years with a diagnosis of acute bronchitis, URI, Influenza who were prescribed an antibiotic during the office visit or urgent care visit	Antibiotic prescribed during the same encounter as the diagnosis	Encounter for patients aged ≥18 years at the time of encounter Diagnosis of Acute Bronchitis, URI, Influenza	Ophthalmic medication route Patients with a competing antibiotic-appropriate diagnosis 30 d prior through 7 d after the visit Patients who had a comorbid condition diagnosis on the date of inclusionary diagnosis or 12 months prior to date of inclusionary diagnosis
Diagnosis shifting measures					
Diagnosis shifting	Prescription rate of antibiotics for all diagnosis shifting codes	Percentage of encounters for patients aged ≥3 months with a diagnosis shifting diagnosis were prescribed an antibiotic	Antibiotic prescribed during the same encounter as the diagnosis	Encounter for patients aged ≥3 months at the time of the encounter Diagnosis shifting code	None
All-antibiotic measure					
All antibiotics	Prescription rate of antibiotics for all urgent care visits	Percentage of encounters for patients of any age were prescribed an antibiotic	Antibiotic prescribed	Encounter for all ages	None

Urgent-care stewardship program implementation

In FY19, review of health system data indicated that antibiotic prescribing was generally the highest in the urgent care clinics. This resulted in an initiative presented to the NMG Urgent Care Quality Committee, which included regional medical directors. Following approval by this committee, next steps included multiple introductory meetings between the lead regional medical director and local urgent-care physician leaders. The meeting introduced a review of ARI measure definitions, inclusion and exclusion criteria, and baseline data. These meetings were effective in gaining understanding and support from these key leaders. All of the regional medical directors as well as these lead urgent-care physicians performed random chart audits, provided feedback, and verified the accuracy of the data being captured by the stewardship measures.

An educational initiative was developed and implemented at urgent care clinics across multiple regions. Data for the 4 measures were presented to all the clinicians by the lead medical director at multiple immediate-care regional quarterly meetings. Specialty and regional data were also presented at the quarterly Urgent

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

Care Leadership meetings, Ambulatory Pharmacy and Therapeutics Committee meetings, and the monthly System Antimicrobial Stewardship Quality Committee meetings.

Intervention design

In designing our interventions, we considered the competing priorities of our integrated academic health system. The goal of these interventions was not only to improve clinician antibiotic use but also (1) to not interfere with clinician workflows at the point of care (eg, introducing a hard stop in the electronic health record if only a nonantibiotic appropriate diagnosis was documented during a patient visit), (2) to not cause undesirable behavior change like diagnosis shifting, and (3) to not decrease patient satisfaction. We catalogued stewardship-related activities from September 2019 through September 2021 (Appendix 1.C online). Different interventions were introduced, mainly starting in December 2019, among the regions and urgent care clinics based on operational staff availability as well as decision making by the AASC, quality directors, and medical directors. In this intervention design, we used comparative feedback, clinician and patient education, and commitment posters.

Interventions—Clinician comparative feedback and education

Comparative feedback

Regional-level comparative antibiotic prescription data were shared with clinicians and leadership through multiple regional and quality committee meetings. In addition, we developed a quality-measure summary report using the NMG Enterprise Data Warehouse (EDW), which provided individual clinician antibiotic prescribing rates and compared them with the overall regional rates (Appendix 1.D online). We leveraged clinicians' competitive nature and sense of group pride by providing comparisons of health-system regions and specialties (ie, urgent care vs primary care).[21] This report included the 4 ARI stewardship measures, the denominator for the last 12 months, and individual and regional-level antibiotic prescribing rates. The report did not include the diagnosis shifting measure. Regional medical directors reviewed the report with individual physicians and/or APPs annually to discuss potential barriers and opportunities for improvement. Additional follow-up was conducted with individual clinicians who had greater opportunity for improvement in their antibiotic prescribing.

Video

All urgent-care clinicians were assigned and required to view an internally developed 3-minute video showcasing a physician–patient interaction.[22] The video showed a physician explaining the diagnosis of a viral illness, why an antibiotic prescription was not necessary, the expected duration of illness, and symptom management options.

Presentation by subject-matter expert

A physician champion also conducted a series of educational sessions discussing appropriate management of viral illnesses for urgent care clinicians. This forum also provided the opportunity for dialogue, questions, and answers.

Interventions—Patient education

Commitment posters

The CDC "A Commitment to Our Patients About Antibiotics" poster was printed (18×24 inches), signed by clinicians working in each individual location, and posted in each exam room facing the examination table in each urgent care clinic.[23,24]

Patient education pamphlets

A trifold patient education pamphlet was developed and made available to urgent care clinics explaining the potential harms of being prescribed and taking antibiotics for viral illnesses.

Impact of the COVID-19 pandemic

During the initial COVID-19 period, from March 2020 to July 2020, the visit volume decreased dramatically in all urgent care clinics. Many urgent care locations implemented drive-through testing sites for influenza, pharyngitis, and COVID-19 and eventually became the outpatient COVID-19 testing sites for the system. Urgent care clinics resumed in-clinic testing in June 2020 for influenza, pharyngitis, and COVID-19. Each clinic managed telemedicine visits from March 2020 onward.

Statistical analysis

We calculated and report means (with standard deviations) and percentages. We examined visits and antibiotic prescribing initially by year. For antibiotic prescribing, we calculated the difference in antibiotic prescribing rates from FY19 to FY21 and the 95% confidence interval (CI) of the differences. We examined trends in visit rates and antibiotic prescribing over time by month. To compare antibiotic prescribing and patient satisfaction within each study year, we calculated Pearson correlation coefficients and *P* values.

Results

Clinician survey

To the survey, we received 38 responses (response rate, 41%) and 51 answers. Clinicians said the most common reasons for prescribing antibiotics for viral respiratory diagnoses were (1) fear of receiving a poor postvisit patient satisfaction score (42%), (2) to treat superimposed secondary bacterial infections (37%), (3) patient perception of the value of the clinic visit (32%), and (4) to instruct the patient wait and fill the prescription if the symptoms worsen (24%) (Appendix 1.E online).

Patient characteristics

From FY19 to FY21, 576,609 patients made 1,358,816 visits to the urgent care practices. Patients had a mean age of 42 years; 57% were women; 78% were white; and 9% were Latino (Table 2c and Table 3). Overall, patients had a median of 0 comorbidities, took a median of 3 prescription medications, and had a median of 1 physician visit during the study period. Also, 77% of patients had a primary care physician listed. Unique patients with a stewardship visit, compared to patients overall, were younger, were more likely to be women, to be single, and to have private insurance. They were less likely to make physician visits or emergency department visits or to be hospitalized (Table 2a and 2c). From FY19, the mean age of stewardship visit patients decreased from 35 to 30 years (Table 2a); the mean age of all patients increased from 40 to 44 years (Table 2c).

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

Table 2a. Unique Patients in Denominator for Any Stewardship Measure[a]

Patient Population Characteristics	FY19	FY20	FY21	Total Unique Patients FY19–FY21
Stewardship	(N=40,012)	(N=33,987)	(N=23,369)	(N=89,026)
Age, mean y (SD)	35 (20)	34 (19)	30 (19)	33 (19)
Sex, female, no. (%)[b]	24,402 (61)	20,712 (61)	14,203 (61)	53,973 (61)
Ethnicity, Hispanic or Latino, no. (%)	3,589 (9)	3,466 (10)	2,735 (12)	8,873 (10)
Race, no. (%)				
White	30,703 (77)	25,921 (76)	17,610 (76)	67,834 (76)
Black	2,586 (7)	2,168 (6)	1,494 (6)	5,689 (6)
Asian	2,065 (5)	1,860 (6)	1,064 (5)	4,547 (5)
Other/unknown	4,658 (12)	4,038 (12)	3,201 (14)	10,956 (12)
Marital status, no. (%)				
Married/Partner	16,164 (40)	13,416 (40)	7,170 (31)	33,825 (38)
Divorced/separated/widowed	1,782 (5)	1,387 (4)	738 (3)	3,639 (4)
Single	20,623 (52)	17,989 (52)	14,335 (61)	48,013 (54)
Other/unknown	1,443 (4)	1,195 (4)	1,126 (5)	3,549 (4)
Insurance, no. (%)				
Private	31,690 (79)	26,980 (79)	18,111 (78)	70,268 (79)
Medicaid	3,486 (9)	3,471 (10)	3,033 (13)	8,820 (10)
Medicare	3,747 (9)	2,619 (8)	1,284 (6)	7,170 (8)
Self-pay/other	988 (3)	830 (2)	881 (4)	2,544 (3)
Comorbidities, median no.	0	0	0	0
Other prescriptions, median no.	2	2	1	2
Physician visits in period, median no.	1	0	1	1
Counts of in-person encounters between patient and any clinician during the study period, mean (SD) and median	2 (5) and 1	2 (4) and 1	2 (4) and 1	2 (4) and 1
ED visits in period, no. (%)				
0	35,071 (88)	29,649 (87)	20,128 (86)	78,657 (88)
1	3,529 (9)	3,136 (9)	2,267 (10)	8,745 (10)
2	859 (2)	697 (2)	560 (2)	2,094 (2)
≥3	553 (1)	505 (2)	414 (2)	1,418 (2)
Hospitalizations in period, no. (%)				
0	38,651 (97)	32,911 (97)	22,614 (97)	86,381 (97)
1	1,217 (3)	944 (3)	674 (3)	2,814 (3)
2	107 (<1)	96 (<1)	55 (<1)	258 (<1)
≥3	37 (<1)	36 (<1)	26 (<1)	99 (<1)
Primary care clinician listed, no. (%)	30,155 (76)	25,719 (76)	17,039 (73)	66,290 (75)

Note. FY, fiscal year and FY19 indicates fiscal year 2019.
[a]Percentages may not add up to 100% because of rounding.
[b]1 patient was missing data for sex.

Antibiotic prescribing

Examined by year, from FY19 to FY21, antibiotic prescribing for stewardship measures decreased from 34% to 12% (−22%; 95% CI, −23% to −22%) (Table 3). By absolute percentage, the largest decreases in antibiotic prescribing were in the adult acute bronchitis, URI, influenza measure, with a mean decrease of 28% (95% CI, −29% to −27%). The number of qualifying visits also notably declined from 21,531 in FY19 to 7,341 in FY21. For adult acute bronchitis, URI, and flu, the biggest decrease was for antibiotic prescribing for acute bronchitis (−25%; 95% CI, −28% to −23%).

Antibiotic prescribing for the diagnosis shifting measures decreased from 63% to 35% (−28%; 95% CI, −28% to −27%), and the number of visits that qualified for the diagnosis shifting measure also decreased. Antibiotic prescribing for any visit decreased from 30% to 10% (−20%; 95% CI, −20% to −20%) and the year-to-year total number of visits increased.

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

Table 2b. Unique Patients in Denominator for Diagnosis Shifting Measure[a]

Patient Population Characteristics	FY19	FY20	FY21	Total Unique Patients FY19–FY21
Diagnosis Shifting	(N = 52,880)	(N = 48,818)	(N = 28,271)	(N = 115,183)
Age, mean y (SD)	41 (20)	40 (20)	40 (20)	41 (20)
Sex, female, no. (%)[b]	32,208 (61)	29,402 (60)	16,915 (60)	68,986 (60)
Ethnicity, Hispanic or Latino, no. (%)	4,142 (8)	4,169 (9)	2,806 (10)	9,902 (9)
Race, no. (%)				
White	42,071 (80)	38,087 (78)	21,521 (76)	89,698 (78)
Black	3,242 (6)	3,233 (7)	1,938 (7)	7,408 (6)
Asian	2,387 (5)	2,318 (5)	1,274 (5)	5,433 (5)
Other/Unknown	5,180 (10)	5,180 (11)	3,538 (13)	12,644 (11)
Marital status, no. (%)				
Married/partner	25,483 (48)	22,546 (46)	11,966 (42)	52,752 (45)
Divorced/separated/widowed	3,462 (7)	2,985 (6)	1,570 (6)	6,952 (6)
Single	22,223 (42)	21,571 (44)	13,343 (47)	51,059 (44)
Other/unknown	1,712 (3)	1,716 (4)	1,392 (5)	4,420 (4)
Insurance, no. (%)				
Private	39,412 (75)	37,056 (76)	20,978 (74)	86,655 (75)
Medicaid	3,930 (7)	3,980 (8)	2,741 (10)	9,186 (8)
Medicare	8,133 (15)	6,470 (13)	3,340 (12)	15,718 (14)
Self-pay/Other	1,251 (2)	1,176 (2)	1,123 (4)	3,297 (3)
Comorbidities, median no.	0	0	0	0
Other prescriptions, median no.	3	3	2	3
Physician visits in period, median no.	1	1	1	1
Counts of in-person encounters between patient and any clinician during the study period, mean (SD) and median	3 (5) and 1	2 (5) and 1	3 (6) and 1	3 (5) and 1
ED visits in period, no. (%)				
0	44,777 (85)	41,117 (84)	23,211 (82)	98,943 (86)
1	5,647 (11)	5,280 (11)	3,398 (12)	13,895 (12)
2	1,428 (3)	1,388 (3)	992 (4)	3,722 (3)
≥3	1,028 (2)	1,033 (2)	670 (2)	2,534 (2)
Hospitalizations in period, no. (%)				
0	50,478 (96)	46,692 (96)	26,804 (95)	110,517 (96)
1	1,989 (4)	1,710 (4)	1,204 (4)	4,814 (4)
2	258 (1)	269 (1)	166 (1)	688 (1)
≥3	155 (<1)	147 (<1)	97 (<1)	391 (<1)
Primary care clinician listed, no. (%)	41,961 (79)	38,234 (78)	20,970 (74)	**88,718 (77)**

Note. FY, fiscal year and FY19 indicates fiscal year 2019.
[a]Percentages may not add up to 100% because of rounding.
[b]4 patients were missing data for sex.

By month, superimposed on the overall downward trend in antibiotic prescribing for the stewardship measure, in the first 3 months of the COVID-19 pandemic, the number of visits that qualified for the stewardship measure and the diagnosis shifting measure notably decreased and the antibiotic prescribing rate increased (Fig. 1). Toward the end of FY21, the diagnosis shifting measure increased.

Patient satisfaction

The patient satisfaction scores for ARI visits in FY19, FY20, and FY21 were 83%, 89%, and 89%, respectively. Examined by year, there was no association between antibiotic prescribing rates of individual clinicians and patient satisfaction for ARI visits (Fig. 2).

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

Table 2c. Unique Patients in Denominator for All Antibiotic Prescribing[a]

Patient Population Characteristics	FY19	FY20	FY21	Total Unique Patients FY19–FY21
All Antibiotics Prescribing	(N = 223,566)	(N = 264,090)	(N = 29,538)	(N = 576,609)
Age, mean y (SD)	40 (22)	43 (21)	44 (22)	42 (22)
Sex, female, no (%)[b]	131,677 (59)	153,395 (58)	187,104 (57)	327,272 (57)
Ethnicity, Hispanic or Latino, no. (%)	19,278 (9)	24,153 (9)	31,542 (10)	53,433 (9)
Race, no. (%)				
White	171,764 (77)	202,482 (77)	253,192 (77)	435,678 (76)
Black	15,433 (7)	17,653 (7)	19,894 (6)	37,906 (7)
Asian	11,737 (5)	14,328 (5)	16,869 (5)	31,270 (5)
Other/Unknown	24,632 (11)	29,627 (11)	39,583 (12)	71,755 (12)
Marital status, no. (%)				
Married/Partner	98,358 (44)	121,482 (46)	152,167 (46)	252,067 (44)
Divorced/separated/widowed	14,462 (7)	17,733 (7)	21,326 (7)	34,752 (6)
Single	102,640 (46)	114,903 (44)	140,321 (43)	262,431 (46)
Other/Unknown	8,106 (4)	9,972 (4)	15,724 (5)	27,359 (5)
Insurance, no. (%)				
Private	162,061 (73)	189,230 (72)	228,994 (70)	412,982 (72)
Medicaid	16,956 (8)	20,759 (8)	28,417 (9)	47,001 (8)
Medicare	36,048 (16)	44,735 (17)	56,760 (17)	89,232 (16)
Self-pay/Other	7,202 (3)	7,976 (3)	13,673 (4)	24,158 (4)
Comorbidities, median no.	0	0	0	0
Other prescriptions, median no.	2	2	2	2
Physician visits in period, median no.	1	2	2	5
Counts of in-person encounters between patient and any clinician during the study period, mean (SD) and median	3 (6) and 2	3 (6) and 2	4 (6) and 2	10 (14) and 6
ED visits in period, no (%)				
0	187,471 (84)	221,024 (84)	278,145 (84)	429,292 (75)
1	25,603 (12)	30,411 (12)	35,786 (11)	86,096 (15)
2	6,163 (3)	7,421 (3)	9,221 (3)	29,135 (5)
≥3	4,329 (2)	5,234 (2)	6,386 (2)	32,086 (6)
Hospitalizations in period, no. (%)				
0	212,366 (95)	249,275 (94)	309,060 (94)	513,129 (89)
1	9,075 (4)	11,584 (4)	16,022 (5)	45,974 (8)
2	1,356 (1)	2,060 (1)	2,833 (1)	10,147 (2)
≥3	769 (<1)	1,171 (<1)	1,623 (1)	7,359 (1)
Primary care clinician listed, no. (%)	177,591 (79)	214,128 (81)	264,449 (80)	445,930 (77)

Note. FY, fiscal year and FY19 indicates fiscal year 2019.
[a]Percentages may not add up to 100% because of rounding.
[b]42 patients were missing data for sex.

Discussion

We conducted a multifaceted quality-improvement project to improve antibiotic prescribing in urgent care practices that was associated with achieving the stewardship target. In addition, we noted reductions in diagnosis shifting and overall antibiotic prescribing. Patient satisfaction at ARI visits increased over time, and patient satisfaction was not associated with clinicians' antibiotic prescribing rate.

Urgent care clinics may have particularly high antibiotic-prescribing rates because of case mix (ie, urgent care practices see a higher proportion of patients with respiratory complaints) as well as high antibiotic prescribing for non–antibiotic-appropriate diagnoses. For example, Palms et al[5] reported that urgent care centers have particularly high antibiotic prescribing rates compared to medical offices, emergency departments, and retail clinics.[5] In addition, the focus on convenience and patient satisfaction may encourage inappropriate antibiotic prescribing.[9]

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

Table 3. Antibiotic Prescribing in Stewardship Measures, Diagnosis Shifting Measure, and All-Antibiotic Prescribing at Urgent Care Clinics from FY19 to FY21

Measure	FY19, % (n/N)	FY20, % (n/N)	FY21, % (n/N)	Total FY19–FY21, % (n/N)	Difference, FY19–FY21, % (95% CI)
Stewardship measures	34 (15,107/44,046)	22 (8,086/36,472)	12 (3,012/25,263)	25 (26,205/105,781)	−22 (−23 to −22)
URI, child	12 (523/4,429)	8 (288/3,526)	4 (126/3,070)	8 (937/11,025)	−8 (−9 to −7)
Pharyngitis and neg strep, child	23 (1,150/4,985)	20 (766/3,917)	9 (319/3,609)	18 (2,235/12,511)	−14 (−16 to −13)
Pharyngitis and neg strep, adult	30 (3,880/13,101)	21 (2,221/10,482)	12 (1,362/11,243)	21 (7,463/34,826)	−18 (−18 to −17)
Acute bronchitis/URI/flu, adult	44 (9,554/21,531)	26 (4,811/18,547)	16 (1,205/7,341)	33 (15,570/47,419)	−28 (−29 to −27)
Acute bronchitis	74 (6,043/8,140)	61 (3,243/5,298)	49 (817/1,675)	67 (10,103/15,113)	−25 (−28 to −23)
URI	27 (3,486/12,771)	14 (1,512/10,683)	7 (388/5,659)	19 (5,386/29,113)	−20 (−21 to −20)
Influenza	4 (25/620)	2 (56/2,566)	0 (0/7)	3 (81/3,193)	−4 (−6 to −3)
Diagnosis shifting	63 (39,400/62,205)	51 (28,428/55,837)	35 (11,211/31,649)	53 (79,039/149,691)	−28 (−28 to −27)
All antibiotic prescribing	30 (100,701/340,472)	20 (86,853/426,644)	10 (58,213/591,700)	18 (245,767/1,358,816)	−20 (−20 to −20)

Note. Neg strep, negative for *Streptococcus*; FY, fiscal year and FY19 indicates fiscal year 2019.

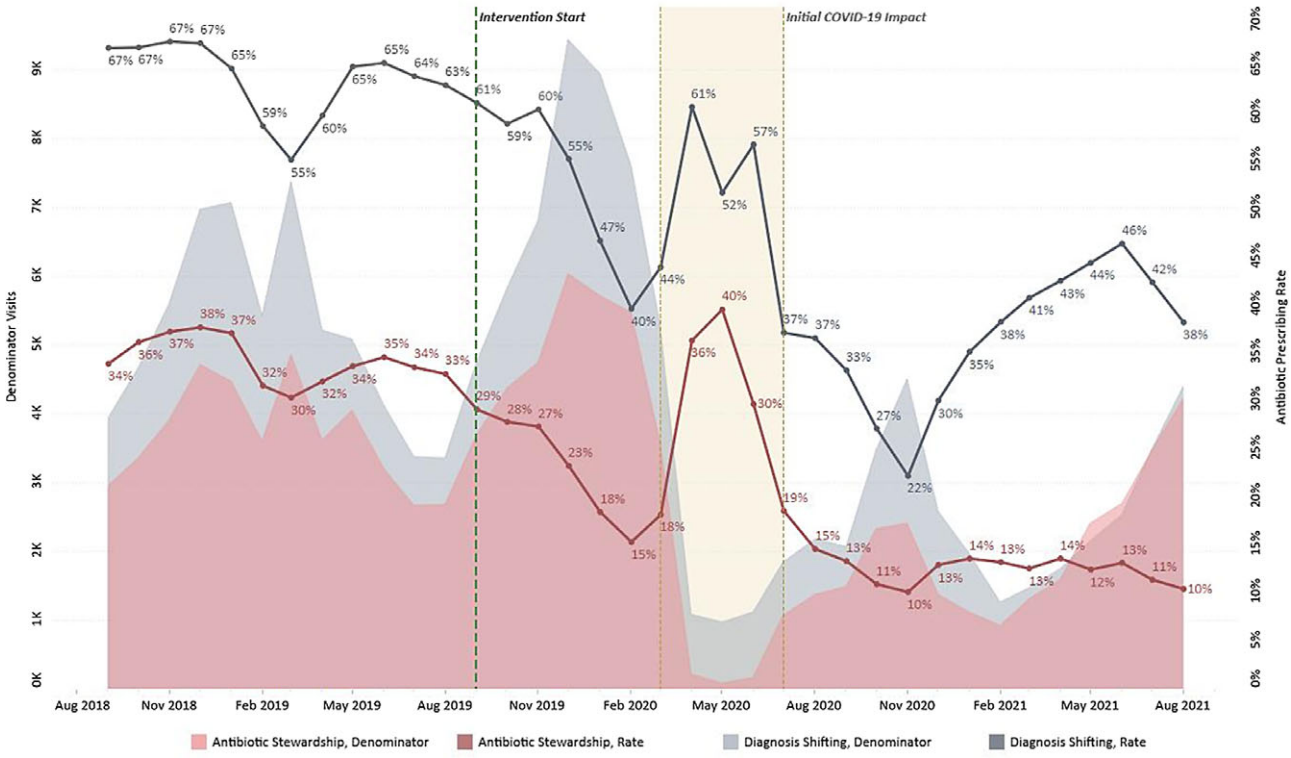
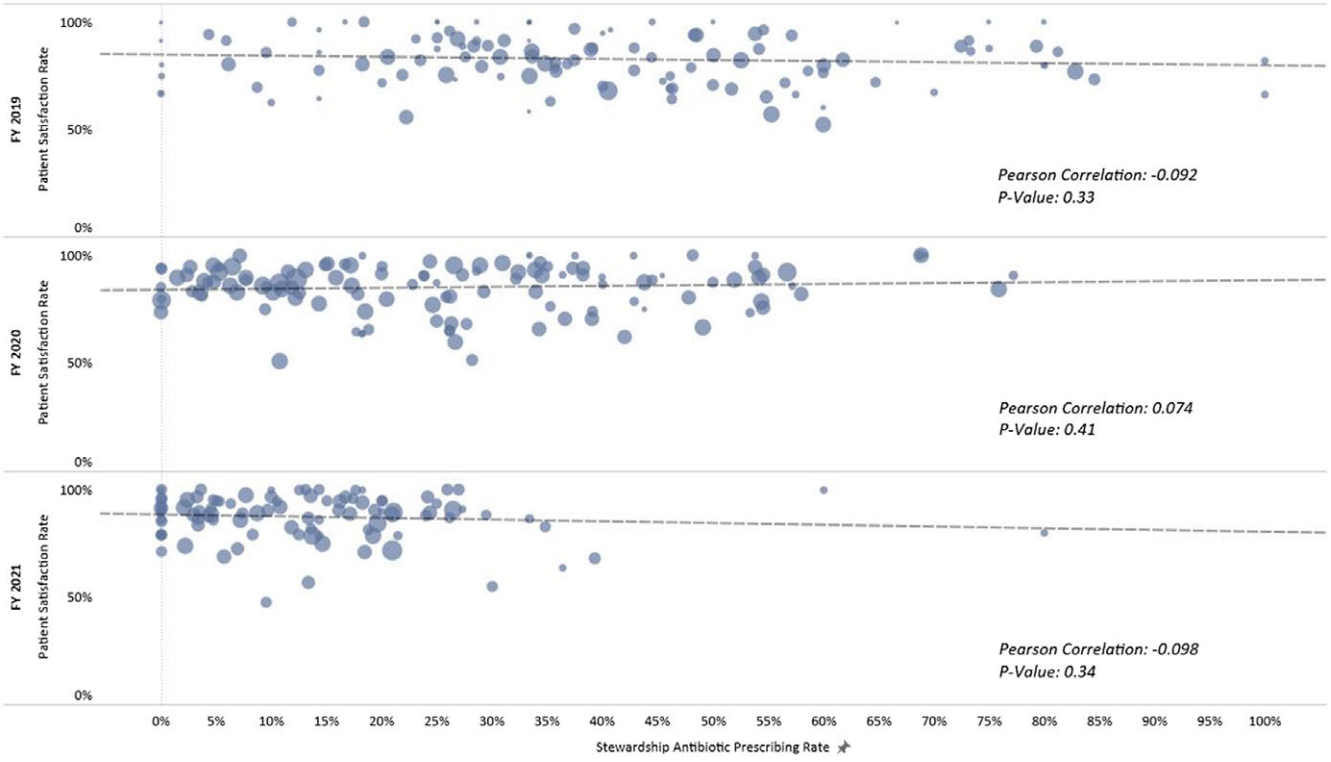


Fig. 1. Monthly antibiotic stewardship and diagnosis shifting visits and antibiotic prescribing rates from September 2018 to August 2021.

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press



Variable	FY19	FY20	FY21	All FY19–FY21
Total no. of unique clinicians with ≥1 satisfaction report	178	174	165	252
Total no. of stewardship encounters with a satisfaction report	5,604	10,130	6,570	22,304
No. of satisfaction reports per clinician, mean	31	58	39	89

Note. FY, fiscal year and FY19 indicates fiscal year 2019.

Fig. 2. Stewardship antibiotic prescribing and patient satisfaction for individual clinicians.

Other antibiotic stewardship efforts in urgent care clinics have been successful,[25–30] but to our knowledge, none have simultaneously measured stewardship, diagnosis shifting, and overall antibiotic prescribing while striving to maintain patient satisfaction.

Our survey confirmed prior work; clinicians' main concern in prescribing antibiotics for viral respiratory diagnoses was maintaining patient satisfaction and meeting patients' expectations.[17,18] Clinicians also cited use of "delayed" prescriptions despite many reasons why delayed antibiotics are inadvisable.[31,32] With a focus on clinician–patient communication, individual antibiotic prescribing rates for ARIs were not associated with decreased patient satisfaction.

Our intervention and measurement study had several limitations. First, this was not a randomized trial, we did not use a comparison or control group, and the changes we noted happened during the COVID-19 pandemic. At the beginning of the COVID-19 pandemic, we observed an increase in the antibiotic prescribing rate. We attributed this trend to the inability of clinicians to perform a physical examination due to the introduction of telemedicine visits and empirical treatment. Because the number of visits during this period was lower, the overall impact on the cumulative annual prescription rate was minimal. Excluding rapid shifts in visits and antibiotic prescribing during the initial phase of the COVID-19 pandemic, there appeared to be a reasonably consistent downward trend in antibiotic prescribing over the study period.

Second, the intervention was not implemented in a uniform way among the urgent care practices, making it impossible to attribute changes to any one activity or component of the intervention. Third, diagnoses depended on clinician coding. By examining a diagnosis shifting measure, we tried to ensure that improvements in the stewardship measure were not a result of "gaming." This intervention improved diagnosis shifting as well as overall antibiotic prescribing. Fourth, the COVID-19 pandemic and the staggered implementation among practices precluded our use of a more robust primary analysis, like an interrupted time series.[33] However, a post-hoc interrupted time series demonstrated a significant step decrease in antibiotic prescribing (Appendix 1.F online).

Despite the apparent success of these efforts, the antibiotic prescribing rate for non–antibiotic-appropriate diagnoses remained ~10% by the end of the measurement period. In addition, in the last year of the intervention, there appeared to be a dissociation between the stewardship and the diagnosis shifting measures that should be monitored.

In conclusion, it is possible to decrease antibiotic prescribing for presumed viral illnesses in the urgent-care setting and maintain

https://doi.org/10.1017/ice.2022.164 Published online by Cambridge University Press

patient satisfaction. Key elements of success may have included an ambulatory antimicrobial stewardship committee, physician champions, having data for analysis and reporting, and educational resources for patients and prescribers. Decreasing antibiotic prescribing for non–antibiotic-appropriate diagnoses has the potential to start a virtuous cycle for patients because nonreceipt of antibiotics may be associated with less antibiotic seeking in the future.[34]

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2022.164

Acknowledgments. We thank the members of the Ambulatory Antimicrobial Stewardship Subcommittee, System Antimicrobial Stewardship Quality Committee, and Immediate Care Center Quality Committee for their contributions. We are grateful to Immediate Care Center clinicians who participated in the survey, performed chart audits, and shared their insights.

Financial support. No funding specifically supported this work. Dr. Linder is supported by a contract from the Agency for Healthcare Research and Quality (grant no. HHSP233201500020I) and grants from the National Institute on Aging (grant nos. R33AG057383, R33AG057395, P30AG059988, and R01AG069762), the Agency for Healthcare Research and Quality (grant nos. R01HS026506 and R01HS028127), and the Peterson Center on Healthcare.

Conflicts of interest. No author reports potential conflicts of interest related to this article.

References

1. Duffy E, Ritchie S, Metcalfe S, Van Bakel B, Thomas MG. Antibacterials dispensed in the community comprise 85%–95% of total human antibacterial consumption. *J Clin Pharm Ther* 2018;43:59–64.
2. Chua KP, Fischer MA, Linder JA. Appropriateness of outpatient antibiotic prescribing among privately insured US patients: ICD-10-CM based cross sectional study. *BMJ* 2019;364:k5092.
3. Suda KJ, Hicks LA, Roberts RM, Hunkler RJ, Danziger LH. A national evaluation of antibiotic expenditures by healthcare setting in the United States, 2009. *J Antimicrob Chemother* 2013;68:715–718.
4. Dosh SA, Hickner JM, Mainous AG 3rd, Ebell MH. Predictors of antibiotic prescribing for nonspecific upper respiratory infections, acute bronchitis, and acute sinusitis. an UPRNet study. Upper Peninsula Research Network. *J Fam Pract* 2000;49:407–414.
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. Ebell MH, Radke T. Antibiotic use for viral acute respiratory tract infections remains common. *Am J Manag Care* 2015;21:e567–e575.
7. Sharp AL, Shen E, Kanter MH, Berman LJ, Gould MK. Low-value antibiotic prescribing and clinical factors influencing patient satisfaction. *Am J Manag Care* 2017;23:589–594.
8. Jones BE, Sauer B, Jones MM, *et al.* Variation in outpatient antibiotic prescribing for acute respiratory infections in the veteran population: a cross-sectional study. *Ann Intern Med* 2015;163:73–80.
9. Incze MA, Redberg RF, Katz MH. Overprescription in urgent care clinics—the fast and the spurious. *JAMA Intern Med* 2018;178:1269–1270.
10. Jerant A, Fenton JJ, Kravitz RL, *et al.* Association of clinician denial of patient requests with patient satisfaction. *JAMA Intern Med* 2018;178:85–91.
11. Hamm RM, Hicks RJ, Bemben DA. Antibiotics and respiratory infections: are patients more satisfied when expectations are met? *J Fam Pract* 1996;43:56–62.
12. Ray DA, Rohren CH. Characteristics of patients with upper respiratory tract infection presenting to a walk-in clinic. *Mayo Clin Proc* 2001;76:169–173.
13. Hong JS, Philbrick JT, Schorling JB. Treatment of upper respiratory infections: do patients really want antibiotics? *Am J Med* 1999;107:511–515.
14. Martinez KA, Rood M, Jhangiani N, Kou L, Boissy A, Rothberg MB. Association between antibiotic prescribing for respiratory tract infections and patient satisfaction in direct-to-consumer telemedicine. *JAMA Intern Med* 2018;178:1558–1560.
15. Foster CB, Martinez KA, Sabella C, Weaver GP, Rothberg MB. Patient satisfaction and antibiotic prescribing for respiratory infections by telemedicine. *Pediatrics* 2019;144:e20190844.
16. Sanghavi P, McWilliams JM, Schwartz AL, Zaslavsky AM. Association of low-value care exposure with healthcare experience ratings among patient panels. *JAMA Intern Med* 2021;181:941–948.
17. Patel A, Pfoh ER, Misra Hebert AD, *et al.* Attitudes of high versus low antibiotic prescribers in the management of upper respiratory tract infections: a mixed methods study. *J Gen Intern Med* 2020;35:1182–1188.
18. Kohut MR, Keller SC, Linder JA, *et al.* The inconvincible patient: how clinicians perceive demand for antibiotics in the outpatient setting. *Fam Pract* 2019;37:276–282.
19. Linder JA. Breaking the ambulatory antibiotic prescribing cycle with all-antibiotic stewardship, patient stewardship, and visit stewardship. *Clin Infect Dis* 2021;73:e1680–e1683.
20. HEDIS measures and technical resources. National Committee for Quality Assurance website. https://www.ncqa.org/hedis/measures/. Accessed February 7, 2022.
21. Linder JA, Meeker D, Fox CR, *et al.* Effects of behavioral interventions on inappropriate antibiotic prescribing in primary care 12 months after stopping interventions. *JAMA* 2017;318:1391–1392.
22. Choose wisely: avoiding unnecessary antibiotic prescribing in ambulatory practice. northwestern medicine antimicrobial stewardship program. Northwestern Medcine Antimicrobial and Diagnostic Stewardship Program website. https://asp.nm.org/uploads/b/90789983-155283105139956222/181105.2_choose_wisely_antibiotics_for_delivery_263.mp4. Accessed January 31, 2022.
23. Meeker D, Knight TK, Friedberg MW, *et al.* Nudging guideline-concordant antibiotic prescribing: a randomized clinical trial. *JAMA Intern Med* 2014;174:425–431.
24. Sanchez GV, Fleming-Dutra KE, Roberts RM, Hicks LA. Core elements of outpatient antibiotic stewardship. *MMWR Recomm Rep* 2016;65:1–12.
25. Link TL, Townsend ML, Leung E, Kommu S, Vega RY, Hendrix CC. Reducing Inappropriate antibiotic prescribing for adults with acute bronchitis in an urgent care setting: a quality improvement initiative. *Adv Emerg Nurs J* 2016;38:327–335.
26. 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.
27. Harris RH, MacKenzie TD, Leeman-Castillo B, *et al.* Optimizing antibiotic prescribing for acute respiratory tract infections in an urban urgent care clinic. *J Gen Intern Med* 2003;18:326–337.
28. Cummings PL, Alajajian R, May LS, *et al.* Utilizing behavioral science to improve antibiotic prescribing in rural urgent care settings. *Open Forum Infect Dis* 2020;7:ofaa174.
29. Laude JD, Kramer HP, Lewis M, *et al.* Implementing antibiotic stewardship in a network of urgent care centers. *Jt Comm J Qual Patient Saf* 2020;46:682–690.
30. Ha D, Ong'uti S, Chang A, *et al.* Sustained reduction in urgent care antibiotic prescribing during the coronavirus disease 2019 pandemic: an academic medical center's experience. *Open Forum Infect Dis* 2022;9:ofab662.
31. Rowe TA, Linder JA. Delayed antibiotic prescriptions in ambulatory care: reconsidering a problematic practice. *JAMA* 2020;323:1779–1780.
32. Rowe TA, Linder JA. Novel approaches to decrease inappropriate ambulatory antibiotic use. *Expert Rev Anti Infect Ther* 2019;17:511–521.
33. Schweizer ML, Braun BI, Milstone AM. Research methods in healthcare epidemiology and antimicrobial stewardship-quasi-experimental designs. *Infect Control Hosp Epidemiol* 2016;37:1135–1140.
34. Shi Z, Barnett ML, Jena AB, Ray KN, Fox KP, Mehrotra A. Association of a clinician's antibiotic prescribing rate with patients' future likelihood of seeking care and receipt of antibiotics. *Clin Infect Dis* 2021;73:e1672–e1679.