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RESEARCH

Impact of outpatient antimicrobial stewardship guideline implementation in an urgent care setting

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A R T I C L E I N F O

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A B S T R A C T

Background: Urgent care medicine is a rapidly growing health care sector where patients are commonly treated for acute infectious diseases−related conditions. However, there are few antimicrobial stewardship interventions described in these settings.
Objective: The objective of this study is to determine whether implementing outpatient antimicrobial stewardship guidelines would improve antibiotic prescribing for acute upper respiratory tract infections (ARTIs), skin and soft tissue infections (SSTI), and urinary tract infections (UTI) at a single urgent care site.
Methods: This was a pre-post interventional study comparing antibiotic prescribing patterns for ARTI, SSTI, and UTI at a single urgent care site in the preintervention group (November 2019 to January 2020) with the postintervention group (November 2020 to January 2021) after implementation of outpatient stewardship guidelines. A second urgent care site that did not receive any interventions served as a control. The outpatient stewardship guidelines were implemented in October 2020 via didactic provider education and pocket guide distribution. The primary end point was the rate of total guideline-concordant antibiotic prescribing. Secondary end points included the rates of guideline concordance of each component of the prescription, including antibiotic selection, duration, dose, therapy indication, and patient safety outcomes.
Results: The primary outcome of total guideline-concordant antibiotic prescribing significantly improved after implementation of outpatient antimicrobial stewardship guidelines at the study site (50% vs. 70%, $P < 0.001$), which was also reflected when comparing postintervention study site with postperiod control site (70% vs. 48%, $P < 0.001$). There was a statistically significant improvement in guideline-concordant duration of antibiotic therapy (43% vs. 61%, $P = 0.001$), driven by a reduction in antibiotic duration for UTI (7 [interquartile range (IQR) 5−7] vs. 5 [IQR 5−7] days, $P = 0.007$), which was also observed when comparing the postintervention study site with the postperiod control site (61% vs. 48%, $P = 0.02$). Patient safety outcomes were similar between groups.
Conclusion: An antimicrobial stewardship intervention comprising institutional outpatient guideline implementation and provider education significantly improved total guideline-concordant antibiotic prescribing by 20% for ARTI, UTI, and SSTI in an urgent care site.

Background

Although hospital antimicrobial stewardship program (ASP) interventions improve antibiotic prescribing in the inpatient settings, a recent national surveillance study revealed at least 30% of outpatient antibiotic prescriptions in the United States are unnecessary, illustrating the need for ASPs to expand to outpatient clinical settings.[1,2] In 2016, the Centers for Disease Control and Prevention (CDC) published the Core Elements of Outpatient Antibiotic Stewardship to provide guidance for clinicians practicing in outpatient care settings, such as primary care offices, medical and surgical specialties, emergency departments, and urgent cares.[3] The 4 core elements are commitment, action for policy and practice, tracking and reporting, and education and expertise.[3] In January 2020, The Joint Commission (TJC) instituted new requirements that echo the core elements developed by the CDC for antimicrobial stewardship in the outpatient

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Key Points

Background:

- Urgent cares are a common setting for patients to receive treatment for acute infectious diseases.
- There is a lack of outpatient stewardship interventions described in urgent care settings.

Findings:

- Implementing outpatient stewardship guidelines significantly improved antibiotic prescribing by 20% in the urgent care setting.

setting.[4] Although both the CDC and TJC emphasize the importance of collecting, analyzing, tracking, and reporting stewardship data as a core stewardship strategy, hospital ASPs may not have adequate resources to allow for timely expansion to the outpatient setting.[3,5] The new requirements emphasize the identification of antimicrobial stewardship leaders, which are commonly antimicrobial stewardship pharmacists or infectious diseases physicians with within health care institutions. These leaders are not commonly associated with outpatient sites, such as urgent care facilities, creating a possible barrier for implementation of antimicrobial stewardship practices. Developing outpatient-specific guidelines to establish antibiotic prescribing standards and providing educational resources to clinicians about antibiotic prescribing are 2 strategies that may require less time and resources to implement.

Although there are several successful ASPs described in primary care practices, a paucity of literature exists exploring antimicrobial stewardship initiatives in urgent care centers.[6–11] Urgent care medicine is a rapidly growing health care sector servicing high volumes of patients presenting with common infections requiring antimicrobial therapy. A recent study reported that almost 40% of urgent care visits are linked with an antibiotic prescription, compared with 7% with traditional medical office visits.[10] In the outpatient setting, the 3 most commonly encountered infectious disease states are acute respiratory tract infections (ARTI), including sinusitis, pharyngitis, bronchitis, and other nonspecific respiratory tract infections; urinary tract infections (UTIs); and skin and soft tissue infections (SSTIs).[11] Owing to the frequent use of antimicrobial agents in each of the aforementioned disease states, they serve as quality targets for establishing antimicrobial stewardship practices. The purpose of this study was to evaluate whether a multimodal stewardship approach with implementation of outpatient institutional guidelines and provider education would improve antibiotic prescribing for ARTI, UTI, and SSTI at a single urgent care site.

Methods

Study location

This institutional review board–approved study was conducted at a single urgent care site affiliated with a large health care system. This urgent care network operates more than 30 urgent care centers in a large metropolitan area. A second urgent care site within the network with the same staffing model and similar patient volumes was selected to serve as a control. Each urgent care location is staffed by 3 physicians and 3 advanced practice providers (APPs) and services more than 22,000 patient visits annually. Providers did not overlap between these 2 urgent care locations.

Study design

This study was a pre-post interventional study design evaluating the impact of implementing an outpatient antimicrobial stewardship guideline at a single urgent care site. The preintervention period included patients treated from November 1, 2019, to January 31, 2020. The postintervention period included patients treated from November 1, 2020, to January 31, 2021. A second urgent care clinic with similar patient volume and number of providers was chosen as the control site. The control urgent care location was evaluated for the same antibiotic prescribing outcomes during the same time periods as the study site, although they did not receive the intervention. Given the pre-post study design, each urgent care clinic location was intended to serve as its own control. All adult patients at the age of at least 18 years who were treated for ARTI (including sinusitis, pharyngitis, bronchitis, or other nonspecific upper respiratory tract infection), UTI, or SSTI were included. A list of patients treated for ARTI, UTI, and SSTI was extracted from the electronic medical record based on their ICD-10 diagnosis code, antibiotic prescriptions issued during the study time frames, and medications for symptomatic treatment (e.g., urinary analgesics, cough suppressants, antipyretics). This list was randomized within each time period to account for potential temporal confounding factors, such as seasonality, (e.g., antibiotic prescribing may have improved in November immediately after the implementation of guidelines but may have waned over the following months), and then screened for inclusion. Patients were excluded if any of the following criteria were met: concurrent treatment with an antibiotic at index visit, recurrent or chronic infection, confirmed positive rapid diagnostic test for influenza or severe acute respiratory syndrome coronavirus 2 (coronavirus disease 2019 [COVID-19]), known exposure to a person with COVID-19, complicated cystitis or pyelonephritis, treatment of suspected polymicrobial SSTI (e.g., secondary to animal bite, diabetic foot infection, or burn), pregnancy, or immunocompromised patients. The group size between urgent care locations, time periods, and infection types were planned to each contain the same number of patients for equal size group comparisons. The randomized patient lists by disease state and time period with the least number of patients were exhaustively screened first, and then the other randomized patient lists were screened and included the same number of patients.

Outpatient antimicrobial stewardship guidelines

Before this study, institutional inpatient guidelines for the treatment of UTI and SSTI were already published. For this study, a new outpatient stewardship guideline was developed with a focus on acute sinusitis, acute pharyngitis, acute bronchitis, other nonspecific upper respiratory tract infections, uncomplicated and complicated cystitis, and mild SSTI. The guideline summarized the clinical signs and symptoms, diagnostic criteria, common organisms, and antibiotic prescribing recommendations for each disease state. Information included in this outpatient guideline were based on national clinical practice guidelines and recommendations, including the Infectious Diseases Society of America and the American Academy of Family Physicians.[12–16] This outpatient guideline was then reviewed during a 1-hour didactic lecture presented to the study site providers by 2 pharmacists and an infectious diseases physician. The outpatient stewardship guideline was also condensed into a pocket card resource and distributed to the study site providers. All providers of the study site were present for the didactic lecture reviewing the new outpatient antimicrobial guideline. The control site did not receive any antimicrobial stewardship interventions.

Study end points

The primary end point of this study was to compare the rate of total guideline-concordant antibiotic therapy before versus after the implementation of outpatient antimicrobial stewardship guidelines. Total guideline concordance was defined as meeting all of the following criteria as outlined by the outpatient stewardship guidelines: guideline-concordant therapy indication, guideline-concordant drug selection, guideline-concordant dosage, guideline-concordant frequency, and guideline-concordant duration. Each individual component of the antibiotic prescription was evaluated as secondary end points. Baseline patient demographic information, including the Charlson comorbidity index, antibiotic allergies, and provider type, was collected. Patient safety outcomes, such as adverse effects, infection-related revisits, infection-related hospitalizations, and new *Clostridioides difficile* infection, were also evaluated.

Statistical analysis

A sample size calculation performed a priori estimated that at least 712 patients per site would be needed to detect a 10% change in the primary end point using a 2-sided alpha of 0.05 and 80% power. The primary end point of total guideline-concordant antibiotic regimens between the preintervention and postintervention groups was compared using Pearson chi-square test. Secondary end points collected as categorical data were compared using Pearson chi-square test or the Fisher exact test, as appropriate. For the secondary end points of guideline-concordant drug selection, guideline-concordant dosage, guideline-concordant frequency, and guideline-concordant duration, the antibiotic prescriptions that were not guideline concordant for therapy indication (e.g., antibiotics prescribed for acute bronchitis) were excluded from analysis. The baseline demographics of patients' age between groups were compared using the *t* test. The Charlson comorbidity index scores and durations of antibiotic therapy in days were compared between groups using the Mann-Whitney *U* test. Statistical analyses were performed using SPSS software, version 26.0 (IBM Corp, Armonk, NY).

Results

Baseline patient demographics

After screening 1398 patients for eligibility for matched group size between urgent care sites, time periods, and infection types, each urgent care site had a total of 520 patients that met criteria for inclusion. Of the 520 patients, 260 patients represented the preintervention period and 260 patients were from the postintervention period. Each time period was further divided into 150 patients with ARTI, 80 patients with UTI, and 30 patients with SSTI (Figure 1). The most common reason for exclusion was caused by a positive rapid diagnostic test for COVID-19 or influenza or known exposure to person with COVID-19. With the COVID-19 pandemic occurring during the postperiod of this study, there were overall fewer patient visits at both sites in the postperiod so ultimately this study did not meet power. Baseline patient demographics were overall similar within and between groups for both the study site and control site, with the exception of an older patient population (47.9 [±17.4] vs. 44.2 [±16.9] years, $P = 0.02$) and more male patients (33% vs. 25%, $P = 0.04$) in the preperiod control site than the preintervention study site. In addition, more patients were treated by an APP in the postperiod at the control site than the preperiod (56% vs. 42%, $P = 0.002$) (Table 1).

Primary and secondary outcomes

The primary outcome of total guideline-concordant antibiotic prescribing significantly improved after implementation of outpatient antimicrobial stewardship guidelines at the study site (50% vs. 70%, $P < 0.001$), which was also reflected when comparing the postintervention study site with the postperiod control site (70% vs. 48%, $P < 0.001$) (Table 2). No statistically significant difference was found in guideline-concordant frequency both within and between groups. However, the preintervention study site compared with the preperiod control site had significantly higher rates of guideline-concordant drug choice (81% vs. 71%, $P = 0.03$) and guideline-concordant drug dose (95% vs. 90%, $P = 0.01$), although no differences were found within each site by time period.

Furthermore, a statistically significant improvement was observed for guideline-concordant antibiotic duration at the study site (43% vs. 61%, $P = 0.001$), which was also reflected when comparing the postintervention study site with the postperiod control site (61% vs. 48%, $P = 0.02$). The overall reduced antibiotic duration of therapy in the study site was primarily seen in patients with UTI (preintervention 7 [interquartile range (IQR) 5–7] vs. postintervention 5 [IQR 5–7] days, $P = 0.007$). The secondary outcome of guideline-concordant therapy indication was not significantly different between the preintervention and postintervention groups within the study site; however, in the control site, there was a statistically significant improvement in guideline-concordant therapy indication when comparing the preperiod with postperiod groups (86% vs. 92%, $P = 0.02$). The results of a subgroup analysis by infection type showed a statistically significant improvement in guideline-concordant therapy indication for patients with ARTI within the study

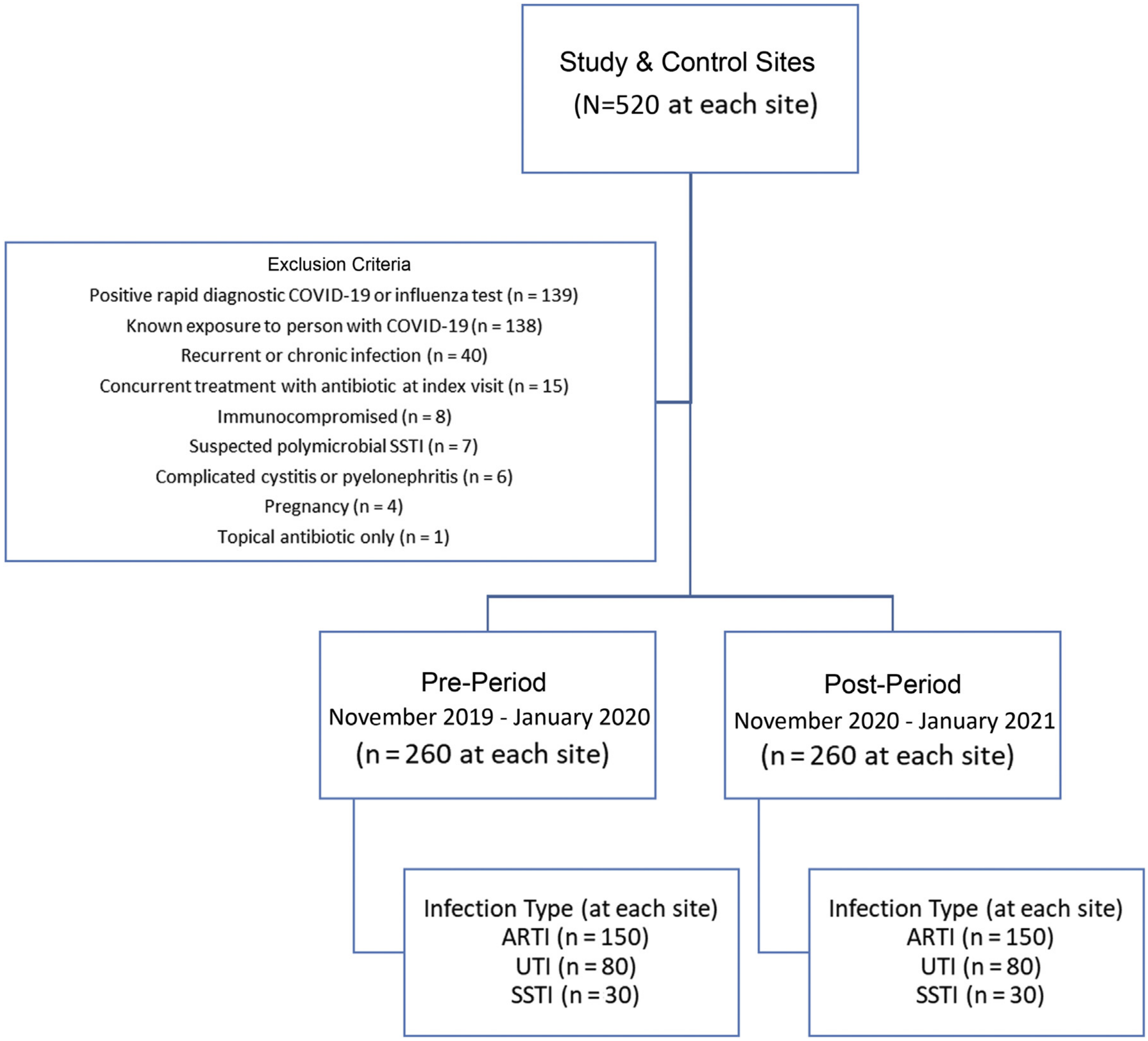

Figure 1. Distribution of patients by location, time period, and disease state. Abbreviations used: ARTI, acute respiratory tract infection; UTI, urinary tract infection; SSTI, skin and soft tissue infection.

site (87% vs. 94%, $P = 0.03$) and also within the control site (77% vs. 87%, $P = 0.02$). We also observed a significantly higher percentage of guideline-concordant therapy indication for UTI in our subgroup analysis when comparing the postperiod control site with the postintervention study site (100% vs. 90%, $P = 0.004$).

Regarding patient safety outcomes, there was no difference between groups at the study site (Table 3). Most patient safety

Table 1
Baseline patient demographics

Variable	Study site (N = 520)			Control site (N = 520)			*P* value	
	Preintervention (n = 260)	Postintervention (n = 260)	*P* value	Preperiod (n = 260)	Postperiod (n = 260)	*P* value	Study pre vs. control pre	Study post vs. control post
Mean age, y (± SD)	44.2 (± 16.9)	44.6 (± 17.1)	0.8	47.9 (± 17.4)	46.0 (± 18.9)	0.23	0.02	0.4
Male sex, n (%)	65 (25)	68 (26)	0.76	86 (33)	77 (30)	0.4	0.04	0.38
Advanced practice provider, n (%)	131 (50)	131 (50)	1.0	110 (42)	145 (56)	0.002	0.07	0.22
Beta-lactam allergy, n (%)	41 (16)	41 (16)	1.0	40 (15)	28 (11)	0.12	0.9	0.09
Sulfonamide allergy, n (%)	16 (6)	16 (6)	1.0	28 (11)	25 (10)	0.66	0.06	0.14
History of MRSA, n (%)	1 (4)	1 (4)	1.0	2 (1)	2 (1)	1.0	0.56	0.56
Recent surgical history, n (%)	2 (1)	6 (2)	1.0	2 (1)	5 (2)	0.25	1.0	0.76
Charlson Comorbidity Index, score (IQR)	0 (0–2)	0 (0–2)	0.25	0 (0–2)	0 (0–2)	0.55	0.08	0.99

Abbreviations used: IQR, interquartile range; MRSA, methicillin-resistant *Staphylococcus aureus*.

Table 2
Primary and secondary outcomes

Outcome	Study site (N = 520)			Control site (N = 520)			P value	
	Preintervention (n = 260)	Postintervention (n = 260)	P value	Preperiod (n = 260)	Postperiod (n = 260)	P value	Study pre vs. control pre	Study post vs. control post
Total antibiotic guideline concordance, n (%)	130 (50)	182 (70)	< 0.001	112 (43)	125 (48)	0.25	0.11	< 0.001
Guideline-concordant therapy indication, n (%)	236 (91)	243 (94)	0.26	224 (86)	240 (92)	0.02	0.1	0.61
ARTI only, n (%)[a]	130 (87)	141 (94)	0.03	115 (77)	131 (87)	0.02	0.03	0.05
UTI only, n (%)[a]	76 (95)	72 (90)	0.37	79 (99)	80 (100)	1.0	0.17	0.004
SSTI only, n (%)[a]	30 (100)	30 (100)	1.0	30 (100)	29 (97)	1.0	1.0	1.0
Guideline-concordant drug choice, n (%)[b]	130 (81)	131 (85)	0.37	118 (71)	132 (78)	0.17	0.03	0.09
Guideline-concordant dosage, n (%)[b]	152 (95)	148 (96)	0.64	144 (90)	158 (93)	0.06	0.01	0.22
Guideline-concordant frequency, n (%)[b]	149 (93)	139 (90)	0.36	149 (90)	147 (87)	0.35	0.28	0.29
Guideline-concordant duration, n (%)[b]	69 (43)	94 (61)	0.001	80 (48)	81 (48)	0.92	0.39	0.02
Duration for acute sinusitis, d (IQR)	10 (7–10)	7 (7–10)	0.19	10 (7–10)	7 (7–10)	0.65	0.68	0.06
Duration for acute pharyngitis, d (IQR)	10 (5–10)	10 (10–10)	0.09	10 (5–10)	10 (10–10)	0.26	0.15	0.22
Duration for UTI, d (IQR)	7 (5–7)	5 (5–7)	< 0.01	6 (5–7)	7 (5–7)	0.35	0.03	0.17
Duration for purulent SSTI, d (IQR)	10 (7–10)	10 (7–10)	1.0	10 (7–10)	10 (7–10)	0.40	0.75	0.27
Duration for nonpurulent SSTI, d (IQR)	10 (7–10)	10 (7–10)	1.0	10 (10–10)	10 (7–10)	0.28	0.28	0.9

Abbreviations used: ARTI, acute respiratory tract infection; UTI, urinary tract infection; SSTI, skin and soft tissue infection; IQR, interquartile range.
[a] Reported percentages based on number of patient cases for each indication (i.e., 150 patients with ARTI, 80 patients with UTI, 30 SSTI patients).
[b] Patient cases where antibiotics were appropriately withheld (e.g., no antibiotic prescription for acute bronchitis) or inappropriately prescribed (e.g., antibiotic prescribed for acute bronchitis) were excluded from analysis.

parameters were similar between groups at the control site, with the exception of less frequent infection-related revisits within 7 days in the postperiod (8.1% vs. 3.8%, $P = 0.042$).

Discussion

This study demonstrates the notable impact of an outpatient antimicrobial stewardship intervention consisting of institutional outpatient guideline implementation and provider education. Total antibiotic prescribing improved by 20% at the intervention site, which was largely driven by a significant reduction in antibiotic duration of therapy in patients with UTIs and an improvement in ARTI guideline-concordant therapy indication. The improvement in the primary outcome was not observed in the control site, although this study did not meet power to detect a difference in the primary outcome at a single site. Although didactic education alone is not recommended in the inpatient setting as a sustainable method to improve antibiotic prescribing practices owing to the staff volume and frequent staff rotation, this study suggests that didactic education may be a worthwhile intervention for urgent care centers that have a consistent core of providers.[5]

A recent study by Laude et al.[17] observed a significant reduction in antibiotic prescribing across 5 urgent care sites after implementing several antimicrobial stewardship strategies, including provider education, development of institutional guidelines, and automation of antibiotic prescribing data. The authors note that implementation of a robust stewardship program was initially labor and resource intensive, but the sustainability of interventions was permissible owing to automation of reporting processes. With the urgent care network involved in this study including more than 30 urgent care sites, a strategic approach to implementing automated or electronic stewardship initiatives is highly critical.

Didactic education and the implementation of facility-specific outpatient guidelines are both minimally time- and labor-intensive stewardship interventions. Because there were existing inpatient treatment guidelines for UTIs and SSTIs for our health care system, minimal resources were required to reformat the information into an outpatient

Table 3
Patient safety outcomes

Outcome	Study site (N = 520)			Control site (N = 520)			P value	
	Preintervention (n = 260)	Postintervention (n = 260)	P value	Preperiod (n = 260)	Postperiod (n = 260)	P value	Study pre vs. control pre	Study post vs. control post
Additional antibiotic prescribed within 72 h, n (%)	10 (4)	9 (4)	0.82	7 (3)	4 (2)	0.54	0.46	0.6
Adverse drug event within 72 h, n (%)	1 (0.4)	3 (1)	0.62	0 (0)	0 (0)	—	0.32	0.08
Infection-related revisit within 7 d, n (%)	21 (8)	16 (6)	0.39	21 (8)	10 (4)	0.04	1.0	0.3
Infection-related revisit within 30 d, n (%)	17 (7)	18 (7)	0.86	19 (7)	15 (6)	0.48	0.73	0.59
Hospitalizations within 7 d, n (%)	1 (0.4)	1 (0.4)	1.0	2 (1)	1 (0.4)	1.0	1.0	1.0
Hospitalizations within 30 d, n (%)	0 (0)	0 (0)	—	1 (0.4)	0 (0)	1.0	0.37	1.0
Clostridioides difficile infection within 30 d, n (%)	0 (0)	0 (0)	—	0 (0)	0 (0)	—	—	—

guideline. The didactic educational materials were also developed and presented by pharmacy residents, with the oversight of infectious diseases specialists, as a part of their residency training curriculum for providing in-service education to health professionals. ASPs with limited resources may choose to focus on implementing similar practices initially, while working to establish sustainable stewardship interventions such as electronic order sets, automated reporting, or prospective audit and feedback.[3,5] Our study identified that an area with a large opportunity for improvement is the reduction in duration of therapy for UTI. Focused education on this particular disease state may be a strategy that ASPs can consider. The practical steps to implementing antimicrobial stewardship interventions should be tailored to the available resources and the unique needs of each institution.

Interestingly, an improvement for guideline-concordant therapy indication specifically for ARTIs was observed within both the study site and control site and when comparing data between sites. We hypothesize that this may be attributed to the confounding factor of the COVID-19 pandemic. The presence of COVID-19 may have normalized acute respiratory illness of viral etiology to both patients and providers. This may have allowed for more frequent clinical scenarios where antibiotics were appropriately withheld, given that there were similar rates of increased concordance at both sites. The control site did not observe an improvement in antibiotic duration for UTIs, suggesting that the improvement witnessed in the study site may be caused by our educational intervention. There was a statistically significant difference in guideline-concordant therapy indication for UTI in our subgroup analysis when comparing the postintervention study site with the postperiod control site, which highlights the potential need to focus on the treatment of asymptomatic bacteriuria during educational sessions and other antimicrobial stewardship interventions.

There are several limitations to be considered regarding this study. First, patient chart review occurred retrospectively, and thus, the results are limited by the accuracy and quality of documentation in the electronic medical record. We hypothesize that the improvement in infection-related 7-day revisit rate in the control site may be attributed to this limitation, although we cannot be certain—given that the study site is physically located next to its affiliated hospital and outpatient clinics, there was the potential for more information to be available regarding follow-up visits through the shared electronic medical record. In contrast, the control site is located remotely and neighbors nonaffiliated health care facilities that may use different medical record systems, so information regarding follow-up visits was likely limited and not available for our analysis. Owing to the low overall number of infection-related revisits in both groups, it is difficult to ascertain the clinical significance of these results. The retrospective nature of this study also poses a limitation in providing an explanation for why more patients in the postperiod of the control site were treated by APPs and whether this difference affected the results of this study. However, the current urgent care network policy requires APPs to staff most patient cases with the physicians on site, so we believe that this difference does not play a significant role in our findings. Another limitation of this study is that it does not assess whether the antimicrobial stewardship strategies implemented are sustainable after the initial 3-month period and an intervention fidelity assessment was not conducted. However, all providers were required to attend the single educational session at the intervention site and were encouraged to ask questions throughout the session. Furthermore, the short follow-up duration of our study owing to time constraints for study completion did not allow the authors to address the long-term sustainability of the educational intervention and whether re-education or additional interventions were necessary.

Nevertheless, this study has allowed our institution's ASP to begin identifying areas for improvement in outpatient antibiotic prescribing, developing sustainable stewardship interventions such as electronic order sets, and create dialogue about antimicrobial stewardship across the health care continuum. As pharmacist presence continues to expand in ambulatory care settings, our study highlights possible initial steps to developing sustainable relationships with outpatient care providers without the constant presence of pharmacy care providers. Although didactic education may provide additional benefit when coupled with further interventions such as electronic order sets and prospective audit and feedback, building rapport with providers is an important first step in establishing an open line of communication to improve antimicrobial stewardship practices. Providers at our intervention site expressed a keen interest in maintaining consistent contact with our inpatient ASP through quarterly didactic education and implementing order sets for common infectious disease states after the completion of the study. Our study adds to the growing body of literature investigating the impact of various antimicrobial stewardship strategies applied in urgent care centers, which is an undoubtedly important target for antibiotic stewardship and a possible area for future pharmacist involvement in the outpatient setting.

Conclusion

An outpatient antimicrobial stewardship strategy comprising provider education and institutional guideline implementation demonstrated significant improvement in outpatient antibiotic prescribing for ARTI, UTI, and SSTI. Urgent care centers will continue to be an important target for antimicrobial stewardship interventions and our study highlights possible areas of focus, namely duration of therapy. For organizations or ASPs with limited resources for outpatient stewardship, initiating the measurement of antimicrobial stewardship metrics, developing and implementing facility-specific guidelines, and providing didactic education to practitioners are effective strategies to improve antibiotic prescribing.

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