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Concise Communication

Antimicrobial stewardship intervention bundle decreases outpatient fluoroquinolone prescribing for urinary tract infections

Ashley L. Cubillos PharmD[1], Megan E. Patch PharmD[1], Elisabeth L. Chandler PharmD[1], Leah W. Lynch MD[2], Morris R. Gieselman MD[2], Mary Beth Saunders DO[3] and Karen E. Calkins MD[2]

[1]Department of Pharmacy, Lee Health, Fort Myers, Florida, [2]Lee Physician Group, Lee Health, Fort Myers, Florida and [3]Department of Infection Prevention and Epidemiology, Lee Health, Fort Myers, Florida

Abstract

An antimicrobial stewardship bundle was implemented in 23 community health system urgent care and primary care clinics to reduce fluoroquinolone prescribing in urinary tract infections. The percentage of urinary tract infection (UTI) visits prescribed a fluoroquinolone subsequently decreased from 17.6% to 3% in urgent care and from 23.8% to 6.8% in primary care.

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Fluoroquinolone antibiotics possess ideal pharmacokinetics, an oral dosage form, and broad-spectrum antimicrobial activity, making them an attractive empiric treatment option for many outpatient infectious conditions. In recent years, numerous safety concerns associated with fluoroquinolones have been identified, including risk for potentially disabling and permanent adverse effects on tendons, joints, nerves, and the central nervous system.[1] Although these events may occur at a relatively low rate after short-term fluoroquinolone use, the US Food and Drug Administration has recommended against fluoroquinolone use in uncomplicated infections for which other treatment options exist, given that the risks of serious adverse effects likely outweigh the benefits.[1] Additionally, community susceptibility of gram-negative bacteria to fluoroquinolones has decreased in the United States during this time.[2]

Despite these factors, fluoroquinolone use for outpatient conditions such as uncomplicated urinary tract infection (UTI) has not uniformly decreased.[3] Multifaceted antimicrobial stewardship intervention bundles utilizing tools available to community care settings, including components of education, clinical decision support, and data feedback, are of interest for addressing outpatient fluoroquinolone prescribing. However, data on the implementation of these initiatives and their effects on fluoroquinolone use are limited. In this report, we summarize the impact of one such model on fluoroquinolone prescribing rates within a health system network of urgent care and primary care clinics.

Methods

In April of 2019, an antimicrobial stewardship intervention bundle aimed at decreasing fluoroquinolone utilization for UTIs was implemented at all 4 urgent care clinic locations of Lee Health, a large public health system. Initial steps in the bundle included development of an antimicrobial stewardship team (including physicians, pharmacists, nursing leaders, and advanced providers) to manage and oversee the intervention, dissemination of a system-specific UTI treatment pathway with emphasis on nonfluoroquinolone antibiotics for uncomplicated infections, and modification of Epic SmartSets (Epic Systems, Verona, WI) to incorporate these treatment recommendations (Supplement 1 online). An educational presentation was given to prescribers, introducing them to these resources. A fluoroquinolone stewardship dashboard (Supplement 2 online) was created using SlicerDicer (Epic Systems, Verona, WI) reports to determine each prescriber's percentage of UTI-related visits at which a fluoroquinolone prescription was issued, allowing for blinded monthly (and subsequently quarterly) peer comparison reports of prescribing patterns. The system's 19 primary care clinics were incorporated into the initiative in August 2019, but prescribing data feedback was issued as unblinded clinic-to-clinic data rather than a provider-to-provider comparison. Data feedback to all clinics was concluded in May 2020.

The impact of this intervention bundle was assessed using the primary outcome of percentage of UTI visits at which a fluoroquinolone antibiotic prescription was issued. All UTI-related clinic visits for patients aged ≥18 years, as identified by a list of predefined ICD-10 diagnosis codes were included (Table 1). Fluoroquinolone prescribing data from a 6-month postintervention period (September 2019–February 2020) was compared to data from a similar preintervention period (September 2018–February 2019). To assess durability of practice change, a third period during which prescribing data feedback was not provided (September 2020–February 2021) was compared to the preintervention period. Secondary outcomes included total number of fluoroquinolone prescriptions issued at any clinic visit, and percentage of all clinic visits at which a fluoroquinolone prescription was issued. Data were retrieved from the Epic electronic health

Author for correspondence: Ashley L. Cubillos, PharmD, Lee Memorial Hospital, 2776 Cleveland Avenue, Fort Myers, FL 33901. E-mail: Ashley.Cubillos@leehealth.org

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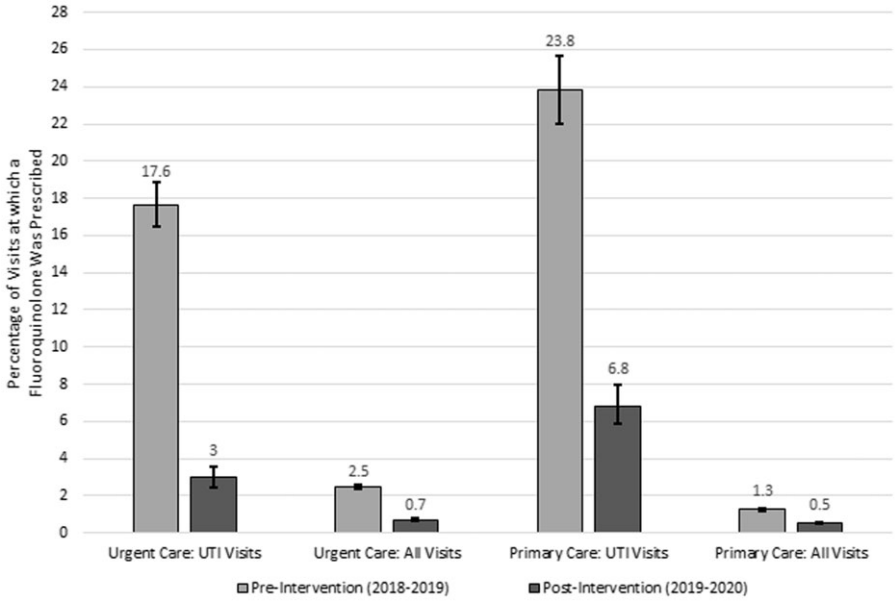

Fig. 1. Percentage of UTI visits receiving a fluoroquinolone prescription, before and after the intervention, all clinics (N=23).

Table 1. *International Classification of Disease, Tenth Revision* (ICD-10) Codes for Identification of Urinary Tract Infection (UTI)–Related Clinic Visits

ICD-10 Code	Description
N10	Acute pyelonephritis
N30.00	Acute cystitis without hematuria
N30.01	Acute cystitis with hematuria
N39.0	Urinary tract infection, site not specified
N41.0	Acute prostatitis
R30.0	Dysuria
R31.9	Hematuria, unspecified
R35.0	Frequency of micturition

record (Epic Systems, Verona, WI). Categorical measures were compared using the χ^2, with $P < .05$ defining statistical significance.

Results

A significant decrease in the percentage of UTI visits at which fluoroquinolone prescriptions were issued was noted across all 23 clinics (Fig. 1). Among the four urgent care clinics, 111 (3%) of 3,752 UTI visits in the postintervention period resulted in a fluoroquinolone prescription, compared with 660 (17.6%) of 3,741 in the preintervention period, a decrease of 14.6% ($P < .001$). This change represented a net 83% reduction in fluoroquinolone prescriptions. Percentages of urgent care clinic visits at which a fluoroquinolone was prescribed for any diagnosis were 423 (0.7%) of 61,596 after the intervention versus 1,437 (2.5%) of 57,884 before the intervention ($P < .0001$).

Similar findings were noted among the 19 primary care clinics, with 156 (6.8%) of 2,287 of UTI visits in the postintervention period resulting in a fluoroquinolone prescription versus 492 (23.8%) of 2,071 in the preintervention period ($P < .001$). This change represented a net decrease in fluoroquinolone prescriptions of 71.3%. Percentages of primary care clinic visits at which a fluoroquinolone was prescribed for any diagnosis were 813 (0.5%) of 156,750 after the intervention versus 1,784 (1.3%) of 142,324 before the intervention ($P < .0001$).

Sustained decreases in percentage of UTI visits at which a fluoroquinolone was prescribed were noted in the third assessment period (after cessation of data feedback) compared to the preintervention period for both urgent care (86 of 2,901; 3%; $P < .0001$) and primary care (176 of 2,527; 7%; $P < .0001$).

Discussion

Our initiative demonstrated that a multifaceted antimicrobial stewardship bundle had a significant and sustained impact on fluoroquinolone utilization in urgent care and primary care clinics. Although the emphasis of our intervention was on UTI-related visits, the impact potentially extended beyond UTI visits, given the large decrease in total fluoroquinolone prescriptions, which was not completely accounted for by visits with UTI-related diagnosis codes.

Multifaceted interventions in the outpatient setting have been applied to various antimicrobial stewardship targets, often acute respiratory tract infection treatment.[4,5] However, initiatives that encompass overall antimicrobial prescribing and specifically fluoroquinolone use reduction have also been described. Lin et al[6] showed a 39% decrease in total fluoroquinolone prescriptions as a result of education, adding warnings to oral fluoroquinolone orders, modification of antimicrobial susceptibility results, and development of order sets. Eudaley et al[7] implemented a sophisticated UTI clinical decision support tool within a family medicine clinic, reducing the use of fluoroquinolones for uncomplicated UTI from 42% to 15%.[7] Shively et al[8] provided data feedback to clinicians on overall prescribing rates of multiple antibiotics, including fluoroquinolones, and noted a 59.4% decrease in fluoroquinolone prescriptions.

This study had several limitations. It is difficult to quantify the impact of any single intervention on prescribing change. Education-only interventions are not recommended by national

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stewardship guidelines due to lack of efficacy and waning impact over time,[9] though most published studies of multifaceted initiatives do contain an education component. Conversely, socially motivated interventions, including peer comparison, have been shown to create durable change in prescribing habits that can last after other interventions are withdrawn.[10] Our experience supports this finding. Although gathering and providing these data require dedicated resources, the time investment is anticipated to be considerably less than with individual chart review and feedback. Revision of order sets that are commonly used within the individual practice setting also encourages guideline-concordant prescribing with limited need for ongoing resources.

The provision of prescribing data feedback in our study varied according to the practice environment, with urgent care centers receiving prescriber-level data, and primary care settings, having fewer individual providers per clinic, receiving clinic-level data. Both approaches appeared to be effective in modification of prescribing practices in conjunction with other interventions in the bundle. Any strategy chosen should be selected based upon the needs of the practice environment and sustainability of data dissemination.

We did not evaluate the bundle's impact on clinical outcomes, such as clinical success or antibiotic-related adverse effects; this remains an important area of research opportunity in outpatient antimicrobial stewardship interventions. In summary, multifaceted antimicrobial stewardship intervention bundles have the potential to significantly and sustainably improve fluoroquinolone prescribing practices for UTI. These findings can be utilized by interdisciplinary teams in the outpatient setting to optimize the management of infectious diseases.

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Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2021.520

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