

ORIGINAL RESEARCH

A single-centre experience rolling out an antibiotic stewardship intervention prior to and during the SARS-CoV-2 pandemic 2019–2022

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Abstract

Background: Antibiotics are prescribed to nearly one-half of patients with viral respiratory tract infections (RTI) in outpatient settings. This use is ineffective and may cause undue harm and excess cost from unnecessary antibiotic exposure. We implemented a multifaceted intervention to address inappropriate antibiotic prescribing for viral RTI. Here, we discuss the impact over 4 years, before and during the SARS-CoV-2 pandemic.

Methods: This observational study describes the implementation and initial impact of a multimodal stewardship intervention on inappropriate antibiotic prescribing for viral RTIs in outpatient care settings at a single centre. We tracked the rate of visits for viral RTI as well as antibiotic prescribing for viral RTIs in urgent care, primary care and the emergency department between January 2018 and March 2022. Data were collected 1 year prior to implementation and 3 years after implementation. The primary outcome – the rate of inappropriate antibiotics prescribed for viral RTIs – was described by calendar year (CY) to review changes after the stewardship intervention.

Results: In CY2018, the year prior to implementation of targeted RTI antimicrobial stewardship, the rate of inappropriate RTI antibiotics prescribed was 10% in urgent care, 11% in primary care and 18% in the emergency department (ED). During the first CY of the intervention, rates were 8% in urgent care, 10% in primary care and 16%

in the ED. In CY2020, the second year of the intervention, inappropriate RTI antibiotics were prescribed in 5% of urgent care and 3% primary care RTI visits and 15% of ED RTI visits. These rates were similar in CY2021 and the first 3 months of CY2022. Over 30,000 visits for RTIs were seen annually in CY2018 and CY2019. Annual RTI visits dropped to 20,222 in CY2020 and 14,172 in CY2021.

Conclusion: Although total visits for non-COVID RTIs decreased by approximately 50% during the first 2 years of the SARS-CoV-2 pandemic, an antimicrobial stewardship intervention was associated with decreases in inappropriate antibiotic prescribing for RTIs. This was maintained throughout 2 years of the pandemic.

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Introduction

Although antibiotic use for viral respiratory tract infections (RTIs) is both ineffective and inappropriate, US data

indicate that antibiotics are prescribed in up to 45% of patients with an RTI in the outpatient setting.^{1,2} In 2018, three hospitals within UW Medicine, WA, USA, collaborated with the Washington State Department of Health to address overuse of antibiotics for viral RTIs. The objective

was to implement a multimodal strategy as proposed by The Multifaceted Intervention to Improve Prescribing for Acute Respiratory Infection for Adult and Children in Emergency Department and Urgent Care Settings (MITIGATE), an antibiotic stewardship toolkit promoted by the CDC.^{3,4} MITIGATE consists of six evidenced-based strategies to reduce unnecessary antibiotic prescribing for RTIs: patient and provider education, signed provider commitment statements pledging to reduce antibiotic use for RTIs, providing direct email feedback to departments and individuals with their specific rates of antibiotic prescribing, and engaging a provider champion.³ Although this was intended to be implemented system wide, the process was interrupted at our academic medical campuses by the SARS-CoV-2 pandemic (causing coronavirus infectious disease 2019; COVID-19) in March 2020. However, it was fully implemented at our community hospital, UW Medicine Valley Medical Center (VMC), located in Renton, WA, USA, within the Seattle metropolitan region. The following describes our experience stewarding RTI prescribing before and during the pandemic.

Methods

In 2019, we implemented the MITIGATE toolkit in a staged fashion amongst four urgent care clinics, eight primary care clinics and the emergency department (ED) at VMC. Initial provider education was delivered during a mandatory 3-hour continuing medical education (CME) event. CME content was provided by invited field leaders, two local infectious disease (ID) physicians and an ID pharmacist. The field leaders discussed communication strategies with patients and their families to avoid antibiotic prescriptions with methods from the Dialogue Around Respiratory Illness Treatment (DART) programme⁵ and an overview of the MITIGATE toolkit, including the context in which it was created.^{3,6} The local ID physicians and ID pharmacist reviewed institutional ID treatment guidelines and antimicrobial use data. The CME event was offered on two separate dates in July and September 2019 to accommodate shifts and other scheduling conflicts. Primary and urgent care providers were compensated for their time. Antibiotic commitment posters were distributed to each primary and urgent care clinic manager to co-ordinate signing by providers and hang in every exam room. Patient education involved distributing flyers available from the CDC to clinic managers and the creation of stock phrases for providers to include in their after-visit summaries about non-antibiotic methods of treating RTIs.⁷ The use of the posters and phrases was at the discretion of clinic managers and providers and not tracked. Reducing antibiotic prescribing for viral RTIs was designated an institutional board goal during the first year of programme implementation, which provided accountability and

administrative support for each of the strategies. We sent individualized feedback to providers via email, indicating whether they were a 'top performer' or 'not a top performer' in antimicrobial stewardship. Top performers were the top 10% compared with their peers for avoiding antibiotic prescriptions for viral RTIs. Providers who saw at least 20 qualifying RTI visits, as specified in the MITIGATE methodology, received email feedback monthly. Feedback occurred in stages starting with urgent care providers in September 2019 ($n=28$), primary care providers in November 2019 ($n=97$) and ED providers ($n=20$) in December 2019. Individualized feedback was sent between September through March of each year, coinciding with the time of year in which we see most viral RTIs and the traditional influenza season in our region. During the second year of implementation, we changed the top provider threshold from a comparative value: top 10% of prescribers compared with their peers, to a fixed value: rate of inappropriate antibiotic prescribing $\leq 2\%$ in primary and urgent care clinics and $\leq 5\%$ in the ED. We also changed the email subject header for those not meeting the top threshold from 'You are not a top performer in antimicrobial stewardship' to 'Your antimicrobial prescribing data'. Those meeting the threshold for top performer still received an email with the subject header 'You are a top performer in antimicrobial stewardship'. These changes were made based on feedback from the providers.⁸ For sustainability of our intervention, in September of 2020, we decreased the volume of individualized feedback from 12 urgent and primary care clinics and the ED (145 providers) to 4 clinics (21 providers) and the director of the ED. The selected clinics included two urgent care centres with the highest inappropriate antibiotic prescribing rates, and their two geographically corresponding primary care clinics. Department feedback was provided to the medical directors of primary care, urgent care and the ED by granting direct access to the electronic report to review at their discretion.

Analysis

We tracked rates of antimicrobial prescribing for viral RTIs starting in January 2018, prior to the implementation of the MITIGATE toolkit, until March 2022. Data are reported as the median monthly inappropriate antibiotic prescribing rate and are aggregated by calendar year (CY). Inappropriate antibiotics were defined as antibiotics prescribed for infections coded by the diagnosing provider as viral RTIs according to the MITIGATE toolkit. The denominator was total qualifying viral RTIs. Qualifying viral RTIs were derived from 157 ICD-10 codes of diagnoses specified by MITIGATE. Notable included RTIs were acute bronchitis, non-suppurative otitis media and acute upper respiratory tract infection (URI) unspecified. Notable excluded RTIs were sinusitis and pharyngitis because antibiotic treatment may be appropriate in some

cases. The full list of diagnoses is available online in the MITIGATE toolkit.³ Visits for patients with concomitant non-viral RTIs meriting antibiotics at the time of the RTI visit were excluded. Those with medical comorbidities, such as a chronic lung disease, that would justify antibiotic prescribing were also excluded. Antibiotics prescribed between day 0 and up to 3 days after the RTI visit were captured. Antibiotic prescribing data and associated visit and patient diagnosis were pulled from the electronic medical record (EMR) with an enduring report built by the information technology team and visualized with Tableau Server Version 2021.3.14. In March 2020, the first SARS-CoV-2 outbreak was identified in our region. The study was reviewed and approved by the University of Washington Institutional Review Board, STUDY00006361, and the VMC Research Oversight Committee.

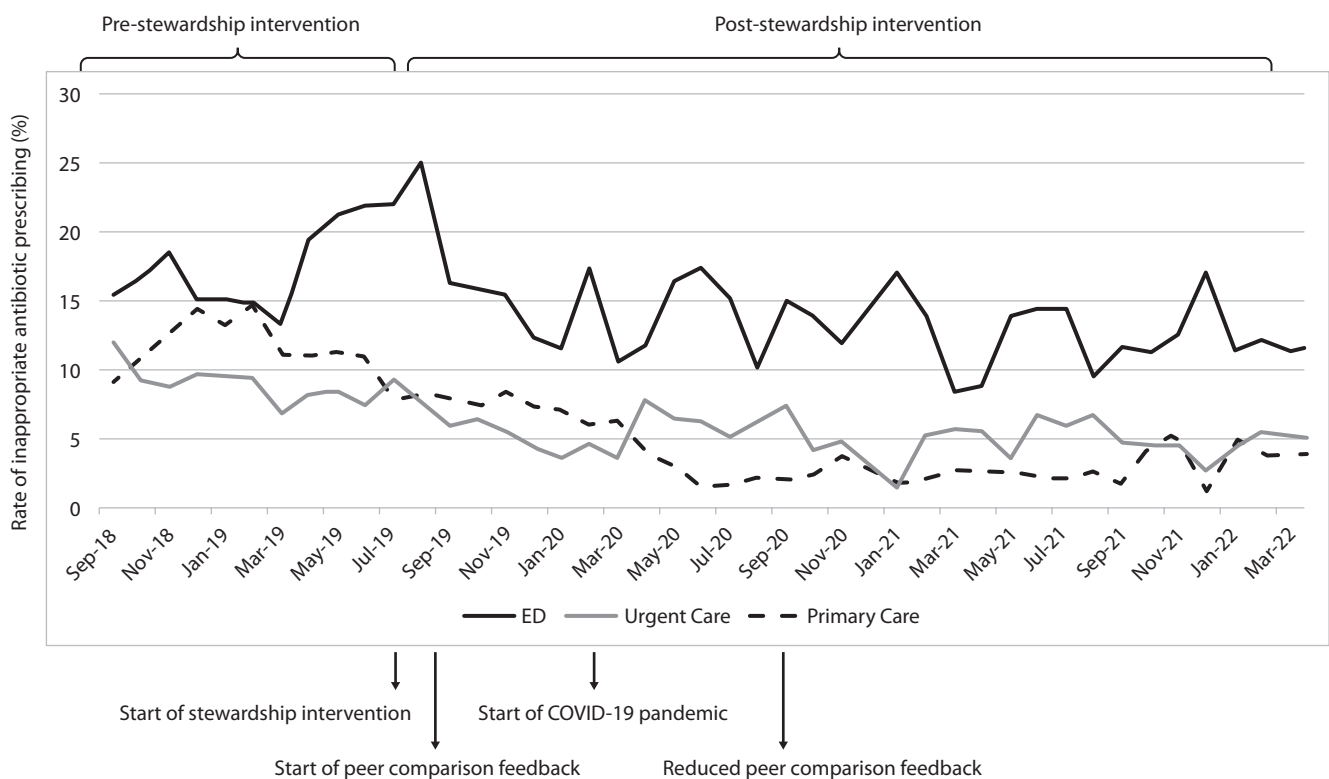
Results

Between January 2018 and March 2022, 106,735 visits for viral RTIs were seen: 47% in urgent care, 38% in primary care and 15% in the ED. A total of 73,921 (69%) visits occurred during the 6-month timeframe between September

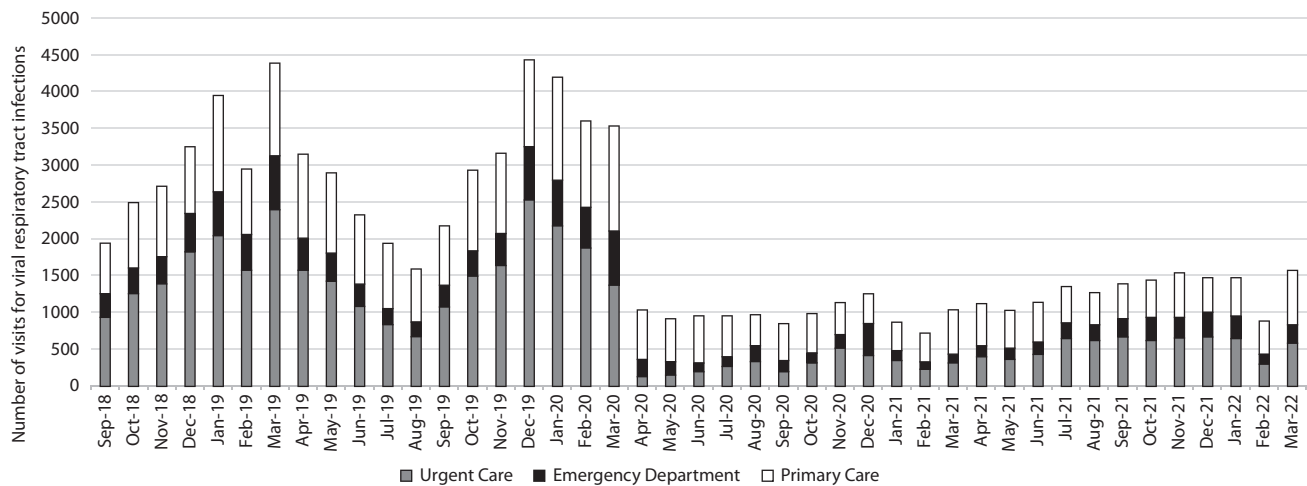
and March. Baseline rates of inappropriate antibiotic prescribing in CY2018 and prior to the implementation of MITIGATE were 10% (1538/16,110), 11% (1298/11,852) and 18% (827/4728) in urgent care, primary care and the ED, respectively. In the first year of stewardship intervention (CY2019), the rates were 8% (1386/18,355), 10% (1516/15,552) and 16% (806/5007), respectively, in urgent care, primary care and the ED (Figure 1). In the second year of intervention (CY2020), the rates were 5% (397/7936) in urgent care, 3% (241/8770) in primary care and 15% (510/3516) in the ED. By year 3 (CY2021), inappropriate RTI antibiotic prescriptions were 5% (298/5958) in urgent care, 3% (158/5959) in primary care and 13% (298/2255) in the ED. Finally, in the first 3 months of CY2022, the rate of inappropriate antibiotics for RTI was 5% (202/3882), 4% (66/1703) and 11% (75/660) in urgent care, primary care and the ED, respectively.

During the timeframe of the intervention, the number of visits for RTIs decreased substantially: in CY2018 and CY2019, total RTI visits were 32,690 and 38,914 across all urgent care and primary clinics and the ED. In CY2020, this decreased to 20,222 visits and further to 14,172 in CY2021 (Figure 2). Urgent care clinics and primary care

Figure 1. Inappropriate antibiotic prescribing for viral respiratory tract infections (%).



Changes in inappropriate antibiotic prescribing for viral respiratory tract infections in the urgent care, emergency department (ED) and primary care before and after implementation of a multimodal stewardship intervention. Highlighted timepoints include the start of the intervention, beginning of the COVID-19 pandemic locally, and the start and reduction of peer comparison feedback.

Figure 2. Total visits for viral respiratory tract infections, September 2018 to March 2022.

Number of visits for non-COVID-19 viral respiratory tract infections in urgent care clinics, the emergency department and primary care clinics. The stewardship intervention began in July 2019, and the first local COVID-19 outbreak was identified in March 2020.

clinics were the site of the majority of RTI visits, seeing between 11,000 and 18,000 visits each in the pre-COVID-19 CYs. Annual RTI ED visits were approximately 5000 during this same period.

Discussion

We noted a decrease in antibiotic prescribing for viral RTIs over 3 years, two of which overlapped with the SARS-CoV-2 pandemic. This change was maintained even after reducing individualized feedback to approximately 15% (21/145) of providers after the first year of intervention. In their analysis of stewardship interventions and impact on antibiotic prescribing, Meeker et al. found peer comparison to be the most effective measure compared with other measures, including suggesting alternate therapies or having clinicians document justification of their antibiotic prescribing in EMRs.⁹ In the 12-month period after termination of their stewardship intervention, the authors found regression in antibiotic prescribing across each of the groups.¹⁰ Amongst the group of clinicians randomized to peer comparison, inappropriate antibiotic prescribing remained statistically significantly lower than the control group of clinicians who received no stewardship intervention.¹⁰ Our experience indicates sustained benefit after decreasing the breadth and intensity of peer comparison feedback. The MITIGATE toolkit employs a combination of both passive and active antimicrobial stewardship strategies. Although data indicate peer comparison to be one of the most effective approaches, other methods also

demonstrate benefit in reducing inappropriate antibiotic prescribing.⁹ We speculate that the multimodal approach helped maintain decreased inappropriate antibiotic prescribing; this includes passive strategies like signed commitment posters that hang in every exam room and active strategies such as ongoing awareness and support of physician champions, who were often, but not always, the same department leaders viewing department feedback. The highest rate of inappropriate antibiotic prescribing was seen in the ED. This is consistent with observational data showing antibiotic prescribing amongst one of eight patients attending the ED with a large proportion being unnecessary or inappropriate.¹¹ Despite individualized feedback, the change in inappropriate antibiotic prescribing was minimal compared with the change seen in primary care and urgent care. Unique features of the ED, such as high patient turnover, quick decision-making and concerns for medical liability, are all challenges to antimicrobial stewardship identified in this environment.¹²

The context of our intervention occurring concomitantly with the SARS-CoV-2 pandemic cannot be understated. Data have demonstrated that, amongst the rationale for unnecessary antibiotic prescriptions is patient demand, or perceived patient demand.^{5,13} With a viral RTI dominating people's lives and the news, greater awareness amongst providers and patients of the lack of utility of antibiotics for viral respiratory infections may have occurred. A substantial decrease in overall antibiotic prescribing in the first 5 months of the pandemic was noted nationally, especially for respiratory infections.¹⁴

Decreases in unnecessary antibiotic prescriptions for viral RTIs seen at our institution may be related, in part, to this overall national trend. However, it is unclear whether the national trend has persisted due to a paucity of published data. In our centre, visits for non-COVID-19 viral RTIs dropped substantially in the SARS-CoV-2 pandemic. This was noted most substantially in urgent care and primary care. The reasons are likely multifactorial, relating to the pandemic and public health response, including stay-at-home orders, school closures, and the lower prevalence of non-COVID-19 respiratory viral infections.¹⁵ Other centres also reported lower RTI visits in the ED within the first 5 months of the pandemic.¹⁶ In our ED, visits for RTIs decreased by nearly 50% as did RTI visits in urgent care and primary care.

This study is limited, as it is a single-centre investigation. However, we included multiple clinics and sites of care, which typically do not have overlapping providers in our system. Prescriber practices vary and some providers were hired after or otherwise did not attend the initial CME. Patients with comorbid conditions may warrant antibiotic treatment even when the suspected aetiology is viral. This concern is vetted in the MITIGATE criteria for inclusion and those patients as well as patients with concomitant infections in other sites were excluded from this analysis.³ Finally, this study is observational and occurred during a global pandemic with a massive public health response to reduce transmission of a respiratory infection. Thus, we cannot assume full responsibility for the change in antibiotic prescribing practices.

Whilst the initial lift of implementing this antimicrobial stewardship intervention, including building and verifying the inappropriate antibiotic prescribing report was significant,⁸ we have found maintenance sustainable. The antibiotic commitment posters remain signed and

posted in clinic exam rooms. The report for inappropriate antibiotic prescribing is available for clinic and department leads and the antimicrobial stewardship team to view and access. The intensity of peer comparison feedback can be increased or decreased depending on inappropriate antibiotic prescribing trends, which allows for endurance of this intervention. In the ED, we are exploring rapid diagnostic tools to identify respiratory viruses, which may further alleviate the perceived need to prescribe antibiotics.

Conclusion

A multimodal stewardship strategy to reduce antibiotic prescribing for viral RTIs demonstrated durability over 3 years and throughout a global viral pandemic. This occurred despite discontinuation of one of the most effective stewardship strategies, peer comparison, for over 80% of providers after the first year. Prior data have found regression with the removal of an active stewardship effort.^{10,17} We found that decreasing the intensity of feedback, for example, sending individualized data to a limited proportion of providers, maintained the peer comparison momentum gained. By rotating the selection of providers who receive feedback and/or utilizing a department head to distribute feedback, this presents a sustainable approach to an intensive stewardship effort. Approaching the issue of overprescribing antibiotics for viral RTIs from multiple angles as designed by the MITIGATE toolkit and with the support of administrators and clinical leaders was associated with a change in the culture of antibiotic prescribing in our institution. National data have found antibiotics prescribed amongst 30% of COVID-19-associated outpatient visits.¹⁸ Thus, finding a durable solution to address inappropriate antibiotic use in RTIs is critical.

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