






Concise Communication

Low rates of antibiotics prescribed during telehealth primary-care visits persisted during the coronavirus disease 2019 (COVID-19) pandemic

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Abstract

For primary care clinics at a Veterans' Affairs (VA) medical center, the shift from in-person to telehealth visits during the coronavirus disease 2019 (COVID-19) pandemic was associated with low rates of antibiotic prescription. Understanding contextual factors associated with antibiotic prescription practices during telehealth visits may help promote antibiotic stewardship in primary care settings.

(Received 15 October 2022; accepted 30 November 2022; electronically published 10 February 2023)

In the initial phases of the coronavirus disease 2019 (COVID-19) pandemic, outpatient antibiotic prescriptions in the United States decreased sharply.¹ By July 2020, however, outpatient prescribing rates for several agents returned to or exceeded those observed prior to April 2020.² Reasons for this increase in antibiotic prescriptions may have included the resumption of in-person visits as well as implementation of telehealth services. Prior to the COVID-19 pandemic, evidence of the influence of telehealth on antibiotic prescriptions in the outpatient setting was inconsistent.³

In 2019, the Department of Veterans' Affairs (VA) served >900,000 veterans via telehealth visits.^{4–6} The influence of telehealth on antibiotic prescriptions in primary care settings in the context of the COVID-19 pandemic has not been well characterized. We conducted a retrospective study of primary care visits at a large VA medical center. Our objectives were to determine rates of antibiotics prescribed during telehealth versus in-person primary-care visits and to assess changes in antibiotic prescribing rates in each of these settings during the COVID-19 pandemic.

Methods

Study design, setting, and data sources

We used administrative data from the Veterans' Healthcare Administration to conduct a retrospective cohort study of patients

seen in a primary care clinic at a VA medical center in the 2 years before March 1, 2020 (is, the pre-COVID-19 period) or after March 1, 2020 (ie, during the COVID-19 pandemic). We included patients with ≥ 1 clinical encounter in a primary clinic, including routine, follow-up, and same-day visits. Both telehealth and in-person visits were considered clinical encounters. We excluded patients who were only seen in a primary care clinic for case management, an injectable medication (eg, vaccine), or a shared medical appointment. Visits to urgent care were also excluded. The Institutional Review Board (IRB) at the VA Northeast Ohio Healthcare System approved the study protocol.

Patient and visit characteristics

We assessed the modality of the primary care visits, antibiotic prescription(s), and infectious disease diagnoses via *International Classification of Diseases, Tenth Revision* (ICD-10) codes.⁷ Antibiotic prescriptions issued by the same clinic within 1 week of a primary-care encounter were considered to be associated with that visit. We also used patient characteristics at the time of the first visit in the pre-COVID-19 and COVID-19 periods.⁸

Data analysis and statistical methods

We used descriptive statistics to summarize primary care visit and patient characteristics in the pre-COVID-19 and COVID-19 periods of study. The numbers of outpatient visits with and without an antibiotic prescription were determined for each calendar month, stratified by visit modality. Rates of visit modalities and antibiotic prescribing in primary care visits in the pre-COVID-19 versus

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Cite this article: Jump RLP, et al. (2023). Low rates of antibiotics prescribed during telehealth primary-care visits persisted during the coronavirus disease 2019 (COVID-19) pandemic. *Infection Control & Hospital Epidemiology*, 44: 1518–1521, <https://doi.org/10.1017/ice.2022.309>



Table 1. Characteristics of Veterans Using Telehealth for Primary Care Visits Before and During the COVID-19 Pandemic

Patient Characteristics	Pre-COVID-19 (n = 7,258), No. (%) ^{a,b}	COVID-19 (n = 21,122), No. (%) ^{a,c}
Age, mean (±SD)	62.1 (±13.1)	63.4 (±14.6)
Male sex	6,748 (93.0)	19,352 (91.6)
Race and ethnicity		
White Non-Hispanic	2,258 (31.1)	10,698 (50.6)
Black Non-Hispanic	4,461 (61.5)	8,739 (41.4)
Hispanic	106 (1.5)	351 (1.7)
Other ^d	433 (6.0)	1,334 (6.3)
Urbanicity		
Urban	6,691 (92.2)	16,046 (76.0)
Rural	564 (7.8)	5,071 (24.0)
Unknown	3 (0.1)	5 (0.0)
Charlson comorbidity index, mean (±SD)	1.9 (±2.1)	1.8 (±2.0)
Comorbidities		
Diabetes mellitus	2,525 (34.8)	7,438 (35.2)
Chronic pulmonary disease	1,654 (22.8)	4,493 (21.3)
Liver disease	1,095 (15.1)	2,090 (9.9)
Chronic renal disease	1,021 (14.1)	2,625 (12.4)
Cancer	945 (13.0)	2,547 (12.1)
Heart disease	861 (11.4)	2,217 (10.5)
Peripheral vascular disease	761 (10.5)	2,137 (10.1)
Stroke	755 (10.4)	2,138 (10.1)
Patients with only telehealth visits	753 (10.4)	11,578 (54.8)

Note. SD, standard deviation.

^aUnits unless otherwise indicated. Because some patients were included in both the pre-COVID-19 and COVID-19 periods, meaning the groups were not independent, statistical comparisons were not made.

^bThe pre-COVID-19 period was March 1, 2018, through February 28, 2020.

^cThe COVID-19 period was from March 1, 2020, through February 28, 2022.

^dIncludes American Indian, Alaska Native, Asian, Native Hawaiian or Pacific Islander and unknown.

COVID-19 periods were compared using χ^2 tests. Statistical comparisons were not made for patients seen during the pre-COVID-19 and COVID-19 periods because these were not independent groups (ie, a large proportion of patients seen in the pre-COVID-19 period also had primary care visits during the COVID-19 pandemic).

Results

In the pre-COVID period, primary-care visits averaged 4,144 (±320) visits per month and increased slightly to 4,490 (±294) visits per month after the COVID-19 pandemic began (Fig. 1A). However, the proportion of primary care visits associated with an antibiotic prescription decreased from 1.39% (1,383 of 99,454) before the COVID-19 pandemic to 0.82% (887 of 107,767; $P < .001$) during the COVID-19 pandemic.

In-person primary-care visits averaged 3,313 (±260) visits per month and comprised 80% of visits before the COVID-19 pandemic. In-person visits decreased to 1,236 (±486) visits per month and 27.5% of all visits after the COVID-19 pandemic began

($P < .001$) (Fig. 1B). The rate of antibiotic prescriptions was 1.62% (1,293 of 79,520 in-person visits) before the COVID-19 pandemic; this did not change significantly during the COVID-19 pandemic (1.54%; 457 of 29,653 visits; $P = .334$). Only 643 (50%) of 1,293 in-person primary care visits associated with an antibiotic prescription were accompanied by an infectious disease diagnostic code; this changed little after the pandemic began, when 203 (44%) of 457 antibiotics prescribed were accompanied by an infectious disease diagnostic code.

Telehealth primary-care visits averaged 831 (±167) visits per month and comprised 20% of visits before the COVID-19 pandemic. Telehealth visits increased to 3,255 (±547) visits per month and comprised 72.5% of all visits after the COVID-19 pandemic began ($P < .001$) (Fig. 1C). The change in the proportion of telehealth primary care visits associated with an antibiotic prescription was modest, from 0.45% (90 of 19,934 visits) before the COVID-19 pandemic to 0.55% (430 of 78,114 visits) during the COVID-19 pandemic ($P = .10$). The proportion of telehealth primary care visits at which an antibiotic was prescribed that was accompanied by an infectious diseases diagnostic code was 30% (27 of 90) before the COVID-19 pandemic and 36% (152 of 457) during the COVID-19 pandemic.

The characteristics of primary-care patients seen in person were similar before the COVID-19 pandemic and during the pandemic (Supplementary Table 1 online). However, we observed some changes in the population seen via telehealth: the proportion of Black non-Hispanic patients decreased from 62% in the pre-COVID-19 period to 41% in the COVID-19 period (Table 1). Additionally, the proportion of telehealth users living in rural areas increased 3-fold after the pandemic (8% before the COVID-19 pandemic vs 24% during the pandemic).

Discussion

Our findings indicate that in the pre-COVID-19 period, primary care visits at a VA medical center that were conducted by telehealth had a lower rate of antibiotic prescriptions than in-person visits. After the COVID-19 pandemic began, the rate of antibiotic prescriptions associated with telehealth visits did not increase significantly, whereas the number of telehealth primary-care visits increased sharply. Thus, the overall decrease in the rate of antibiotics prescribed through primary care clinics at a VA medical center was associated with increased use of telehealth. To our knowledge, this is the first report to describe patterns of antibiotic prescriptions in a primary care practice within a well-established telehealth system, which permitted an assessment that encompassed the 24 months before and after the onset of the COVID-19 pandemic.

Prior to the pandemic, the overall rate of antibiotics prescribed at our primary care clinics was much lower than that reported for medical offices in the United States. Estimates based on a large set of administrative data from 2014 indicated that 7.1% of medical office visits resulted in an antibiotic prescription.⁹ In contrast, our study's prepandemic rate of primary care visits associated with an antibiotic prescription was substantially lower at 1.4%. In this context, the decrease to an average of 0.8% of primary care visits resulting in an antibiotic prescription observed during the COVID-19 pandemic is notable.

Our cohort was a predominantly male and White non-Hispanic population, consistent with the general characteristics of VA healthcare users.^{10,11} Before the pandemic, the mean Charlson comorbidity index (CCI) was higher among telehealth users than

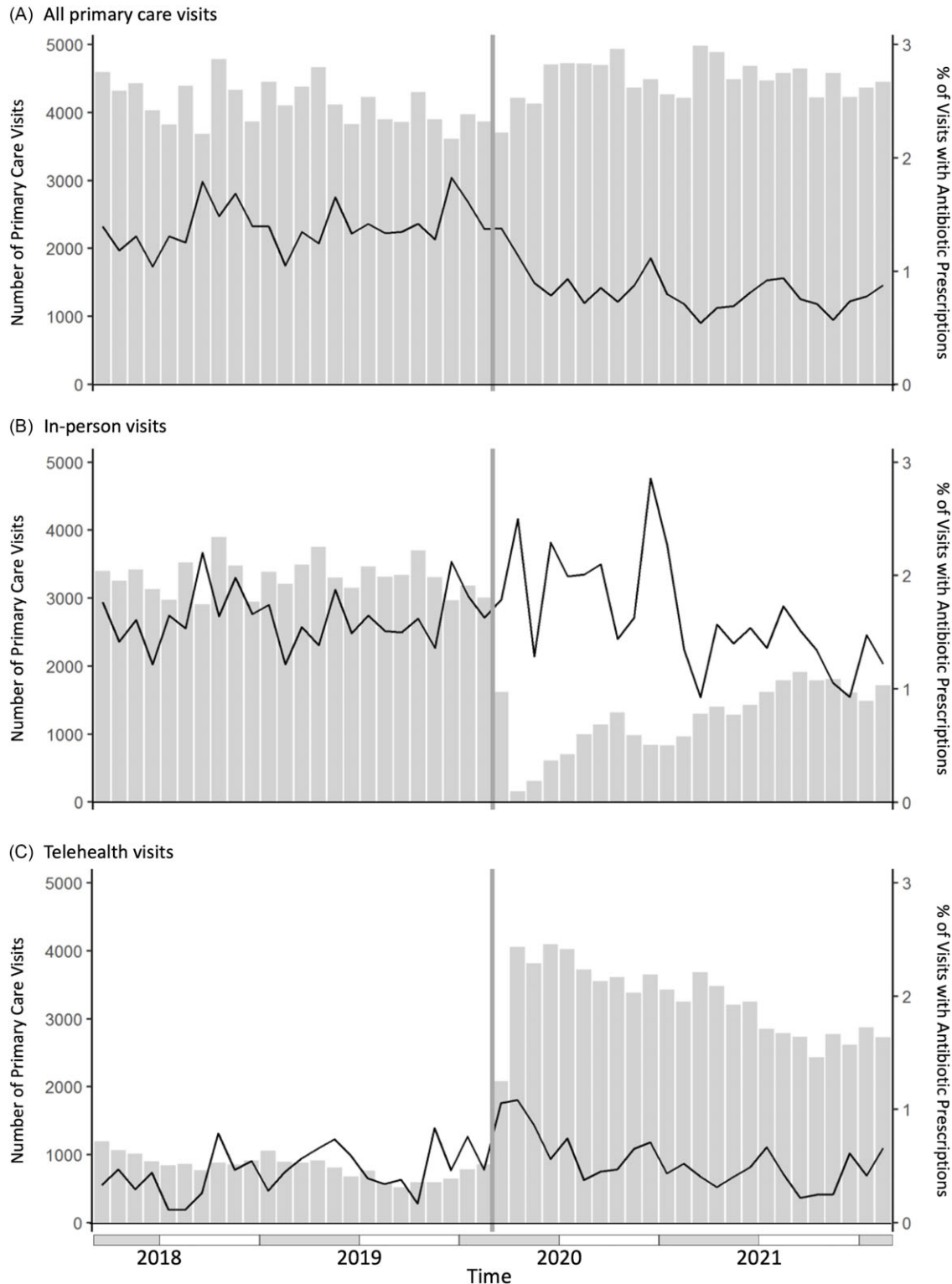


Fig. 1. Number of primary care visits and rate of associated antibiotics prescribed before and following the declaration of the COVID-19 pandemic. Panel A shows all primary care visits in the 2 years before and following declaration of the COVID-19 pandemic. Panel B shows in-person primary care visits, and panel C shows encounters conducted via telehealth. The primary y-axis indicates the number of primary care visits. The secondary y-axis shows the percentage of primary visits accompanied by an antibiotic prescription. The grey vertical line delineates the pre-COVID-19 period (March 1, 2018–February 29, 2020) and the COVID-19 period (March 1, 2020–February 28, 2022). The horizontal line below the x-axis changes from white to shaded sections at the start of January and July for each calendar year.

those with in-person visits. After the onset of the pandemic, however, the mean CCI was similar among people with telehealth compared to in-person visits. These findings suggest that differences in the population served do not account for differences in antibiotic

prescribing rates, which underscores the influence of visit modality on antibiotic prescription.

This study had several limitations. Our assessment considered primary care clinics at a single VA medical center, which may limit

the generalizability of our results. Additionally, our analysis relied on administrative data, which did not allow for the assessment of contextual factors influencing decisions or differences in health-care services provided during telehealth compared to in-person visits. Additionally, we did not assess the appropriateness of individual antibiotic prescriptions. Fewer than half of the antibiotics prescribed by primary care providers were accompanied by an infectious disease-related ICD-10 code, indicating suboptimal diagnostic coding practices.

The COVID-19 pandemic accelerated the adoption of telehealth across many healthcare settings, including primary care. Coincident with a rapid increase and subsequently sustained number of telehealth visits, primary care providers continued to prescribe antibiotics at lower rates to patients seen via telehealth than to patients who received in-person care. These results suggest that contextual factors related to telehealth influence antibiotic prescribing behavior. Understanding those factors may foster continued improvements in antibiotic stewardship, particularly in primary care settings.

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/ice.2022.309>

Acknowledgments. The findings and conclusions in this document are those of the authors, who are responsible for its content, and do not necessarily represent the views of the VA or of the US government.

Financial support. This work was supported by the Merck Investigator Studies Program (MISP 59266 to F.P. and R.J.). This work was also supported in part by funds and facilities provided by the Geriatric Research Education and Clinical Center (GRECCs) at the VA Northeast Ohio Healthcare System in Cleveland, Ohio, and the VA Pittsburgh Healthcare System in Pittsburgh, Pennsylvania.

Conflicts of interest. None of the authors have relevant conflicts of interest to disclose. R.J. is the principal investigator on research grants from the Pfizer and Merck; she has also participated in advisory boards for Pfizer.

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