

# Quality of Antibiotic Prescribing in a Large Direct-to-Patient Telehealth Program: an Observational Study



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## INTRODUCTION

Telehealth use, which has expanded during the COVID-19 pandemic, is expected to grow, yet limited information exists on the quality of telehealth services compared to other forms of care, particularly since physical exams and point-of-care testing are necessarily limited in telehealth. To date, findings on the quality of direct-to-patient (DTP) telemedicine, a specific type of telehealth, have been mixed. Rates of antibiotic prescribing for acute respiratory infection (ARI) have been shown to be higher for televisits than outpatient practice<sup>1</sup> or urgent care center<sup>2</sup> visits, while follow-up visit rates, possibly indicating treatment failure, are comparable across televisits, physicians' offices, and emergency departments (EDs).<sup>3</sup>

We examined DTP virtual visits offered by a large national insurer as a convenient benefit to its members. Using claims data, we assessed the quality of care for televisits across several acute conditions and compared it to physician offices, retail clinics, urgent care centers, and EDs.

## METHODS

We analyzed claims data for individuals aged 18–64 years who were continuously enrolled during 2016–2017 and treated for ARI (bronchitis, sinusitis, pharyngitis, or upper respiratory infection) or, for women, uncomplicated UTI. For each condition, we measured whether a patient received antibiotics.<sup>4</sup> Among those with antibiotics, we measured whether an appropriate antibiotic was selected based on guideline recommendations (all conditions) and whether the duration was appropriate (in pharyngitis, 10 days; in UTI, maximum of 7 days).<sup>5,6</sup> A visit was considered guideline-concordant based on whether or not a viral diagnosis was also present. For streptococcal pharyngitis, we further measured whether a culture or rapid Group A Streptococcus test was obtained.<sup>5</sup>

We estimated visit-level multivariable linear probability models for each outcome. Independent variables included

the site of care (televisit, physician office, retail clinic, urgent care, or ED, derived from claim codes, insurer-provided codes, and organization tax identifiers),<sup>6</sup> gender, age, illness burden using claims-based Episode Treatment Groups, and patient county. Analyses were performed using Stata (Version 15, StataCorp). The George Mason University institutional review board exempted this study from review.

## RESULTS

Overall, 2,400,198 patient visits were analyzed and the results were mixed. After multivariable adjustment, televisits were associated with comparable rates of antibiotic use in URIs, bronchitis, and sinusitis, relative to most other sites, but higher rates in pharyngitis and uncomplicated UTIs (Fig. 1).

When antibiotics were prescribed, rates of guideline concordance were comparable between televisits and several other settings (Fig. 2). For example, antibiotic management for sinusitis was more likely to be guideline-concordant for televisits compared to primary care offices, urgent care, and EDs, but less likely to be guideline-concordant compared with retail clinics.

Patients with pharyngitis who received antibiotics were less likely to receive Group A Strep testing for televisits compared with primary care (2.1% vs. 58.0%, adjusted difference  $-55.9%$  [95% CI,  $-56.8$  to  $-55.0%$ ]), retail clinics (vs. 93.9%, adjusted difference  $-91.8%$  [95% CI,  $-94.0$  to  $-89.6%$ ]), urgent care (vs. 62.0%, adjusted difference  $-59.9%$  [95% CI,  $-61.9$  to  $-57.9%$ ]), and EDs (9.5%, adjusted difference  $-7.5%$  [95% CI,  $-9.8$  to  $-5.2%$ ]).

## DISCUSSION

Direct-to-patient televisits were associated with comparable quality of care relative to several other settings for two major dimensions of antibiotic management for ARIs and UTIs: presence of antibiotic use and guideline concordance with respect to antibiotic type and duration when antibiotics are prescribed. However, televisits were associated with less frequent Group A strep testing in pharyngitis, which may suggest problems with obtaining convenient lab tests for those patients who receive care virtually as opposed to in person. This is important since reduced Group A strep testing, and reduced testing overall (e.g., urinalysis or urine cultures), in televisit

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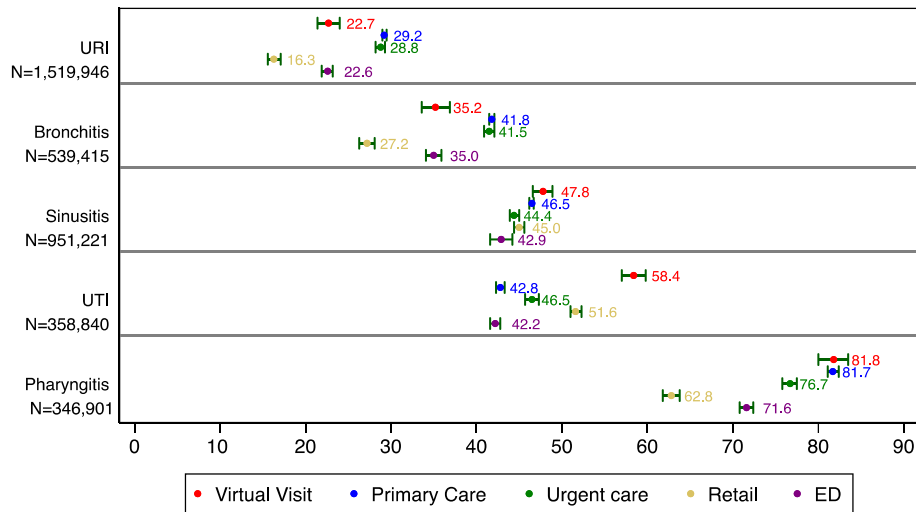


Figure 1 Proportion of patient visits with antibiotic medication, by condition and site of care.

encounters may promote overuse of antibiotics and antibiotic resistance.

Study limitations include a single national private insurer and third-party televisit vendor, claims data which may lack relevant clinical information, unobserved patient case-mix (in the ED setting, broad-spectrum antibiotics may also be indicated and clinical appropriateness, as defined by our claims-

based approach, would be underestimated), and motivation to seek care in alternative settings (e.g., some patients seeking antibiotic prescriptions may be more likely to seek care by televisit) and the observational nature of the study, all of which preclude a causal interpretation of study findings and a firm determination of the clinical appropriateness of antibiotic use in any given instance.

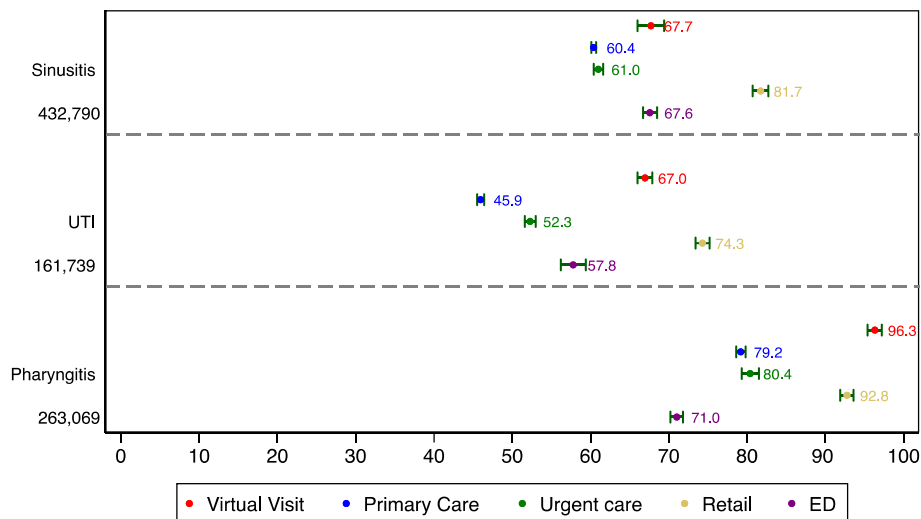


Figure 2 Among visits with prescribed antibiotics, proportion with guideline-concordant antibiotic management, by condition and site of care.

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#### Declarations:

**Conflict of Interest:** Dr. Cuellar reports receiving (in the last 36 months) consulting fees unrelated to this work from Casey Family Programs. Dr. Jena reports receiving (in the last 36 months) consulting fees unrelated to this work from Bioerativ, Merck/Sharp/Dohme, Janssen, Edwards Life Sciences, Novartis, Amgen, Eisai, Otsuka Pharmaceuticals, Vertex Pharmaceuticals, Celgene, Sanofi Aventis, Precision Health Economics, and Analysis Group. Dr. Jena

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## REFERENCES

1. **Uscher-Pines L, Mulcahy A, Cowling D, Hunter G, Burns R, Mehrotra A.** Antibiotic Prescribing for Acute Respiratory Infections in Direct-to-Consumer Telemedicine Visits. *JAMA Intern Med.* 2015 Jul;175(7):1234-5. <https://doi.org/10.1001/jamainternmed.2015.2024>
2. **Ray KN, Shi Z, Gidengil CA, Poon SJ, Uscher-Pines L, Mehrotra A.** Antibiotic Prescribing During Pediatric Direct-to-Consumer Telemedicine Visits. *Pediatrics.* 2019 May;143(5):e20182491. <https://doi.org/10.1542/peds.2018-2491>
3. **Uscher-Pines L, Mehrotra A.** Analysis of Teladoc use seems to indicate expanded access to care for patients without prior connection to a provider. *Health Aff (Millwood).* 2014 Feb;33(2):258-64. <https://doi.org/10.1377/hlthaff.2013.0989>
4. **Mehrotra A, Gidengil CA, Setodji CM, Burns RM, Linder JA.** Antibiotic prescribing for respiratory infections at retail clinics, physician practices, and emergency departments. *Am J Manag Care.* 2015 Apr;21(4):294-302.
5. **Shi Z, Mehrotra A, Gidengil CA, Poon SJ, Uscher-Pines L, Ray KN.** Quality Of Care For Acute Respiratory Infections During Direct-To-Consumer Telemedicine Visits For Adults. *Health Aff (Millwood).* 2018;37(12):2014-2023. <https://doi.org/10.1377/hlthaff.2018.05091>
6. **Mehrotra A, Liu H, Adams JL, et al.** Comparing costs and quality of care at retail clinics with that of other medical settings for 3 common illnesses. *Ann Intern Med.* 2009;151(5):321-328. <https://doi.org/10.7326/0003-4819-151-5-200909010-00006>

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