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RESEARCH BRIEF

Before and During Pandemic Telemedicine Use: An Analysis of Rural and Urban Safety-Net Clinics

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Introduction: Differences in face-to-face and telemedicine visits before and during the COVID-19 pandemic among rural and urban safety-net clinic patients were evaluated. In addition, this study investigated whether rural patients were as likely to utilize telemedicine for primary care during the pandemic as urban patients.

Methods: Using electronic health record data from safety-net clinics, patients aged ≥18 years with ≥1 visit before or during the COVID-19 pandemic, March 1, 2019−March 31, 2021, were identified, and trends in face-to-face and telemedicine (phone and video) visits for patients by rurality using Rural–Urban Commuting Area codes were characterized. Multilevel mixed-effects regression models compared service delivery method during the pandemic by rurality.

Results: Included patients (N=1,015,722) were seen in 446 safety-net clinics: 83% urban, 10.3% large rural, 4.1% small rural, and 2.6% isolated rural. Before COVID-19, little difference in the percentage of encounters conducted face-to-face versus through telemedicine by rurality was found. Telemedicine visits significantly increased during the pandemic by 27.2 percentage points among patients in isolated rural areas to 52.3 percentage points among patients in urban areas. Rural patients overall had significantly lower odds of using telemedicine for a visit during the pandemic than urban patients.

Conclusions: Despite the increased use of telemedicine in response to the pandemic, rural patients had significantly fewer telemedicine visits than those in more urban areas. Equitable access to telemedicine will depend on continued reimbursement for telemedicine services, but additional efforts are warranted to improve access to and use of health care among rural patients.

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INTRODUCTION

Almost 20% of the U.S. population resides in rural areas.[1] Residents in rural areas have higher rates of chronic diseases, risky health behaviors, and age-adjusted mortality than their urban counterparts.[2−9] Use of primary care services reduces mortality rates and preventable hospitalizations and improves self-rated health.[10−12] However, rural patients face particular barriers to accessing needed and recommended primary care compared with urban patients.[13,14] In particular, a smaller rural healthcare workforce and long distances to access clinical facilities

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may contribute to rural/urban disparities in the use of healthcare services.[5,13,15–17]

Telemedicine (TM), which includes both video- and phone-based encounters, is a tool long believed to improve access to care, particularly for those in rural areas.[18] TM use is affected by differences among patients in their access to high-speed internet needed for video-based TM, digital literacy, economic stability, and trust in technology.[19–21] Previous studies show that nearly half of primary care providers in the U.S. have adopted TM since the beginning of March 2020,[22] up from just 18% in 2018.[23] However, rural clinics are less likely to provide TM than urban clinics,[24–27] and rural and low-income patients use less TM than patients in more urban or affluent communities.[20,26,28]

Research on the effects of the coronavirus disease 2019 (COVID-19) pandemic and TM on healthcare utilization among rural patients have primarily used surveys or claims data.[24,26,29] Using longitudinal electronic health record (EHR) data from a network of safety-net clinics (SNCs), which play an important role in providing care to medically underserved populations,[30–32] the following aims were examined: (1) service delivery methods (TM and face-to-face) before and during the COVID-19 pandemic among rural as compared with that among more urban patients to determine whether differences existed and (2) whether rural patients were as likely to utilize TM for primary care during the COVID-19 pandemic as more urban patients.

METHODS

EHR data from OCHIN, a non-profit healthcare innovation center providing a single instance of Epic to SNCs in 16 states, were utilized.[33] U.S. Department of Agriculture Rural-Urban

Table 1. Safety-Net Clinic Patients With a Visit Before or During the COVID-19 Pandemic by Rurality

Variables	Urban, *n*/average (%/SD)	Large rural, *n*/average (%/SD)	Small rural, *n*/average (%/SD)	Isolated rural, *n*/average (%/SD)
Total patients	843,535 (83.0)	104,694 (10.3)	41,167 (4.1)	26,326 (2.6)
Encounters				
Average number of annual visits	3.4 (5.9)	3.3 (5.0)	2.9 (3.6)	3.9 (7.4)
% visits, face-to-face	72.8	75.5	83.2	83.9
% visits, TM	27.2	24.5	16.9	16.1
% clinics providing TM	89.8	88.9	81.8	91.7
Average age	42.5 (16.1)	45.7 (17.4)	48.3 (18.5)	50.1 (18.3)
Sex				
Female	483,542 (57.3)	60,243 (57.5)	23,929 (58.1)	14,298 (54.3)
Male	359,993 (42.7)	44,451 (42.4)	17,238 (41.9)	12,028 (45.7)
Race				
Asian	42,411 (5.0)	1,587 (1.5)	1,157 (2.8)	122 (0.5)
Black	185,362 (22.0)	3,085 (3.0)	8,347 (20.3)	814 (3.1)
AI/AN, NHPI, or other	21,276 (2.5)	2,739 (2.6)	788 (1.9)	648 (2.5)
White	494,402 (58.6)	88,875 (84.9)	26,998 (65.6)	22,472 (85.4)
Unknown	100,084 (11.9)	8,410 (8.0)	3,877 (9.4)	2,270 (8.6)
Ethnicity				
Non-Hispanic	501,719 (59.5)	80,080 (76.5)	32,533 (79.0)	21,479 (81.6)
Hispanic	288,744 (34.2)	17,461 (16.7)	5,490 (13.3)	2,902 (11.0)
Unknown	53,042 (6.3)	7,153 (6.8)	3,144 (7.6)	1,945 (7.4)
Health insurance				
% visits Medicaid insured	49.5	38.8	23.7	33.0
% visits Medicare insured	15.2	26.0	32.8	30.5
% visits private insured	13.7	22.0	26.9	20.8
% visits uninsured	18.6	12.2	13.1	13.5
% visits other insurance	3.0	1.1	3.5	2.2
Patient health				
% patients with hypertension	27.0	31.9	42.0	36.8
% patients with diabetes	14.2	13.6	18.8	13.6

Note: Study dates: March 1, 2019–March 31, 2021.
AI/AN, American Indian/Alaskan Native; NHPI, Native Hawaiian and Pacific Islander; TM, telemedicine.

Commuting Area ZIP code approximation data files were used to determine the rurality of patients.[34] Visits to clinics that were live on OCHIN's EHR throughout the study period, from March 1, 2019 through March 31, 2021, were analyzed to understand trends before (March 1, 2019–February 28, 2020) and during (April 1, 2020–March 31, 2021) the pandemic. This study was approved by the Advarra IRB.

Study Population

All analyses were restricted to patients aged ≥18 years with at least 1 face-to-face or TM visit at an eligible SNC during the study period. Patients with a missing ZIP code at every visit were excluded from analyses.

Measures

The outcome of interest was service delivery method: face-to-face versus TM. The covariate of interest was rurality, assigned using the patient address at each encounter linked to ZIP code approximations of rurality categorized as urban, large rural, small rural, and isolated rural.[35] Other confounders (age, sex, race, ethnicity, insurance, hypertension, and diabetes) were assigned at each encounter.

Statistical Analysis

Frequencies and percentages were calculated to describe the patient population by rurality at the study start. To understand whether the service delivery methods followed similar patterns by rurality during the study period, the percentage of visits conducted by each service delivery method comparing the periods before and during the pandemic and monthly by rurality were obtained.

Using multilevel mixed-effects models clustered at the patient, the odds of service delivery method during the pandemic restricted to SNCs that provided TM during the pandemic were estimated. The main covariate of interest was rurality, and the model adjusted for all confounders listed earlier and state indicators to account for state-level differences in TM reimbursement.

Analyses were conducted using SAS EG 8.3 and Stata, version 15.1.

RESULTS

The study population included 1,015,722 patients seen in 446 SNCs across 16 states. The percentage of patients with a TM visit ranged from 16.1% in isolated rural areas to 27.2% in urban areas (Table 1).

Before the COVID-19 pandemic, little difference in the percentage of total encounters conducted face-to-face versus through TM by rurality was found (Figure 1). The proportion of urban patients who had a TM visit during the pandemic period was 23 percentage points higher than that of patients in isolated rural communities. Trends in monthly use of TM versus face-to-face visits followed similar patterns across rurality (Figure 2). There was an initial peak in TM use at the start of the pandemic, followed by a downward trend for all rurality categories. The increase in TM visits before versus during the pandemic ranged from a 27.2 percentage point increase in isolated rural areas to a 52.3 percentage point increase in urban areas.

Throughout the pandemic period, the proportions of visits received through TM were consistently lower among rural patients than among more urban patients.

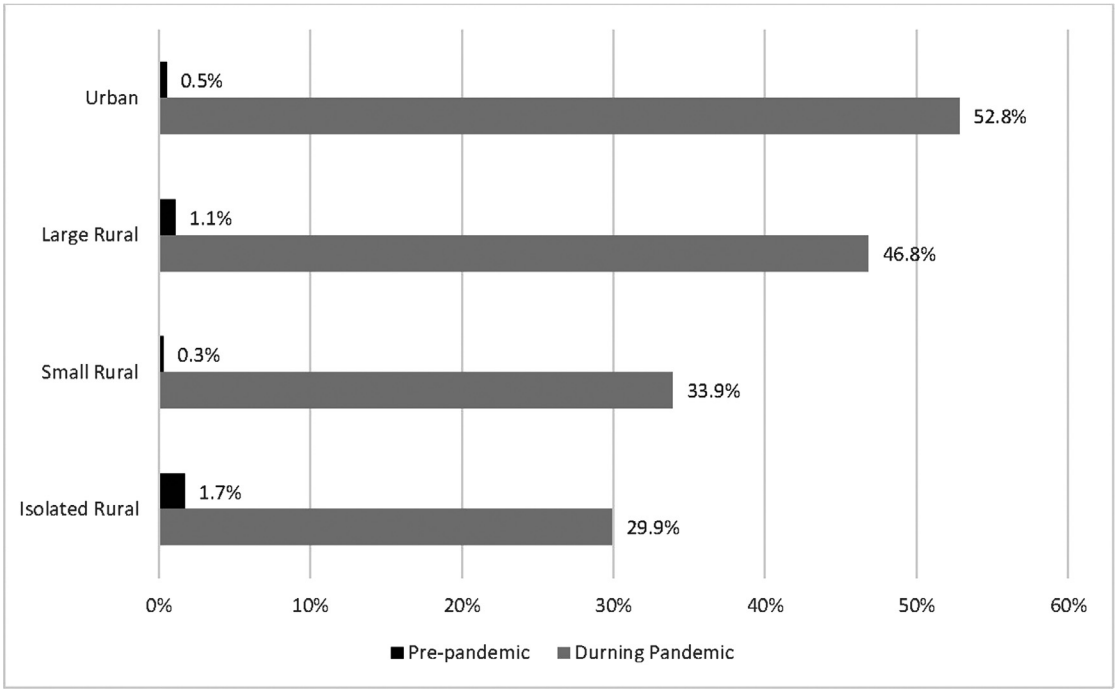

Figure 1. Telemedicine encounters before/during COVID-19 pandemic by rurality.

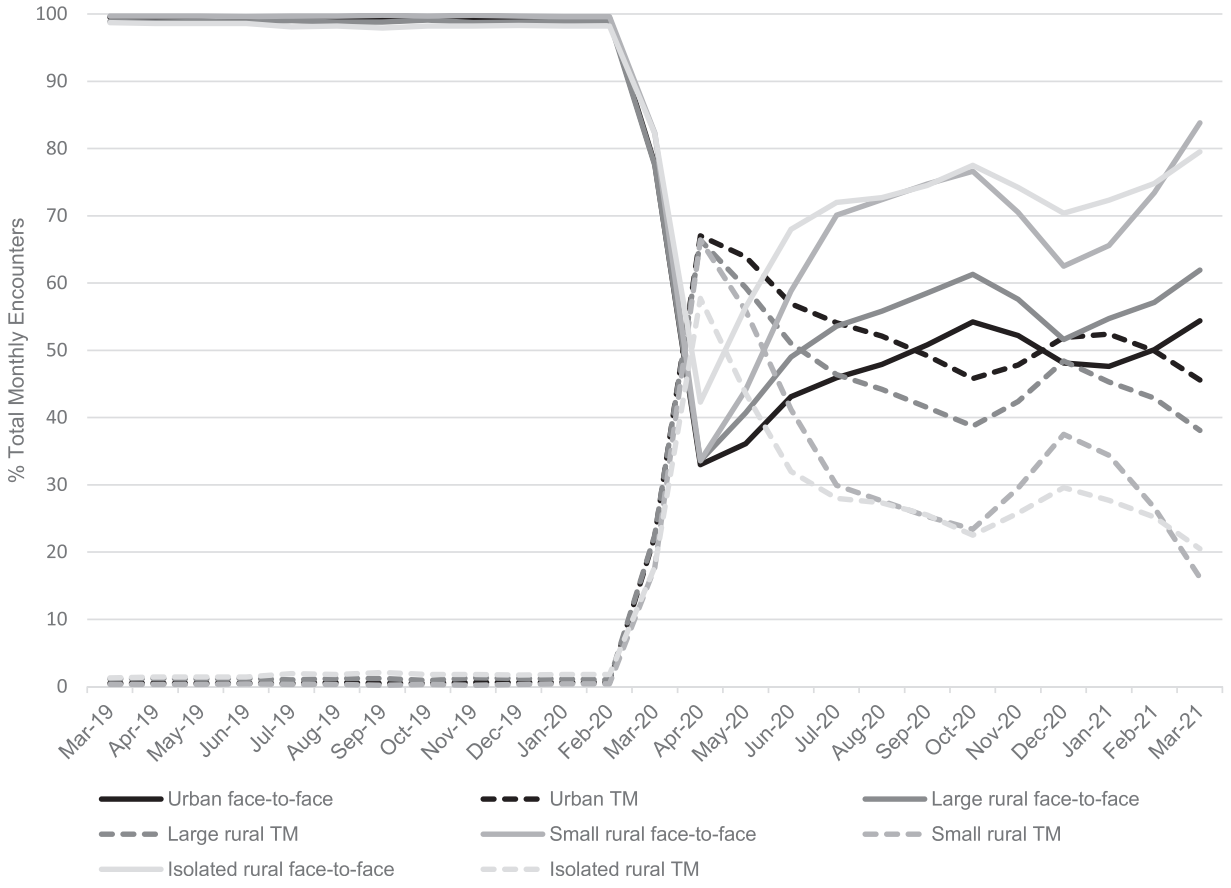

Figure 2. Monthly rate of face-to-face and TM encounters by rurality.
Apr, April; Aug, August; Dec, December; Feb, February; Jan, January; Jun, June; Mar, March; Nov, November; Oct, October; Sep, September; TM, telemedicine.

Table 2. Odds of a Telemedicine Visits During the COVID-19 Pandemic Among Patients Seen in Safety-Net Clinics

Rurality	OR (95% CI)	*p*-value
Urban	ref	
Large rural	0.71 (0.70, 0.72)	**<0.001**
Small rural	0.90 (0.87, 0.93)	**<0.001**
Isolated rural	0.25 (0.24, 0.26)	**<0.001**

Note: Boldface indicates statistical significance ($p<0.05$).
Model is clustered at the patient level and adjusts for state, age, sex, race, ethnicity, insurance, and chronic disease diagnoses.

All rural patients had significantly lower odds of using TM for a visit during the pandemic period than patients residing in urban areas, with isolated rural patients showing the lowest odds (Table 2).

DISCUSSION

Telemedicine has the potential to improve access to care for patients in rural areas and reduce rural/urban disparities in care. Despite the increased use of TM in response to the pandemic, this study found that rural patients had significantly fewer TM visits than those in more urban areas. It is unclear whether the difference in TM delivery in rural versus in urban settings identified in this study is related to variation in SNC offerings, the type of service needed, patient preferences for care modality, or a combination of these factors.

Equitable access to TM will depend on continued reimbursement for TM services and the success of efforts to improve broadband access.[36] In addition, SNCs are often excluded or not mentioned in TM-eligible provider lists,[37] potentially creating challenges for SNCs that desire to continue providing TM services. The coronavirus Aids, Relief, and Economic Security Act authorized Rural Health Clinics and Federally Qualified Health Centers to serve as a distant site (i.e., providing care to patients) for Medicare beneficiaries during the public health emergency.[38] Despite these coverage expansions, this study found geographic disparities in TM utilization.

The increased financial burden from the COVID-19 pandemic resulted in hospital layoffs, clinical practice closures, and delayed care.[39] TM has the potential to provide healthcare services that may no longer be available within rural communities.[40] Future research should continue to monitor healthcare access as well as the quality of care among low-income and rural patients, monitor the type of services TM is most suitable for, and examine the type of TM used (e.g., phone, video, patient portal) to understand whether method of delivery varies and whether specific reimbursement policies differentially help to facilitate access to care.

Limitations

Patient's address was only available on the basis of information recorded in the EHR. Because of reporting requirements for most SNCs, ZIP code missingness was minimal.[41] Address at the most recent visit was used for patients with missing encounter addresses. Less than 1% of patients were missing a ZIP code at all encounters and were excluded from the analyses. These patients did not differ significantly in selected demographics from those included.

CONCLUSIONS

This study's findings indicate that during the first year of the COVID-19 pandemic, rural patients were less likely to use TM for outpatient services than urban patients. Additional efforts are needed to improve access to and the use of TM and face-to-face healthcare among rural patients.

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CREDIT AUTHOR STATEMENT

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