Video and Telephone Telehealth Utilization and Online Patient-Portal Activation Among Rural-Dwelling Patients: Demographic Analysis and Policy Implications

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Abstract

Background: Telehealth may help redress rural healthcare shortages in the United States and improve related rural health disparities. However, following the expansion of telehealth related to the COVID-19 pandemic, telehealth utilization has been lower overall among rural populations compared to urban populations. Certain populations are also more likely to use audio-only telehealth, with implications for care quality.

Objective: To describe demographic and telehealth utilization characteristics of a population of rural-dwelling adult patients and explore relationships of these characteristics with patients' level of rurality and with modality of patients' most recent telehealth encounter.

Methods: Retrospective medical record review of adults who lived in rural California ZIP codes and utilized telehealth at an urban medical center from December 2021 to December 2022. Rural-Urban Commuting Area Codes were used to assign ZIP code rurality and to group patients by three levels of rurality. Telehealth visits defined as video-enabled and telephone encounters with any provider type. Demographic variables included age, race or ethnicity, preferred language, payer, and online patient portal activation status, as proxy for digital health literacy. Telehealth encounter variables were video or telephone modality, visit provider, and specialty area. Chi Square and Fisher's Exact were conducted to test associations of demographic and encounter characteristics with patient level of rurality and telehealth encounter modality.

Results: A total of 9,359 patients were included. Telehealth patients living in the most rural ZIP codes were older, and a higher proportion were White, compared to those in less rural ZIP codes. Although patients who were American Indian, Asian, Black, and Latino together comprised 25% of the sample, this was lower than their average population in rural counties in California. Video visit use was significantly lower among patients who were older, Latino race or ethnicity, primary Spanish speakers, and publicly insured. Spanish-speaking patients had the lowest use of video telehealth visits. Patient portal activation was lower among Latinx and Spanish-speaking patients compared to White and English-speaking patients, respectively, and among Medicare patients compared to other insurance types. Telehealth modality and patient portal activation were not significantly associated with level of rurality.

Conclusions: Findings substantiate concerns of rural telehealth access disparities, particularly among patients who are older, of minoritized race or ethnicity, and Spanish-speaking. Ongoing research is needed to understand how underserved rural populations are utilizing telehealth, as well as to understand variation in utilization between regions and healthcare settings.
To help remedy rural telehealth utilization disparities, policy should address patient-level telehealth barriers by supporting measures such as healthcare navigation resources, culturally tailored telehealth patient outreach, digital access assessment, and patient digital education.

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Conclusions: Findings substantiate concerns of rural telehealth access disparities, particularly among patients who are older, of minoritized race or ethnicity, and Spanish-speaking. Ongoing research is needed to understand how underserved rural populations are utilizing telehealth, as well as to understand variation in utilization between regions and healthcare settings.

To help remedy rural telehealth utilization disparities, policy should address patient-level telehealth barriers by supporting measures such as healthcare navigation resources, culturally tailored telehealth patient outreach, digital access assessment, and patient digital education.

Keywords: healthcare access; patient demographics; patient portal; rural; rural health; telehealth; video visit.

Introduction

In the United States, rural populations experience worse outcomes related to the most common health conditions, as well as a higher burden of morbidity and mortality compared to urban populations [1-5]. These rural health disparities are often more pronounced among rural populations of color, who make up about 20% of rural United States residents [3, 6, 7]. Rural health disparities negatively impact rural social systems and prevent rural communities from thriving [8].

A major contributor to rural health disparities is limited healthcare access, a chronic issue with multifaceted causes, including structural factors that constrain the overall availability of healthcare in rural areas [4, 8-10]. Long-term trends in healthcare organization, health system affiliation, and rural economies have resulted in reduction of services or closure for hundreds of rural healthcare facilities nationwide, including hospitals, nursing homes, and pharmacies [3, 8, 11]. Maldistribution of the healthcare workforce between urban and rural areas also limits rural healthcare access with severe shortages of rural healthcare providers, including in primary care but most extreme among specialist providers [4, 12-15].

The virtual delivery of healthcare using communication technologies, broadly known as telehealth, may improve rural healthcare access by connecting rural patients to remote healthcare providers where they already practice [16-18]. Despite this promise, widespread scale-up of telehealth provision was not realized until the coronavirus disease (COVID-19) pandemic, which necessitated an abrupt shift away from in-person care in March 2020. Subsequent telehealth reimbursement expansions by both the Centers for Medicare and Medicaid Services (CMS) and private insurers resulted in rapid, dramatic increases in the share of healthcare encounters conducted via telehealth [19-21].

More than four years after the declaration of the COVID-19 Public Health Emergency (PHE), however, a picture has emerged of the mixed impact this rapid expansion has had on telehealth access. While the increase in telehealth appears to have improved access for some patients [19], evidence has shown that telehealth utilization during the COVID-19 PHE followed historical healthcare and telehealth access disparity trends [22], revealing lower use among patients who are rural dwelling [19, 21, 23, 24], lower income [21, 23], uninsured [25], and belong to certain race or ethnicity groups [19, 23]. Furthermore, the use of video versus audio-only telehealth modalities introduces a new dimension to access concerns. It remains unclear whether audio-only or telephone visits support the same care quality as video visits [26-29], and video use has been shown to vary by age [29-33], income [32, 33], education [31-33], insurance [29, 30, 32, 33], race and ethnicity [29-34], patient language [29, 31, 32, 34], rurality [29, 34, 35], and area broadband availability [29, 32]. However, studies report sometimes contradictory telehealth and video visit utilization across patient characteristics, and findings vary by region [19, 23, 33], healthcare setting, specialty, and diagnosis [30, 31, 35].

Given the complexity of telehealth utilization, further research is needed to more fully understand how specific patient populations are using telehealth. This is of particular importance in specialized healthcare settings, where access barriers may be more pronounced, and among populations already at risk of access disparities, such as rural populations and populations of color. The purpose of this paper is to describe the demographic characteristics of a population of rural-dwelling adults in California who utilized telehealth services at a large urban medical center and to describe visit characteristics of these patients' most recent telehealth encounters, including video or telephone modality. We also explore the relationship of patient demographic and telehealth encounter characteristics with the degree of patient rurality and with modality of patients' most recent telehealth encounter. Finally, we conclude with a discussion of the policy implications of our findings.

Methods

Data and Study Setting

Data in this retrospective study was obtained from the electronic health records (EHR) of a large health system providing diverse specialty care, located in a major urban center in California. This health system also operates a network of primary care clinics in the larger metropolitan area; all but one are located in urban ZIP codes (see *Assigning Rurality*, below).

Data from patients with telehealth encounters at the health system in the one-year period from December 2021 to December 2022 was included in this study. We selected this timeframe as a later phase of the COVID-19 PHE, when telehealth care was well-established but in-person restrictions had been loosened and telehealth utilization had settled from its peak pandemic levels. For this study, telehealth visits were defined as video-enabled and telephone encounters between a patient and any provider type.

This study was reviewed by the university's institutional review board. As a retrospective medical record review of de-identified patient data that had been previously collected as part of clinical care and quality improvement, it was deemed exempt from the requirement for informed consent and HIPAA authorization.

Study Population

All adult patients (≥18 years) in the health system residing in a rural California ZIP code who had at least one telehealth encounter in the study period (12/2021 – 12/2022) were included in the dataset (N = 9,359). The study population was drawn from a geographically disperse area of California and included residents of ZIP codes hundreds of miles from the health center.

Assigning Rurality

Rural patients were identified using Rural-Urban Commuting Area (RUCA) Codes [36] ZIP code approximations from the Washington, Wyoming, Alaska, Montana, Idaho (WWAMI) Rural Health Research Center (RHRC) [37]. RUCA codes are assigned to US Census tracts based on population density, measures of urbanization, and daily commuting flows. The WWAMI RHRC database combines RUCA values from census tracts that comprise specific ZIP code areas [38]. We used a four-level urban-rural categorization of RUCA codes [39]: Urban; Large Rural City/Town (micropolitan), the most populous or least rural level; Small Rural Town; and Isolated Small Rural Town, the most rural level. All California ZIP codes in the three rural categories were included (Figure 1). These RUCA groupings allowed us to analyze demographic and telehealth encounter characteristics of a diverse rural population with more nuance, reflective of meaningful measures of rural population density and resource proximity.

Figure 1. The three levels of rurality used to group included patients, with population density (by ZIP code area) and relative rurality of each group. Based on the "Categorization A" organization of RUCA Codes suggested by the WWAMI RHRC [39].

Variables

Patient Demographic Variables

We extracted the following patient demographic characteristics (Table 1): ZIP code, age, gender, race/ethnicity, preferred language, payer, and patient-portal activation status. Each patient was then grouped by ZIP code into one of the three rurality levels described above. EHR data at the health system does not have separate variables for race and ethnicity (e.g., Hispanic ethnicity); we used labels in the EHR (e.g., Latinx). Some categories of race/ethnicity and preferred language had very few observations in the Small Rural Town and Isolated Rural Town levels, and we combined categories of these variables for association tests.

Table 1. Patient demographic and telehealth encounter variables in dataset.

Variable Name	Description
Patient Demographic Variables	
ZIP Code	United States ZIP code of patient's residence address
Level of Rurality	Patients' ZIP codes were used to group patients into one of three rurality levels (from least to most rural): Large Rural Town; Small Rural Town; or Isolated Rural Town
Age	Exact age at time of first telehealth encounter and dichotomous age, under 65 years and 65 years or older.
Gender	Four categories: female, male, unknown, or non-binary. Unknown and non-binary had too few observations to support tests of association and were excluded from analyses.
Patient-identified Race/ethnicity	Four categories included in analyses: White, Latinx, Unknown/ declined, and Combined Other. Categories included in

	Combined Other were Asian, Black or African American, Multi-race/ethnicity, Native American or Alaska Native, Native Hawaiian or Other Pacific Islander, Other, and Southwest Asian and North African.
Preferred Language	Three categories included in analyses: English, Spanish, and Other. Other included 21 additional languages.
Payer	Type of Health Insurance, three categories: Medicare, Medi-Cal, and Other Insurance. Other included commercial health plans; Covered California insurance[a]; self-pay[b]; and several other less common insurance options
Patient Portal Activation Status	*Activated:* Portal account set up completed; does not indicate recency of account creation or access *Pending activation:* Patient issued an activation code but had not yet completed account set-up *Inactivated:* Account creation not completed before the activation code expired after 30 days
Telehealth Encounter Variables	
Telehealth Modality	Mode of telehealth delivery, video or telephone:
Provider	Healthcare professional charted for the telehealth encounter: Physician, Nurse Practitioner, Physician Assistant, and Other. Other included resource providers, counselors, chaplains, resident physicians, and all other provider types.
Specialty Area	*Primary care:* included primary care and family medicine; *medical specialties:* any non-surgical specialties; *surgical specialties*, including surgical oncology; *oncology and cancer center care,* all non-surgical cancer-related care; and *women's and maternal health,* including fetal health and neonatology.

Patient-portal activation status was collected as a proxy for digital or eHealth literacy. Patients of the health system can make use of an online patient portal, an online account to securely access personal health information and services such as provider messaging. At the study health system, a patient portal account is not required for video visits. Payer or insurance type was categorized as either Medicaid, Medicare, or Other Insurance.

Telehealth Encounter Variables

For each patient's most recent telehealth encounter in the period December 2021 to December 2022, we extracted telehealth modality, type of provider for the visit, and specialty area or clinic. There were 94 unique specialties represented in encounters; to allow tests of association, the research team condensed these into five categories (see Table 1). Telehealth modality was either video or telephone. Telephone visits were charted as "scheduled telephone" or "telephone" encounters; the latter are unscheduled calls to patients, for example to provide lab results. Although scheduled and unscheduled telephone encounters may differ in content, we collapsed these categories in order to compare telephone and video modalities. Furthermore, unscheduled telephone encounters made up a small proportion of all telehealth encounters.

Data Analysis

Statistical analysis was conducted from July 1 to October 17, 2023. We conducted descriptive statistical analysis of all patient demographic and telehealth encounter variables, with distribution of categorical variables and measures of central tendency for patient age, the only continuous variable. Descriptive statistics were calculated for the total sample, by rurality level, and by telehealth modality.

Pearson's chi-square test or Fisher's Exact test were used as appropriate to assess for significant associations between categorical variables. Because age was negatively skewed in this sample, the Kruskal-Wallis H test was used to test associations with continuous age.

Data were analyzed with Stata BE/17.0 (StataCorp, College Station, TX). For this study, statistical significance was determined at *P*-values <.05.

Results

Sample Population

There were 9,359 unique patients with an address in a rural California ZIP code who had at least one telehealth encounter with the health system from December 2021 to December 2022 (Table 2). The majority lived in Large Rural Town ZIP codes (68.3%; n = 6,393); 16.5% (n = 1,543) lived in Small Rural Town ZIP codes and 15.2% (n = 1,423) lived in Isolated Rural Town ZIP codes. Of 506 rural ZIP codes in California, 331 were represented in the sample. One quarter of patients (25.2%) lived in just six ZIP codes, which were all Large Rural Towns, and 50.7% of patients lived in 21 ZIP codes.

Demographic and Telehealth Encounter Characteristics by Rurality

Demographic and telehealth encounter characteristics are presented by rurality level in Table

2. Mean age of the sample was 56.1 years (median = 59.4, SD = 17.0) and increased as rurality increased. There was a statistically significant difference in age between the three rurality levels (Kruskal-Wallis H test, $X^2(df = 2) = 52.2$, $P<.001$). Dichotomous age, under and over 65 years, was also significantly associated with level of rurality ($X^2(df = 2) = 18.3$, $P<.001$). Patients 65 years or older made up 37.2% of the sample (*n* = 3,485); the proportion of those over 65 was lower in Large Rural Town ZIP codes (35.8%) and higher in Small Rural Town and Isolated Rural Town ZIP codes (39.3% and 41.3%, respectively). Level of rurality and gender were not significantly associated ($X^2(2) = 3.2$, $P=.21$).

Table 2. Demographic and most recent telehealth encounter characteristics of all patients residing in rural zip codes with at least one telehealth visit[c] in the period December 2021 – December 2022, presented by level of rurality.[d]

	Total	**Large Rural Town**	**Small Rural Town**	**Isolated Rural Town**	**Chi-square (*df*)/ Fisher's Exact[e]**	***P* value**
Level of Rurality, *n*(%)						
	9,359 (100)	6,393 (68.3)	1,543 (16.5)	1,423 (15.2)		
Gender, *n*(%)						
Female	5,158 (55.1)	3,529 (55.2)	825 (53.5)	804 (56.5)	3.2 (2)	.21
Male	4,175 (44.6)	2,844 (44.5)	717 (46.5)	614 (43.2)		
Total[f]	9,333 (99.7)	6,373 (99.7)	1,542 (99.9)	1,418 (99.7)		
Mean age, years [Median, SD[g]]						
	56.1 [59.4, ±17.0]	55.2 [58.4, ±17.2]	57.7 [60.7, ±16.5]	58.5 [62.1, ±16.0]	52.2 (2)[h]	**<.001**
Age, years						
18–64	5,874 (62.7)	4,102 (64.2)	937 (60.7)	835 (58.7)	18.3 (2)	**<.001**
65+	3,485 (37.2)	2,291 (35.8)	606 (39.3)	588 (41.3)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		
Race/ethnicity, *n*(%)						
White	6,508 (69.5)	4,351 (68.1)	1,056 (68.4)	1,101 (77.4)	83.9 (6)	**<.001**

	Total	Large Rural Town	Small Rural Town	Isolated Rural Town	Chi-square (*df*)/ Fisher's Exact	*P* value
Latinx	1,352 (14.5)	1,004 (15.7)	251 (16.3)	97 (6.8)		
Other Race/Ethnicity	951 (10.2)	664 (10.4)	147 (9.5)	140 (9.8)		
Unknown/Declined	548 (5.9)	374 (5.8)	89 (5.8)	85 (6.0)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		
Preferred Language, *n*(%)						
English	8,926 (95.4)	6,082 (95.1)	1,443 (93.5)	1,401 (98.5)	Fisher's exact, two-tailed	**<.001**
Spanish	383 (4.1)	279 (4.4)	87 (5.6)	17 (1.2)		
Other	50 (0.5)	32 (0.5)	13 (0.8)	5 (0.3)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		
Payer						
Medicare	4,193 (44.8)	2,749 (43.0)	742 (48.1)	702 (49.3)	40.8 (4)	**<.001**
Other Insurance	3,304 (35.3)	2,293 (35.9)	560 (36.3)	451 (31.7)		
Medi-Cal[i]	1,862 (19.9)	1,351 (21.1)	241 (15.6)	270 (19.0)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		
Patient Portal Activation						
Activated	8,577 (91.6)	5,851 (91.5)	1,411 (91.5)	1,315 (92.4)	2.2 (4)	.69
Pending Activation	693 (7.4)	481 (7.5)	119 (7.7)	93 (6.5)		
Inactivated	89 (1.0)	61 (1.0)	13 (0.8)	15 (1.1)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		
Provider of Most Recent Telehealth Encounter						
Physician	7,200 (77.0)	4,192 (76.8)	1,176 (76.2)	1,112 (78.1)	15.7 (6)	**.015**
Nurse Practitioner	1,194 (12.8)	829 (13.0)	202 (12.1)	163 (11.5)		
Other Providers	500 (5.3)	363 (5.7)	69 (4.5)	68 (4.8)		
Physician Assistant	465 (5.0)	289 (4.5)	96 (6.2)	80 (5.6)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		

	Total	Large Rural Town	Small Rural Town	Isolated Rural Town	Chi-square (*df*)/ Fisher's Exact	*P* value
Specialty of Most Recent Telehealth Encounter						
Medical Specialties	4,360 (46.6)	3,001 (46.9)	713 (46.2)	646 (45.4)	14.7 (8)	.07
Surgical Specialties	2,692 (28.8)	1,822 (28.5)	460 (29.8)	410 (29.8)		
Oncology and Cancer Center	1,763 (18.8)	1,167 (18.3)	302 (19.6)	294 (20.7)		
Women's, Maternal, and Fetal Specialties	427 (4.6)	317 (5.0)	52 (3.4)	58 (4.1)		
Primary Care	117 (1.2)	86 (1.6)	16 (1.0)	15 (1.0)		
Total	9,359 (100)	6,393 (100)	1,543 (100)	1,423 (100)		

The majority of rural telehealth patients (69.5%, *n* = 6,508) were White, 14.5% were Latinx (*n* = 1,352), 10.2% were another race/ethnicity, and 5.9% had unknown race/ethnicity. Race/ethnicity was significantly associated with rurality level (X^2(*df* = 6) = 83.9, *P*<.001). Isolated Rural Town ZIP codes had less racial/ethnic diversity: 77.4% of patients in these ZIP codes were White. By contrast, Latinx patients made up a slightly larger share of the Small Rural Town grouping, at 16.3%. Race/ethnicity categories represented in the category Combined Other included Asian (1.5%, *n* = 142), Black or African American (1.1%, *n* = 105), Native American or Alaska Native (1.7%, *n* = 161), and Other (3.6%, *n* = 340).

English was the preferred language for 95.4% of the sample, with 4.1% of telehealth patients preferring Spanish, and 0.5% preferring one of 21other languages. Language and rurality level were significantly associated (Fisher's Exact, two-tailed *P*<.001). Aligning with Latinx race/ethnicity, the highest proportion of primary Spanish-speakers was in the Small Rural Town grouping (5.6%), while the proportion was lowest in the Isolated Rural Town grouping (1.2%).

At 44.8% of the sample, the largest payer group was Medicare (*n* = 4,193) followed by Other Insurance at 35.3% (*n* = 3,304), and Medi-Cal at 19.9% of the sample (*n* = 1,862). Payer was significantly associated with rurality level (X^2(4) = 40.8, *P*<.001). Nearly a quarter (23.3%, *n* = 975) of Medicare recipients were aged 18 to 64 years. There were more Medicare recipients in Small Rural Town and Isolated Rural Town (48.1% and 49.3%, respectively), compared to Large Rural Town ZIP codes (35.9%). More Medi-Cal patients were in Large Rural Town compared to Small and Isolated Rural Town ZIP codes, while the Isolated Rural Town grouping had notably fewer Other Insurance patients.

Physicians were the most common provider, providing 76.9% of visits (n = 7,200), and provider type was significantly associated with level of rurality ($X^2(10) = 21.8$, P=.016). The proportions of specialty types were similar across levels of rurality, with the notable exceptions of surgical specialties and oncology and cancer center care, which both made up higher proportions of encounters with patients in Small Rural Town and Isolated Rural Town ZIP codes. However, specialty and rurality level were not significantly associated ($X^2(8) = 14.7$, P=.07). While portal activation status was not significantly associated with rurality level ($X^2(4) = 2.2$, P=.69), notably, more patients in Isolated Rural Town ZIP codes had active patient portals, at 92.4% compared to 91.6% of the sample as a whole.

Telehealth Modality by Rurality, Demographic, and Telehealth Encounter Characteristics

Most telehealth encounters were video visits, at 92.9% of most recent telehealth encounters (n = 8,690), while 7.1% (n = 669) were telephone visits (Table 3).

Table 3. Modality (telephone or video) of most recent telehealth encounter by patient demographic and telehealth encounter characteristics for all patients residing in rural zip codes[j] with at least one telehealth visit[k] in the period December 2021 – December 2022.

	Video	Telephone	Total	Chi-square (*df*)/ Fisher's Exact[l]	*P* value
Telehealth Visit Modality, *n*(%)					
	8,690 (92.9)	669 (7.1)	9,359 (100)		
Level of Rurality,[m] *n*(%)					
Large Rural Town	5,954 (93.1)	439 (6.9)	6,393 (68.3)	2.4 (2)	.30
Small Rural Town	1,423 (92.2)	120 (7.8)	1,543 (16.5)		

	Video	Telephone	Total	Chi-square (*df*)/ Fisher's Exact	*P* value
Isolated Rural Town	1,313 (92.3)	110 (7.7)	1,423 (15.2)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Gender, *n*(%)					
Female	4,812 (93.3)	346 (6.7)	5,158 (55.1)	3.3 (1)	.07
Male	3,854 (92.3)	321 (7.7)	4,175 (44.6)		
Total[n]	8,666 (92.9)	667 (7.1)	9,333 (99.7)		
Mean age, years [Median, ±SD[o]]					
	55.8 [59.0, ±17.0]	59.7 [63.0, ±16.2]	56.1 [59.4, ±17.0]	32.8 (1)[p]	**<.001**
Age, years					
≥64	5,507 (93.8)	367 (6.3)	5,874 (62.8)	19.3 (1)	**<.001**
65+	3,183 (91.3)	302 (8.7)	3,485 (37.2)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Race/ethnicity, *n*(%)					
White	6,078 (93.4)	430 (6.6)	6,508 (69.5)	12.0 (3)	**.008**
Latinx	1,229 (90.9)	123 (9.1)	1,352 (14.4)		
Other	881 (92.6)	70 (7.4)	951 (10.2)		
Unknown/Declined	502 (91.6)	46 (8.4)	548 (5.9)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Preferred Language, *n*(%)					
English	8,305 (93.0)	621 (7.0)	8,926 (95.4)	Fisher's Exact, two-tailed	**<.001**
Spanish	336 (87.7)	47 (12.3)	383 (4.1)		
Other	49 (98.0)	1 (2.0)	50 (0.5)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Payer					
Medicare	3,843 (91.7)	350 (8.4)	4,193 (44.8)	27.9 (2)	**<.001**
Other Insurance	3,130 (94.7)	174 (5.3)	3,304 (35.3)		
Medi-Cal[q]	1,717 (92.2)	145 (7.8)	1,862 (19.9)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Patient Portal Activation					
Activated	8,062 (94.0)	515 (6.0)	8,577 (91.6)	219.7 (2)	**<.001**
Pending Activation	547 (78.9)	146 (21.1)	693 (7.4)		
Inactivated	81 (91.0)	8 (9.0)	89 (1.0)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Provider of Most Recent Telehealth Encounter					

	Video	Telephone	Total	Chi-square (*df*)/ Fisher's Exact	*P* value
Physician	6,799 (94.4)	401 (5.6)	7,200 (76.9)	292.9 (3)	**<.001**
Nurse Practitioner	1,095 (91.7)	99 (8.3)	1,194 (12.8)		
Other Providers	371 (74.2)	129 (25.8)	500 (5.3)		
Physician Assistant	425 (91.4)	40 (8.6)	465 (5.0)		
Total	8,690 (92.9)	669 (7.1)	9,359 (100)		
Specialty of Most Recent Telehealth Encounter					
Medical Specialties	4,041 (92.7)	319 (7.3)	4,360 (46.6)	Fisher's Exact, two-tailed	**<.001**
Surgical Specialties	2,469 (91.7)	223 (8.3)	2,692 (28.8)		
Oncology and Cancer Center	1,670 (94.7)	93 (5.3)	1,763 (18.8)		
Women's, Maternal, and Fetal Specialties	395 (92.5)	32 (7.5)	427 (4.6)		
Primary Care	115 (98.3)	2 (1.7)	117 (1.2)		
Total	8,690 (92.9)	669 (100)	9,359 (100)		

Before collapsing telephone encounter types, unscheduled telephone encounters comprised 0.7% of patients' most-recent telehealth encounters (69 of 9,359); 10.3% of telephone encounters (69 of 669) were unscheduled. Mean age was significantly associated with modality of telehealth encounter (Kruskal-Wallis H test, $X^2(1) = 32.8$, P<.001), as was dichotomous age ($X^2(1) = 19.3$, P<.001). Video users were younger than telephone patients, with a mean age of 55.8 years (median = 59.0, ±17.00) compared to 59.7 (63.0, ±16.2). Patients 65 years or older had 8.7% of their telehealth encounters as telephone, compared to only 6.3% of those under 65 years (Table 3).

Telehealth modality differed substantially by race/ethnicity. Telephone use was highest among Latinx patients, nearly two percentage points higher (9.1%) than the sample and 2.5 percentage points higher than among White patients (6.6%). The category unknown/declined also used more telephone visits, at 8.4% of these patients' encounters. Race/ethnicity was significantly associated with most recent telehealth encounter modality ($X^2(3) = 12.0$, P=.008). Similarly, preferred Spanish language speakers had nearly double the telephone use compared to preferred

English language patients, at 12.3% and 7.0%, respectively. Preferred language was significantly associated with telehealth modality (Fisher's Exact, two-tailed P<.001).

Payer was significantly associated with modality of patients' most recent telehealth visit, $X^2(2) = 27.9$, P<.001. With 8.4% of their telehealth encounters as telephone, Medicare patients had the highest use of telephone modality, followed by Medi-Cal patients with 7.8% telephone. Patients with Other Insurance had the lowest telephone use at 5.3% of their encounters. Among patients within the Other Insurance category, rate of telephone visits was 4.7% for commercial insurance, 5.3% for Covered California, 4.8% for other insurance, and 17.7% for self-pay patients (these categories were not tested for association with telehealth modality).

Patient portal status was significantly and strongly associated with telehealth encounter modality ($X^2(2) = 219.7$, P<.001). Patients with activated portals had 94% of their encounters as video, while those with portals that were pending activation had only 78.9% of their encounters as video. Provider and modality of most recent telehealth encounter were significantly associated (Fisher's Exact, two-tailed P<.001). Finally, specialty and telehealth modality were also significantly associated (Fisher's Exact, two-tailed P<.001). Surgical specialties, oncology and cancer center care, and primary care demonstrated some variation in utilization of the two modalities, while medical specialties and women’s health specialties were more consistent.

Rurality level was not significantly associated with telehealth modality ($X^2(2) = 2.4$, P=.30), and distribution of telehealth modality differed only marginally among patients in Small and Isolated Rural Town ZIP codes. Female patients used slightly fewer telephone visits than male patients (6.7% of telehealth encounters compared to 7.7%, respectively), however gender and telehealth modality were not significantly associated (X^2 (1) = 3.3, P=.07).

Patient Portal Activation Status

A large majority of the sample (91.6%, *n* = 8, 577) had activated patient portals, while 7.4% (*n* = 693) were pending activation, and 1.0% (*n* = 89) were inactivated (Table 4). Female or male patient gender and patient portal activation status were significantly associated ($X^2(2) = 37.8$, $P<.001$). Substantially more female patients than male patients had activated patient portals (93.2% compared to 89.7%). Patient age was also significantly associated with patient portal status (Kruskal-Wallis H test, $X^2(2) = 35.7$, $P<.001$). Mean age was slightly higher among patients with portals pending activation (56.9 years, median = 60.4, ±18.2) than among those with active portals (55.9 years, 59.1, ±16.9), and was highest among patients with inactivated patient portals, at 66.3 years (67.2, ±11.7).

Table 4. Electronic patient portal activation status by patient demographic and telehealth encounter characteristics by for all patients residing in rural zip codes[r] with at least one telehealth visit[s] in the period December 2021 – December 2022.

	Activated	Pending	Inactivated	Total	Chi-square (*df*)/ Fisher's Exact[t]	*P* value
Activation Status, *n*(%)						
	8,577 (91.6)	693 (7.4)	89 (1.0)	9,359 (100)		
Gender, *n*(%)						
Female	4,806 (93.2)	318 (6.2)	34 (0.6)	5,158 (55.1)	37.8 (2)	**<.001**
Male	3,746 (89.7)	374 (9.0)	55 (1.3)	4,175 (44.6)		
Total[u]	8,552 (91.6)	692 (7.4)	89 (1.0)	9,333 (99.7)		
Mean age, years [Median, SD[v]]						
	55.9 [59.1, ±16.9]	56.9 [60.4, ±18.2]	66.3 [67.2, ±11.7]	56.1 [59.4, ±17.0]	35.7 (2)[w]	**<.001**
Age, years						
18–64	5,415 (92.2)	419 (7.1)	40 (0.7)	5,874 (62.8)	14.2 (2)	**.001**
65+	3,162 (90.7)	274 (7.9)	49 (1.4)	3,485 (37.2)		
Total	8,577 (91.6)	693 (7.4)	89 (1.0)	9,359 (100)		
Race/ethnicity, *n*(%)						
White	6,099 (93.7)	342 (5.3)	67 (1.0)	6,508 (69.5)	n/a[x]	
Latinx	1,183	158	11	1,352		

	Activated	Pending	Inactivated	Total	Chi-square (*df*)/ Fisher's Exact	*P* value
	(87.5)	(11.7)	(0.8)	(14.5)		
Other Race/Ethnicity	859 (90.3)	83 (8.7)	9 (1.0)	951 (10.2)		
Unknown/Declined	436 (79.6)	110 (20.1)	2 (0.4)	548 (5.9)		
Total	8,577 (91.6)	693 (7.4)	89 (1.0)	9,359 (100)		
Preferred Language, *n*(%)						
English	8,241 (92.3)	599 (6.7)	86 (1.0)	8,926 (95.4)	Fisher's Exact, two-tailed	**<.001**
Spanish	295 (77.0)	86 (22.5)	2 (0.5)	383 (4.1)		
Other	41 (82.0)	8 (16.0)	1 (2.0)	50 (0.5)		
Total	8,577 (91.6)	693 (7.4)	89 (1.0)	9,359 (100)		
Payer						
Medicare	3,802 (90.7)	336 (8.0)	55 (1.3)	4,193 (44.8)	106.3 (4)	**<.001**
Other Insurance	3,140 (95.0)	142 (4.3)	22 (0.7)	3,304 (35.3)		
Medi-Cal[y]	1,635 (87.8)	215 (11.6)	12 (0.6)	1,862 (19.9)		
Total	8,577 (91.6)	693 (7.4)	89 (1.0)	9,359 (100)		

Patient portal activation status varied substantially between race/ethnicity groups. More White patients had activated patient portals (93.7%) than Latinx patients (87.5% activated portals), Other race/ethnicity patients (90.3%), and unknown race/ethnicity patients, which had the lowest proportion of activated portals, at 79.6%. However, we were not able to test the association of portal status with race/ethnicity due to small cell counts. A similar distribution of patient portal activation was seen for patients who preferred Spanish language: fewer Spanish-speaking patients had activated patient portals, with only 77.0% compared to 92.3% among English speaking patients. The association of preferred language with portal status was significant (Fisher's exact, two-tailed $P<.001$).

Fewer patients with Medicare insurance had activated patient portals (90.7%) than patients with Other Insurance types (95.0%). The majority of patients with inactivated portal status were Medicare patients, who comprised 61.8% of this group, compared to 24.7% Other Insurance patients and 13.5% Medi-Cal patients. However, patients with Medi-Cal had the lowest level of active portals, at 87.8%. Payer was significantly associated with patient portal activation status, $X^2(4) = 106.3$, $P<.001$.

Discussion

In this study, we used three levels of rurality to characterize a population of rural-dwelling California adults who utilized telehealth services at an urban medical center from December 2021 to December 2022. Patients who lived in more rural ZIP codes were older and a much higher proportion were White and primary English speakers. This aligns with other research showing that rural populations tend to be on average older and less racially and ethnically diverse [3, 4]. Older age among more rural patients is of particular concern, as challenges associated with more rural status (e.g., distance to services, weather disruptions) may be more impactful for older adults, compounding healthcare access challenges. Older adults also have lower digital access [40] and higher telehealth unreadiness [41], evidenced in our study by fewer video visits and lower patient portal use among older patients. Interventions to increase healthcare access through telehealth utilization among rural older adults could include patient digital education and measures to support rural connectivity.

A quarter of our sample was comprised of patients from race/ethnicity groups other than White, in line with the rural United States as a whole [42]. However, at the time of the 2020 US Census [43], the percent of residents in rural California counties[a] [44] who were Asian (2.1%), Black or African American (1.69%), Hispanic or Latino (22.8%), and American Indian or Alaska Native (5.4%; AI/AN) was higher than in our sample. While these data do not support a direct comparison because of different rurality measures, this may indicate that fewer rural individuals from these race or ethnicity groups are utilizing telehealth at this urban health center. This is significant given evidence that rural AI/AN and populations of color experience worse health outcomes than rural White populations [6, 7, 45]. Rural AI/AN and populations of color contend with complex barriers to realizing health as a result of legacies of colonization and slavery [6, 46]. For these populations, patient-centeredness and cultural tailoring [47] will be of central importance for successful implementation and equitable utilization of telehealth services.

Our findings align with existing research showing higher video visit use by White patients compared to patients of other races or ethnicities [30-33]. In our rural sample, patients who were Latinx had the lowest video visit use despite being younger and living less rurally, characteristics of patients who had more video visits overall. These findings agree with a majority of studies showing lower video use among Hispanic or Latino patients [31, 32, 48],

[a] The smallest scale for which U.S. Census data is consistently available. The U.S. Census Bureau QuickFacts data tool provides statistics for all counites and for cities and towns with a population of 5,000 or more. Many rural areas have a population below 5,000.

although Drake et al. found higher video use among rural and urban Hispanic patients in North Carolina [30]. Research has also found that while Hispanic or Latino individuals used less video visits, they had higher overall telehealth use compared to non-Hispanic White individuals [25, 33, 49]. We did not include a comparison to in-person patients at the health center, and more research is needed to explore how rural Latino patients utilize in-person versus telehealth specialty services at distant health centers.

Video use disparity was greatest among Spanish-speaking patients in our rural sample. Multiple other studies have shown that patients with Limited-English Proficiency (LEP) have fewer video and more telephone visits than English-proficient patients [29, 31, 32, 34]. Patients with LEP experience multiple barriers to healthcare access overall and, consequentially, worse health outcomes [50]. Video visit disparities may exacerbate this issue. While video access is limited by patient-level LEP barriers, such as mistrust and perceived discrimination [51, 52], clear provider- and system-level barriers also exist. LEP patients may not be offered video visits [26, 34], lack of language concordant front office staff poses challenges to LEP patients in obtaining appointments [51] and coordinating care [52], and difficulties bringing an interpreter on video platforms may also deter providers from offering video visits to LEP patients [26, 53]. Integrated video translation services, LEP community outreach and digital access assessment, and availability of language-concordant outreach materials, front office or call center staff, and patient portals have all been identified as important areas for intervention [50, 53].

The patterns we found of lower video visit use among patient subgroups are similar to those reported in studies early in the COVID-19 pandemic [29-32]. Our video use findings also concur with more recent national data [33]. The persistence of video visit disparities after the initial phases of the COVID-19 PHE, when systems- and patient-level telehealth barriers were likely highest related to implementation and scale-up challenges, underscores the need for ongoing research and policy attention to understand this issue. As others have noted [26, 28, 29], telephone visits likely support overall access for vulnerable populations; therefore, while efforts should be made to address video barriers, policy should continue to support telephone visit availability and reimbursement.

As a proxy measure of digital engagement, an unactive patient portal may indicate patients at risk of digital access disparities [54, 55], and our findings appear to substantiate this. Video visits were less common among patients whose portals were inactive or pending activation than among those with active portals, a finding we anticipated based on other studies [32, 35, 48]. On the other hand, our finding that neither telehealth modality nor patient portal status were significantly associated with rurality level was unexpected. Previous research has found that rural patients were significantly less likely to have video visits [29, 35] and significantly less likely to have an activated patient portal [48]. However another study found that while rurality was not associated with three measures of technology access, video and portal use were both positively associated with living in isolated rural Census tracts [56].

In this context, our findings contribute to a complex picture of digital access and telehealth utilization patterns among rural populations. One potential explanation for our finding of no association is that these other studies used non-rural comparison groups, while our sample was entirely rural. Another possible explanation is the use of different methodologies to define rurality, for example RUCA codes versus Rural-Urban Continuum Codes, as well as different geographic units, such as Census tract, ZIP code, or county [57, 58]. Finally, rural populations in the United States are heterogeneous [8, 42, 59], and these findings may represent meaningful variation between these rural populations.

Implications for Research and Policy

Our findings point to several areas for future research and intervention. More study is needed to fully characterize rural telehealth users, specifically rural populations of color. Future studies should apply sampling methods that account for the relatively fewer people of color living in rural areas in order to support statistical analysis of these groups. Research is also needed to elucidate the nature of relationships between patient demographic factors and telehealth modality use among rural patients utilizing telehealth at distant urban medical centers.

Policy interventions are needed to support equitable access to telehealth overall [60] as well as the appropriate application of telephone and video visit modalities [28, 29]. Such interventions could include support for culturally-tailored and language concordant telehealth patient outreach and education, digital access assessment, and patient digital education. Involving patients in the development of these resources, through research participation and patient advisory boards, can help ensure the materials are accurately targeted to address the perceived needs and preferences of their intended recipients [47, 60]. To ensure appropriate video access, policy must also address digital access concerns, for example through support for the ongoing development of broadband access in rural and other underserved areas [61, 62], free or low-cost smart device and data plans for low-income patients, and development of telehealth resources in public spaces, such as rural libraries [63]. Finally, policy makers must stay abreast of evidence regarding the effectiveness and accessibility of telephone and video telehealth modalities to inform reimbursement decisions in support of equitable healthcare access.

Limitations

Low representation of patients from several race/ethnicity groups in our sample and the choice to collapse several categories of race/ethnicity to enable tests of association were limitations of our study. The categories of race/ethnicity we combined represent distinct populations of rural residents, who experience particular structural barriers to realizing health, and focused researched with these patient populations is needed. In our data, services provided by nurse practitioners, physician assistants, or other provider types may have been billed under the physician billing code, potentially inflating the number of physician encounters. Further, while patient portal activation status and race/ethnicity showed a strong trend of association, we were not able to test this due to limitations in our statistical analysis. Our data also did not support comparison to non-rural telehealth utilizers or rural in-person patients, and further research is needed to explore how these groups differ in utilization of specialty care at an urban medical center. Our data are from a single health system; results may not be applicable in other settings. Finally, our study timeframe did not allow for addressing longitudinal changes in telehealth use among rural patients at this health center; further research is needed to clarify possible changes in demographics or telehealth utilization over time.

Conclusions

In this sample of rural patients who utilized telehealth at an urban medical center, video visit use and patient portal activation were lower among patients who were older, Latino race/ethnicity, primary Spanish speakers, and publicly insured. Targeted policies are needed to support appropriate video visit utilization in populations at risk of access barriers.

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Authors' Contributions

First: Conceptualization (lead); data curation and formal analysis (lead); writing – original draft (lead); writing – review and editing (equal). **Second:** Conceptualization (supporting); formal analysis (supporting); writing – review and editing (equal). **Third:** Conceptualization (supporting); formal analysis (supporting); writing – review and editing (equal).

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Conflicts of Interest

None declared.

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[a] California's subsidized health insurance marketplace created by the Affordable Care Act
[b] Self-pay or out-of-pocket, when no insurance is billed.

[c] Including all visits categorized as video visit, scheduled telephone encounter, telemedicine, and telephone.
[d] Levels of rurality, from least rural (i.e., most populous) to most rural: Large Rural City/Town (micropolitan) focused; Small Rural Town Focused; and Isolated Small Rural Town Focused (http://depts.washington.edu/uwruca/ruca-uses.php). Patients were grouped by ZIP code.
[e] Association with level of rurality assessed with Chi square test, Fisher's Exact test, or Kruskall-Wallis H test, as appropriate.
[f] The gender categories "unspecified" and "non-binary" were excluded from the analysis due to small size.
[g] SD, standard deviation.
[h] Chi-square value with ties from the Kruskal-Wallis H test of association, for continuous age at first telehealth encounter with level of rurality.
[i] California's State Medicaid program.
[j] Zip code rurality designated using the WWAMI Rural Health Research Center's (RHRC) zip code approximations of the USDA's Economic Research Service Census tract-based Rural-Urban Commuting Area (RUCA) Codes.
[k] Including all visits categorized as video visit, scheduled telephone encounter, telemedicine, and telephone.
[l] Association with modality assessed with Chi square test, Fisher's Exact test, or Kruskall-Wallis H test, as appropriate.
[m] Levels of rurality, from least rural (i.e., most populous) to most rural: Large Rural City/Town (micropolitan) focused; Small Rural Town Focused; and Isolated Small Rural Town Focused (http://depts.washington.edu/uwruca/ruca-uses.php). Patients were grouped by ZIP code.
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[t] Association with modality assessed with Chi square test, Fisher's Exact test, or Kruskall-Wallis H test, as appropriate.
[u] The gender categories "unspecified" and "non-binary" were excluded from the analysis due to small size.
[v] SD, standard deviation.
[w] Chi-square value with ties from the Kruskal-Wallis H test of association, for continuous age at first telehealth encounter with level of rurality.
[x] n/a, not applicable: Chi square analysis not appropriate due to small cell counts, and our statistical software could not execute Fisher's exact test with this number of variable categories.
[y] California's State Medicaid program.

Supplementary Files

Figures

The three levels of rurality used to group included patients, with population density (by ZIP code area) and relative rurality of each group. Based on the "Categorization A" organization of RUCA Codes suggested by the WWAMI RHRC [39].