Patient Characteristics Associated with Telemedicine Use at a Large Academic Health System Before and After COVID-19

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INTRODUCTION

The COVID-19 pandemic has led to the rapid adoption of telemedicine. Health systems nationwide moved quickly to scale their telemedicine capabilities, and the Centers for Medicare & Medicaid Services (CMS) and other payers expanded reimbursement for telehealth visits.¹ While widely lauded as a means to improve value of care, telemedicine may exacerbate disparities in health care access.² In this study, we describe the increased adoption of telemedicine at a large academic health system since the pandemic and examine our hypothesis that this increase is associated with widening racial, ethnic, and socioeconomic differences in access to care.

METHODS

Our analytic sample included all adult non-surgical and surgical ambulatory visits at the University of California, Los Angeles (UCLA) Health System that occurred between December 1, 2019, and June 30, 2020. We evaluated encounters encoded within the health record as either in-person office visits or telemedicine visits, including both video and telephone encounters. Our post-period was defined as beginning March 19, the date the California stay-at-home order was issued.³ We assessed several patient-level variables including age, sex, self-reported race and ethnicity, primary language, insurance status, and disease burden as measured by the number of listed patient comorbidities in the health record. We also estimated patient distance from clinic⁴ and linked median household income to patient zip code⁵ using data published by the United States Census Bureau.

We first conducted unadjusted analyses quantifying characteristics of the telemedicine and in-person patient populations before and after COVID-19. We then constructed multi-level mixed effects logistic regression models for each time period, controlling for demographic and clinical covariates, to

identify individual characteristics independently associated with telemedicine use before and after COVID-19. The models included clustering by patient ID to correct for inpatient correlation. All hypothesis tests were two-sided and a p value below 0.05 was considered statistically significant. The study was approved by the UCLA Institutional Review Board (IRB).

RESULTS

In total, 3371 out of 644,630 visits (0.5%) were conducted via telemedicine from December 1 to March 18 compared with 186,127 out of 451,577 visits (41.2%) from March 19 to June 30. Most telemedicine encounters were video visits (pre-pandemic = 96.0%, post-pandemic = 98.2%), with the remaining visits conducted via telephone.

Patient characteristics of telemedicine and in-person care users before and after COVID-19 are summarized in Table 1. Multivariable regression analyses (Table 2) revealed that, both before and after COVID-19, patients aged 65 years or older, non-English speaking patients, male patients, and Medicare-insured and uninsured patients had lower adjusted odds of telemedicine use compared with patients under 65 years, English-speaking patients, female patients, and patients with commercial insurance, respectively. Additionally, after the pandemic onset, patients residing in low- and middle-income zip codes, Asian-American and multiracial patients, Latinx patients, and patients with Medicaid coverage had lower odds of having a telemedicine encounter than patients residing in high-income zip codes, White patients, non-Latinx patients, and patients with commercial insurance, respectively. The adjusted odds ratios for women and Medicare patients moved closer to 1.0 after the pandemic onset, suggesting that the predominance of female patients and underrepresentation of Medicare patients among telemedicine users lessened between time periods.

DISCUSSION

Our results show differences in telemedicine utilization by age, primary language, and insurance status that pre-date the pandemic. After the onset of the pandemic, we also observed lower rates of telemedicine use among Latinx patients, Asian-

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Table 1 Patient Characteristics by Encounter Type from December 1, 2019, to June 30, 2020

	December 1–March 18		March 19–June 30	
	In-person (n = 278,986)	Telemedicine (n = 2848)	In-person (n = 139,903)	Telemedicine (n = 105,050)
Mean age in years (SD)	53.5 (18.4)	45.1 (16.3)	55.0 (18.2)	49.6 (17.2)
Median distance from clinic in miles (IQR)	7.0 (3.5–16.3)	10.5 (4.6–23.6)	7.1 (3.5–16.3)	7.3 (3.6–16.9)
Median household income* (IQR)	\$110,645 (\$82,511–\$130,779)	\$111,094 (\$83,482–\$133,136)	\$108,570 (\$78,733–\$130,625)	\$110,645 (\$82,511–\$130,876)
Sex (n, %)				
Female	161,237 (98.9%)	1861 (1.1%)	80,515 (56.5%)	62,026 (43.5%)
Male	117,730 (99.2%)	987 (0.8%)	59,371 (58.0%)	43,011 (42.0%)
Race (n, %)				
White	155,367 (98.9%)	1661 (1.1%)	77,510 (56.3%)	60,200 (43.7%)
Black	12,295 (98.9%)	135 (1.1%)	6717 (56.7%)	5130 (43.3%)
Asian	24,841 (99.1%)	233 (0.9%)	11,436 (57.9%)	8326 (42.1%)
American Indian	803 (99.3%)	6 (0.7%)	395 (57.6%)	291 (42.4%)
Pacific Islander	499 (99.0%)	5 (1.0%)	224 (53.0%)	199 (47.0%)
Multiple races	9313 (98.9%)	99 (1.1%)	4769 (58.0%)	3453 (42.0%)
Other/unknown	75,868 (99.1%)	709 (0.9%)	38,852 (58.6%)	27,451 (41.4%)
Ethnicity (n, %)				
Latinx	32,548 (98.8%)	389 (1.2%)	17,618 (58.0%)	12,755 (42.0%)
Non-Latinx	246,438 (99.0%)	2459 (1.0%)	122,285 (57.0%)	92,295 (43.0%)
Primary language (n, %)				
English	265,451 (99.0%)	2777 (1.0%)	132,329 (56.5%)	101,884 (43.5%)
Non-English	13,535 (99.5%)	71 (0.5%)	7574 (70.5%)	3166 (29.5%)
Insurance status (n, %)				
Commercial	121,816 (99.0%)	1279 (1.0%)	55,418 (54.2%)	46,751 (45.8%)
Medicare	64,483 (99.7%)	215 (0.3%)	35,014 (66.7%)	17,518 (33.3%)
Medicaid	4081 (99.1%)	36 (0.9%)	2528 (59.7%)	1706 (40.3%)
UCLA Managed Care†	30,202 (98.8%)	353 (1.2%)	15,703 (54.4%)	13,168 (45.6%)
Uninsured	4825 (99.2%)	39 (0.8%)	2078 (59.2%)	1431 (40.8%)
Other/unknown	53,579 (98.3%)	926 (1.7%)	29,162 (54.4%)	24,476 (45.6%)
Mean comorbidities (SD)	8.5 (8.3)	10.1 (10.5)	9.4 (9.1)	9.4 (9.1)

Duplicate patient encounters were excluded within each stratum

*Based on median household income linked to patient zip code

†Commercial and Medicare Advantage plans directly contracted with UCLA Medical Group

Table 2 Adjusted Correlates of Telemedicine vs. In-Person Care Utilization Before and After the COVID-19 Pandemic

	Before COVID-19 onset		After COVID-19 onset	
	Adjusted OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Age ≥ 65 years	0.32 (0.27–0.38)	< 0.001	0.29 (0.28–0.31)	< 0.001
Distance from clinic (miles)	1.0004 (1.0002–1.0007)	< 0.001	1.0007 (1.0006–1.0008)	< 0.001
Median household income* (≥ \$100 K as ref.)				
\$50–100 K	0.91 (0.82–1.01)	0.090	0.92 (0.89–0.94)	< 0.001
\$0–50 K	0.95 (0.76–1.19)	0.656	0.81 (0.76–0.87)	< 0.001
Female sex (male as ref.)	1.43 (1.29–1.59)	< 0.001	1.15 (1.12–1.19)	< 0.001
Race (White as ref.)				
Black	0.88 (0.69–1.11)	0.287	0.98 (0.92–1.04)	0.527
Asian	0.94 (0.78–1.13)	0.521	0.92 (0.87–0.97)	0.001
Pacific Islander	0.76 (0.25–2.31)	0.634	0.92 (0.67–1.27)	0.611
American Indian	0.56 (0.18–1.77)	0.324	0.88 (0.68–1.14)	0.343
Multiple races	0.86 (0.65–1.13)	0.273	0.81 (0.75–0.87)	< 0.001
Other/unknown	0.94 (0.82–1.06)	0.303	0.82 (0.80–0.85)	< 0.001
Latinx ethnicity	1.10 (0.94–1.28)	0.235	0.94 (0.90–0.98)	0.006
Non-English primary language	0.53 (0.38–0.72)	< 0.001	0.47 (0.43–0.50)	< 0.001
Insurance (commercial as ref.)				
Medicare	0.41 (0.34–0.51)	< 0.001	0.89 (0.85–0.93)	< 0.001
Medicaid	0.74 (0.49–1.12)	0.159	0.83 (0.75–0.92)	< 0.001
UCLA Managed Care†	0.83 (0.72–0.97)	0.019	1.06 (1.01–1.10)	0.011
Uninsured	0.55 (0.34–0.89)	0.016	0.61 (0.55–0.68)	< 0.001
Listed comorbidities	1.021 (1.015–1.026)	< 0.001	1.020 (1.019–1.022)	< 0.001

ref., reference group

*Based on median household income linked to patient zip code

†Commercial and Medicare Advantage plans directly contracted with UCLA Medical Group

American patients, multiracial patients, patients residing in low- and middle-income zip codes, and patients with Medicaid coverage. These differences are consistent with previously described instances of the “digital divide” in the uptake of patient portals and remote monitoring for chronic conditions, which has been documented in older patients, patients belonging to racial and ethnic minorities, low-income patients, and uninsured patients.⁶ Our study was limited by including a single health system and a small telemedicine sample size pre-pandemic, possibly preventing identification of additional pre-existing differences. It is important to note that determining whether observed differences were unjust or unfair is beyond the scope of this study. Future studies should identify the complex causes of the observed differences, determine whether these differences persist over time, and evaluate whether these differences propagate disparities in health outcomes.

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Compliance with Ethical Standards:

Conflicts of Interest: Dr. Kamdar holds equity and is a medical advisor for HeartCloud Inc, is a seed preferred shareholder and medical advisor for HAI Solutions LLC, and has given telemedicine lectures for Medtronic. Dr. Quinton works with UnitedHealthcare on the individual exchange team. Dr. Ong receives royalties from UpToDate for their telemedicine section.

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