Research and Applications

Virtual care expansion in the Veterans Health Administration during the COVID-19 pandemic: clinical services and patient characteristics associated with utilization

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ABSTRACT

Objectives: To describe the shift from in-person to virtual care within Veterans Affairs (VA) during the early phase of the COVID-19 pandemic and to identify at-risk patient populations who require greater resources to overcome access barriers to virtual care.

Materials and Methods: Outpatient encounters (N = 42 916 349) were categorized by care type (eg, primary, mental health, etc) and delivery method (eg, in-person, video). For 5 400 878 Veterans, we used generalized linear models to identify patient sociodemographic and clinical characteristics associated with: 1) use of virtual (phone or video) care versus no virtual care and 2) use of video care versus no video care between March 11, 2020 and June 6, 2020.

Results: By June, 58% of VA care was provided virtually compared to only 14% prior. Patients with lower income, higher disability, and more chronic conditions were more likely to receive virtual care during the pandemic. Yet, Veterans aged 45–64 and 65+ were less likely to use video care compared to those aged 18–44 (aRR 0.80 [95% confidence interval (CI) 0.79, 0.82] and 0.50 [95% CI 0.48, 0.52], respectively). Rural and homeless Veterans were 12% and 11% less likely to use video care compared to urban (0.88 [95% CI 0.86, 0.90]) and non-homeless Veterans (0.89 [95% CI 0.86, 0.92]).

Discussion: Veterans with high clinical or social need had higher likelihood of virtual service use early in the COVID-19 pandemic; however, older, homeless, and rural Veterans were less likely to have video visits, raising concerns for access barriers.

Conclusions and Relevance: While virtual care may expand access, access barriers must be addressed to avoid exacerbating disparities.

Key words: Veterans, telemedicine, COVID-19, disparities, access to care

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INTRODUCTION

As the novel severe acute respiratory syndrome coronavirus-2 spread through the US in March 2020 causing the COVID-19 pandemic, the Veterans Health Administration (VA) made a dramatic and unprecedented nationwide shift from in-person patient encounters to virtual care (ie, video- and phone-based care).[1–3] Rapid expansion of virtual care was central to the VA national response to the COVID-19 pandemic.[1–3] This shift was made possible by several VA strategies which increased training of care providers, expanded technology infrastructure, and provided consistent messaging regarding the transition to patients and stakeholders.[1] Virtual care expansion was also facilitated by a loosening of national restrictions on the use of HIPPA-compliant video platforms and reimbursement for virtual care.[2] Widespread adoption of virtual care across multiple clinical specialties was encouraged to bridge the physical gap between Veterans, VA, and its providers—especially in states under "stay at home" orders.[1]

Virtual care has been critical to maintaining healthcare access when in-patient care is disrupted, especially during natural disasters.[4,5] Perceived benefits of virtual care unique to the COVID-19 pandemic include reducing exposure among patients and providers as well as preserving in-person services for patients diagnosed with COVID-19 or other urgent care needs. In nonemergency settings, virtual care is widely recognized for increasing access to treatment, increasing patient satisfaction, and reducing cost to patients.[6–10]

Despite this potential, there were concerns that the rapid transition to virtual care in March 2020, could exacerbate technology access disparities known as the digital divide.[11–14] In particular, older Veterans, Veterans in rural locations, and those with low income may be vulnerable to the negative impacts caused by the digital divide and may face larger barriers to care while sheltering in place.[13,14] Furthermore, Veterans with prior utilization of VA services may be more likely to stay in contact with VA through the virtual care transition, where Veterans with low VA care utilization may be more susceptible to access barriers.

Objectives

To inform policies and interventions related to virtual care expansion, we sought to describe the shift from in-person to virtual care within the VA during the first 3 months (88 days) of the COVID-19 pandemic. Our objectives were to: 1) describe the proportion of encounters for different types of care that took place in-person, by phone, and by video, and 2) characterize patients who utilized video- or phone-based care during the early phase of the pandemic, accounting for previous VA healthcare utilization. We also investigated variation in video- and phone-based care by rurality due to the potential for limited broadband in rural areas and the large expansion of VA virtual care in rural areas prior to the COVID-19 pandemic. Our goal was to identify patient populations that might require greater resources and support to overcome access barriers during this time and to inform VA policy post-COVID-19 given the likelihood of continued widespread use of virtual care in the future.

MATERIALS AND METHODS

Data sources and study population

VA encounters and Veteran patient data were drawn from the VA Corporate Data Warehouse, a repository for VA electronic health records.[15] To examine trends in clinical encounters that took place in-person, by phone, and by video before and during COVID-19, we analyzed outpatient healthcare encounters, excluding compensation or pension examinations, (N = 42 916 349) that took place between January 5, 2020 and June 6, 2020.

For analyses of patient characteristics associated with video- and phone-based care, we identified Veterans in active care. Active care was defined as assignment to a primary care management team and having at least 1 VA outpatient encounter (excluding compensation or pension examinations) between March 11, 2019 and March 10, 2020. While COVID-19 may have been circulating earlier, March 11, 2020 was chosen as the start of the pandemic period, as it was the day the World Health Organization declared COVID-19 a pandemic.[16] Shortly after, on March 15, VA leadership directed facilities to defer nonemergent care and to convert in-person care to virtual care whenever appropriate.[1]

Veterans who were alive as of March 11, 2020 and aged between 18 to 105 years were included in analysis. Veterans who were missing data on rurality and priority enrollment group (described below) were excluded from analysis (< 0.5% combined). The analytic cohort comprised 5 400 878 Veterans who met all criteria, and they were followed for virtual care utilization through June 6, 2020.

Classification of VA outpatient encounters

Encounters were classified into type of care and method of care delivery using the VA Managerial Cost Accounting Stop Codes. These 3-digit codes are used to characterize all VA outpatient encounters to define clinical work units for resource allocation. Encounters were categorized into 6 mutually exclusive categories by type of care provided and grouped as follows: primary care,[17] mental health care, specialty care, rehabilitation care, emergency/urgent care, and diagnostic/ancillary care (Supplementary Table1). Based on the stop code and/or stop code pairing, each encounter was also categorized as in-person care, virtual care (phone or video-based), or supplementary remote care (Supplementary Table 2). Supplementary remote care included remote patient monitoring (ie, blood pressure measurements) as part of the national VA home telehealth program, Care Coordination/Home Telehealth.[18]

Encounters were aggregated into weekly counts, starting on Sunday. Trends in the number of encounters overall, by type of care and care delivery method, were described graphically. Emergency/urgent care and supplementary remote care were not explicitly demarcated in figures but are included in totals, as they were less than 4% of all encounters combined and largely unaffected by the pandemic.

Veteran patient characteristics

Patient-level data included sociodemographic and clinical characteristics and VA utilization during the baseline period (March 11, 2019–March 10, 2020), as presented in Table 1. Race and ethnicity were recorded as the most frequently reported identification in the patient health records. Missing data on race, ethnicity, or marital status were treated as distinct categories. Twenty-eight chronic conditions and diagnoses were defined using International Statistical Classification of Disease-10 codes and selected based on prior VA research.[19–21] Chronic conditions include: Acid-Related Diseases, Cancers (all types), Alzheimer's Disease, Arthritis, Asthma, Chronic Obstructive Pulmonary Disease, Heart Failure, Diabetes, HIV/AIDS, Headache, Hepatitis C, Hypertension, Ischemic Heart Diseases, Lower Back Pain, Multiple Sclerosis, Parkinson's Disease, Peripheral Vascular Disease, Pneumonia, Prostatic Hyperplasia, Renal Failure, Spinal Cord Injury, Stroke, Dementia, and Traumatic Brain Injury. Mental health conditions were defined using VA Program

Table 1. Characteristics of study population (N = 5 400 878) and virtual care use before and during the COVID-19 pandemic

	Total	Use of Virtual Care			Use of Video Care		
		Never	Existing	New	Never	Existing	New
N	5 400 878	1 207 072	3 377 156	816 650	4 909 584	124 963	366 331
Age (median)	66	68	66	66	67	52	57
(interquartile range)	(51, 74)	(51, 75)	(52, 73)	(51, 74)	(52, 74)	(39, 66)	(42, 69)
Age category (%)							
18–44	18	19	18	18	17	36	28
45–64	29	26	31	30	29	38	37
65+	53	55	52	53	55	27	35
Sex (%)							
Male	91	93	90	92	92	79	83
Female	9.2	6.6	10	8.1	8.4	21	17
Race (%)							
White	72	75	72	71	73	69	68
Black/African American	18	14	19	18	17	20	22
Asian	1.2	1.5	1.1	1.3	1.1	1.5	1.6
American Indian/Alaska Native	0.94	0.89	0.96	0.91	0.93	1.2	1
Native Hawaiian/Pacific Islander	0.93	0.86	0.94	0.98	0.91	1.2	1.1
Unknown/missing	6.8	8.1	6.3	7.2	6.9	6.6	6.4
Ethnicity (%)							
Hispanic/Latino	6.8	6.1	6.7	8.2	6.6	9.1	9.4
Not Hispanic/Latino	89	89	90	88	90	87	87
Unknown/missing	3.9	4.8	3.5	4	3.9	3.7	3.5
Marital status (%)							
Single/ divorced/ widowed	43	38	46	40	43	46	46
Married	55	60	53	59	56	52	53
Unknown/missing	1.5	1.8	1.3	1.5	1.5	1.6	1.6
Rural/urban dwelling (%)							
Rural	33	35	33	32	34	32	25
Urban	65	64	66	67	65	67	75
Highly Rural	1.3	1.4	1.3	1.1	1.3	1.4	0.7
Priority group (%)							
No service disability	17	23	14	17	17	7.2	8.9
Low income	18	16	19	16	19	11	13
Low/moderate disability	24	31	22	25	25	17	20
High disability	41	30	45	41	39	65	58
Homeless (%)	4	0.98	5.7	1.4	3.7	6.7	7
Chronic conditions (%)							
1–2 Conditions	50	72	40	57	51	32	35
3–4 Conditions	31	23	34	32	31	37	34
5+ Conditions	19	5.1	26	11	18	32	30
Mental health condition (%)	34	17	41	32	69	72	59

Note: Virtual care includes either phone-based or video-based care. Never users had no history of virtual care use between March 11, 2019 and June 6, 2020. Existing users had virtual care use between March 11, 2019 and March 10, 2020 but may or may not have had virtual care use between March 11, 2020 and June 6, 2020. New users had no history of virtual care use between March 11, 2019 and March 10, 2020, but had recorded use in the pandemic period of March 11, 2020–June 6, 2020.

Evaluation Resource Center definitions and include substance use disorders, severe mental illness (Bipolar disorder, severe depression, and additional psychotic disorders), depression, and posttraumatic stress disorder (PTSD).[22] Urban and rural definitions were derived from US Census Bureau criteria. Highly rural areas were defined as areas with a population density less than 7 people per square mile.[23] Homelessness was defined using outpatient stop codes reflecting use of homeless services and VA diagnosis codes.

We incorporated information from the VA priority-based enrollment system, which categorizes patients into 8 groups based on their service-connected disability rating, income, recent military service, and other factors.[23] We defined Veterans with high disability as those in groups 1 (> 50% service-connected disability) and 4 (VA catastrophically disabled). Veterans with low/moderate disability in-

clude groups 2 (30%–40% service-connected disability), 3 (10%–20% service-connected disability), and 6 (military exposures). Veterans with low income include those in group 5 (annual income below area-adjusted income threshold[23]). Finally, Veterans with no service-connected disability included Veterans from groups 7 and 8 (0% service-connected disability).

We assessed prior utilization of VA healthcare as past use is associated with future use of VA care. Utilization of healthcare by care delivery method prior to the pandemic period was dichotomized (eg, prior phone use: yes/no). Prior utilization of specialty and rehabilitation care was combined into 1 category due to small numbers of rehabilitation care. Prior utilization of healthcare services by type of care provided was categorized by the interquartile ranges of the number of visits in the baseline period (ie, low utilization [< 25th

percentile], average utilization [≥ 25th–≤ 75th percentile] and high utilization [> 75th percentile]). Prior mental health utilization was dichotomized into low and high use due to a limited range in number of mental health care visits.

Virtual care was defined as either phone- or video-based care. We classified Veterans into 3 categories based on their prepandemic and pandemic virtual care utilization: New, Never, and Existing Users. New Users had no history of virtual care use between March 11, 2019 and March 10, 2020 but had recorded use in the pandemic period of March 11, 2020 and June 6, 2020. Never Users had no history of virtual care use between March 11, 2019 and June 6, 2020. Existing Users had virtual care use between March 11, 2019 and March 10, 2020 but may or may not have had virtual care use between March 11, 2020 and June 6th, 2020. To examine the association of patient characteristics and virtual care use in the pandemic, we used a generalized linear model to predict virtual care during the pandemic (March 11, 2020 to June 6, 2020), adjusting for patient demographics, social determinants of health, comorbid conditions, and history of VA healthcare use. A second generalized linear model predicted the likelihood of video use (irrespective of phone-based care) during the pandemic. To evaluate the effect of measure modification by rurality, we examined the likelihood of virtual care and video care use in models stratified by Veteran urban and rural dwelling status. All models had standard errors clustered on the parent VA medical center (N = 140) where the patient was assigned a primary, mental health, specialty or rehabilitation, or other care team (in ranked order). All statistical analyses and graphical output were conducted in Stata 14 (StataCorp, LLC). This evaluation was conducted as part of the Virtual Access Quality Enhancement Research Initiative, which is designated as nonresearch quality improvement by VA program office partners in the VA Office of Rural Health.

RESULTS

Patterns of clinical care in VA

VA dramatically shifted patient care from in-person visits to other modalities between the prepandemic period and the first 2 months of the COVID-19 pandemic. As seen in Figure 1, between March and April 2020 a 3.3-fold reduction in in-person encounters (from a weekly average of 2 million to 600 000) co-occurred with a 2.65-fold increase in phone visits (from a weekly average of 327 275 to 869 251). Video visits also rose markedly from 10 000 a week prior to the pandemic to over 60 000 in April. In May 2020, VA was averaging over 114 000 video encounters a week—a 11.4-fold increase compared with prepandemic numbers. Effectively, by early June, VA was providing 58% of outpatient care encounters by phone or video, when it had averaged only 14% prior to the COVID-19 pandemic.

The decrease in in-person encounters and compensatory shift to other care modalities varied by type of care delivered (Figure 1). Mental health care and primary care were large contributors to the shift to virtual care; mental health care accounted for 55% of all video encounters and primary care accounted for 37% of all phone encounters. Among primary care encounters, prior to March 11, on average 71% of encounters took place in person, 29% via phone, and 0.2% on video. In comparison, after March 11, on average 19% of primary care encounters were in person, 77% by phone, and 4% by video. For mental health care, prior to March 11, 84% of encounters took place in person, 12% by phone and 2% by video.

After March 11, 25% of mental health encounters were in person, 59% were by phone, and 15% were by video.

While mental health care had the largest percentage of its encounters provided through video-based care and the largest absolute number of video encounters, it had the smallest increase, only 6.4-fold, in video care in the first 3 months of the pandemic. In comparison, primary care had a 15.6-fold increase, specialty care had a 14.2-fold increase, and diagnostic/ancillary care had an 8-fold increase in video-based encounters. While the absolute number for rehabilitation care encounters was small, there was a 17.1-fold increase in video-based encounters—the largest increase in video care among all services. Rehabilitation care also had the largest fold increase in phone-based encounters (4.8-fold), followed by mental health care (4.5-fold), specialty care (2.9-fold), and diagnostic care (1.3-fold).

Patient characteristics associated with virtual care utilization

Approximately 58% of the 5 400 878 patients in the study cohort utilized virtual care in the first 3 months of the pandemic. Among all Veterans, 7% used both phone and video, 51% used either, and 42% did not use virtual care during the pandemic period. Veterans who used video-based care tended to also use phone-based care (84%), however, few Veterans with phone-based care also utilized video visits (12%).

Veterans who used virtual care before and/or during the pandemic were more likely to be non-White, Hispanic, single, urban, disabled, and experiencing homelessness (Table 1) compared to Veterans who never used virtual care. These differences increased when examining video care use. New users of video care were more likely to be urban dwelling (75% vs 65%), homeless (7% vs 4%), and have a high level of disability (58% vs 39%) compared to Veterans who never used video care. While there were minor differences in age and sex among new and never users of any virtual care, new users of video care were proportionally more female (17% vs 8%) and were on average 10 years younger than those who never used video care (57 vs 67 years). Patients with high levels of prepandemic utilization of primary, mental health, specialty or rehabilitation, and diagnostic/ancillary care were more likely to be new users of any virtual care and video care (Table 2).

In adjusted models, older age was only slightly associated with virtual care use in the pandemic period (Table 3). In contrast, older Veterans aged 45–64 and 65+ were substantially less likely to use video care compared to Veterans aged 18–44 years (Risk Ratio 0.80 [95% confidence interval (95% CI) 0.79, 0.82] and 0.50 [95% CI 0.48, 0.52], respectively). There were minor, and likely not clinically significant, differences in virtual care or video care use by race or ethnicity. Black Veterans had a marginally increased likelihood of using any virtual care (1.02 [95% CI 1.01,1.03]) and a slightly decreased likelihood of using video care compared to White Veterans (0.96 [95% CI 0.94, 0.97]). Highly rural and rural dwelling Veterans were less likely to use video-based care during the pandemic; with highly rural Veterans being 17% less likely to use video care during the pandemic period compared to urban Veterans (0.83 [95% CI 0.78, 0.87]). Homeless Veterans were 11% less likely to use video care in the pandemic compared to nonhomeless Veterans (0.89 [95% CI 0.86, 0.92]). Overall, Veterans with multiple chronic conditions, with a mental health condition, and Veterans with low income and high disability had higher likelihood of using video care. History of virtual care was associated with both virtual care and
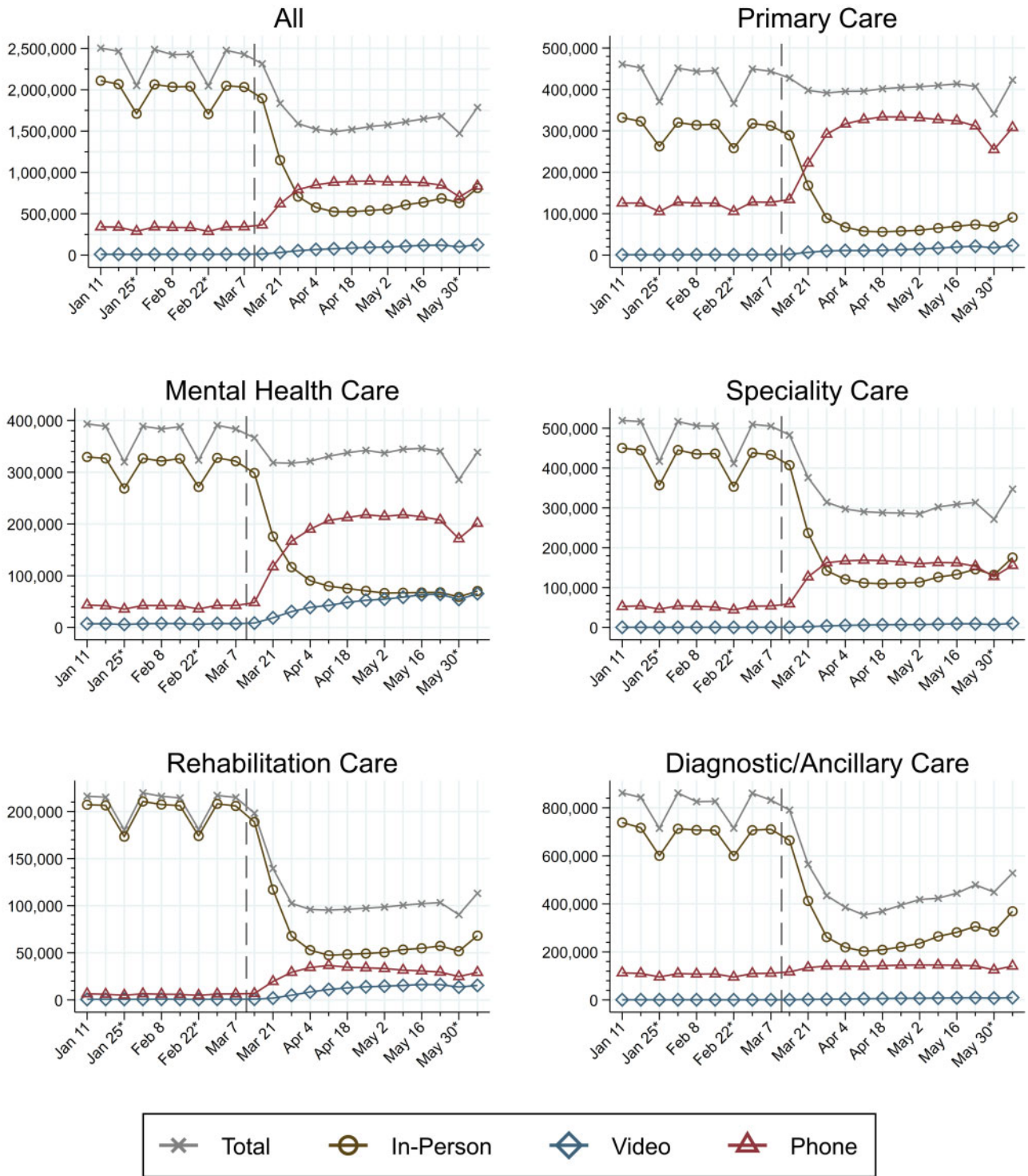
Figure 1. Encounters at the Veterans Health Administration (VA) between January 4 and June 6, 2020 by care delivery method and care type.

Dashed line represents March 11, 2020: World Health Organization declares COVID-19 a pandemic. *Represents 4-day week due to federal holiday.

video care utilization during the pandemic. Of note, prior users of video-based care were over twice as likely to use video care during the pandemic (2.52 [95% CI 2.36, 2.68]) compared to those with no prior utilization. Veterans with a history of high utilization of mental health care were nearly twice as likely to use video-based care as those with low past mental health care utilization.

Among models stratified by rurality, there was little evidence of effect measure modification among Veterans who used virtual or video care (Table 4). The risk ratio for video-based care comparing Veterans 65+ to those aged 18–44 years was marginally decreased among rural dwelling (0.46 [95% CI 0.44, 0.48]) compared with urban dwelling Veterans (0.52 [95% CI 0.50, 0.54]). Prior video use

Table 2. Prior utilization of Veterans Health Administration care and use of virtual and video care (N = 5 400 878)

	Total	Use of Virtual Care			Use of Video Care		
		Never	Existing	New	Never	Existing	New
N	5 400 878	1 207 072	3 377 156	816 650	4 909 584	124 963	366 331
Prior use of virtual care (%)							
Video	2.3	0	3.7	0	0	100	0
Phone	62	0	99	0	60	85	78
Prior supplementary remote care	15	6.9	20	11	14	32	22
Prior primary care							
Low (0–1 encounters)	27.5	57.5	13.5	41.2	28.5	15.3	18.3
Average (2–4 encounters)	43.6	38.9	43.8	50.1	44.2	35.7	38.6
High (5+ encounters)	28.8	3.6	42.7	8.7	27.3	49.0	43.1
Prior mental health care							
Low (0–1 encounters)	73.6	92.0	66.2	77.1	76.8	29.0	46.0
High (2+ encounters)	26.4	8.0	33.8	22.9	23.2	71.0	54.0
Prior specialty or rehabilitation care							
Low (0 encounters)	28.6	49.0	19.9	34.5	29.7	18.2	18.1
Average (1–6 encounters)	44.6	45.4	42.7	50.1	45.2	39.0	38.4
High (7+ encounters)	26.8	5.6	37.4	14.6	25.2	42.8	43.5
Prior diagnostic/ancillary care							
Low (1–2 encounters)	41.3	66.3	18.4	46.2	34.8	17.3	18.5
Average (3–9 encounters)	33.3	30.8	44.4	44.0	41.6	38.6	39.1
High (10+ encounters)	25.4	2.9	37.2	9.8	23.7	44.2	42.5

Note: Virtual care includes either phone-based or video-based care. Never users had no history of virtual care use between March 11, 2019 and June 6, 2020. Existing users had virtual care use between March 11, 2019 and March 10, 2020, but may or may not have had virtual care use between March 11, 2020 and June 6, 2020. New users had no history of virtual care use between March 11, 2019 and March 10, 2020 but had recorded use in the pandemic period of March 11, 2020–June 6, 2020.

was associated with a higher likelihood of pandemic video use among both urban (3.05 [95% CI 2.87, 3.25]) and rural (2.31 [95% CI 2.17, 2.46]) Veterans, compared to Veterans without prior video use.

DISCUSSION

This evaluation of virtual care use in VA illustrates the dramatic shift from in-person encounters to virtual care and how patterns varied by type of care and patient characteristics during the early phase of the COVID-19 pandemic. Similar to reports from other healthcare systems, such as the Centers for Medicare and Medicaid Services and Kaiser Permanente, VA saw an unprecedented increase in virtual care,[24] and even a complete flip of the proportion of in-person to virtual care.[25] While phone care was widely established and video care had been implemented across most VA facilities prior to the pandemic, the volume of virtual care use in VA was highly variable by type of care provided. Video encounters were largely used for mental health care, while primary care visits comprised the majority of phone visits. The higher use of phone-based care compared to video care may reflect remaining skepticism among patients and providers regarding the benefit of video care.[1] Phone-based appointments are also less complex and have fewer technological barriers compared with video-based care which is dependent on possession of an internet-capable device with a camera as well as broadband limitations.[2] Mental health care, which accounted for over half of all video visits, may have been better poised to rapidly expand video care and support large numbers of video visits as baseline video usage rates were higher.

While specialty care and diagnostic/ancillary care had large relative increases in the number of video and phone encounters, the ab-

solute numbers remained low—particularly for video encounters. This was likely due to multiple factors, including low baseline use of virtual care and the intentional postponement of elective procedures early in the pandemic. Providing virtual care is also more challenging for specialties that rely on physical exams or specialized equipment and machines only available in a VA facility. There is strong evidence for the efficacy of virtual rehabilitation,[26,27] and growing evidence supporting the role of virtual specialty care,[28,29] suggesting opportunities for future expansion. The low use of virtual care in the diagnostic/ancillary care services category reflects that some services, such as diagnostic tests and procedures, are particularly dependent on in-person contact and may lag as health systems scale up virtual care. Some of the difficulty in telemedicine conversion lies with the provider of care; for example, barriers in provider training or bandwidth limitations among teleworking providers. However, patients may also have preferences that limit the type of encounters that can be virtualized.[1,30–34]

Analyses of virtual care users suggest that patients with higher levels of need (eg, individuals who were lower income, higher disability, older, and with more physical and chronic conditions) were generally more likely to receive virtual care. This may be indicative of VA efforts to ensure Veterans who need VA care the most can access it; programs such as the VA national loaned tablet program[1,30,35] and the distribution of phones to homeless Veterans early in the pandemic.[36] Additionally, patients with higher levels of need may be more reliant on VA care and may have been more likely to have preexisting appointments which were converted to virtual care. During this time, there was also proactive and systemic contact between frontline clinicians and high-risk populations in primary and mental health care.[1] However, the reduced likelihood of video care among homeless Veterans and Veterans over 45 years old sug-

Table 3. Adjusted risk ratios and 95% confidence intervals for virtual care use between March 11, 2020 and June 6, 2020 in Veterans in active care at the Veterans Health Administration (N = 5 400 878)

	Model 1: Any Virtual Care	**Model 2:** Any Video care
Age category (ref: 18–44)		
45–64	1.04 (1.04, 1.05)	0.80 (0.79, 0.82)
65+	1.05 (1.04, 1.06)	0.50 (0.48, 0.52)
Sex (ref: Male)		
Female	1.02 (1.02, 1.03)	1.31 (1.28, 1.33)
Race (ref: White)		
Black/African American	1.02 (1.01, 1.03)	0.96 (0.94, 0.97)
Asian	0.96 (0.95, 0.98)	0.97 (0.94, 1.01)
American Indian/Alaska Native	1.00 (0.99, 1.01)	0.99 (0.95, 1.02)
Native Hawaiian/Pacific Islander	1.01 (1.00, 1.01)	0.98 (0.95, 1.01)
Unknown/missing	0.99 (0.99, 1.00)	0.96 (0.94, 0.97)
Ethnicity (ref: Not Hispanic/Latino)		
Hispanic/Latino	1.00 (1.00, 1.01)	1.00 (0.98, 1.02)
Unknown/missing	0.98 (0.97, 0.99)	1.01 (0.99, 1.04)
Rural/urban status (ref: Urban)		
Rural	1.00 (0.99, 1.00)	0.88 (0.86, 0.90)
Highly rural	0.99 (0.97, 1.00)	0.83 (0.78, 0.87)
Priority category (ref: No disability)		
Low income	1.07 (1.06, 1.08)	1.01 (0.99, 1.03)
Low/moderate disability	1.03 (1.02, 1.03)	1.21 (1.19, 1.23)
High disability	1.10 (1.09, 1.10)	1.35 (1.33, 1.38)
Homeless (ref: No)		
Yes	1.02 (1.01, 1.03)	0.89 (0.86, 0.92)
Chronic conditions (ref: 1–2)		
3–4 Conditions	1.11 (1.10, 1.11)	1.11 (1.10, 1.12)
5+ Conditions	1.10 (1.10, 1.11)	1.18 (1.16, 1.20)
Mental health condition (ref: None)		
Any	1.03 (1.03, 1.04)	1.22 (1.19, 1.26)
Prior video care (ref: None)		
Yes	1.07 (1.06, 1.08)	2.52 (2.36, 2.68)
Prior phone care (ref: None)		
Yes	1.18 (1.17, 1.20)	1.24 (1.22, 1.26)
Prior supp. remote care (ref: None)		
Yes	1.04 (1.03, 1.04)	1.15 (1.13, 1.18)
Prior primary care (ref: Average: 2–4)		
Low (0–1 encounters)	0.89 (0.88, 0.90)	1.00 (0.98, 1.01)
High (5+ encounters)	1.08 (1.07, 1.08)	1.14 (1.13, 1.16)
Prior mental health care (ref: Low: 0–1)		
High (2+ encounters)	1.26 (1.24, 1.27)	1.92 (1.84, 2.00)
Prior specialty/rehab care (ref: Average 1–6)		
Low (0 encounters)	0.87 (0.87, 0.88)	0.87 (0.85, 0.88)
High (7+ encounters)	1.11 (1.10, 1.12)	1.35 (1.32, 1.37)
Prior diagnostic/ancillary care (ref: Average 3–9)		
Low (1–2 encounters)	0.81 (0.80, 0.82)	0.84 (0.82, 0.85)
High (10+ encounters)	1.12 (1.11, 1.13)	1.16 (1.15, 1.18)

Note: Virtual care includes either phone-based or video-based care.

Models mutually adjusted for variables presented in table and also adjusted for current marital status. Standard errors clustered on VA medical center (N = 140). Prepandemic period is March 11, 2019–March 10, 2020; pandemic period is March 11, 2020–June 6, 2020.

Abbreviations: ref, reference category; rehab, rehabilitation; supp., supplementary.

gests that disparities might persist due to patient preferences, usability barriers, access to technology, and reliable internet or other factors.

Many have raised concerns about the possibility of virtual care increasing disparities in healthcare access and quality of care.[11–14] In this evaluation, Black Veterans had a decreased, but not clinically significant, likelihood of using video care in VA during COVID-19, and there were no other meaningful differences by race or ethnicity. This may reflect that the VA is able to reduce health disparities among race and ethnic groups as Veterans receive subsidized health-care that is not dependent on insurance coverage. However, consideration of racial and ethnic disparities in this analysis are limited by the categorization and potential misclassification of race and ethnicity in the VA. There are subgroups of both race and ethnicity that we are unable to characterize—each with different lived experiences of structural racism that may influence their access to virtual care. Nevertheless, rural Veterans had lower likelihood of video care use, raising concerns for access barriers possibly due to limited internet.[1] Virtual visits in the VA are usually associated with attempts to overcome physical distance for rural Veterans; however, the results

Table 4. Adjusted risk ratios (95% confidence intervals) for virtual care use March 11, 2020–June 6, 2020 among Veterans in Veterans Health Administration active care, stratified by Veteran rurality status (N = 5 400 878)

	Predicting any Virtual Care		Predicting any Video care	
	Rural N = 1 871 077	**Urban** N = 3 529 801	**Rural** N = 1 871 077	**Urban** N = 3 529 801
Age category (ref: 18–44)				
45–64	1.03 (1.02, 1.04)	1.05 (1.04, 1.06)	0.78 (0.77, 0.80)	0.81 (0.79, 0.82)
65+	1.03 (1.02, 1.04)	1.05 (1.05, 1.06)	0.46 (0.44, 0.48)	0.52 (0.50, 0.54)
Sex (ref: Male)				
Female	1.02 (1.02, 1.03)	1.02 (1.02, 1.03)	1.30 (1.27, 1.33)	1.31 (1.28, 1.34)
Race (ref: White)				
African American	1.02 (1.01, 1.03)	1.02 (1.01, 1.02)	0.97 (0.93, 1.00)	0.96 (0.94, 0.97)
Asian	0.96 (0.94, 0.98)	0.97 (0.95, 0.98)	1.02 (0.95, 1.10)	0.97 (0.94, 1.01)
American Indian/Alaska Native	0.99 (0.98, 1.01)	1.00 (0.99, 1.01)	0.97 (0.91, 1.03)	0.99 (0.95, 1.03)
Native Hawaiian/Pacific Islander	1.00 (0.98, 1.01)	1.01 (1.00, 1.02)	0.94 (0.89, 0.99)	0.99 (0.96, 1.02)
Unknown/missing	0.99 (0.98, 0.99)	1.00 (0.99, 1.00)	0.94 (0.92, 0.97)	0.96 (0.95, 0.98)
Ethnicity (ref: Not Hispanic/Latino)				
Hispanic/Latino	1.01 (1.00, 1.01)	1.00 (1.00, 1.01)	1.03 (0.99, 1.06)	1.00 (0.98, 1.02)
Unknown/missing	0.98 (0.97, 0.99)	0.98 (0.97, 0.99)	1.04 (1.00, 1.08)	1.00 (0.98, 1.03)
Priority Category (ref: No Disability)				
Low income	1.06 (1.06, 1.07)	1.07 (1.07, 1.08)	1.04 (1.02, 1.07)	1.00 (0.98, 1.02)
Low/moderate disability	1.02 (1.02, 1.03)	1.03 (1.02, 1.04)	1.24 (1.20, 1.27)	1.20 (1.18, 1.23)
Disability	1.10 (1.09, 1.10)	1.10 (1.09, 1.10)	1.39 (1.36, 1.43)	1.34 (1.31, 1.38
Homeless (ref: No)				
Yes	0.97 (0.96, 0.99)	1.03 (1.02, 1.04)	0.96 (0.92, 1.00)	0.88 (0.85, 0.92)
Chronic conditions (ref: 1–2)				
3–4 Conditions	1.11 (1.10, 1.12)	1.11 (1.10, 1.11)	1.08 (1.06, 1.09)	1.12 (1.11, 1.13)
5+ Conditions	1.12 (1.11, 1.13)	1.10 (1.09, 1.10)	1.14 (1.11, 1.17)	1.20 (1.18, 1.22)
Mental health condition (ref: None)				
Any	1.03 (1.02, 1.04)	1.03 (1.03, 1.04)	1.23 (1.20, 1.27)	1.22 (1.18, 1.25)
Prior video care (ref: None)				
Yes	1.08 (1.07, 1.09)	1.07 (1.06, 1.08)	3.05 (2.87, 3.25)	2.31 (2.17, 2.46)
Prior phone care (ref: None)				
Yes	1.19 (1.18, 1.21)	1.18 (1.16, 1.19)	1.26 (1.23, 1.29)	1.23 (1.21, 1.26)
Prior supp. remote care (ref: None)				
Yes	1.04 (1.03, 1.05)	1.03 (1.03, 1.04)	1.17 (1.14, 1.20)	1.14 (1.12, 1.16)
Prior primary care (ref: Avg: 2–4)				
Low (0–1 encounters)	0.88 (0.87, 0.89)	0.90 (0.89, 0.90)	1.01 (0.98, 1.03)	0.99 (0.98, 1.01)
High (5+ encounters)	1.10 (1.09, 1.11)	1.07 (1.06, 1.08)	1.16 (1.13, 1.19)	1.14 (1.12, 1.16)
Prior mental health care (ref: Low: 0–1)				
High (2+ encounters)	1.26 (1.25, 1.28)	1.25 (1.24, 1.27)	1.99 (1.91, 2.08)	1.89 (1.80, 1.98)
Prior specialty/rehab care (ref: Avg 1–6)				
Low (0 encounters)	0.88 (0.87, 0.89)	0.87 (0.86, 0.88)	0.85 (0.83, 0.87)	0.87 (0.86, 0.89)
High (7+ encounters)	1.10 (1.09, 1.11)	1.11 (1.11, 1.12)	1.34 (1.30, 1.37)	1.35 (1.32, 1.38)
Prior diagnostic/ancillary care (ref: Avg 3–9)				
Low (1–2 encounters)	0.80 (0.79, 0.81)	0.81 (0.80, 0.82)	0.85 (0.82, 0.87)	0.84 (0.82, 0.85)
High (10+ encounters)	1.14 (1.13, 1.15)	1.11 (1.10, 1.12)	1.17 (1.14, 1.20)	1.16 (1.14, 1.18)

Note: Virtual care includes either phone-based or video-based care.

Models mutually adjusted for variables presented in table and also adjusted for current marital status. Standard errors clustered on VA medical center (N = 140).

Abbreviations: ref, reference category; rehab, rehabilitation; supp., supplementary.

from our study indicate that urban dwelling Veterans had higher likelihood of using video care. This increased likelihood of use among urban Veterans could reflect underlying patterns of COVID-19 risk as metropolitan centers were hardest hit in the first months of the pandemic.

While VA has achieved substantial improvements in healthcare quality over several decades, previous studies have reported health disparities in medication adherence, surgery, and other processes likely to be affected by quality and quantity of patient–provider communication.[37,38] Our nationwide analysis may obscure health disparities at the medical center level and further studies are needed—particularly as the COVID-19 pandemic affected localities at different times and with varying intensity. Moreover, our study only examines the characteristics of patients using virtual care during the first 3 months of the pandemic. Therefore, our study would only identify health disparities and patterns of video or phone to home use that originated during, or were exacerbated by, the pandemic and not disparities that existed prior to the pandemic.

Several limitations should be noted. This evaluation focused on virtual care encounters and did not explore quality of care or clinical outcomes. Future studies should investigate patient and provider perceptions regarding the quality and comprehensiveness of virtual

care, as well as downstream utilization and health outcomes. In addition, we did not account for patients' preferences for virtual care, patients' lack of knowledge, or unfamiliarity with communication technology, which may influence propensity for using virtual care.[14,39] We captured rural and urban dwelling status, which may be correlated with, but is not a surrogate for, virtual care barriers such as limited technology or connectivity which may be accessible in future studies through FCC broadband spatial data.[40,41] Finally, our study only examined potential interactions between rural and urban status; however, there may be disparities in virtual care utilization present in subgroups (ie, Black men, older women) that we did not identify. Future work is needed to assess if virtual care utilization differs by subgroups of demographic characteristics.

CONCLUSION

In this nationally representative study in a large integrated healthcare system during a pandemic, we identified variation in the clinical patterns of care and the characteristics of patients using virtual care. While each disaster will pose unique challenges, our study may inform system-level preparations for future events where virtual delivery of care would be beneficial. In addition to spurring widespread telemedicine implementation, the pandemic is likely to increase patient experience with, and interest in, virtual healthcare. Additional research will be needed to examine whether patients opt to receive care virtually and whether disparities in patient use persist when given the choice of virtual and in-person services in the future. COVID-19 has dramatically changed the way VA has provided care to Veterans and will likely have a lasting impact on how virtual care is utilized in VA.

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AUTHOR CONTRIBUTIONS

Conceptualization: JMF, JJ, MY, LG, LH, DMZ. Data curation: LG. Formal analysis: JMF. Funding Acquisition: JJ, LH, DZ. Methodology: JMF, JJ, MY, LG, LH, DMZ. Visualization: J JMF. Project administration: DMZ. Writing-original draft: JMF. Writing-review and editing: JMF, JJ, MY, LG, LH, DMZ.

SUPPLEMENTARY MATERIAL

Supplementary material is available at the *Journal of the American Medical Informatics Association* online.

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CONFLICT OF INTEREST STATEMENT

None declared.

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