

# Primary Care Video and Telephone Telemedicine During the COVID-19 Pandemic: Treatment and Follow-up Health Care Utilization

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**T**elemedicine use expanded greatly during the COVID-19 pandemic, via either video or telephone visits.<sup>1,2</sup> Temporary provisions provided coverage for telemedicine using either video or telephone for most services.<sup>3</sup> Although broad use of telemedicine is expected to persist beyond the COVID-19 pandemic, national regulatory and payment policies for telephone visits may be more limited than for video visits.<sup>4</sup> Evidence is needed to inform clinical and policy decisions around telemedicine use, including how treatment and follow-up care differ between video and telephone visits.

Video visits can convey visual information and offer a “face-to-face” connection, which could be helpful to both patients and clinicians.<sup>5</sup> However, video visits have additional technical requirements such as a reasonably strong internet connection, a video-enabled device, and digital literacy. These factors may be a barrier to care for some patients. Attention is needed to address the digital divide, particularly because not all patients have equal access to the technology needed to conduct telemedicine visits via video.<sup>6-8</sup> Despite uncertainty in long-term payment models, both video- and telephone-based virtual care options are likely to offer patients important venues to access primary care clinicians. However, it is unknown whether telemedicine primary care visits delivered using video vs telephone result in differential treatment and follow-up health care utilization.

During the early COVID-19 pandemic period, in a large integrated delivery system that temporarily shifted all patient-initiated primary care visits to telemedicine, we used the health system’s research data warehouse and electronic health record (EHR) data to examine whether rates of medication prescribing and laboratory/imaging orders differed and whether patients were more likely to require follow-up in-person office visits, emergency department (ED) visits, and hospitalizations for telephone visits compared with video visits. The objective of this study is to evaluate the efficiency and safety of telemedicine. We hypothesized that serious outcomes (downstream ED visits and hospitalizations) would be rare after both video and telephone visits, but that more patients would require additional follow-up in-person visits after telephone visits than video visits.

## ABSTRACT

**OBJECTIVES:** Telemedicine use expanded greatly during the COVID-19 pandemic, and broad use of telemedicine is expected to persist beyond the pandemic. More evidence on the efficiency and safety of different telemedicine modalities is needed to inform clinical and policy decisions around telemedicine use. To evaluate the efficiency and safety of telemedicine, we compared treatment and follow-up care between video and telephone visits during the COVID-19 pandemic.

**STUDY DESIGN:** Observational study of patient-scheduled telemedicine visits for primary care.

**METHODS:** We used multivariate logistic regression to compare treatment (medication prescribing, laboratory/imaging orders) and 7-day follow-up care (in-person office visits, emergency department visits, and hospitalizations) between video and telephone visits, adjusted for patient characteristics.

**RESULTS:** Among 734,442 telemedicine visits, 58.4% were telephone visits. Adjusted rates of medication prescribing and laboratory/imaging orders were higher in video visits than telephone visits, with differences of 3.5% [95% CI, 3.3%-3.8%] and 3.9% [95% CI, 3.6%-4.1%], respectively. Adjusted rates of 7-day follow-up in-person office visits, emergency department visits, and hospitalizations were lower after video than telephone visits, with differences of 0.7% [95% CI, 0.5%-0.9%], 0.3% [95% CI, 0.2%-0.3%], and 0.04% [95% CI, 0.02%-0.06%], respectively.

**CONCLUSIONS:** Among telemedicine visits with primary care clinicians, return visits were not common and downstream emergency events were rare. Adjusted rates of treatment measures were higher and adjusted rates of follow-up care were lower for video visits than telephone visits. Although video visits were marginally more efficient than telephone visits, telephone visits may offer an accessible option to address patient primary care needs without raising safety concerns.

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## TAKEAWAY POINTS

Among 734,442 patient-initiated primary care telemedicine visits in a large integrated delivery system during the COVID-19 pandemic, we found that return visits were not common and downstream emergency events were rare.

- ▶ Adjusted rates of medication prescribing and laboratory/imaging orders were slightly higher in video visits than telephone visits.
- ▶ Adjusted rates of 7-day follow-up office visits, emergency department visits, and hospitalizations were nominally lower after video visits than telephone visits.
- ▶ Video visits may be marginally more efficient than telephone visits, and telephone visits may offer a simple and convenient option to address patient primary care needs without raising safety concerns.

## METHODS

### Study Setting

The study was conducted within Kaiser Permanente of Northern California (KPNC), a large integrated health care delivery system with about 4.5 million members representative of the insured Northern California region, except at the lowest incomes.<sup>9</sup> Since 2016, KPNC members can directly choose an in-person, telephone, or video visit when self-scheduling a visit with their primary care clinician using the patient portal website or mobile app. Despite the availability of telemedicine, in-person visits were still the most common way to receive primary care prior to the pandemic.<sup>10</sup> However, due to social distancing measures aimed at preventing COVID-19 exposure starting in mid-March 2020, patients could choose only between a telephone or video visit when self-scheduling an appointment. In-person office visits were available based on a physician's recommendation and after an initial telemedicine visit. These protocols continued throughout the study period.

### Study Population and Data

Using the EHR and other health system research data sources, we identified all patient-initiated primary care telemedicine visits scheduled through the portal website or mobile applications between March 16, 2020, and October 31, 2020. To define a relatively distinct care-seeking episode, we excluded visits for patients who had any visit within the previous 7 days. For each visit, we identified any medication prescribing, antibiotic prescribing, and laboratory/imaging orders during the index visit as treatment measures. To characterize short-term follow-up health care utilization, we extracted all in-person office visits, ED visits, and hospitalizations that occurred within 7 days after each index visit. We used medication prescribing, laboratory/imaging orders, and 7-day follow-up in-person visits to assess efficiency (ie, whether telemedicine can adequately address the clinical concern without the need for an in-person visit), and downstream ED visits and hospitalizations to assess safety.

### Statistical Analysis

We used multivariable logistic regression models to examine the association between index visit type (telephone vs video) and

outcomes. We ran separate models for each treatment measure (including medication prescribing, antibiotic prescribing, and laboratory/imaging orders during the visit) and follow-up health care utilization (including in-person office visits, ED visits, and hospitalizations within 7 days after the index visit). All models were adjusted for patient age, sex, race/ethnicity, lower neighborhood socioeconomic status (SES; at least 20% of households have household incomes below the federal poverty level or at least 25% of residents 25 years or

older have less than a high school education in the Census block group), preferred language for health care, lower neighborhood internet access (no more than 80% of households have a residential fixed high-speed connection with at least 10 Mbps downstream and at least 1 Mbps upstream in the Census tract based on Federal Communications Commission data), any mobile portal use in the prior 365 days, any video visits in the prior 365 days, whether the clinician was the patient's own primary care clinician, patient medical problem (*International Classification of Diseases, Tenth Revision* code grouping of primary diagnosis), presence of chronic conditions, and medical center. SEs were adjusted for the repeated visits among patients.

For easier interpretation, we calculated adjusted rates of each outcome by index visit type using the coefficients from the multivariate logistic regression as if the entire cohort were having a video visit and as if the entire cohort were having a telephone visit, respectively, and then calculated the difference in adjusted rates between video and telephone visit for each outcome. All analyses were conducted using 2-sided tests for significance and  $P < .05$  as the threshold for significance in Stata version 17.0 (StataCorp LLC).

The Institutional Review Board of the Kaiser Foundation Research Institute approved the study protocol and materials and waived the requirement for written informed consent for participants.

## RESULTS

Among 734,442 primary care telemedicine visits scheduled using the patient portal by 567,130 patients during the study period, 58.4% were completed by telephone. Overall, 12.2% of patients were younger than 18 years, 72.8% were aged between 18 and 64 years, 15.0% were 65 years or older, 43.6% were male, 47.6% were of non-Hispanic White race/ethnicity, 19.9% lived in a neighborhood with lower SES, 39.8% lived in a neighborhood with lower internet access, 23.5% had at least 1 video visit in prior 365 days, 57.9% had mobile portal access in the prior 365 days, and 75.7% of visits were with the patient's own primary care clinician (Table).

Figure 1 shows adjusted rates of treatment measures by telephone or video visit. The adjusted rate of medication prescribing was 3.5% (95% CI, 3.3%-3.8%) higher in video visits than telephone visits: 37.4% of video visits had a medication prescribed compared with

33.9% of telephone visits. The adjusted rate of antibiotic prescribing was 0.4% (95% CI, 0.3%-0.5%) higher in video visits than telephone visits: 7.7% of video visits had an antibiotic prescribed compared with 7.3% of telephone visits. The adjusted rate of laboratory/imaging orders was 3.9% (95% CI, 3.6%-4.1%) higher in video visits than telephone visits: 31.3% of video visits resulted in a laboratory/imaging order placed compared with 27.4% of telephone visits. All differences between telephone and video were significant.

Figure 2 shows adjusted rates of 7-day follow-up care by telephone or video visit. The adjusted rate of follow-up in-person office visits was 11.8% after video visits and 12.5% after telephone visits, a difference of 0.7% (95% CI, 0.5%-0.9%). The adjusted rate of ED visits was 1.2% after video visits and 1.5% after telephone visits, a difference of 0.3% (95% CI, 0.2%-0.3%). The adjusted rate of hospitalizations was 0.15% after video visits and 0.19% after telephone visits, a difference of 0.04% (95% CI, 0.02%-0.06%). All differences between telephone and video visits were significant.

## DISCUSSION

In a large integrated health care setting, during the early COVID-19 pandemic when telemedicine was the primary option for patient-initiated primary care appointments, more than half of patient-scheduled visits were telephone visits. As hypothesized, we found that return visits were not common and downstream emergency events were rare. Adjusted rates of treatment measures were significantly higher in video visits than telephone visits, and 7-day follow-up health care utilization was significantly lower after video visits than telephone visits.

Despite increasing use and availability of video technology, telephone-based telemedicine care was commonly used by patients during this early pandemic period. This might be expected due to the lower barrier to entry for telephone visits. Even with access to video technology, some patients may prefer a telephone visit because they do not have to worry about making themselves or their houses presentable for the visit.

Adjusted rates of medication prescribing and laboratory/imaging orders were significantly higher among video visits compared with telephone visits, and the adjusted rate of 7-day follow-up in-person office visits was slightly lower after video visits than telephone visits. These findings might also be expected because video visits can convey more visual information, offer a “face-to-face” connection, and support more interaction between patients and providers.<sup>11</sup> Also,

some patients may use telephone visits as triage to determine whether more care is needed. Data from another survey also showed higher rates of laboratory tests and imaging ordered during video visits, and lower rates of follow-up in-office visits within 30 days of the video visit compared with telephone visits among 269 patients who had televisits with urologists during the pandemic, but the results were not significant.<sup>12</sup> Although we found that adjusted rates of 7-day follow-up ED visits and hospitalizations were slightly higher after telephone visits compared with video visits, it is reassuring that these events were rare. These findings were consistent with those from our previous study on the prepandemic period when in-person office visits were the most common primary care visit type.<sup>13</sup>

In our previous study conducted during the same study period on the association between patient characteristics and the telemedicine modality, we found that patients’ choice of video vs telephone appointment varied by patient demographics and technology access.<sup>14</sup> For example, Black or Hispanic patients or patients living in neighborhoods with lower SES or lower internet access were less likely to choose video visits. Those with technology access, as measured by either prior video visit experience or mobile device portal access, were more likely to choose video

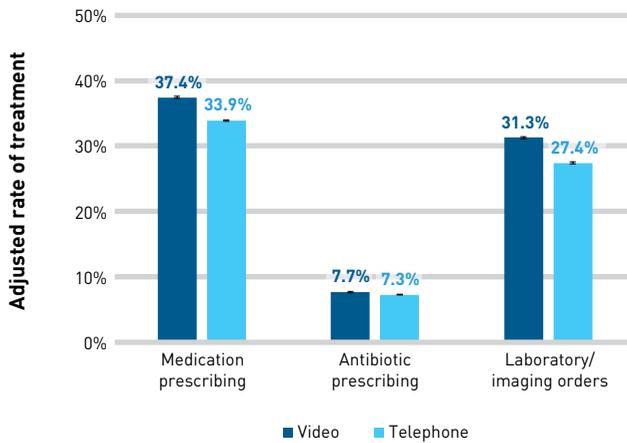
TABLE. Patient Characteristics by Video and Telephone Visits

Characteristics	All visits, n (column %)	Video visits, n (column %)	Telephone visits, n (column %)
Total	734,442 (100.0)	305,205 (100.0)	429,237 (100.0)
Age group in years			
< 18	89,728 (12.2)	44,079 (14.4)	45,649 (10.6)
18-44	331,437 (45.1)	130,820 (42.9)	200,617 (46.7)
45-64	202,908 (27.6)	78,575 (25.7)	124,333 (29.0)
≥ 65	110,369 (15.0)	51,731 (17.0)	58,638 (13.7)
Sex			
Male	320,308 (43.6)	137,698 (45.1)	182,610 (42.5)
Race/ethnicity			
White	349,205 (47.6)	146,841 (48.1)	202,364 (47.2)
Black	50,517 (6.9)	18,573 (6.1)	31,944 (7.4)
Hispanic	148,778 (20.3)	51,544 (16.9)	97,234 (22.7)
Asian	172,222 (23.5)	82,663 (27.1)	89,559 (20.9)
Lower neighborhood SES <sup>a</sup>	146,094 (19.9)	52,272 (17.1)	93,822 (21.9)
Lower neighborhood internet access <sup>b</sup>	292,102 (39.8)	110,127 (36.1)	181,975 (42.4)
Preferred language English	681,822 (92.8)	284,200 (93.1)	397,622 (92.6)
Video visit in prior 365 days	172,639 (23.5)	94,686 (31.0)	77,953 (18.2)
Mobile portal access in prior 365 days	424,979 (57.9)	179,033 (58.7)	245,946 (57.3)
Visit with own primary care clinician	556,130 (75.7)	238,049 (78.0)	318,081 (74.1)
Presence of chronic conditions	197,502 (26.9)	76,493 (25.1)	121,009 (28.2)

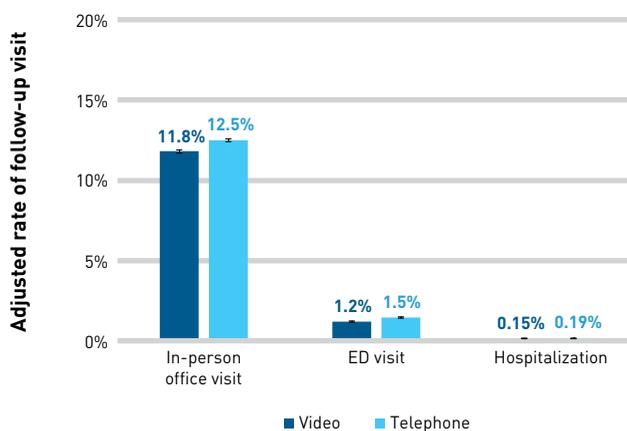
SES, socioeconomic status.

<sup>a</sup>Lower neighborhood SES: At least 20% of households have household incomes below the federal poverty level or at least 25% of residents 25 years or older have less than a high school education in the Census block group.

<sup>b</sup>Lower neighborhood internet access: No more than 80% of households have a residential fixed high-speed connection with at least 10 Mbps downstream and at least 1 Mbps upstream in the Census tract-based Federal Communications Commission data.

**FIGURE 1.** Adjusted Rates of Prescribing and Laboratory/Imaging Orders by Video and Telephone Visits<sup>a</sup>

<sup>a</sup>Adjusted rates were calculated by using coefficients from multivariate logistic regression for each outcome adjusted for characteristics in the Table; *International Classification of Diseases, Tenth Revision* grouping; and medical center as if the entire cohort were having a video visit and as if the entire cohort were having a telephone visit, respectively.

**FIGURE 2.** Adjusted Rates of 7-Day Follow-up Health Care Utilization by Video and Telephone Visits<sup>a</sup>

ED, emergency department.

<sup>a</sup>Adjusted rates were calculated by using coefficients from multivariate logistic regression for each outcome adjusted for characteristics in the Table; *International Classification of Diseases, Tenth Revision* grouping; and medical center as if the entire cohort were having a video visit and as if the entire cohort were having a telephone visit, respectively.

visits.<sup>14</sup> Data from other studies also indicated that patients who are Black and living in a lower-income neighborhood were more likely to use telephone visits than video visits during the COVID-19 pandemic.<sup>6,7,15</sup> Given the digital divide in technology access to support video telemedicine, our findings here of low rates of downstream emergency events (ED visits and hospitalizations) for both video and telephone visits suggest that telephone visits may

offer a simple and convenient health care access option without raising significant safety concerns.

Although in-person visits were historically the dominant type of health care visit, the pandemic created a natural experiment in which the volume of telemedicine visits increased dramatically because patient care-seekers had to use telemedicine as a first line of contact with their primary care clinicians. Prior studies have examined patient characteristics between video and telephone visits,<sup>6,7</sup> but there is limited evidence on the differences in treatment and the downstream outcomes between them. To our knowledge, this is the first large study assessing the efficiency and safety differences between telephone and video primary care visits during the COVID-19 pandemic.

### Limitations

This study was conducted in a large integrated health care setting in which video and telephone telemedicine were already widely available long before the pandemic. The findings may not directly generalize to less integrated telemedicine delivery settings. The population in the health system all have insurance coverage (eg, employer sponsored, Medicare, Medicaid), so those without any insurance coverage may not be as well represented in our data. Because this is an observational study, we cannot rule out unmeasured confounding factors, and results cannot be interpreted as causal. Nonetheless, we collected a wide range of covariates, including patient, technology, and clinical characteristics, and accounted for them in the analyses. Our study outcomes were constructed such that the orders were identified during the index visit and health care utilization was measured over a 7-day follow-up window. Not all visits may need medication or laboratory/imaging orders. These outcomes may not necessarily be directly related to the index visit (medication prescribing can be for refills of chronic medications, laboratory/imaging orders could be for future preventive tests, and visits within 7 days could be related to new health problems). The findings from this study were based on all types of primary care visits with adjustment for primary diagnosis, but severity may differ by visit type (eg, telephone vs video visits) and the results may vary for specific clinical concerns (eg, some clinical concerns may need visual information to assess the condition, and some may not).

## CONCLUSIONS

In this observational cohort study during the early COVID-19 pandemic, we found that return visits were not common and emergency events were rare. Telephone visits were more widely used and resulted in modestly lower rates of treatment measures and higher rates of follow-up health care utilization. Despite uncertainty in long-term payment models, both video- and telephone-based virtual care options are likely to continue to offer patients important venues to access primary care clinicians even after the pandemic crisis subsides. Video and telephone visits expand access to primary care services, and telephone visits may offer a simple and convenient

option to address patient needs without raising safety concerns. Future study is needed to further examine the quality and safety of telemedicine stratified by visits with different clinical concerns. ■

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