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BRIEF COMMUNICATIONS

Influence of Telemedicine-first Intervention on Patient Visit Choice, Postvisit Care, and Patient Satisfaction in Gastroenterology

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The emergence of severe acute respiratory syndrome coronavirus 2 in December 2019 led to a rapid expansion of telemedicine (eg, video and telephone visits) to provide patients with continued access to care while minimizing in-person contacts.[1,2] Within gastroenterology, minimal telemedicine-related data exist on patient choice and acceptance, its impact on medical decision-making, and completion of follow-up testing and treatment. However, rapidly evolving pandemic-related healthcare disruptions make it difficult to currently study such outcomes, even though they are critical to understanding telemedicine's influence on care.[1–6] To address this evidence gap, we evaluated the acceptance and outcomes of offering telemedicine as a first appointment option for initial gastroenterology appointments *before* the onset of the pandemic to inform decisions regarding telemedicine use *during* the pandemic and beyond.

Methods

Study Design

We performed a single-arm, crossover study within a large medical center using an interrupted time series (ITS) design (Supplementary Methods). This method mimics a randomized trial by comparing outcomes of interest before and after an intervention while controlling for other time-related trends. The Kaiser Permanente Northern California Institutional Review Board approved the study protocols.

Eligible Patient Population

All adults aged $\geq$ 18 years who were electronically referred to the San Francisco Medical Center from January 1, 2016 to September 30, 2019 for routine outpatient gastroenterology consultation, excluding a transition period (October 1, 2018 to December 31, 2018) of training, preparatory activities, and holidays. We excluded patients who were referred directly for procedures or to a regional subspecialty consult (eg, interventional endoscopy).

Intervention

Starting January 1, 2019, a telemedicine visit (telephone or video visit) was offered as a first choice to patients referred to the practice. Patients could accept or request an in-person office visit.

Outcomes

The primary outcome was patient participation in a telemedicine visit. Secondary outcomes were time interval from consult to appointment, patient e-mail contacts with the provider, postvisit follow-up care (endoscopic procedures, radiology studies, laboratory tests ordered from visit, and medications prescribed), a composite metric of these primary and secondary outcomes, and patient satisfaction parameters as measured by a standardized questionnaire used for all outpatient visits.

Results

During the study period 7146 appointments had new referrals for gastroenterology consultation. Of these, 4890 patients ultimately completed 5431 appointments with either an office or telemedicine visit: 4260 visits from 3802 members were in the preintervention analysis and 1171 visits from 1088 patients were in the postintervention analysis. Demographic characteristics were similar before and after the intervention (Supplementary Table 1).

Descriptive and ITS Analysis

Patient enrollment in telemedicine. The intervention was associated with a substantial and significant increase in patients completing a telemedicine visit (280/4260 [6.6%] vs 727/1171 [62.1%] of visits, pre- and postintervention, respectively; ITS β_2: immediate change $P < .01$), without trends for additional change postintervention (β_3: change in slope postintervention $P = .08$) (Figure 1*A*).

Patient interval time to appointment. The average patient time to appointment (referral date to visit date) was comparable for both the pre- and postintervention (8.7 days vs 7.4 days, respectively; ITS β_2: immediate change $P = .19$), without trends for additional change postintervention (β_3: $P = .96$).

Follow-up appointments. The percentage of patients with a subsequent return or follow-up in-person or telehealth appointment was similar pre- and postintervention

Abbreviation used in this paper: ITS, interrupted time series.

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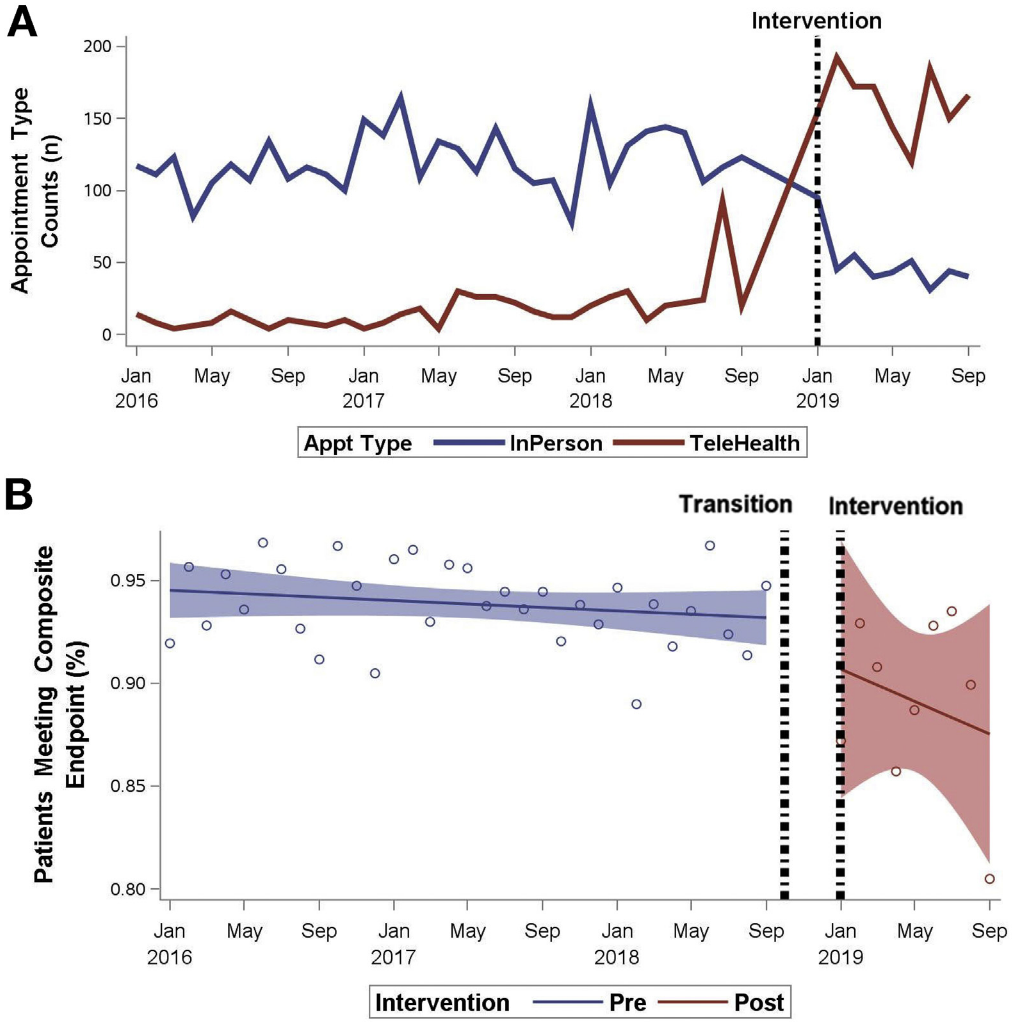

Figure 1. (*A*) Counts of appointment types by month. (*B*) An interrupted time series analysis of percentage of patients with 6 parameter composite endpoints within 3 months after initial e-consult. No significant immediate level change (β_2: 95% confidence interval, –4.9 to 2.7; $P = .58$) or sustained trend change (β_3: 95% confidence interval, –1.0 to 0.2; $P = .25$) was found. The trend regression lines with 95% confidence interval *shaded bands* of the predicted values are provided.

(16.2% vs 11.2%, respectively; ITS β_2: immediate change $P = .15$) and without trends for additional change postintervention (β_3: $P = .49$).

Prescriptions, secure messaging, radiology, gastroenterology procedure follow-up, and lab follow-up. The percentages of patients receiving prescriptions, secure messaging, radiology, gastroenterology procedures, or subsequent laboratory testing were similar pre- and postintervention and without trends for additional change postintervention for these variables.

Composite metric of primary and secondary outcomes. The composite metric included 6 follow-up measures: radiology studies, laboratory tests requested, endoscopy referrals, medications ordered, follow-up visits, and secure messages between provider and patients. No differences were found in the percentages of the composite endpoint pre- and postintervention (93.4% vs 89.2%, respectively; ITS β_2: immediate change $P = .58$) and without trends for additional change postintervention (β_3: $P = .25$) (Figure 1*B*).

Patient satisfaction rating parameters. The telehealth intervention was not associated with marked changes in either composite or individual component patient satisfaction ratings. The composite score among patients who were unfamiliar with their providers before the visit was associated with an immediate increase (very good/excellent: 80% vs 90% pre- vs postintervention, respectively, ITS β_2: immediate change 95% confidence interval, –0.3 to 48.7; $P = .05$) without additional trend changes postintervention (β_3: 95% confidence interval, –4.4 to 3.4; $P = .80$).

Discussion

This single-arm, crossover study using an ITS design to account for temporal trends found high levels of patient acceptance of telemedicine and no discernible changes in outcomes or care use related to medical decision-making, time to appointment, or patient satisfaction. This is the first study to our knowledge to describe both acceptance and relevant outcomes of telemedicine visits as the primary consultative delivery model across a gastroenterology practice; its completion before coronavirus disease 2019 allows for research evaluations that are not biased by the marked pandemic-related changes in care practices (such as limited endoscopy access). This has widespread relevance and applicability, because telemedicine has been minimally studied and implemented in relation to specialty care in gastroenterology.[7,8]

Strengths of this study are a community-based population with diverse demographics. The transition to a virtual practice was done at a discreet point in time, before the coronavirus disease 2019 pandemic. The study was within an integrated prepaid medical system in which there were no financial confounders to remote care, which more closely approximates most current systems that reimburse for telemedicine. Assuming the continuance of telemedicine and video visits in fee-for-service settings after the pandemic, this suggests these results are generalizable to other settings. Finally, patients of all age groups self-selected for telehealth when given a choice, making the adoption and subsequent results patient-directed.

Limitations are its conduct at a single medical center and temporal changes including increasing general use of remote medical assistant telephone services in 2019 and increasing use of physician assistants. However, these and other temporal changes were likely adjusted for the ITS analysis methods.

In conclusion, a rapid transition to telemedicine in gastroenterology can be successfully implemented and is associated with comparable measures of clinical decision-making, postvisit healthcare use, and patient satisfaction. This study provides evidence to support the continuance and expansion of telemedicine for outpatient specialty care.

Supplementary Material

Note: To access the supplementary material accompanying this article, visit the online version of *Gastroenterology* at www.gastrojournal.org and at http://doi.org/10.1053/j.gastro.2020.10.020.

References

1. Centers for Medicare & Medicaid. https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet.
2. Keihanian T, et al. Gastroenterology 2020;154:1598–1601.
3. Reeves JJ, et al. J Am Med Inform Assoc 2020;27:853–859.
4. Lancet 2020;395:1011.
5. Siegel CA. Gastroenterology 2017;152:958–963.
6. Mehrotra A, et al. Health Aff 2017;36:909–917.
7. Spiegel B. Am J Gastroenterol 2016;111:624–630.
8. Lee T, et al. Clin Gastroenterol Hepatol 2020;18:530–533.

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Conflicts of interest
The authors disclose no conflicts.

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Supplementary Methods

Outcomes

Our primary outcome was patient acceptance and participation in a telemedicine visit for initial consultation. Our secondary outcomes were patient interval time to appointment, patient contact with the provider, postvisit follow-up interventions, a composite metric of the primary and secondary outcomes mentioned previously, and patient satisfaction parameters.

Secondary outcomes are defined as follows:

1. Patient interval time to appointment: Defined as the time from referring physician requesting consultation to the patient being seen either in person or via telemedicine.
2. Patient contact with the provider: Defined as any patient secure messaging, subsequent in-person clinic, or telemedicine encounter follow-up within 3 months after the initial e-consult date.
3. Postvisit follow-up interventions: Defined as predefined laboratory tests (including complete blood count, comprehensive metabolic panel, iron studies, hepatitis labs, amylase, lipase, inflammatory markers including erythrocyte sedimentation rate and C-reactive protein, coagulation parameters, thyroid-stimulating hormone, tumor markers, urine studies), radiology imaging (abdominal ultrasound, computed tomography, fluoroscopy tests, magnetic resonance imaging/magnetic resonance cholangiopancreatography and paracentesis), prescriptions ordered by 1 of 11 gastroenterologists, and endoscopic procedures (capsule endoscopy, colonoscopy, esophagogastroduodenoscopy, endoscopic ultrasound, endoscopic retrograde cholangiopancreatography, sigmoidoscopy) ordered within 3 months after the initial e-consult date.
4. Composite metric (6 parameters): Defined as a composite use score of 6 parameters described above, including radiology studies, laboratory tests, endoscopy referrals, medications ordered, follow-up visits, and secure messages between provider and patient follow-up within 3 months after the initial e-consult date.
5. Patient satisfaction parameters. Patient satisfaction parameters were measured using the monthly average scores for individual or a multicomponent member patient satisfaction (MPS) survey. MPS survey parameters were evaluated pre- and postintervention. MPS scores are a composite of patient perception of physician performance of 5 parameters: physician skill and ability, confidence in the care physician provided, whether the physician listened/understood and explained, if the physician involved the patient in care decisions, and physician familiar with medical history. Other individual MPS survey parameters measured were physician performance average by familiar/unfamiliar visits, access to care, whether patient's needs were met, patient's intent to renew health plan membership, perception of physician's time spent during appointment, perception of whether physician arrived to appointment on time, and perception of physician knowledge of care from other providers. Familiarity was defined using patients' perception of how familiar they felt with the provider (before the visit). Patient ratings were calculated based on the count of very good/ excellent ratings (maximum score of 5) over the total number of 5 ratings; blank responses were excluded.

Data Sources

Patient demographics and visit information, physician prescribing practices, and healthcare utilization outcome measurements were extracted using the EPIC-based Kaiser Permanente Health Connect electronic health record databases. Patient satisfaction scores were measured using the Kaiser Permanente MPS survey, which is distributed to 10% to 15% of members after a visit. The MPS score report for healthcare providers is generated quarterly based on MPS surveys.

Statistical Approach

For descriptive analysis, we evaluated physician prescribing and patient healthcare use parameters. Percentages were calculated using total numbers of each follow-up patient care parameter over total encounter types. Patient satisfaction ratings were expressed as percentages. Ratings were calculated based on the percentage of very good/ excellent ratings over the total number of ratings. Blank responses were excluded.

To control for trends unrelated to the intervention, we used a segmented linear regression model ITS analysis approach. We calculated the average monthly percentage of patients' ratings (very good/excellent) for both individual and composite variables of the MPS survey as well as relevant physician prescribing and patient healthcare use practices within 3 months after the initial electronic referral to the department.

The following single ITS model was used in the analysis: $Y = \beta 0 + \beta_1 \times T + \beta_2 \times X + \beta_3 \times XT + \varepsilon$, where Y is the independent outcome variable (patient rating or physician or patient healthcare use practice), β_0 estimates the level of outcome at the starting point, β_1 is the estimated preintervention trend, T is the time in months from the beginning of intervention time, β_2 is the estimated level change immediately after the intervention, X is the study phase time (where X is 0 preintervention and X is 1 postintervention), β_3 is the estimated change in trend or slope comparing pre- and postintervention, XT is the time in months after interruption, and ε is the estimate of the random error. In the analysis, we also calculated $\beta_1 + \beta_3$, which is the estimated postintervention trend.

In the ITS analysis, we reported the monthly average percentage of immediate or sustained effect after the intervention. We calculated level (β_2) and trend changes (β_3) in patient average rating of a visit based on the MPS survey, physician prescribing, and patient telehealth use. We examined the effect of confounding variables such as age, sex, and race pre- and postintervention cohorts using (as appropriate) a linear regression, logistic regression, χ^2, or t test; we also assessed seasonality trends for each outcome variable. Analyses were performed using SAS 9.4 for windows and SAS Studio 3.71 (SAS Institute).

Supplementary Table 1. Demographic Characteristics (Total Visit or Encounter N = 5431)

	Preintervention	Postintervention	*P*
No. of unique visits or encounters	4260	1171	
No. of unique members	3802	1088	
Age, y	47.4 ± 17.2	47.5 ± 17.6	.77
Sex			.35
Male	1866 (43.8)	531 (45.3)	
Female	2394 (56.2)	640 (54.7)	
Race			.38
Nonwhite	2000 (47.0)	537 (45.9)	
African American	261 (6.1)	68 (5.8)	
Asian	1012 (23.8)	250 (21.4)	
Hispanic	501 (11.8)	155 (13.2)	
Other	226 (5.3)	64 (5.5)	
White	2160 (50.7)	590 (50.4)	
Missing	100 (2.4)	44 (3.8)	

NOTE. Value are n (%) or mean ± SD. Study time periods for preintervention were January 1, 2016 to September 30, 2018 and for postintervention January 1, 2019 to September 30, 2019. Percentages are scaled by type and rounded so they may not add to 100%. The *P*-value for age was calculated using a Student *t* test. All other *P*-values were calculated using χ^2 or Mantel-Haenszel χ^2 or Fisher's exact tests.