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Satisfaction With Telehealth Among Patients With Irritable Bowel Syndrome During COVID-19: Cross-Sectional Survey Findings

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INTRODUCTION: Coronavirus disease 2019 rapidly shifted health care toward telehealth. We assessed satisfaction with and preferences for telehealth among patients with irritable bowel syndrome (IBS).

METHODS: We conducted a cross-sectional survey in an integrated healthcare system in Southern California with members aged 18–90 years with an *International Classification of Diseases 9 and 10* codes for IBS from office-based encounters between June 1, 2018, and June 1, 2020. Eligible patients were emailed a survey assessing telehealth satisfaction overall and by patient-related factors, IBS characteristics, health and technologic literacy, utilization, and coronavirus disease 2019 perceptions. We identified perceived telehealth benefits and challenges. Multivariable logistic regression identified predictors of telehealth dissatisfaction.

RESULTS: Of 44,789 surveys sent, 5,832 (13.0%) patients responded and 1,632 (3.6%) had Rome IV IBS. Among 1,314 (22.5%) patients with IBS and prior telehealth use (mean age 52.6 years [17.4]; 84.9% female; and 59.4% non-Hispanic White, 29.0% Hispanic, and 5.6% non-Hispanic Black), 898 (68.3%) were satisfied, 130 (9.9%) were dissatisfied, and 286 (21.8%) felt neutral. In addition, 78.6% would use telehealth again. Independent predictors of telehealth dissatisfaction include social media use of once a week or less (adjusted odds ratio [OR] = 2.1; 1.3–3.5), duration of IBS for <1 year (adjusted OR = 8.2; 1.9–35.8), and willingness to travel 60 plus minutes for face-to-face visits (adjusted OR = 2.6; 1.4–3.7). Patients' main concern with telehealth was a lack of physical examination.

DISCUSSION: Most of the patients with IBS are satisfied with telehealth. Shorter duration of IBS diagnosis, comfort with technology, and increased willingness to travel were associated with telehealth dissatisfaction. These predictors may help identify a target population for a focused IBS-telehealth program.

SUPPLEMENTARY MATERIAL accompanies this paper at <http://links.lww.com/CTG/A850>, <http://links.lww.com/CTG/A851>

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INTRODUCTION

With state-imposed stay-at-home mandates, social distancing, and heightened patient and provider fears, the coronavirus disease 2019 (COVID-19) pandemic prompted significant shifts in healthcare utilization and delivery. While emergency department visits (1), non-COVID-19-related hospitalizations (2) and outpatient office-based visits in the United States all declined (3) and telemedicine visits increased from 0.8 to 17.8 visits per 1,000 enrollees (2,125% change) in individuals with commercial or Medicare Advantage

insurance (3). Telehealth studies in gastroenterology before the pandemic predominantly focused on feasibility and acceptability of telemedicine-based programs in academic settings for inflammatory bowel disease (4–8), chronic liver disease (9,10), and gastrointestinal (GI) motility (11). With widespread telehealth implementation in day-to-day clinical practice and a large percentage of GI visits focused on functional GI disorders (12), it is imperative that we understand the attitudes and perceptions of telehealth in patients with irritable bowel syndrome (IBS).

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Although some data suggest telehealth is well-received among the general GI population, little is known about attitudes and preferences for telehealth in patients with IBS. We aimed to assess overall satisfaction with telehealth in patients with IBS, identify predictors of telehealth satisfaction, and clarify perceived benefits and challenges of telehealth use. To address this objective, we developed, pilot-tested, and electronically administered a survey called the Telemedicine in IBS during the SARS-CoV2 era (TIBS-CoV-2) to patients with Rome IV confirmed IBS.

METHODS

Survey development and pilot testing

Themes surrounding telehealth satisfaction were identified through a literature review and iteratively refined through 3 focus groups of internists and gastroenterologists from different institutions and practice settings. A 28-item survey was developed. Survey components included (i) symptom and subtype assessment adapted from the Bowel Symptom Questionnaire (13) to confirm a diagnosis of IBS by Rome IV criteria and a validated, patient-assessed overall GI symptom severity score ranging from 0 to 20 (20 = most severe) (13); (ii) demographic and clinical characteristics, e.g., marital status, income, and highest education level; (iii) Telehealth Usability Questionnaire (TUQ) (14), a validated survey that assesses telehealth usability as defined by usefulness, ease of use, interface and interaction quality, reliability, and satisfaction; and (iv) perceptions surrounding telehealth use. The TUQ was selected because of its widespread use, its incorporation of all usability factors, and its ease of use across a variety of telehealth systems including videoconferencing, computer-based systems, and mobile systems.

Pilot testing was completed for readability, clarity, question burden, and overall feedback in patients aged 18–90 years with *International Classification of Disease, Ninth Revision* and/or *Tenth Revision, Clinical Modification (ICD-9-CM/ICD-10-CM)* for IBS. A random sample of 200 patients received the survey by email. A total of 12 patients completed the survey and agreed to provide feedback. The research team conducted 10- to 15-minute one-on-one semistructured phone interviews with these participants. Common themes identified (see Supplemental File, Appendix 1a, Supplementary Digital Content 1, <http://links.lww.com/CTG/A850>) during pilot testing helped to refine the final survey (see Supplemental File, Appendix 1b, Supplementary Digital Content 1, <http://links.lww.com/CTG/A850>) before distribution. Of note, the TUQ remained unaltered, given the validated nature of the survey.

Study design, setting, and patient population

A cross-sectional survey was conducted on patients aged 18–90 years who were active Kaiser Permanente members for at least 1 year from the time of survey distribution and were coded for IBS (*ICD-9,564.1; ICD-10 K58.**) from an office-based encounter between June 1, 2018, and June 1, 2020, at any Kaiser Foundation Southern California hospital. Kaiser Permanente Southern California is an integrated health system that serves more than 4 million active members. Study exclusions included (i) active pregnancy at survey distribution; (ii) a history of inflammatory bowel disease, colorectal cancer, or celiac disease; and/or (iii) inability to complete the survey. This study was approved by the Kaiser Permanente Southern California Institutional Review Board.

Survey distribution and data collection

Eligible patients were emailed a link to the survey on November 5, 2020. Up to 3 email reminders were sent to nonresponders at 2, 4, and 8 weeks from the initial email with a recruitment end date of January 20, 2021, a period that overlapped with a surge in the COVID-19 pandemic. Survey data were collected and managed using Research Electronic Data Capture (15). Additional variables were extracted from the electronic health record (EHR). Patients with shared email addresses between family members (e.g., husband and wife), invalid emails, or surveys with unidentifiable medical record numbers were excluded. In the single case of a duplicate survey, the more recent survey was used.

We identified Rome IV confirmed patients based on survey responses. Rome IV IBS was defined as patients with symptom onset at least 6 months before the diagnosis, with recurrent abdominal pain at least 1 day a week in the past 3 months and 2 or more of the following: a relationship to defecation, association with a change in frequency, and/or form of stool for at least 30% of occasions.

Outcome variables

Our primary outcome was overall satisfaction with telehealth in patients with Rome IV confirmed IBS and at least 1 telehealth visit. We defined telehealth as a video, telephone, and/or e-visit. We asked patients to rate the following statement from the TUQ: “Overall, I am satisfied with this telehealth system” on a 5-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree) with “satisfied” encompassing “strongly agree or agree” and dissatisfied as “strongly disagree or disagree.”

Patient variables and definitions

Patient demographics. Patient-related factors abstracted from the EHR included age, sex, race/ethnicity, body mass index (BMI), Charlson Comorbidity Index (CCI), and total number of outpatient GI visits. Marital status, income, and highest level of education were ascertained from the patient. Race/ethnicity included 6 mutually exclusive categories: non-Hispanic White, non-Hispanic Black, Hispanic, Asian, Others, and unknown. BMI ranges were <18.5 (underweight), 18.5 to <25 (normal), 25 to <30 (overweight), and ≥30 (obese). CCI was scored 0, 1, 2, 3 + where higher scores reflect increased comorbid disease burden. CCI and outpatient GI visits were based on encounters from March 1, 2019, to March 1, 2020, 1 year before the start of the pandemic. We also inquired about the amount of travel time patients was willing to endure before accepting telehealth for care.

IBS characteristics

IBS characteristics collected through survey included duration of IBS in years, subtype, and patient-reported severity of GI symptoms rated on a visual scale (13) from 0 to 20 (mild: 0–6; moderate: 7–13; and severe: 14–20). In addition, we asked patients to rate their own knowledge of IBS on a scale from 0 to 100.

Health and technology literacy/utilization. Perceived health and technologic literacy were assessed through confidence in filling out medical forms and frequency of social media use, respectively. We also asked patients to rate their willingness to adopt new technology based on the Roger technology adoption bell curve (16). We assessed healthcare and telehealth utilization by querying the EHR for the total number of outpatient GI visits, total number of telehealth visits, and time to last telehealth visit during

1 year before survey distribution. Finally, we asked patients about their perceptions surrounding telehealth during the COVID-19 pandemic.

Analyses

We (i) evaluated patient experience and satisfaction with telehealth, (ii) identified predictors of telehealth dissatisfaction, and (iii) elicited perceived benefits and challenges of telehealth use overall and stratified by telehealth satisfaction.

Statistical analyses

We used frequencies and proportions or means and SDs to describe patient demographic and clinical factors. To compare baseline patient demographic and clinical characteristics among satisfaction groups in patients with Rome IV confirmed IBS, we used the *t* test for continuous variables (e.g., age) and the χ^2 test for categorical variables. To determine the factors associated with dissatisfaction, multivariable logistic regression was performed to estimate the odds ratio (OR) and 95% confidence interval (CI). We used χ^2 to compare perceived benefits and challenges between satisfied and dissatisfied patients. All tests were 2-sided with a significance level of $P < 0.05$. All analyses were performed using SAS 9.4 (SAS Institute Inc, Cary, NC).

RESULTS

Survey pilot results

Of 200 patients, 10 (5.0%) completed the survey. Semistructured interviews were completed in 9 of 12 (75.0%) patients; median survey completion time was 20 minutes. Feedback focused on (i) the specific purpose and setting of telehealth use (e.g., personal vs familial and IBS-related vs non-IBS-related care), (ii) pertinence of symptom questions to individual patients, and (iii) a definition of telehealth in layman terms. Revisions were made accordingly.

Descriptive characteristics of the study cohort

Of a total 44,789 surveys sent, 5,832 (13.0%) patients responded. After secondary exclusions, 1,632 (28.0%) of these respondents had Rome IV IBS based on survey responses and 1,314 (22.5%) had a prior telehealth experience (Figure 1). The mean age for the final study cohort was 52.6 ± 17.4 years, and 84.9% were female. The cohort consisted of 59.4% non-Hispanic White, 29.0% Hispanic, 5.6% non-Hispanic Black, and 2.7% Asian. Most of the patients were married (686, 52.2%), employed (681, 51.8%), and make less than \$100,000 annually (831, 63.2%). In addition, over half of the patients reported more than 10 years of IBS symptoms. See Table 1 for additional patient characteristics.

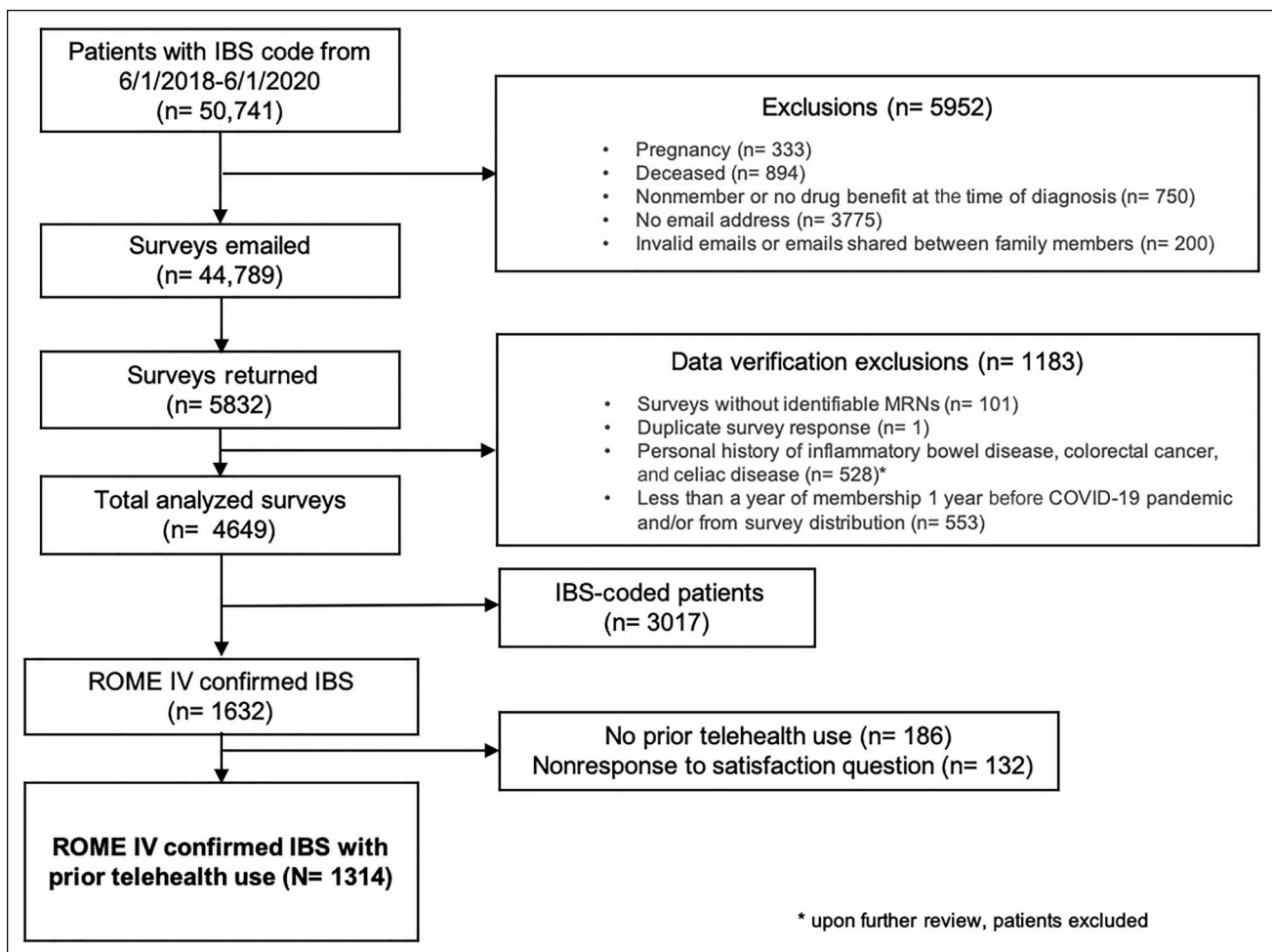


Figure 1. Consort diagram. IBS, irritable bowel syndrome.

Table 1. Descriptive characteristics of the total study cohort (N = 1,314) and by satisfaction with telehealth use (n = 1,028)^a

	Total Rome IV confirmed IBS patients with a prior telehealth experience N = 1,314	Patients with Rome IV IBS satisfied with telehealth Experience, n (%) n = 898	Patients with Rome IV IBS dissatisfied with telehealth Experience, n (%) n = 130	P value ^b
Mean age (SD)	52.6 (17.40)	51.0 (16.81)	57.6 (17.81)	<0.0001
Sex				
Female	1,116 (84.93)	774 (86.19)	112 (86.15)	0.99
Male	198 (15.07)	124 (13.81)	18 (13.85)	
Race/ethnicity				
White	780 (59.36)	519 (57.79)	86 (66.15)	0.24
Hispanic	381 (29.00)	273 (30.40)	28 (21.54)	
Black	74 (5.63)	55 (6.12)	7 (5.38)	
Asian	36 (2.74)	23 (2.56)	3 (2.31)	
Others	23 (1.75)	12 (1.34)	4 (3.08)	
Unknown	20 (1.52)	16 (1.78)	2 (1.54)	
Body mass index				
Obese	568 (43.23)	398 (44.32)	51 (39.23)	0.53
Overweight	345 (26.26)	231 (25.72)	39 (30.00)	
Normal	383 (29.15)	257 (28.62)	37 (28.46)	
Underweight	18 (1.37)	12 (1.34)	3 (2.31)	
Charlson Comorbidity Score				
0	680 (51.75)	502 (55.90)	41 (31.54)	<0.0001
1	318 (24.20)	198 (22.05)	42 (32.31)	
2	146 (11.11)	99 (11.02)	17 (13.08)	
3+	170 (12.94)	99 (11.02)	30 (23.08)	
Marital status				
Married	686 (52.21)	482 (53.67)	66 (50.77)	0.03
Single	345 (26.26)	242 (26.95)	28 (21.54)	
Divorced/separated	132 (10.05)	73 (8.13)	21 (16.15)	
Widowed	51 (3.88)	31 (3.45)	8 (6.15)	
Others	2 (0.15)	1 (0.11)	0 (0.00)	
Unknown	98 (7.46)	69 (7.68)	7 (5.38)	
Income level				
<\$50,000	407 (30.97)	274 (30.51)	38 (29.23)	<0.001
\$50,000–\$100,000	424 (32.27)	315 (35.08)	30 (23.08)	
>\$100,000	212 (16.13)	153 (17.04)	20 (15.38)	
Unknown	271 (20.62)	156 (17.37)	42 (32.31)	
Employment status				
Full-time employment/student	550 (41.86)	414 (46.10)	32 (24.62)	<0.0001
Retired	359 (27.32)	219 (24.39)	51 (39.23)	
Part-time employment/student	131 (9.97)	92 (10.24)	13 (10.00)	
Other	242 (18.42)	159 (17.71)	29 (22.31)	
Unknown	32 (2.44)	14 (1.56)	5 (3.85)	
Highest level of education				
College degree or higher	683 (51.98)	492 (54.79)	63 (48.46)	<0.001
Some college/Associate degree	450 (34.25)	291 (32.41)	53 (40.77)	

Table 1. (continued)

	Total Rome IV confirmed IBS patients with a prior telehealth experience N = 1,314	Patients with Rome IV IBS satisfied with telehealth Experience, n (%) n = 898	Patients with Rome IV IBS dissatisfied with telehealth Experience, n (%) n = 130	P value ^b
High school graduate/GED equivalent	143 (10.88)	94 (10.47)	8 (6.15)	
Some high school or less	16 (1.22)	13 (1.45)	0 (0.00)	
Unknown	22 (1.67)	8 (0.89)	6 (4.62)	
Duration of IBS				
More than 10 yr	767 (58.37)	530 (59.02)	78 (60.00)	0.03
5–10 yr	276 (21.00)	182 (20.27)	26 (20.00)	
1–5 yr	258 (19.63)	181 (20.16)	22 (16.92)	
Less than 1 yr	13 (1.00)	5 (0.56)	4 (3.08)	
IBS subtype				
IBS_M	551 (41.93)	366 (40.76)	58 (44.62)	0.86
IBS_D	499 (37.98)	347 (38.64)	46 (35.38)	
IBS_C	241 (18.34)	170 (18.93)	24 (18.46)	
IBS_U	23 (1.75)	15 (1.67)	2 (1.54)	
IBS severity				
Mild	263 (20.02)	186 (20.71)	25 (19.23)	0.43
Moderate	589 (44.82)	405 (45.10)	53 (40.77)	
Severe	462 (35.16)	307 (34.19)	52 (40.00)	
No. of telehealth visits in 1 yr				
None	56 (4.3)	43 (4.8)	4 (3.1)	0.10
1–4	340 (25.9)	248 (27.6)	26 (20.0)	
5+	918 (69.9)	607 (67.6)	100 (76.9)	
Time to the last telehealth visit				
None	56 (4.3)	43 (4.8)	4 (3.1)	0.12
< 3 mo	941 (71.6)	629 (70.0)	103 (79.2)	
3–6 mo	191 (14.5)	137 (15.3)	11 (8.5)	
6–12 mo	126 (9.6)	89 (9.9)	12 (9.2)	

See appendix for additional variables, Supplementary Digital Content 2, <http://links.lww.com/CTG/A851>.

IBS, irritable bowel syndrome; GED, General Educational Development.

^aPatients who felt neutral about telehealth use (n = 286) were not included.

^bP values are for comparison between satisfied and dissatisfied patients.

Experience and satisfaction with telehealth

Of 1,314 (80.5%) patients with Rome IV IBS who completed the survey entirely and used telehealth for their care, 898 (68.3%) were satisfied, 130 (9.9%) were dissatisfied, and 286 (21.8%) felt neutral about their experience. In addition, 1,072 (81.8%) patients reported that telehealth was simple to use, and 1,030 (78.6%) would use telehealth again. Satisfied patients considered telehealth as good or better than face-to-face (F2F) visits as compared with dissatisfied patients (736 [82.0%] vs 16 [12.3%], $P < 0.0001$). In total, 852 (92.3%) patients were more likely to use telehealth now because of the COVID-19 pandemic; 920 (96.6%) and 759 (91.0%) patients felt that telehealth limited exposure risk to and relieved anxiety of contracting the virus from the healthcare setting, respectively.

Satisfaction by patient demographics

Telehealth dissatisfaction was higher in older (57.6 vs 51.0 years, $P < 0.0001$) and sicker patients (CCI 3+: 23.1% vs 11.0%, $P < 0.0001$). In univariate analysis, no significant differences were seen with sex, race/ethnicity, and BMI between satisfied and dissatisfied groups. Patients making less than \$100,000 annually were more satisfied with telehealth (65.6% vs 52.3%, $P < 0.005$). Satisfied patients would consider telehealth over a F2F visit for a travel time of 30–59 minutes (328/898, 36.5%, $P < 0.01$); dissatisfied patients did not consider travel time a factor (39/130, 30.0%, $P < 0.005$).

Satisfaction based on IBS characteristics

Patients with less than a year of IBS were more dissatisfied with telehealth (3.1% vs 0.6%, $P < 0.05$). All other IBS-related variables were not significantly different.

Health and technologic literacy/utilization

Among IBS patients with telehealth use, 92.9% were extremely confident in their level of health literacy and 74.8% use social media at least once a day. Patients with higher self-perceived health literacy (93.2% vs 85.4%, $P < 0.01$), daily use of social media (77.3% vs 57.7%, $P < 0.0001$), and readiness to try new technology (32.4% vs 20.0%, $P < 0.01$) were more satisfied with telehealth. Nearly 60% of the satisfied patients had 2 or less GI clinic visits 1 year before the pandemic as compared with 41.5% of the dissatisfied patients ($P < 0.001$), whereas dissatisfied patients sought GI care 5 or more times compared with their satisfied counterparts (40.8% vs 28.8%, $P < 0.05$) (see Appendix 2, Supplementary Digital Content 1, <http://links.lww.com/CTG/A850>).

COVID-19 perceptions and satisfaction with telehealth

Patients satisfied with telehealth felt safer using telehealth during the COVID-19 pandemic as compared with dissatisfied patients (74.4% vs 35.4%, $P < 0.0001$). Satisfied patients reported that telehealth limited exposure risk to (98.9% vs 75.8%, $P < 0.0001$) and relieved anxiety around contracting SARs-CoV2 from the healthcare setting (96.3% vs 44.7%, $P < 0.0001$). Interestingly, 75.8% of the dissatisfied patients felt their exposure risk was limited with telehealth, yet 64.4% did not feel safer using telehealth during the pandemic.

Predictors of telehealth dissatisfaction

Multivariable analysis identified predictors of dissatisfaction in all domains: patient-related factors, IBS characteristics, and health and technologic literacy. Patients with a CCI of 1 or 3+ were more likely to be dissatisfied with telehealth (adjusted OR = 2.1; 95% CI = 1.3–3.5 and adjusted OR = 2.5; 95% CI = 1.3–4.6, respectively) compared with those with a CCI of 0. For income, patients who chose not to respond were more likely to be dissatisfied (adjusted OR = 2.1; 1.3–3.7). Patients with a willingness to travel more than 60 minutes had 2.2 times higher odds of dissatisfaction than those willing to travel less than 60 minutes.

We analyzed several IBS characteristics including IBS duration, subtype, and severity. Among these, only shorter duration of IBS was significant on the multivariable analysis (<1 year: adjusted OR = 8.2; 95% CI = 1.8–35.8).

Similar to income, patients who preferred not to answer for health literacy tended to be more dissatisfied (adjusted OR = 2.1; 1.3–3.7). Patients who used social media once a week or less had 2.1 times higher odds of telehealth dissatisfaction compared with those with daily use (adjusted OR = 2.1; 95% CI = 1.3–3.5) (Table 2).

Benefits and challenges of telehealth use

A total of 958 (93.2%) and 726 (70.6%) patients with Rome IV IBS indicated that telehealth was beneficial and convenient, respectively. Patient-reported issues experienced with F2F visits that were considered less problematic with telehealth included transportation (621, 60.4%), higher copays (360, 35.0%), absence from work (334, 32.5%), and finding substitute caregivers (109, 10.6%). Nearly one-third of patients felt that they had better access to their care team. All benefits were significantly different between satisfied and dissatisfied groups (Figure 2a).

Despite the benefits, 731 (71.1%) patients indicated that telehealth still has its challenges. The most commonly reported challenges with telehealth included the absence of physical examination (640, 62.3%), feeling impersonal (260, 25.3%), being

unable to address all of their issues/concerns (226, 22.0%), and feeling rushed (182, 17.7%). These challenges were significantly more common in patients dissatisfied with telehealth (Figure 2b).

DISCUSSION

In this cross-sectional study, we developed, refined, and administered a survey to evaluate telehealth satisfaction in patients with IBS during the COVID-19 pandemic. Overall, patients reported high satisfaction rates and ease of use with telehealth. A majority felt that telehealth was as good or better than F2F visits and would use telehealth for future care. Despite this, approximately 10% of the patients remain dissatisfied. Sicker patients (CCI 1+) and those with a diagnosis of IBS for less than a year, a travel time more than 60 minutes for F2F appointments and/or use of social media once a week or less were more likely to be dissatisfied. However, 69.5% of the patients felt safer using telehealth due to the COVID-19 pandemic, and more than 90% of the patients felt that telehealth limited exposure to and allayed fears of contracting the virus from the healthcare setting. Benefits to telehealth include diminished issues with transportation, high copays, work absenteeism, and the need for substitute caregivers; notable challenges were the absence of physical examinations, feelings of impersonality, and incapacity to address patient concerns.

COVID-19 transformed healthcare delivery almost overnight. Relaxed regulatory and licensure barriers and changes to reimbursement made widespread adoption of telehealth possible. Emerging literature suggests that these changes may continue in the postpandemic era (17,18), and in the past year, telehealth has demonstrated high patient satisfaction with a reduction in costs to all stakeholders (9,19,20). Thus, it is ever more important to understand the successes and limitations of telehealth, dive more deeply into determinants of telehealth care, and use reported benefits and challenges of telehealth to identify target populations for telehealth programs (17). One such population are those with IBS, a chronic illness affecting more than 15 million people (12) with an average of 2.7 million visits annually (21) and direct and indirect annual costs of \$1,562–\$7,547 and \$791–\$7,737, respectively (22).

Currently, there are limited data on satisfaction and perceptions of telehealth in patients with IBS during the COVID-19 pandemic. Only 2 studies exist to date in the general GI population (9,20). Although rates of future telehealth use and identified barriers were similar in the general GI population and our IBS population, telehealth satisfaction rates were lower in our study (68.3% vs 78–80%). Although recall bias may have explained this discrepancy when comparing our study with that of Serper et al (9) where surveys were administered through patient portal and telephone, survey administration was similar between our study and that of Dobrusin et al. (20). This raises the question of inherently lower rates of satisfaction in patients with IBS as compared with the general GI population. Studies have shown that patients with IBS are less resilient (23), often unhappy with available pharmacologic therapies (24) and more satisfied with increased diagnostic testing, higher number of recommendations, and higher number of follow-up visits (25,26).

In addition, our study had a much lower response rate as compared with other survey-based studies among patients with IBS (13.0% vs 53.8–83.8% (27,28)). Our initial cohort was identified through ICD-9-CM/ICD-10-CM coding, whereas other studies confirmed a diagnosis of IBS through a chart review. This discrepancy in response rates supports prior findings of high

Table 2. Predictors of dissatisfaction with telehealth use in patients with Rome IV confirmed IBS

Variable	Total number of patients per group	No. of dissatisfied patients	Adjusted odds ratio (95% CI)
CCI	0		
0	543	41	Ref
1	240	42	2.13 (1.29, 3.52) ^a
2	116	17	1.41 (0.71, 2.77)
3+	129	30	2.46 (1.30, 4.65) ^a
Income			
<\$50,000	312	38	Ref
\$50,000-\$100,000	345	30	0.86 (0.49, 1.50)
>\$100,000	173	20	1.22 (0.63, 2.35)
Unknown	198	42	2.14 (1.25, 3.66) ^a
Duration of IBS			
One or more years	1,019	126	Ref
Less than 1 yr	9	4	8.15 (1.85-35.84) ^a
IBS subtype			
Constipation-predominant	194	24	Ref
Diarrhea-predominant	393	46	1.19 (0.66–2.15)
Mixed-type	424	58	1.15 (0.65, 2.03)
Undefined	17	2	1.9 (0.37, 9.38)
IBS severity			
Mild	211	25	Ref
Moderate	458	53	1.12 (0.65–1.94)
Severe	359	52	1.47 (0.84, 2.57)
Health literacy			
Extremely confident	948	111	Ref
Somewhat or not confident	72	15	1.76 (0.89–3.47)
Unknown	8	4	6.32 (1.38, 28.97) ^a
Technology literacy			
At least once a day	769	75	Ref
Once a week or less	144	33	2.13 (1.29–3.51) ^a
Never	8	22	1.40 (0.77, 2.55)
Travel time threshold			
Less than 60 minutes	631	58	Ref
60 or more minutes	198	33	2.26 (1.37–3.71) ^a
Travel time is not a factor	199	39	2.30 (1.43, 3.69) ^a

Data are presented as odds ratios (95% CI). The final logistic regression model included the following variables: age, sex, race/ethnicity, CCI, marital status, income, employment, health literacy, technologic literacy, IBS duration, subtype, severity and travel time. Age, sex, race/ethnicity, marital status, and employment status were not significant.

CI, confidence interval; CCI, Charlson Comorbidity Index; IBS, irritable bowel syndrome.

^a $P < 0.05$.

levels of inaccuracy with provider coding and administrative data (29,30). In addition, other studies offered small remunerations for participation, whereas ours did not.

Telehealth has immense potential in the care of patients with IBS as a tool to improve access without supplanting individualized in-person care. This survey helps to identify barriers to telehealth use in a broader context and provides insight into

new avenues for research. Barriers should be addressed to improve the telehealth experience, specifically the loss of reassurance provided during face-to-face consultations and a clinical care tool that is critical to improving symptoms of the gut-brain interaction. The development of an IBS-focused telecare pathway may help to decrease economic burden, healthcare utilization, and access issues, but accommodations for patients with

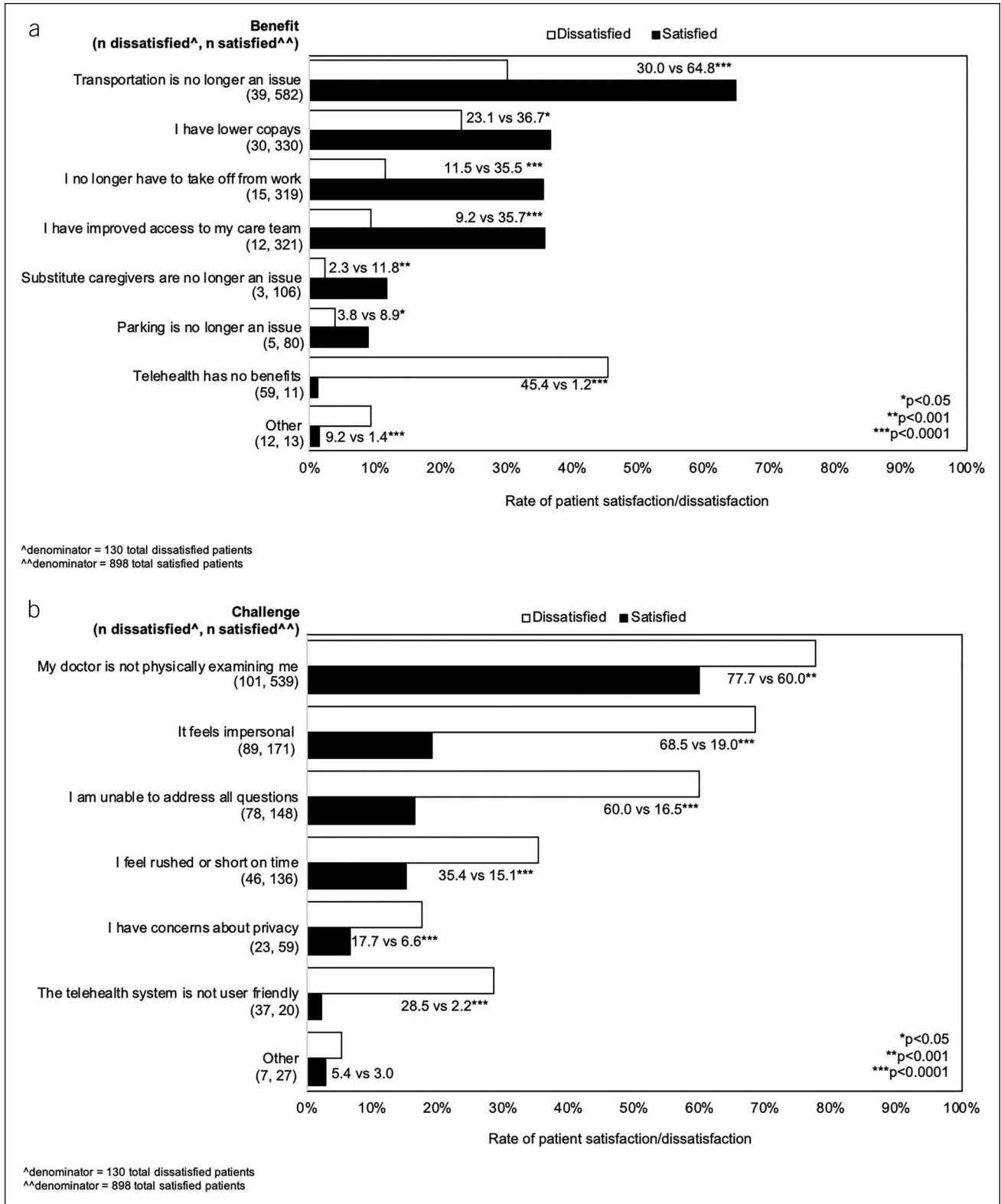


Figure 2. (a) Benefits of telehealth in patients with Rome IV confirmed irritable bowel syndrome and prior telehealth experience, stratified by satisfaction with prior telehealth use. (b) Challenges of telehealth in patients with Rome IV confirmed irritable bowel syndrome and prior telehealth experience, stratified by satisfaction with prior telehealth use.

a newer diagnosis of IBS, those who lack health and technologic literacy, and those with more comorbidities should be considered for programmatic success.

Our study has several strengths. First, our survey confirmed a diagnosis of IBS by Rome IV criteria and subtyped patients' symptoms, especially given the inaccuracies of *ICD-9 CM/ICD-10 CM* coding in identifying and subtyping IBS (29,30). In addition, the survey was developed and refined by both providers of differing specialties and levels of training and practice and direct patient feedback. The TUQ validation population and our study population shared similar characteristics including majority non-Hispanic White, women, and recent telehealth experience within 3 months of survey distribution. Because the survey was sent electronically, we reviewed preliminary data to ensure no logistical or technical errors occurred during survey administration. The study was also conducted in a diverse patient population of a large integrated health system. Patients and their IBS were well characterized and phenotyped, respectively, as confirmed by the survey results with readily accessible variables from the EHR and often unattainable patient-reported variables from the survey. Finally, the study was well-powered to observe subtle differences between comparator groups. This was especially clear when examining duration of IBS of less than a year as an independent predictor of telehealth dissatisfaction.

There were several limitations to this study. Overall, the percentage of responders was limited highlighting a significant selection bias. The survey was conducted exclusively in English and distributed in California, both of which limit generalizability of the study. In addition, we used email as the sole mode of distribution, which may have led to an overestimation of telehealth satisfaction. Patients were required to opt into the online survey, potentially introducing self-selection bias. There was also risk of recall bias because the survey was not administered immediately after the use of telehealth, rather patients were asked to evaluate their prior experiences with telehealth. Finally, patient unease with income and health literacy questions may have made some responses difficult to interpret.

In conclusion, 90% of the patients with IBS were satisfied with telehealth. The remaining 10% expressed dissatisfaction. Independent predictors of dissatisfaction included social media use of once a week or less, duration of IBS for <1 year, CCI score 1 or more, and willingness to travel of 60 minutes or more. Patients' main concerns were a lack of physical examination and feelings of impersonality with telehealth. Incorporating these factors into an IBS-focused telehealth program offers an opportunity to improve access to care, optimize patient satisfaction, and ensure efficient resource utilization through the expansion of virtual care delivery.

CONFLICTS OF INTEREST

Guarantor of the article: Christine Yu, MD.

Specific author contributions: C.Y.: overall study supervision; study concept and design, acquisition of data, conceptual model, analysis and interpretation of data, drafting of the manuscript, critical revision of the manuscript; approval of final draft submitted. S.T.: acquisition of data, critical revision of the manuscript; approval of final draft submitted. J.S.: analysis and interpretation of data; critical revision of the manuscript; approval of final draft submitted. A.P.: acquisition of data, critical revision of the manuscript; approval of final draft submitted. D.P.: acquisition of data, critical revision of the manuscript; approval of final draft submitted. W.K.v.D.: study concept and design; critical revision of the manuscript; approval of final draft submitted.

C.V.A.: study concept and design; critical revision of the manuscript; approval of final draft submitted. B.U.W.: overall study supervision; study concept and design, conceptual model, analysis and interpretation of data, drafting of the manuscript, critical revision of the manuscript; approval of final draft submitted.

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Study Highlights

WHAT IS KNOWN

- ✓ High rates of telehealth satisfaction in the general GI population.
- ✓ Data on satisfaction and perceptions of telehealth in patients with irritable bowel syndrome (IBS) are limited.

WHAT IS NEW HERE

- ✓ High rates of overall telehealth satisfaction in patients with IBS.
- ✓ Sicker patients, a shorter diagnosis of IBS, less frequent social media use, and willingness to travel longer for a face-to-face visit are associated with telehealth dissatisfaction.

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