



## Research Article

## Patient and Provider Perspectives on Telemedicine use in Canadian Gastroenterology Clinics during the COVID-19 pandemic: A Survey study

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### Abstract

**Background:** Telemedicine has revolutionized access to medical care. This was particularly palpable during the COVID pandemic and within gastroenterology. Telehealth can improve access to patients remotely, and lead to high patient and clinician satisfaction. However, questions remain surrounding patient selection and provider considerations. We conducted a Canadian study to examine patient and provider preferences and experiences in telehealth.

**Methods:** An anonymous online survey was conducted amongst patients of an urban gastroenterology practice, as well as Canadian gastroenterologists, evaluating experiences and preferences in utility of telemedicine.

**Results:** Of 1236 patients contacted, 181 (15%) respondents were aged 18-89, 60% were female, and 58% had inflammatory bowel disease (IBD). Patient satisfaction with telehealth was high across all characteristics. Patients used both phone calls (61%) and video/audio applications (50%); higher use of phone calls was associated with older age ( $p=0.02$ ). Patients living more than 30km from clinic and with IBD were more likely to prefer telehealth visits ( $p<0.01$ ). Most providers (96%) and patients (96%) believed that telehealth use should continue for certain patients or follow up visits after the pandemic. Of 100 providers contacted, 25 respondents reported using phone calls (96%) and video/audio applications (44%). Providers perceived follow up of benign endoscopic pathology (96%) and general follow up visits (92%) to be most suitable for telehealth.

**Conclusion:** Canadian gastroenterology providers and patients appreciate telehealth and favor continued use after the pandemic. Consideration of patient factors such as age, distance, health issue, and follow up status can further optimize ongoing telehealth options.

**Keywords:** Telehealth; Telemedicine; COVID-19 pandemic; Patient survey; Provider survey

### Background

Telemedicine, or telehealth is defined as the use of telecommunication media to facilitate healthcare interactions. Prior to the COVID pandemic, the American Medical Association found that gastroenterologists had the second lowest utilization rate of telehealth including just 7.9% of all internal medicine specialties [1]. Within the first four weeks of the COVID pandemic, there was a rapid expansion of telehealth; a real-world study of diverse gastroenterology practices noted an increase in telehealth visits from 5% to 94% [2]. Similar uptake of telehealth for outpatient appointments was seen in Ontario, where virtual care increased from 1.6% in 2019 to 70.6% in 2020 [3].

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Literature preceding the COVID pandemic demonstrated the efficacy of telemedicine in various areas of gastroenterology. Telemedicine appointments for inflammatory bowel disease (IBD) patients were time- and cost-efficient, highly acceptable to patients, and appeared to be effective in maintaining disease control [4,5]. Patients with hepatitis C infection, managed through telemedicine had similarly high rates of sustained virologic response compared to those treated in-person [6]. In patients with cirrhosis, telehealth evaluation reduced the time from referral to evaluation and listing for transplant [7]. Pre-colonoscopy teleconsultation led to equivalent patient satisfaction compared to in-person appointments and increased guideline-concordant endoscopic surveillance rates [8,9].

Early experiences of telehealth use in gastroenterology clinics during the COVID-19 pandemic have reported high levels of satisfaction from both patients and providers [2,10,11]. There was a corresponding rise in clinic capacity, decline in waiting lists, and increase in clinic revenue [12]. In patients managed by telehealth, medication adherence was non-inferior to those with in-person visits [13].

While telehealth was an effective solution to socially distanced care, ongoing use has identified new questions. Higher rates of patient dissatisfaction and telehealth failure have been associated with older age, ethnic minorities, lower socioeconomic status, shorter time under medical care, and gastrointestinal conditions outside of IBD [14-18]. This suggests that patient selection for telehealth requires further optimization to avoid inadvertently disadvantaging vulnerable or marginalized groups. Providers are also faced with novel considerations, including consent, confidentiality, data privacy, licensing, reimbursement, choice of telehealth media, and incorporation of trainees in virtual clinics, which may affect their preferences surrounding virtual clinics when it is no longer necessitated by pandemic measures [2,19].

Limited Canadian studies on patient or provider satisfaction have suggested that telehealth use in gastroenterology clinics will continue beyond the pandemic [20-22]. However, none have examined preferences for future use of telehealth or factors associated with patient satisfaction. Our study sought to bridge this gap by examining both patient and provider perspectives to inform optimal telehealth use in Canada during the pandemic and beyond.

## Methods

### Study design

An anonymous online survey was distributed to patients (Appendix A) and physicians (Appendix B) regarding their experiences and preferences regarding telehealth. Patients were recruited from a tertiary Gastroenterology clinic in downtown Vancouver, in which 11 gastroenterologists work. All patients had previously consented to be contacted for

research purposes and were invited by email to participate in the patient survey with a cover letter explaining the potential benefits, risks, and measures to participate. The physician survey was distributed by email to Canadian gastroenterologists on a mailing list and through the Canadian Association of Gastroenterology website. All participants provided consent prior to participating in the surveys. Both surveys collected responses from August 30, 2020 to February 22, 2021. Ethics approval was obtained from the University of British Columbia Clinical Research Ethics Board prior to commencement of any research activities.

### Survey tool

The SimpleSurvey software was used to collect responses from patients and providers. The survey was developed through consensus between 4 academic gastroenterologists. The physician survey included 17 items including physicians' demographic and practice details, current use and preferences towards telehealth media, experiences with implementation of telehealth, and opinions on the role of telehealth following the COVID-19 pandemic. The patient survey was comprised of 22 items covering clinicodemographic information, experiences of the telehealth appointment (including satisfaction rating from 1-10 where 10 is very satisfied), impact of telehealth use on health behaviours, preferences of telehealth compared to in-person visits, and future use after the pandemic.

### Statistical analysis

Descriptive statistical analysis was conducted based on the total number of responses for each survey item. Per visit analysis was undertaken to assess for any correlation between factors associated with phone or audio/video use, satisfaction rating, and patient preferences for telehealth or in-person appointments in the future using Mann-Whitney U test, ANOVA, and Chi-square or Fisher's exact test, with pairwise comparisons, where applicable. Analysis was conducted using R version 4.2.0 and statistical significance was defined as P-value less than 0.05 in a two-tailed test.

## Results

### Patient respondent characteristics

Of 1236 patients contacted, 181 (15%) responded to their survey (Table 1). Patient ages were similarly distributed between 18-89 years old, 60% were female, and 66% of patients lived less than 30km from the clinic. Most patients (78%) had met their provider prior to the telehealth visit. Gastrointestinal issues discussed at the telehealth visit included inflammatory bowel disease (58%), GERD and esophageal disease (14%), liver disease (7%), and pending diagnosis (5%). English was the preferred language in 98% of patients and 62% had previously used telehealth for appointments. Most patients self-reported that their technology skill level was either average (61%) or above average (35%).

**Table 1:** Patient respondents' characteristics

Characteristic	N (%)
Contacted	1236
Completed survey	181 (15)
Age (years)	
18-29	23 (13)
30-39	40 (22)
40-49	23 (13)
50-59	31 (17)
60-69	35 (19)
70-79	27 (15)
80-89	2 (1)
Female (%)	107 (60)
Distance from home to clinic	
<30 km	97 (66)
>30 km	77 (44)
English as preferred language	170 (98)
Previously used telehealth	62 (37)
Self-reported technology skill level	
Below average	8 (5)
Average	104 (61)
Above average	59 (35)
Number of encounters prior to telehealth visit	
0	37 (22)
1-3	55 (32)
4-10	45 (26)
>10	33 (19)
Health issue discussed at telehealth visit	
Anemia	9 (6)
Cancer	4 (3)
Inflammatory bowel disease	91 (58)
Irritable bowel syndrome	9 (6)
Liver disease	17 (11)
Pancreas disease	6 (4)
GERD and esophageal disease	25 (16)
Pending diagnosis	13 (8)

### Patient experiences of telehealth

Most patients used phone calls alone (61%), or a video and audio application (50%) such as Zoom, doxy.me, and Medeo (Table 2). Higher use of phone calls was associated with older age (particularly those aged >60 years,  $p=0.02$ ) and living within 30 km of the clinic ( $p<0.01$ ) (Table 3). Around a third

of patients (30%) reported their appointments starting before the scheduled time and 45% started within 5 minutes of the time scheduled. The majority of patients reported the same willingness to follow advice (90%) and felt their concerns were addressed (86%) at the telehealth visit. Patients reported sufficient opportunity to ask questions (91%) and few patients reported withholding information during the televisit (11%) or being concerned about the lack of a physical exam (18%). When patients were asked which modalities they wished to use in the future, 50% selected phone calls and 56% selected video and audio applications.

**Table 2:** Patient experiences of telehealth visit

Characteristic	N (%)
Telehealth medium used †	
Phone call alone	100 (61)
Audio call via internet application	3 (2)
Video and audio (Zoom, Doxy.me, Medeo)	81 (50)
Preferred telehealth medium	
Phone call alone	80 (50)
Audio via internet	11 (7)
Audio and video via internet	89 (56)
Start of telehealth appointment	
Before scheduled time	48 (30)
After 5 minutes	72 (45)
After 5-10 minutes	22 (14)
After 10-20 minutes	9 (6)
After 20-30 minutes	7 (4)
After >30 minutes	2 (1)
Willingness to follow advice with telehealth visit*	
More likely	10 (6)
Same	144 (90)
Less likely	5 (3)
Concerns addressed during telehealth visit*	
Better addressed	7 (4)
Same	136 (86)
Worse addressed	16 (10)
Withheld information during telehealth visit‡	18 (11)
Concerned about lack of physical exam	28 (18)
Sufficient opportunity to ask questions	145 (91)
Preference after the COVID-19 pandemic:	
Telehealth visits	62 (39)
Indifferent	51 (32)
In-office visits	45 (28)
Role of telehealth after the COVID-19 pandemic:	
All possible visits	44 (28)
Follow up visits only	108 (68)
No role	6 (4)

†out of 163 unique respondents to the question (90%)

‡compared to in-person appointment

**Table 3:** Factors associated with patient satisfaction with telehealth visit

Characteristic	N (%)	Mean satisfaction Mean $\pm$ SD [median]	P-value	Prefer Office	Neutral	Prefer telehealth	P-value	Phone call	Audio/ Video	P-value
Age (years)			0.31				0.39			<b>0.02</b>
18-39	69 (38)	8.35 $\pm$ 2.03 [9]		19	18	32		28	40	
40-59	54 (30)	8.7 $\pm$ 1.94 [9.5]		13	20	20		33	21	
60-89	57 (32)	8.84 $\pm$ 1.56 [9]		16	23	18		38‡	21	
Gender			0.68							0.35
Female	111 (61)	8.57 $\pm$ 1.99 [9]		23	38	49	0.05	58	54	
Male	70 (39)	8.56 $\pm$ 1.94 [9]		25	23	21		41	28	
Distance from home to clinic			0.52							
<30 km	97 (66)	8.58 $\pm$ 1.83 [9]		36	37	22	<b>&lt;0.01</b>	65	34	<b>&lt;0.01</b>
>30 km	77 (44)	8.64 $\pm$ 1.92 [9.5]		12	24	48		34	48	
Previous telehealth use			0.91							0.29
Yes	103 (57)	8.58 $\pm$ 1.94 [9]		26	31	46	0.20	53	51	
No	77 (43)	8.65 $\pm$ 1.77 [9]		22	30	24		46	31	
Self-reported technology skill level			0.55				0.22			0.53
Below average	8 (5)	8.72 $\pm$ 1.86 [8]		4	1	3		33	30	
Average	104 (61)	8.59 $\pm$ 1.87 [9]		32	35	39		60	50	
Above average	59 (35)	8 $\pm$ 1.93 [9]		12	25	28		6	2	
Health issue addressed			0.54				<b>&lt;0.01</b>			0.05
GERD and esophageal disease	24 (14)	8.42 $\pm$ 1.72 [8.5]		8	12	4		16	8	
Inflammatory bowel disease	102 (58)	8.66 $\pm$ 1.84 [9]		18	37	47		44	55	
Liver disease	13 (7)	8.23 $\pm$ 2.17 [9]		7	3	3		9	4	
Pending diagnosis	8 (5)	7.88 $\pm$ 3.23 [9]		4	3	2		20	9	
Other†	29 (16)	8.97 $\pm$ 1.55 [10]		11	6	2		4	5	
Type of visit							0.26			0.46
New patient	37 (21)	8.3 $\pm$ 2.21 [9]	0.33	14	10	14		18	19	
Follow-up	143 (79)	8.69 $\pm$ 1.77 [9]		34	51	56		81	63	
Telehealth medium			0.26				0.29	-	-	
Phone call alone	96 (54)	8.58 $\pm$ 1.85 [9]		29	33	32		-	-	
Audio call	2 (1)	6.5 $\pm$ 4.95 [6.5]		1	1	0		-	-	
Video and audio	81 (45)	8.68 $\pm$ 1.81 [9]		18	27	37		-	-	

†includes anemia, cancer, functional disorders, pancreas/biliary disease, and pre-endoscopy consultation

‡compared to patients aged 18-39 years.

When patients were asked to rate their telemedicine appointment on a scale of 1 (very dissatisfied) to 10 (very satisfied), 164 patients (88%) were satisfied or very satisfied (rating 7-10 out of 10) compared to 10 patients (5%) were dissatisfied or very dissatisfied (rating 1-4 out of 10). Patient satisfaction was similar amongst different telehealth media (Figure 1). Mean patient satisfaction was similar across gender, previous telehealth use, health issue addressed, and type of visit (new patient or follow-up); younger patients (18-39 years old), those residing less than 30 km from the clinic, and below average technology skill had slightly lower satisfaction ratings compared to their counterparts, though this was not statistically significant (Table 3).

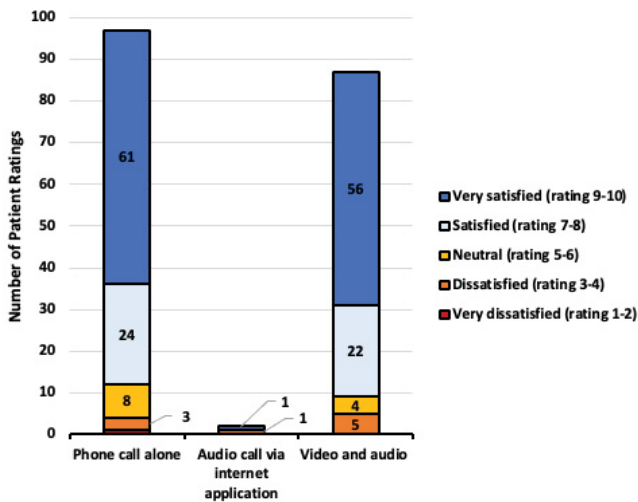


Figure 1: Patient satisfaction with telehealth appointments, by media type used

### Patient preferences for use of telehealth

Slightly more patients preferred telehealth visits (39%) compared to in-office visits (28%), and 32% of patients were indifferent (Table 2). Patients living more than 30 km away from the clinic and those with inflammatory bowel disease were more likely to prefer telehealth visits over office visits ( $p < 0.01$ ; Table 3). Most patients felt telehealth after the COVID-19 pandemic to be most suitable for follow-up appointments (68%) while almost a third (28%) endorsed using telehealth for all possible visits (Figure 2).

Of 62 patients who preferred telehealth, reasons included avoiding travel (82%), requiring less time off work (63%), being able to avoid going into the doctor’s office (58%), and telehealth appointments making it easier for friends and family to attend (11%).

Reasons for preferring in-person visits in 45 patients were better rapport (56%), lack of physical exam with telehealth (56%), privacy concerns (9%), and low level of skill with technology (2%).

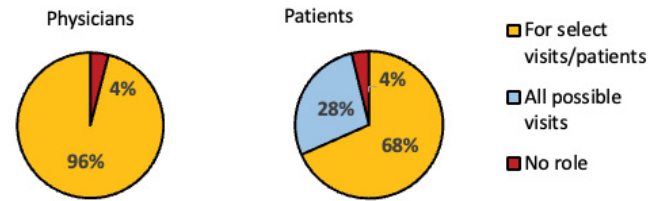


Figure 2: Opinions on role of telehealth after the COVID-19 pandemic

### Provider respondent characteristics

Of 100 gastroenterology providers contacted, 25 completed the survey (Table 4). Most respondents were 40-49 years old (44%) and 7 (28%) were female. Slightly more than half of respondents had an academic practice (64%) and subspecialties included therapeutic endoscopy (32%), IBD (24%), hepatology (12%), and motility (4%). Location of practice included British Columbia (68%), Quebec (24%), and Ontario (8%). Most providers reported their technology skill level to be average (52%) or above average (40%).

Table 4: Physician respondents’ characteristics

Characteristic	N (%)
Contacted	100
Completed survey	25
Age (years)	
30-39	4 (16)
40-49	11 (44)
50-59	5 (20)
60-69	4 (16)
70-79	1 (4)
Female (%)	7 (28)
Province (%)	
BC	17 (68)
ON	2 (8)
QC	6 (24)
Practice setting (%)	
Community	11 (44)
Academia	16 (64)
Subspecialty (%)	
Therapeutic endoscopy	8 (32)
IBD	6 (24)
Hepatology	3 (12)
Motility	1 (4)
None	8 (32)
Self-reported technology skill level	
Below average	2 (8)
Average	13 (52)
Above average	10 (40)



**Provider experiences of telehealth**

Overall, provider respondents had positive experiences with telehealth. Most providers used phone calls (96%) or a video and audio application (44%) such as Zoom, Doxy.me, and Medeo (Table 5). Relative ranking of telehealth media demonstrated a preference towards phone call alone and video/audio with Zoom over other modalities including Doxy.me, Medeo, and audio call by internet application (Figure 3). Around half (48%) of providers felt that video did not have added value over audio alone and 80% felt that patients would be just as forthcoming with information with telemedicine, compared to in-person visits. Most physicians believed that the lack of physical exam would only minimally impair (48%) or not impact (44%) the quality of their assessment. The use of telehealth led to most appointments either running more on time (40%) or the same as in-person visits (36%). Compared to in-person visits, patients were perceived to have more appreciation (52%) or the same appreciation (44%) of the appointment, and financial remuneration for telehealth was the same for 96% of providers. Most providers (96%) felt that telehealth should continue for certain patients after the COVID-19 pandemic.

**Table 5:** Physician experiences of telehealth applications

Characteristic	N (%)
Type of media used	
Phone call alone	24 (96)
Audio call via internet application	4 (16)
Video and audio (Zoom, Doxy.me, Medeo, other)	11 (44)
Combination phone and Zoom	1 (4)
Believe that video has no added value over audio alone.	12 (48)
Believe that patients would not withhold information due to telemedicine.	20 (80)
Impact of the lack of physical exam on quality of assessment:	
No impact	11 (44)
Minimally impaired	12 (48)
Greatly impaired	2 (8)
Impact of telehealth on appointment timing†:	
More on time	10 (40)
Same as in-person visits	9 (36)
Running later	6 (24)
Impression of patients' appreciation of telehealth*:	
Less appreciated	1 (4)
Same appreciation	11 (44)
More appreciated	13 (52)
Financial remuneration for telehealth*:	

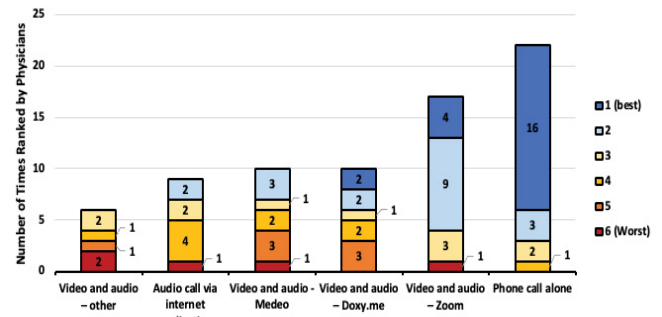
Better compensated for equivalent time	0 (0)
Same compensation	24 (96)
Less compensated	1 (4)
Role of telehealth after the COVID-19 pandemic:	
No role	1 (4)
Continue for certain patients	24 (96)
Replace in office visits	0 (0)

†compared to in-person visits

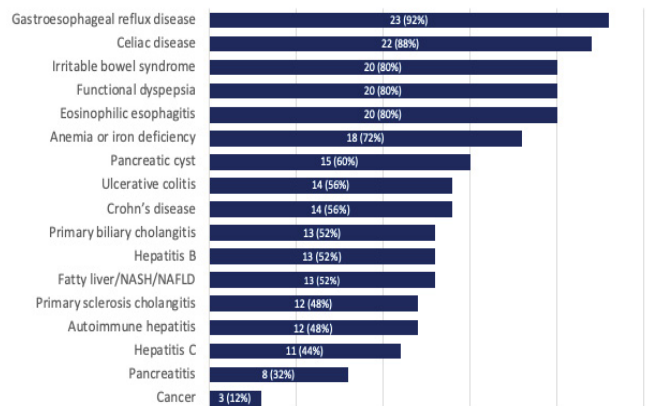
**Provider preferences for use of telehealth**

Most providers believed that telehealth would be suitable for follow-up of benign endoscopic pathology (96%), follow-up visits (92%), and consultations prior to endoscopy (76%). Only a minority of providers felt that consultation for new patients (32%) and follow-up of malignant endoscopic pathology (24%) were appropriate indications for telehealth visits (Figure 4).

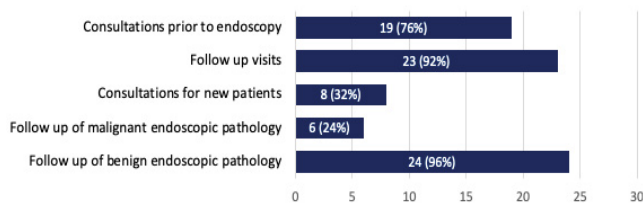
Preferred gastrointestinal conditions for telehealth visits included GERD (92%), celiac disease (88%), irritable bowel syndrome (80%), functional dyspepsia (80%), and eosinophilic esophagitis (80%) (Figure 5).



**Figure 3:** Physician relative ranking of telehealth media by physicians



**Figure 4:** Physician preferences for telehealth visit type (after the pandemic)



**Figure 5:** Physician preferences on conditions best suited for telehealth

## Discussion

Our study demonstrated that Canadian gastroenterology providers and patients of an urban clinic had positive experiences with telehealth and the vast majority (96% of both groups) believed it had a role following the pandemic. This reflects existing Canadian studies on telehealth satisfaction during the pandemic, which have found 83% of patients were satisfied with telehealth and 78% wished to continue telehealth appointments [20,22]. Similarly, an Alberta study of gastroenterology providers found that 88% were satisfied with telehealth and all survey respondents were willing to continue its use [21]. Phone calls were used more often than video and audio modalities by providers in our survey at 96% and 44%, respectively, whereas patients reported use at 61% and 50%, respectively. Preferences for phone or video/audio applications were similar in both groups. However, we observed that phone call use was associated with older age, concordant with previous literature that found the use of video-based telehealth visits declined with increasing age [16]. While we detected no association between technology skill level and audio/visual application use, previous studies have shown that patients are more receptive to video-based telehealth following training; further consideration in engaging older adults in video-based telehealth is needed as this population tends to have more medical complexity and may particularly benefit from visual evaluation [23].

Optimal patient selection for telehealth likely depends upon patient, provider, and telehealth media factors. While we did not detect any factors associated with a statistically significant difference in patient satisfaction, those preferring telehealth in the future tended to reside remotely and have a diagnosis of IBD. It is expected that IBD is compatible with telehealth as a chronic disease requiring frequent active management, for which multiple telehealth solutions have already demonstrated improved quality of life and reduction in hospital admissions [24-26]. Physician preferences for conditions best suited for telehealth are compatible with a previous study finding higher patient satisfaction for management of IBD and luminal conditions [14]. These findings also reinforce the compatibility of telehealth with the specialty of gastroenterology as many clinical queries can be adequately addressed virtually, such as discussion of endoscopic procedures, follow up of benign pathology, or disease monitoring with well-established biochemical

markers. This is in contrast with other areas of medicine where management is dependent upon in-person assessment and physical exam. Other patient factors associated with lower satisfaction in previous studies include younger age, female gender, and new patient consultation (as opposed to follow-up appointments) [10,14,27]. While we did not find any association between new patient status and satisfaction or preference for telehealth, most providers (92%) in our survey preferred telehealth for follow-up visits. Finally, telehealth literature shows that video modalities are preferred over phone calls; however, patients in our study had similar preferences for phone calls (61%) compared to video applications (50%) and only half of providers felt video had added value over audio alone (48%) [2,27]. Our findings suggest that certain conditions such as luminal disease and IBD, long-distance residence, and follow-up visits may be best suited for telehealth, which may be through phone, audio, or video modalities. Possible reasons why phone is preferable is the user fatigue that exists with various on-line methods (i.e. passwords/downloading apps/virtual waiting rooms) that may be present in methods other than a simple phone call. As phone appointments are not equipped with security and privacy features built into dedicated telehealth modalities, further studies are required to investigate patient preferences surrounding consent and privacy.

In our survey, gastroenterology providers from the three most populous provinces in Canada reported few concerns with telehealth appointments and associated logistical considerations. Few providers were concerned about less information from patients (20%) or lack of physical exam (8%). Three-quarters of providers reported appointments being earlier than or the same as in-person visits and 96% reported no change in compensation for telehealth visits. This is reassuring as a previous survey on provider preference in Alberta elicited concerns on reimbursement and in some provinces decreased support for telehealth has already occurred [21,28]. Guidelines for telemedicine use have largely been in IBD or guidance for American providers surrounding privacy concerns, telehealth media, billing codes, and licensing [19,29]. Best practice recommendations for Canadian providers of general gastroenterology care are needed given the different practice landscape in Canada compared to the United States.

There are several limitations to our study, which highlights the need for future research. We had a low response rate of 15% for patients and 25% for providers contacted. There is likely a selection bias in our respondents as our design utilized an online survey, which selected patients and providers who tend to use technology as reflected by the low proportion of respondents reporting below-average technology skill level. While the survey was sent out to gastroenterologists of provinces and territories in Canada, respondents were only from three provinces, limiting the generalisability of our results as we would not capture other interprovincial

variations in provider experiences. Similarly, our patients were from a large urban clinic, which may not reflect other gastroenterology patients across the country, though we did have similar findings to existing studies in other provinces. Our sample size was too small to conduct certain analyses such as examining preferences amongst different audio and video media, and audio-only platforms. We have provided initial patient and provider preferences on telehealth use in gastroenterology, however objective markers of incomplete or failed telehealth appointments as well as collecting socioeconomic and ethnicity data can further clarify whether Canadian patients are disadvantaged by telehealth similar to findings in US literature [15,18]. Further, as telehealth use continues to grow possibly at the detriment of outpatient clinical education, future studies should examine how to best incorporate trainees into virtual clinic [30]. Finally, our survey was conducted during the pandemic, when the endorsement of telehealth was likely affected by the fear of communicable disease risk. Further research is required to elicit perspectives on telehealth use as the end of the pandemic draws near.

## Conclusion

In summary, Canadian gastroenterologists and patients of an urban clinic had positive experiences with telehealth visits and would continue its use even after the pandemic. Phone and video-based telehealth visits were equally preferred by providers and patients, though older patients were more likely to have phone visits, suggesting that telehealth for older adults can be further optimized. Based on patient and provider preference, patients living in remote locations and with certain health issues, such as luminal disease or IBD, may be more suitable for telehealth visits. As telemedicine use will likely persist beyond the pandemic, understanding patient and provider preferences in the local context will enable Canadian gastroenterologists to optimize telehealth in the future.

## Declarations

Ethics approval and consent to participate: Ethics approval was obtained from the University of British Columbia Clinical Research Ethics Board and participants provided informed consent prior to participating in the study. All methods were carried out in accordance with relevant guidelines and regulations.

**Consent for publication:** Not applicable.

## Availability of data and materials

Available upon request by contacting the corresponding author (SM).

## Competing interests

MT: Consultant: Boston Scientific, Pendopharm.

SXJ, HJK, BZ, EL, RE: None.

BB: Advisor/Speaker: Ferring, Janssen, Abbvie, Takeda, Pfizer, Novartis, BMS, Merck, Sandoz, Organon, Lifelabs. Advisor: Alimentiv, Gilead, Iterative Scopes, AMT, Celgene, Merck, Amgen, Pendopharm, Genentech, BMS, Allergan, Protagonist, Fresenius Kabi, Mylan, Viatrix, Bausch Health, Celltrion Healthcare, BioJamp Pharma, Eupraxia. Research support: Janssen, Abbvie, GSK, BMS, Amgen, Genentech, Merck. Stock Options: Qu Biologic

SM: Consultant: Bausch, Sanofi. Speaker's bureau: Bausch, Knight Therapeutics. Grant: VCHRI.

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## Author's contributions

MT, HJK, BZ, EL, RE, BB, SM were involved in the conception, design, and data collection for the project. MT and SXJ contributed to data analysis and drafting the work. All authors were involved in revising it for critically important content. SM provides final approval of the manuscript. All authors agree to be accountable for the work.

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## Appendix A: Patient Survey

### What is your age?

18-30 years  
30-40 years  
40-50 years  
50-60 years  
60-70 years  
70-80 years  
80-90 years  
Over 90 years

### What is your gender?

M/F

### How far do you live from the gastroenterologist's office (1190 Hornby, Vancouver)?

Less than 5 km  
5-15 km  
15-30 km  
30-100 km  
Over 100 km

### Is English your language of preference?

Yes/no

### What is your language of preference?

-free text

### How skilled do you consider yourself with regards to technology?

Below average  
Average  
Above average

### How many times had you met this gastroenterologist prior to this tele-health visit?

None  
1-3 visits  
4-10 visits  
More than 10 visits

### Had you previously used tele-health to meet another healthcare professional?

Y/N

### Which medium of tele-health did you use in your visit?

Phone call alone  
Audio call via internet application  
Video and audio – Zoom  
Video and audio – Doxy.me  
Video and audio - Medeo  
Video and audio – other  
Other – please specify

### When did your tele-health appointment start?

Before scheduled time  
5 minutes after the scheduled time  
5-10 minutes after the scheduled time  
10-20 minutes after the scheduled time  
20-30 minutes after the scheduled time  
Over 30 minutes after the scheduled time

### Which medium of tele-health would you prefer in future visits?

Phone call alone  
Audio via internet application  
Video and audio via internet

### How satisfied were you with the tele-health appointment/interaction?

0 → 10 (Visual analog scale)

### Do you feel any difference in following the gastroenterologist's advice because the visit occurred via tele-health?

More likely to follow advice  
Less likely to follow advice  
No difference in following advice

### How well did the gastroenterologist address your concerns?

As well as an in-office visit  
Better than an in-office visit  
Less well than an in-office visit

### Were you concerned about the lack of being physically examined during your tele-health visit?

Yes/no

### Did you feel you had enough opportunity to ask questions?

Yes/no

### Were your questions answered adequately during the tele-health visit?

Yes/no

### Did you feel you with-held information you would have been likely to share in person?

Yes/no

### From the date you were referred to a gastroenterologist, how long did it take for you to have your tele-health appointment?

Less than a week  
1-2 weeks  
2-4 weeks  
1-2 months

2-4 months  
4-6 months  
More than 6 months

**Once the COVID-19 pandemic is over, would you prefer tele-health visits compared to regular in office appointments?**

Y/N/indifferent

**If yes, why would you prefer tele-health visits to regular in office appointments?**

Avoiding waiting in doctor's office  
Avoiding travel  
It would be easier for my family members/friends to attend as well  
Can attend from work or home without taking time off  
Other – specify

**If not, why would you prefer regular office appointments?**

Establishing relationship with the doctor  
I do not believe I am skilled enough with technology  
I am concerned about the privacy of tele-health  
Lack of physical examination by the consulting physician with tele-health concerns me  
Other - specify

**Once the COVID-19 pandemic is over, what role would you think tele-health should play in gastroenterology office visits?**

Follow up visits after having met the gastroenterologist in person  
All possible visits  
No role for tele-health after the pandemic

**What disease were you seen at the gastroenterologist for?**

Still awaiting a diagnosis  
Anemia or iron deficiency  
Autoimmune hepatitis  
Celiac disease  
Eosinophilic esophagitis  
Fatty liver/NASH/NAFLD  
Functional dyspepsia  
Gastroesophageal reflux disease/GERD/reflux/heartburn  
Gastrointestinal cancer  
Hepatitis B  
Hepatitis C  
Inflammatory bowel disease – Crohn's disease  
Inflammatory bowel disease – Ulcerative colitis  
Inflammatory bowel disease – unsure if Crohn's or  
Ulcerative colitis  
Irritable bowel syndrome  
Pancreatic cyst

Pancreatitis  
Primary biliary cholangitis  
Primary sclerosis cholangitis  
Other - specify

**If you have not received a diagnosis, then why were you referred to the gastroenterologist?**

1. Abdominal pain
2. Nausea or vomiting
3. Problems swallowing
4. Diarrhea
5. Constipation
6. Blood in stools
7. Abnormal liver tests
8. Anemia
9. Other - specify

**You have completed the survey. Thank you for participating.**

**Appendix B: Physician Survey**

**What is your age?**

18-30 years  
30-40 years  
40-50 years  
50-60 years  
60-70 years  
70-80 years  
80-90 years  
Over 90 years

**What is your gender?**

M/F

**Where is your practice?**

BC  
AB  
SK  
MB  
ON  
QC  
NS  
NF  
NB  
PEI  
Nunavut  
Yukon  
North West Territories

**How would you describe your clinical practice?**

Community gastroenterology – urban  
Community gastroenterology – rural  
Academic gastroenterology  
Private gastroenterology

**Do you have a subspecialty within gastroenterology?**

No subspecialty  
Therapeutic endoscopy  
Motility  
IBD  
Non-transplant hepatology  
Transplant hepatology  
Nutrition

**How skilled do you consider yourself with regards to technology?**

Below average  
Average  
Above average

**Which of the following media have you used in your tele-health visits?**

Phone call alone  
Audio call via internet application  
Video and audio – Zoom  
Video and audio – Doxy.me  
Video and audio - Medeo  
Video and audio – other  
Other – please specify

**Please rank the tele-health media from best to worst (no need to rank all media):**

Phone call alone  
Audio call via internet application  
Video and audio – Zoom  
Video and audio – Doxy.me  
Video and audio - Medeo  
Video and audio – other

**With regards to seeing a patient’s video during the visit:**

I do not believe it adds much over audio  
I believe it allows me to pick up on non-verbal cues

**Regarding the lack of physical exam in tele-health:**

I do not believe it has affected to quality of my assessment  
I believe it has minimally impaired the quality of my assessment  
I believe it has greatly impaired the quality of my assessment

**Given tele-health visits, my clinic is now:**

Running more on time  
Running later  
Running the same it would with in-office visits

**Did you feel that patients might with-hold information because of tele-medicine?**

Yes/no

**What is your impression of patients’ impressions of tele-health?**

They generally appreciate it as much as in-office visits  
They generally appreciate it less than in-office visits  
They appreciate it more than in-office visits

**After the COVID-19 pandemic, I believe that tele-health should:**

Replace in-office visits  
Continue for certain patients but in-office visits should still be available for others  
Have no role

**Financial remuneration for tele-health visits in your province is currently:**

More than an in-office visit of equivalent time  
Less than an in-office visit of equivalent time  
The same as an in-office visit of equivalent time

**After the COVID-19 pandemic, which visits would be best for tele-health (check all that apply)?**

Follow up of benign endoscopic pathology  
Follow up of malignant endoscopic pathology  
Consultations for new patients  
Follow up visits  
Consultations prior to endoscopy

**Which conditions would be worst for tele-health? (select all that apply)**

Anemia or iron deficiency  
Autoimmune hepatitis  
Celiac disease  
Eosinophilic esophagitis  
Fatty liver/NASH/NAFLD  
Functional dyspepsia  
Gastroesophageal reflux disease/GERD/reflux/heartburn  
Gastrointestinal cancer  
Hepatitis B  
Hepatitis C  
Inflammatory bowel disease – Crohn’s disease  
Inflammatory bowel disease – Ulcerative colitis  
Inflammatory bowel disease – unsure if Crohn’s or Ulcerative colitis  
Irritable bowel syndrome  
Pancreatic cyst  
Pancreatitis  
Primary biliary cholangitis  
Primary sclerosis cholangitis

**You have completed the survey. Thank you for participating.**