

**SATISFACTION OF INDIVIDUALS LIVING WITH INFLAMMATORY BOWEL
DISEASE AND GASTROENTEROLOGY CARE PROVIDERS WITH TELEPHONE
CARE**

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By

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ABSTRACT

Background: People living with inflammatory bowel disease (IBD) require regular medical follow-up, which could be challenging for individuals living in rural areas and those who have limited access to specialized care. Telephone care (TC) could improve health care by increasing access to specialized care and decreasing the strain of travel and time to see a consultant. The coronavirus disease 2019 pandemic increased the usage of TC appointments in Canada including Saskatchewan. There are no validated questionnaires to measure satisfaction with TC among individuals living with IBD and gastrointestinal care providers (GCPs). In addition, there is limited evidence around the levels and factors associated with satisfaction with TC among individuals with IBD.

Purpose: This study aimed to adapt and validate a questionnaire to evaluate the satisfaction of individuals living with IBD and GCPs with TC, and to evaluate the factors associated with TC satisfaction among individuals living with IBD in Saskatchewan, Canada.

Methods: The Telehealth Usability Questionnaire was adapted to the IBD TC context by a committee of experts. Two questionnaires were generated - the Telephone Care Satisfaction Questionnaire (TCSQ) for individuals living with IBD (IBD-TCSQ-patient) and GCPs (IBD-TCSQ-provider). A pilot study among GCPs and IBD individuals assessed the readability and usability of the questionnaire items. Subsequently, between December 2021 and April 2022, individuals living with IBD in Saskatchewan and GCPs completed an online survey with, respectively, the TCSQ-patient and IBD-TCSQ-provider questionnaires. For individuals with IBD, the online survey also included the Quality of Care Through the Patient's Eyes-IBD (QUOTE-IBD) questionnaire, Short Inflammatory bowel disease questionnaire (SIBDQ), and demographic questions. Data were analyzed using descriptive and correlational techniques. Psychometric analysis was conducted to examine the reliability and validity of the IBD-TCSQ-patient. Factors associated with TC satisfaction were explored using linear regression models. A backward model-building strategy was used, and 95% confidence intervals (95%CI) were reported.

Results: The IBD-TCSQ-patient and IBD-TCSQ-provider questionnaires were developed, each with 16 individual items and one question on global TC satisfaction. The pilot study demonstrated good readability and usability of the questionnaires. Then, 87 IBD individuals completed the IBD-TCSQ-patient questionnaire and six GCPs the IBD-TCSQ-provider questionnaire. The standardized level of TC satisfaction for the 16-item IBD-TCSQ-patient was 5.70 (SD=0.94) on a scale from 1.00 to 7.00. The IBD-TCSQ-patient had optimal internal reliability ($\alpha=0.96$). Two dimensions were identified in the exploratory factor analysis of the IBD-TCSQ-patient questionnaire (i.e., *usefulness* and *convenience*). Adjusting by gender, age group, type of disease, and health care provider managing IBD, the satisfaction with TC was 0.48 (95%CI 0.02-0.94) higher among individuals with IBD living in rural Saskatchewan in comparison to their urban counterparts.

Conclusion: Questionnaires to measure satisfaction with TC among individuals with IBD and GCPs were developed. Good validity and reliability of the IBD-TCSQ-patient were confirmed. This questionnaire could help identify opportunities for TC improvement and thereby improve utilization among individuals living with IBD. Individuals living with IBD in Saskatchewan reported high levels of satisfaction with TC. Rural residence is associated with higher levels of TC satisfaction. These results could help in the promotion of TC utilization and improve access to specialized IBD care, especially among those living in rural areas.

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DEDICATION

This work is dedicated to my parents, Mr. Foncham Ephraim and Mrs. Foncham Anastasia, for all the sacrifices and support they have given me to get this far in my educational career. I would also like to dedicate this to my two sisters Foncham Linda Mah and Foncham Britney for always cheering me up during my hard times and encouraging me to see this through and lastly to my late brothers, Christian, Edmond and Edwin Foncham who have always been the drive behind my determination. Continue to rest in perfect peace. Thank you all so much.

Table of Contents

PERMISSION TO USE	II
ABSTRACT.....	III
ACKNOWLEDGMENTS	IV
DEDICATION	V
TABLE OF TABLES	IX
TABLE OF FIGURES	X
LIST OF ABBREVIATIONS.....	XI
1. BACKGROUND.....	1
1.1. IBD CARE AND QUALITY OF CARE.....	3
1.2. VIRTUAL CARE	4
1.3. VIRTUAL CARE USE BEFORE AND DURING THE COVID-19 PANDEMIC	5
1.4. SATISFACTION WITH VIRTUAL CARE	6
1.4.1. <i>Patients’ Satisfaction with virtual care</i>	6
1.4.2. <i>Health care providers’ satisfaction with virtual care</i>	7
1.5. SATISFACTION WITH TELEPHONE CARE	8
1.6. STUDY OBJECTIVES.....	9
2. METHODS	11
2.1. STUDY DESIGN.....	11
2.2. SETTING AND SAMPLE	11
2.2.1. <i>Eligibility and recruitment of individuals with IBD</i>	12
2.2.2. <i>Eligibility and recruitment of GCPs</i>	12
2.5. QUESTIONNAIRES.....	12
2.5.1. <i>Satisfaction with Telephone care Questionnaire</i>	13
2.5.2. <i>Questionnaire Adaptation</i>	13
2.5.3. <i>Other questionnaires</i>	14
2.6. DATA ANALYSIS.....	15
2.6.1 <i>Exploratory factor analysis</i>	16
2.6.2 <i>Regression analysis</i>	16
3. RESULTS.....	18
3.1. TELEPHONE CARE SATISFACTION AMONG INDIVIDUALS LIVING WITH IBD	18
3.1.1. <i>Demographics</i>	18
3.1.2. <i>Health care utilization</i>	19
3.1.3. <i>Preferences, perceptions, and satisfaction with IBD care</i>	20
3.1.4. <i>Telephone care satisfaction questionnaire</i>	21
3.1.5. <i>Questionnaire validation among IBD individuals</i>	22
3.1.6. <i>Levels of telephone care satisfaction among IBD individuals</i>	25
3.2. TELEPHONE CARE SATISFACTION AMONG GASTROENTEROLOGY CARE PROVIDERS	26
3.3. FACTORS ASSOCIATED WITH TC SATISFACTION AMONG INDIVIDUALS LIVING WITH IBD.....	27
3.3.1. <i>Factors associated with TC Usefulness</i>	29
3.3.2. <i>Factors associated with TC Convenience</i>	30
4. DISCUSSION	32
4.1 ADAPTATION OF QUESTIONNAIRES TO MEASURE TC SATISFACTION.....	32
4.2 THE PROPERTIES OF THE TCSQ-PATIENT.....	33
4.3 SATISFACTION WITH TC AMONG INDIVIDUALS LIVING WITH IBD	34
4.4 SATISFACTION WITH TC AMONG GCPs	35
4.5 FACTORS ASSOCIATED WITH HIGHER TELEPHONE CARE SATISFACTION OF IBD INDIVIDUALS	36
4.6 STUDY LIMITATIONS	38

4.8 RECOMMENDATIONS	39
4.9. CONCLUSION	39
APPENDIX A	56
APPENDIX B	58
APPENDIX C	61
APPENDIX D	63
APPENDIX E	65
APPENDIX F	66
APPENDIX G	67

TABLE OF TABLES

Table 1: Definitions of telehealth, telemedicine, virtual care and telephone care.....	2
Table 3.1: Descriptive characteristics of the sample of individuals living with inflammatory boweldisease.....	18
Table 3.2: Health care utilization of individuals living with inflammatory bowel disease.....	19
Table 3.3: Preference perceptions and satisfaction of individuals living with living with inflammatory bowel disease	20
Table 3.4: Inter-item correlations of the IBD-TCSQ-Patient	23
Table 3.5: IBD-TCSQ-Patient rotated and sorted items and corresponding loadings with uniqueness.....	24
Table 3.6: Descriptive characteristics of the sample of gastroenterology care providers.....	26
Table 3.7: Linear regression estimates of factors associated with telephone care among individuals living with inflammatory bowel disease.....	28
Table 3.8: Linear regression estimates of factors associated with <i>telephone care usefulness</i>	29
Table 3.9: Linear regression estimates of factors associated with <i>telephone care convenience</i>	31

TABLE OF FIGURES

Figure 3.1: Situations in which in-person visit is preferred over telephone care visits with a gastroenterology care provider.....	21
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LIST OF ABBREVIATIONS

- 95%CI:** 95% Confidence Interval
- CD:** Crohn's Disease
- EFA:** Exploratory Factor Analysis
- GCPs:** Gastroenterology Care Providers
- HRQOL:** Health Related Quality of Life
- IBD:** Inflammatory Bowel Disease
- IBD-TCSQ-Patient:** Inflammatory Bowel Disease -Telephone Care Satisfaction Questionnaire -Patient
- IBD-TCSQ-Provider:** Inflammatory Bowel Disease -Telephone Care Satisfaction Questionnaire-Provider
- KMO:** Kaiser Meyer Olkin
- MAUQ:** Mobile Health App Usability Questionnaire
- QUOTE-IBD:** Quality of Care Through the Eyes – Inflammatory Bowel Disease
- QOL:** Quality of Life
- SIBDQ:** Short Inflammatory Bowel Disease Questionnaire
- TC:** Telephone Care
- TCSQ:** Telephone Care Satisfaction Questionnaire
- TUQ:** Telehealth Usability Questionnaire
- TSUQ:** Telemedicine Satisfaction Usability Questionnaire
- TSQ:** Telemedicine Satisfaction Questionnaire
- UC:** Ulcerative Colitis
- USA:** United States of America
- VC:** Virtual Care

Satisfaction of Individuals living with Inflammatory Bowel Disease and Gastroenterology Care Providers with Telephone Care

1. BACKGROUND

Inflammatory bowel disease (IBD), consisting of Crohn's disease (CD) and ulcerative colitis (UC), is a chronic disorder of the gastrointestinal tract. Both diseases share similar signs and symptoms which may include diarrhea, abdominal pain, rectal bleeding, and weight loss. This disease may occur at any age, affecting men and women equally. (1) The incidence of IBD, as well as its prevalence, is high in the Western world. The highest reported prevalence is in Europe (UC 505 per 100,000 population in Norway: CD 322 per 100,000 population in Germany) and North America (UC 286 per 100,000 population in the United States of America [USA], CD 319 per 100,000 population in Canada), (2,3) with a substantial health cost of around \$6 billion in the USA, \$1.2 billion in Canada, and €4.6–5.6 billion in Europe. (4,5) Environmental factors, as well as infectious, immunological, and genetic susceptibility, could lead to the onset of IBD.(6)

IBD symptoms, as well as side effects of therapies, could negatively affect patients' quality of life (QOL). (7) Individuals living with IBD require frequent medical follow-ups (8) which could be challenging for persons living in remote areas who might experience a lack of access to health care specialists. (9)

Virtual care (VC), which involves any remote interaction between a patient and a health care provider, could improve access to health care. (10) VC includes live video conferencing consultation (mostly in the form of Telemedicine where the patients connect to a device with a camera and can see as well as talk with their care providers about their health), remote Telemonitoring (wearable device mostly through a mobile application that transmits information on patient's vital signs to the care provider remotely), instant messaging (the patient communicates with the provider through texts on health issues), and Telephone care (TC) appointments (where the patient consults a health care provider through phone calls) (Table 1). (11,12)

VC could act as a solution to the accessibility challenge by cutting traveling time, cost, and increasing comfort and efficiency of care. (13) Research has shown VC to be as effective as in-person care in terms of quality of care (QOC) and health care outcomes. (14) Although,

VC also has limitations, including poor internet connections, which may act as additional barriers to care. A study highlighted that patient find difficulties in manipulating VC technologies, especially among older adults, which may lead to lower health care satisfaction. (15) Software for telemedicine need to be user-friendly and provide guide for patients with low technological proficiency. (16) Another limitation of VC is poor connectivity especially for patients living in rural areas, like in northern Saskatchewan, due to lack of 3G/4G internet networks. (16)

Some studies have reported that, some health care providers may face difficulties when using VC related to ensuring privacy and security, lack of informed consent, connectivity problems (17–19). Thus, there is need to identify and find solution to the challenges that could affect the successful use of telemedicine such as patient’s data confidentiality which will need to be established. Another barrier to VC use is that privacy protection, and healthcare laws differ across the various provinces in Canada. Although it’s a step in the right direction, there is still uncertainty regarding reimbursement rates, billing procedures, and more. (19)

Table 1: Definitions of telehealth, telemedicine, virtual care, and telephone care

Terms	Definitions
Telemedicine	Telemedicine is the use of electronic information and telecommunication technology to get the health care you need from a distance. (20,21)
Telehealth	It is an umbrella term which involves the use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health, and health administration. (22)
Virtual care	Virtual care has been defined as any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies with the aim of facilitating or maximizing the quality and effectiveness of patient care. (23,24)
Telephone care	Provision of remote care between a patient and a care provider through telephone. (12,25)

The use of VC has significantly increased and evolved during the coronavirus disease 2019 (Covid-19) pandemic. (19) The Covid-19 pandemic required lockdowns and other restrictions that promoted a switch from in-person to VC. (19,26) Canada saw an increase in VC since March 2020 when a state of emergency was declared due to the Covid-19 pandemic. (27,28)

This switch also affected individuals living with IBD and gastroenterologists who mostly offered care virtually. (29,30)

Studies in Europe and the USA on the use of VC for IBD have been focused on Telehealth and other VC alternatives (e.g., remote monitoring, mobile applications, and telephone consultations). (31–33) Despite some studies evaluating the use of IBD-specific VC,(33–35) there are limited evaluations on TC for IBD in Canada. The increase in IBD TC appointments in Canada requires the evaluation of patients' and gastroenterology care providers' (GCPs) satisfaction with this form of VC. (31) However, previous studies have failed to evaluate the psychometric properties (validity and reliability) of the questionnaires used to measure satisfaction with TC. (35)

1.1. IBD Care and Quality of Care

In 2018, more than 270,000 Canadians were living with IBD, with an estimated direct health care cost of 1.2 billion CAD per year and about 1.5 billion CAD indirect costs (e.g., early retirement, disability coverage, lost work productivity, or death). (36) Given that about 400,000 Canadians are predicted to have IBD by 2035, the burden of IBD is also expected to rise. (36) Individuals living with IBD visit GCPs between two and four times annually depending on the disease activity. (37,38) Persons living in rural areas with IBD may experience barriers to accessing specialized IBD care and may depend on family physicians, general surgeons, and nurses for IBD care. (39) This lack of access to specialized IBD care could result in poor QOC and an increased risk of IBD-related complications. The health care system must prepare for the rising burden of IBD. (40) Therefore, appropriate management of IBD is important and should be focused on reducing cost and enhancing accessibility. (41)

Over the next 10 years, gastroenterology clinics will have to acquire the necessary resources, infrastructure, and personnel required to deliver care for patients with IBD living in Canada. (32) A team-based approach must be applied to IBD care to reduce the burden on patients. (43,44) Specialists can improve treatment monitoring and identify better ways of providing care that is more efficient, cost-effective, and improve health outcomes. (34) The introduction of new strategies and approaches to improve patient satisfaction, adherence, and attendance to clinics that could improve QOC should be promoted, such as the use of remote care (45).

QOC is understood as the extent to which health services can improve the likelihood of desired health outcomes for both individuals and populations. (46,47) QOC is essentially determined by the quality of infrastructure, quality of training, the competence of personnel, and the efficiency of operational systems. (48) It is therefore important to provide appropriate care to meet patients' needs, when they need it, in an affordable, safe, and effective manner(49). QOC also means engaging and involving the patient, so the patient takes ownership in preventive care and the treatment of diagnosed conditions. (50)

QOC can be measured through different approaches. One approach is the Quality of Care Through the Patient's Eyes for IBD (QUOTE-IBD), a valid and reliable questionnaire that focuses on QOC from the perspective of patients. (51) Another questionnaire that has been used to measure the QOC is the Patient Satisfaction Questionnaire III (PSQ III). (52) This questionnaire measures technical competence, interpersonal manner, communication, time spent with the doctor, financial aspects, and access to care. However, the PSQ III is not specific to IBD care.

A few aspects of QOC for IBD patients, such as access to health care providers and disease management, were disrupted at the beginning of the Covid-19 pandemic and during the lockdowns. (53) An international survey showed that most gastroenterologists reduced clinic visits, restricted steroid use, and postponed endoscopic procedures and surgery. (54)(53) This could have negatively affected patients' QOC and QOL. Although, thanks to VC, most patients were able to receive the care they needed. (53)

1.2. Virtual Care

Individuals in rural areas living with chronic diseases such as IBD may lack access to specialized care (39,55). Alternative methods of health care delivery such as VC may increase accessibility. Studies conducted among individuals living in rural communities support the notion that, telemedicine has the potential to decrease health costs, increase QOC, and improve health care access. (13,56) A study documented an increase in telemedicine use among rural recipients before the Covid-19 pandemic. (57) Older people, as well as persons with disabilities and limited mobility, can get medical care from home. (58) In addition, the spread of contagious diseases like Covid-19 can be prevented with the use of VC as it helps avoid the time spent sitting in crowded waiting rooms with other patients. (26)

1.3. Virtual care use before and during the Covid-19 pandemic

Before the covid-19 pandemic, telemedicine was recognised as an effective VC option for monitoring and managing chronic conditions, such as heart failure and chronic obstructive pulmonary disease. (59,60) Canada was among the first countries to design and employ VC through the work of the late Dr. Maxwell in the 1970s. He used a telephone to deliver virtual consultations to remote areas throughout the province of Newfoundland. (61) However, several countries have since then surpassed Canada in terms of VC options and advances. (24)

According to statistics from digital appointments, in the United Kingdom in 2019, 14 % of the over 23 million general practice appointments were conducted by phone, and 0.5 % were completed through video conference. (62) In the USA, the Kaiser Permanente system (which serves 12 million health care members) reported in 2017 that about half of all consultations between patients and health care teams were virtual. Telephone conversations (50%), secure messages (40%), planned telephone visits (10%), and video calls were the most common of the 85.5 million VC connections. (63)

In Canada, a small percentage of the population made use of VC prior to 2020, before the emergence of the Covid-19 pandemic. (27) Although most of the physicians in Canada used some type of digital record-keeping, data suggested that less than one in ten family physicians allowed patients to book appointments online, less than 1 in 4 made themselves available via email, and just 4% offered videoconference visits. According to the 2019 Canadian Medical Association (CMA) Physician Workforce Survey, half of the Canadian physicians did not offer interactive electronic services for their patients. (64)

The slow adoption of VC in Canada could be a result of the lack of national criteria for patient access to health information, and concerns regarding the safety or quality of VC. (64) Electronic medical systems are frequently created locally or regionally and do not communicate with one another. (65,66) Medical licensure requirements make it difficult for physicians to work across provincial borders, even digitally. Furthermore, health care providers were not compensated for VC services by provincial public health insurance. (24) The COVID-19 pandemic forced the health care system to respond to many of these barriers quickly as VC options were needed urgently to help provide patient care in a new environment.

Canada has seen a rise in demand and use of VC since the start of the Covid-19 pandemic, with the sudden transition from the traditional face-to-face out-patient clinics to VC clinics. (19,67) In Ontario, VC increased from 1.6% of total ambulatory visits in the second quarter of 2019 to 70.6% in the second quarter of 2020. Older patients were the highest users of VC. (19). In addition, the proportion of physicians who provided one or more virtual visits per year increased from 7.0% to 85.9% in the second quarter of 2020. Also, in 2020 physicians across the different Canadian provinces like Manitoba, Saskatchewan, Alberta, and British Columbia reported a rise in the proportion of VC provided over the months.(68) With the current increase seen in the utilization of VC, it is therefore important to evaluate patients' satisfaction with VC and their perceived QOC, as well as clinical outcomes, during this time and even after the Covid-19 pandemic to identify areas for improvement.

1.4. Satisfaction with virtual care

1.4.1. Patients' Satisfaction with virtual care

VC could improve QOC, especially during the Covid-19 pandemic as patients have been having limited in-person outpatient visits. (69). There is a need to assess VC as we are moving out of the pandemic and may hopefully return to “normal” someday. It would be important to know ways to incorporate VC even after the Covid-19 pandemic. Also, assessing patients' satisfaction with VC is important to improve QOC. Several studies have evaluated IBD patients' satisfaction with VC, and other forms of remote care such as Telehealth. (9,70–72) A study conducted among patients of eight community-based gastroenterology practices across the USA reported a high level of satisfaction with the use of Telehealth among individuals with IBD. Patients also found in-person care to be similar to VC in terms of QOC. (73) Individuals with IBD using VC have also reported greater QOL, better disease outcomes, increased disease-related information, understanding of the plan of care, and fewer in-person clinic visits. (74,75) In addition, higher satisfaction rates with Telehealth were linked to lower direct health care costs, improved disease outcomes, improved communication with health care providers, and better self-management (70,71).

IBD individuals are willing to employ VC technologies like smartphone apps and internet websites to help them manage their disease. (76) The utilization of VC initiatives for IBD-

related care results in high patients' satisfaction. (74,77) Reasons for satisfaction include: being able to attend appointments in their own community or home; reduced travel time for appointments, wait times, ease of use; patient cost savings, improved disease self-management, health outcomes, and communication between providers and their patients. (78) According to the CMA, 91% of patients were satisfied with VC services, and 46% of Canadians stated they would choose a VC approach as their initial point of contact with their care providers. (27) A study in Alberta reported a high satisfaction level with VC for IBD; 84.3% of IBD individuals were comfortable communicating with their physician using remote systems, 77.5% agreed that a virtual clinic was an acceptable way to receive health care services, 84.8% agreed they would use VC services again, and 82.6% agreed they were satisfied with the Telehealth system. (35)

Though studies have reported high satisfaction with VC, a few of these studies also highlighted that patient were not satisfied with some aspects of VC. A study in Alberta among Individuals with IBD and GCPs identified challenges with VC, including ineffective communication, difficulty establishing and maintaining the patient-provider relationship, and the inability to perform physical examinations. (35) Researchers have highlighted poor communication, such as non-verbal cues and language barriers, socioeconomic constraints, navigating and accessing technology as factors affecting patients' satisfaction with VC among individuals with Chronic Obstructive Pulmonary Disease.(79)

Some studies identified demographic factors associated with high VC satisfaction, specifically with telemedicine. These factors included age (younger age group), gender (females), rural vs urban residence, and level of education (higher education). (76–78). A study evaluating satisfaction with outpatient cardiology Telehealth visits during the Covid-19 pandemic in the USA reported that patient convenience (travel distance <10 miles), along with female gender, younger age, and non-white ethnicity were correlated with greater patients' satisfaction. (80)

1.4.2. Health care providers' satisfaction with virtual care

Health care providers' perception of VC need to be evaluated in order to understand the challenges being faced and to find better ways of improving them. A few studies have evaluated health care providers' satisfaction with telemedicine (83–85), and very limited studies have reported their satisfaction with VC during the Covid-19 pandemic.(35)(86) A study carried out

in Florida, USA, to evaluate physicians' satisfaction with VC reported that 63% of participants found VC comparable to in-person care in terms of QOC, 80% considered telemedicine was cost-effective, 76% thought that telemedicine boosted their flexibility and control over patient care activities, 36% expressed improved work-life balance, 30% reported an improvement in burnout symptoms, and 42% of the respondents preferred telemedicine over in-person appointments. (83) A survey administered by Nova Scotia Health to physicians, reported that 85% of physicians were satisfied or very satisfied with VC. Most of the physicians participating in this study indicated an interest to continue using VC in their clinics after the Covid-19 pandemic, expressing more satisfaction using telephone care, and low satisfaction using videoconference systems (e.g., Zoom). Video conferencing was less preferred and found to be associated with administrative and booking barriers, and a lack of patient interest. (84) Another study in Alberta reported that GCPs were eager to employ VC in the future, 82.7% of individuals with IBD maintained their care without disruption, and that most of them were satisfied with a transition to VC. In addition, TC was the most used VC technology through which providers connected with their patients in this study. However, in this study 60% of health care providers said VC is not similar to in person visits, and they indicated that, patient safety, patient education on best practices, adequate remuneration, additional administrative duties, and challenges with providing care for new patients on virtual platforms affected their satisfaction with VC. (35)

1.5. Satisfaction with telephone care

Telephones can be used to access a broad spectrum of health care, ranging from delivery of routine care to renewed prescriptions or reading laboratory results.(87,88) TC, like other forms of VC, gained popularity since the beginning of the Covid-19 pandemic. (19,65) Several chronic diseases have also been managed through TC in the world and different parts of Canada. (89,90) Technologies like TC could help in the follow-up of individuals with chronic diseases like IBD by notifying them when they are not available or miss their appointments with their care providers. There is therefore a need to improve and encourage the use of TC.

A few studies have shown high satisfaction with TC among patients and physicians. (35,90,91) Canadian and international studies have been conducted to expand and improve the use of TC. (19,27,33)

Several questionnaires have been developed, tested and used to assess satisfaction with VC. (81–83) There are also available validated questionnaires that measure satisfaction with telemedicine and TC. (92,93) In the field of IBD specifically, the satisfaction of GCPs with VC was evaluated in the Western Canadian province of Alberta. (35) However, of all these studies, none has reported the psychometric properties of the satisfaction scale used. (31,32,67) A validated questionnaire with psychometric scales measuring different dimensions of satisfaction with IBD TC could contribute to the evaluation of the impact of TC in IBD. Therefore, questionnaires to assess patients' and health care providers' satisfaction with IBD TC are still needed. In addition, it is important to understand the role of TC within IBD care to help policy makers and providers find ways for promoting, improving, and incorporating TC.

1.6. Study objectives

This study aimed to examine the perceptions of individuals living with IBD and GCPs with TC in Saskatchewan, Canada, during the Covid-19 pandemic. The specific research objectives were to:

- Adapt and validate a questionnaire to measure satisfaction with TC for specialized IBD care among individuals diagnosed with IBD in Saskatchewan.

Hypothesis: the adapted questionnaire to measure satisfaction with TC has good validity and reliability among individuals living with IBD in Saskatchewan.

- Measure the satisfaction of individuals with IBD using TC for specialized IBD care in Saskatchewan.

Hypothesis: Individuals with IBD have high satisfaction levels with TC in Saskatchewan.

- Identify the factors associated with individuals' satisfaction with TC for IBD in Saskatchewan.

Hypothesis: high levels of satisfaction with TC are observed among Saskatchewan individuals with IBD who are: females, belong to younger age groups, live in urban centers, perceive high QOC, and report high levels of health related QOL (HRQOL).

- Explore the satisfaction of GCPs with using TC to provide care for individuals living with IBD in Saskatchewan.

Hypothesis: GCPs report high satisfaction levels utilizing TC for IBD appointments.

2. METHODS

2.1. Study design

A cross-sectional study was conducted among individuals living with IBD and GCPs utilizing TC in Saskatchewan using an online survey which assessed IBD individuals' satisfaction with TC for specialized IBD care. Similarly, an online survey was conducted with Saskatchewan's GCP to explore their satisfaction with TC when providing IBD-related care.

2.2. Setting and Sample

This study was carried out between December 1, 2021, and April 31, 2022, in Saskatchewan, a western Canadian province with a population of about 1.2 million people. The majority of Saskatchewan's population reside in Regina and Saskatoon, and about 35% of the population lives in rural and remote areas. (94,95) The prevalence of IBD tripled in the past 20 years in this province. (95) In 2016, more than 6,400 individuals were living with IBD in Saskatchewan, with a provincial IBD prevalence and incidence rate of 664 per 100,000 and 15 per 100,000 population, respectively. (94,95)

Since the start of the Covid-19 pandemic, Saskatchewan incorporated a more frequent use of VC for non-emergency consultations and disease management. (96) Telehealth was used in Saskatchewan to manage some conditions, but its regular use for IBD care was limited before the Covid-19 pandemic. (65) Also, physician billing system logged above 1.7 million VC appointments, an average of 170,000 each month (most by telephone) between March 2020 and December 2020. (65) This is a significant increase from the pre-pandemic number of 1,000 virtual visits per month. (65)

Despite having TC as the main form of VC for IBD care during the Covid-19 pandemic in this province, no studies have evaluated satisfaction with TC among individuals living with IBD and GCPs.

Survey data of both individuals living with IBD and GCPs were collected through SurveyMonkey® and was anonymous. Informed consent was obtained from each participant. Participants were asked to review a consent form at the beginning of the survey. Completion and submission of the survey were taken as implied consent. To prevent duplicative responses,

IP addresses were collected within the survey; no names, emails, or telephone information were captured. Only aggregated results were reported. Ethical approval was obtained from the University of Saskatchewan Ethics board (Beh-REB 2704, see Appendix 1).

A convenience sample was used in the study with individuals with IBD and GCPs in Saskatchewan.

2.2.1. Eligibility and recruitment of individuals with IBD

Four IBD GCPs supported the recruitment of study participants, two gastroenterologists based in Regina and two based in Saskatoon. Diagnosed IBD individuals residing in Saskatchewan over the age of 18 years and seen by one of the four IBD GCPs in outpatient visits were invited to participate in the online survey. Potential participants had at least one TC visit with a GCP during the last years and a previous in-person visit.

administrative staff shared information about the study, and recruitment of participants was done through the online survey during the scheduling of in-person. Patients received a letter of invitation to participate and a study poster, both with a link to the online questionnaire. Communications stated that participation in the study is voluntary and that their health care will not be affected if they decide to participate or not.

2.2.2. Eligibility and recruitment of GCPs

All GCPs and nurse practitioners who provide IBD care in Saskatchewan were invited to participate in an online survey. There are 18 gastroenterologists and 2 IBD NPs in the province. Study information was distributed to the 20 Saskatchewan GCPs via email, with the support of the Department of Medicine Head office of the University of Saskatchewan.

2.5. Questionnaires

The survey for individuals living with IBD included three sections. The first section consisted of the demographics, the second section measured satisfaction with VC, and the last section assessed perceived QOC and HRQOL. This survey required between 20 and 30 minutes to be completed. The questionnaire for GCPs contained two sections, demographic questions, and a questionnaire to measure satisfaction with TC. The survey for GCPs required about 10 minutes to be completed.

Demographic data were collected from all study participants. For individuals living with IBD, the online survey included questions about the year of birth, gender, urban (population >15,000) or rural area of residence (population <15,000), year of IBD diagnosis, type of IBD, as well as questions related to IBD care (Appendix 2). For GCPs, the online survey inquired about age, gender, years of experience, past VC experience, and preferences (Appendix 3).

2.5.1. Satisfaction with Telephone care Questionnaire

The Telehealth Usability Questionnaire (TUQ) was adapted to the IBD TC context. The TUQ is a 21-item questionnaire that examines satisfaction with Telehealth and its items score on a 7-point Likert scale from 1 “strongly disagree” to 7 “strongly agree”. This questionnaire was developed by Parmanto et al. to evaluate the usability of Telehealth implementation and services. (92) An adapted version of the TUQ has some evidence of its validity and reliability among IBD care providers in the province of Alberta; (35) however, the TUQ questionnaire has not been specifically adapted and validated for TC among individuals living with IBD.

2.5.2. Questionnaire Adaptation

Consent was obtained from the principal author of the TUQ for the adaptation of the original version to the context of TC for IBD. The TUQ is a 21-item questionnaire with a 7-point Likert scale designed to evaluate the usability of Telehealth implementation and services with robust evidence of its validity and reliability. The development of the TUQ also considered existing questionnaires for the evaluation of VC technologies. (92) The TUQ was selected due to its multidimensional structure (i.e., usefulness, ease of use, effectiveness, reliability, and satisfaction) and capacity to measure the quality of VC interactions and services. In addition, the TUQ was recently used to evaluate VC satisfaction among individuals with IBD and GCPs in Canada.(35)

A committee of experts (including three IBD GCPs, two IBD-patient partners, and two health care researchers) convened, assessed, and adapted each item of the TUQ.(92)

The committee agreed on two adapted TC satisfaction questionnaires: one for individuals living with IBD (IBD-TCSQ-Patient) and one for GCPs (IBD-TCSQ-Provider). Content validity was also assessed by this committee of experts to determine if they were representative of the TC experience within the IBD context.

Subsequently, a pilot study was carried out among IBD individuals and GCPs to evaluate the readability and usability of the items on the IBD-TCSQ.

After completing the pilot phase, the committee of experts reconvened to review the pilot results and made final adjustments to the adapted questionnaires, such as rewording some items and deleting others.

2.5.3. Other questionnaires

The online survey for individuals living with IBD included the QOC Through the Patient's Eyes - IBD (QUOTE-IBD) questionnaire. The QUOTE-IBD has been used in multiple studies to measure the perceived QOC from the perspective of individuals living with IBD within the last 12 months. (51) This questionnaire consists of 23 items: 10 generic and 13 disease-specific items relating to health care received and the health care system over the past year. The QUOTE-IBD has high validity and reliability and contains 8 dimensions (i.e., accessibility, cost, accommodation, continuity of care, courtesy, information, competence, and autonomy). (51) This questionnaire considers the weight that patients give to various aspects of care ('importance'[I]), patients' experience of how particular aspects of care work ('performance'[P]), and the 'quality impact' score (QI) which is the joint effect of the impact and the performance ($QI_s = 10 - [I * P]$). QI scores for each item or dimension range from 0 to 10. The questionnaire also includes a visual analog scale as a proxy measure to assess the patient's opinion of the total care provided. (51)(97) A QI score < 9.0 is indicative of suboptimal QOC. (97)

The Short Inflammatory bowel disease questionnaire (SIBDQ) was also included in the online survey to evaluate the HRQL of IBD individuals. The SIBDQ is the short version of the HRQOL IBD Questionnaire and is a valid and reliable questionnaire for evaluating HRQOL. (98) The SIBDQ consists of 10 items and four dimensions (i.e., bowel, systemic, emotional, and social functioning). Each questionnaire item was evaluated on a 7-point Likert scale. The SIBDQ absolute score range from 10 (indicative of worst HRQOL) to 70 (indicating optimum HRQOL).(98) The final score was calculated by adding the Likert scale score of the 10 items of the questionnaire. (98)

2.6. Data Analysis

Descriptive statistics such as frequencies, means, standard deviations, medians, and interquartile ranges (IQR, q1, and q3) were calculated from demographic characteristics of persons with IBD and the GCPs, as well as for the levels of TC satisfaction, QUOTE-IBD, and SIBDQ.

The reliability of the IBD-TCSQ-Patient was evaluated by calculating inter-item Pearson correlations to see how related the questionnaire items are to each other. In addition, a Pearson's correlation between the IBD-TCSQ-Patient standardised score and the overall TC satisfaction item was evaluated. Values range between -1 and 1 , where 0 is no correlation, 1 is a total positive correlation, and -1 implies a negative correlation. A correlation value of 0.7 and above indicated an adequate relationship (99).

The IBD-TCSQ-Patient internal consistency was assessed by computing Cronbach's alpha coefficient to evaluate how correlated the items were. Cronbach's alpha coefficients ranged from 0 to 1 and were closer to 1 as intercorrelation among the items increased. A Cronbach's alpha value of 0.7 and above was considered acceptable and a value less than 0.7 implied poor internal consistency. (91). This coefficient was estimated for the overall measure and each underlying dimension of the IBD-TCSQ-Patient questionnaire.

The Kaiser-Meyer-Olkin (KMO) measure and Bartlett sphericity tests ($P \leq 0.05$) were used to determine sampling adequacy to conduct a factor analysis for identifying the dimension of the IBD-TCSQ-Patient. Sampling adequacy measures are used to compare the magnitudes of the observed correlation coefficients. KMO takes values between 0 and 1 . A value near 0 indicated that the sum of the partial correlations was larger compared to the sum of the correlations, indicating that the correlations were widespread and so were not clustered among a few variables, indicating a problem for factor analysis. (101) A KMO value of above 0.60 was acceptable for factor analysis. Once these criteria were met, an exploratory factor analysis (EFA) was completed to identify the dimensions of the IBD-TCSQ-Patient. The EFA was used to evaluate the construct validity (102) of the IBD-TCSQ-Patient.

2.6.1 Exploratory factor analysis

An EFA was completed to identify the best measurement properties (best-fit constructs) for analysis. An EFA was needed given that TC satisfaction could be understood as a multidimensional construct. (98). Because we did not know the nature of the factors to be extracted and the common error variance, we used an EFA where we obtained eigenvalues (i.e., the sum of squared component loadings across all items for each component and represent the amount of variance in each item that can be explained by the principal component). (101)

To evaluate the factor structures, three steps were followed. First, items factor loadings were carried out. Second, each dimension was evaluated for stability in case the scale had more than one dimension. Each dimension had at least three items to be considered stable. Lastly, if an item loaded in more than one dimension and the difference in loading between them was lower than 0.02, the item was deleted. However, if the difference in loadings was equal to or greater than 0.20, then the item was included in the dimension that had the highest factor load. (101,102)

After conducting the EFA, the dimensions identified were given a theme. The name of each dimension was decided based on the most common verb identified amongst the items in that dimension.

2.6.2 Regression analysis

To evaluate the factors associated with patients' TC satisfaction, bivariate and multivariable regression models were run. A manual backward selection strategy, in which the model is started from a full model with all covariates included and terms are being removed, was used to build the multivariable model. The predictors with the highest p-values were removed one by one from the model.

The factors associated with the different dimensions identified in the IBD-TCSQ-patient were also evaluated subsequently to identify what factors could influence the different psychometric properties of the TCSQ.

The effect of potential confounding variables (i.e., age group, gender, urban/rural area of residence) were evaluated by removing them from the model. Type of disease (CD/UC) was

also evaluated as a confounding variable. This was done by fitting one model containing the confounding variable (crude model) and another model without the confounding variable (adjusted model). The coefficients of the crude and adjusted estimates were compared. A difference of > 20% was considered as evidence of a confounding effect. (105) A final model included variables with $p < 0.05$ and confounding variables.

The following model was used: $Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_px_p + \epsilon \dots\dots\dots (1)$

Where Y dependent variable (i.e., level of patient's satisfaction with TC), β_0 is the model intercept, $\beta_1, \beta_2, \beta_3$ represent the covariate coefficients and x_1, x_2, x_3 representing the independent variables. Regression coefficients with their corresponding 95% confidence intervals (95% CIs) were also reported.

Statistical analysis was completed using the statistical software Stata version 17. The level of significance was set at $\alpha = 0.05$.

3. RESULTS

3.1. Telephone care satisfaction among individuals living with IBD

3.1.1. Demographics

In total, 91 individuals living with IBD gave online consent to participate in the study. Four participants were excluded because they accepted to participate but did not complete any of the questions in the survey. Thus, we included data from 87 individuals in the data analysis.

Among the study participants, 54/84 (64.3%) had Crohn's disease, 53/86 (61.6%) were women, and 60/86 (69.8%) lived in urban centers (i.e., in areas with a population of more than 15,000 people). Most of the study participants 37/85 (43.5%) were between 41-59 years old. Table 3.1 presents sample demographics (i.e., frequency, mean, standard deviation [SD], and percentages).

Table 3.1. Descriptive characteristics of the sample of individuals living with inflammatory bowel disease (n=87)

Variables	n/mean	%/(SD)
Gender*		
Women	53	61.6
Men	33	38.4
Age group**		
18-40 years	25	29.4
41-59 years	37	43.5
≥60 years	23	27.1
Type of disease***		
Crohn's disease	54	64.3
Ulcerative colitis	28	33.3
Indeterminate colitis	2	2.4
Place of residence*		
Urban center (Population > 15,000 people)	60	69.8
Rural center (Population <15,000 people)	26	30.2
City where Gastroenterologist resides*		
Saskatoon	56	65.1
Regina	29	33.7
Others	1	1.2
Age diagnosed with IBD		
≤20 years	21	24.2
21-40 years	37	42.5
>=40	29	33.3
Years living with IBD		
≤ 5	15	17.2

6-10	38	43.7
11 or more	34	39.1
Professionals managing IBD*		
A gastroenterologist only	54	62.8
GCPs (i.e., a nurse practitioner and a gastroenterologist)	16	18.6
A family physician, a gastroenterologist, and other non GCPs	16	18.6
Current medications for IBD*		
Biologics, Immunomodulators or both	53	61.6
5-ASA or 5-ASA and Corticosteroids	25	29.7
None	8	9.3
IBD under control within the past 12 months*		
Yes	58	67.4
No	28	32.6
Treatment is useful in controlling IBD*		
Yes	72	84.7
No	13	15.3
Overall control of IBD in the last year (0: worse possible control – 100: best possible control) ***		
IBD Control	72.84	26.9
SIBDQ (10: Worst QOL – 70: Optimal QOL) ***		
QOL	48.14	13.02

GCP: gastroenterology care provider; IBD: inflammatory bowel disease; SIBDQ: Short Inflammatory bowel disease questionnaire; QOL: quality of life

* Data not available for all subjects [missing values=1]

** Data of not available for all subjects [missing values=2]

*** Data not available for all subjects [missing values=3]

3.1.2. Health care utilization

As presented in Table 3.2, the majority of IBD individuals 50/86 (58.1%) saw their GCPs every 7-12 months, 28/87 (32.3%) of the study participants had at least one in-person appointment with their GCP within the last year, and 47/87 (54.0%) individuals had two or more virtual appointments with their GCPs in the last year. Most of the participants 56/86 (65.1%) indicated that they must travel to see their GCPs. Majority of the participants (89.2%) identified TC as the main VC option used to see their GCPs. Other VC options used included Telehealth, video conferencing and emails.

Table 3.2. Health care Utilization of individuals living with Inflammatory bowel disease (n=87)

Variables	n	%
Frequency of outpatient visits with a GCP*		
0-6 months	28	32.6
7-12 months	50	58.1
13 months or longer	8	9.3

Need to travel to see a GCP *		
Yes	56	65.1
No	30	34.9
VC visits with a GCP use pre-Covid-19 pandemic**		
Yes	68	80.9
No	16	19.1
VC options used after the start of Covid-19 pandemic**		
Telephone care	74	89.2
Others (Telehealth, video conferencing, emails etc.)	9	10.8

GCP: gastroenterology care provider; IBD: inflammatory bowel disease; VC: Virtual Care; COVID-19: Corona Virus Disease 2019.

* Data not available for all subjects [missing values=1]

**Data not available for all subjects [missing values=3]

3.1.3. Preferences, perceptions, and satisfaction with IBD care

In person visits were preferred by 19 (21.8%) study participants (Table 3.3). In-person visits were preferred over VC when individuals had a flare (43.6%), required a physical exam and needed laboratory tests (29.2%), and in situations of more in depth and serious health updates (16.7%). (Figure 3.1). Also, 78 (92.9%) IBD individuals considered VC convenient to use and 73(85.3%) study participants indicated that VC resolved their main health concerns. The overall satisfaction with VC was 82% (SD=21.29) in a scale from 0 to 100. The mean quality of care as indicated by QUOTE-IBD in the sample was 8.96 (SD=1.70) in a scale from (0-10). Most of the study participants (73.6%) ranked their IBD QOC during the last year as optimal (<9.0) while 23 individuals (26.4%) of them scored it below 9.

Table 3.3. Preferences, perceptions, and satisfaction of individuals living with Inflammatory Bowel Disease (n=87)

Variables	n/mean	% / (SD)
Appointment Preference*		
In person	19	21.8
No preference	36	41.4
VC	32	36.8
In person care is preferred for particular instances*		
Yes	48	57.1
No	36	42.9
VC is convenient to use***		
Yes	78	92.9
No	6	7.1
VC resolves my main health concerns****		
Yes	73	85.9
No	12	14.1
Overall satisfaction with IBD care		
(0: no satisfaction- 100: completely satisfied) *****		
IBD Care Satisfaction (%)	82.28	21.29

Overall satisfaction with VC

(0: no satisfaction- 100: completely satisfied) *****

Satisfaction

75.31

31.99

GCP: gastroenterology care provider; IBD: inflammatory bowel disease; VC: Virtual Care.

* Data not available for all subjects [missing values=1]

***Data not available for all subjects [missing values=3]

****Data not available for all subjects [missing values=4]

*****Data not available for all subjects [missing values=7]

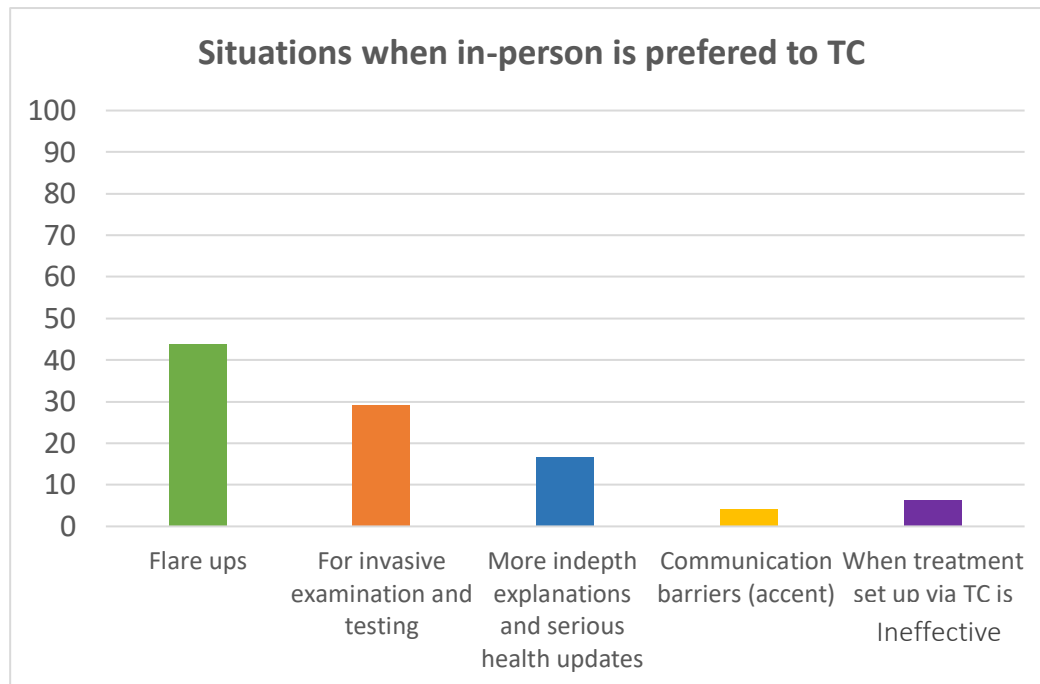


Figure 3.1. Situations in which in-person visit is preferred over telephone care visits with a gastroenterology care provider.

3.1.4. Telephone care satisfaction questionnaire

Questionnaire adaptation and Pilot

During the adaptation phase of the IBD-TCSQ, I contributed to the selection of a questionnaire suitable for the adaption. A committee of experts made up of two GCPs, two patient partners, and the principal investigators (including myself) adapted the TUQ to the IBD-TCSQ for both GCPs and IBD individuals. Items 7,10 and 17 of the TUQ were dropped because they were related to systems applications like video conferencing and were not applicable to TC. Item 9 was dropped because it was similar to item 4. The committee made some wording adjustments to the rest of the other items from VC to TC.

A total of 15 items and an overall item measuring TC satisfaction (16 items in total) were developed by the committee for the IBD-TCSQ-patient. Similarly, the committee also developed the IBD-TCSQ-provider with 17 items and an overall item measuring TC satisfaction (18 items in total) which were adapted and tested in the pilot.

In the pilot, total, 13 individuals living with IBD were recruited. The participants of the pilot identified 10 items to be usable, seven requiring minor wording adjustments, and one item needing conceptual revisions.

The IBD-TCSQ-provider was also pilot tested among 5 GCPs where 8 items were found readable and usable, 5 items required wording adjustments and 3 required conceptual revision.

The final versions of the questionnaires approved by the committee of experts after the pilot included 15 items adapted from the TUQ and one item designed by the committee of experts (i.e., TC is an efficient way to receive or provide care). The final versions of the IBD-TCSQ-patient and the IBD-TCSQ-provider both had 16 items and one overall item for assessing TC satisfaction. These final versions were used in the subsequent online surveys with IBD individuals and GCPs. (Appendix E and F).

3.1.5. Questionnaire validation among IBD individuals

Table 3.4 shows the descriptive characteristics (mean/SD, median, skewness, kurtosis, and variance) of the IBD-TCSQ-patient items reported by the 87 individuals with IBD who participated in the online survey, as well as the corrected item-total correlation and interitem correlation indices. All items were significantly correlated ($p < 0.001$). A strong correlation was observed between the 16-item standardised level of TC satisfaction and the overall item of satisfaction $r = 0.85$ ($p < 0.001$).

The mean of the 16-item standardised level of TC satisfaction was 5.7 ($SD = 0.94$) on a scale from 1.00 to 7.00. The IBD-TCSQ-patient had an overall optimal internal consistency reliability ($\alpha = 0.96$).

Table 3.4. Inter-item correlations of the IBD – TCSQ-patient. (n=75)

	Mean (SD)	Median	Skew	Kurtosis	Variance	Inter-Item Correlation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	
Q1	5.74 (1.13)	6	-0.67	2.93	1.28	0.76	1																	
Q2	6.29 (1.01)	7	-1.83	6.83	1.02	0.58	0.49*	1																
Q3	5.39 (1.34)	6	-0.92	3.68	1.79	0.87	0.67*	0.54*	1															
Q4	6.12 (0.95)	6	-1.21	4.08	0.89	0.76	0.50*	0.46*	0.54*	1														
Q5	6.17 (0.86)	6	-1.04	3.68	0.74	0.71	0.41*	0.45*	0.57*	0.84*	1													
Q6	5.71 (1.30)	6	-1.31	4.75	1.69	0.92	0.70*	0.51*	0.84*	0.68*	0.58*	1												
Q7	6.07 (1.04)	6	-1.33	4.32	1.09	0.83	0.61*	0.49*	0.63*	0.79*	0.69*	0.74*	1											
Q8	6.09 (1.09)	6	-1.55	4.89	1.20	0.79	0.52*	0.44*	0.58*	0.79*	0.73*	0.69*	0.88*	1										
Q9	5.72 (1.27)	6	-1.36	4.69	1.61	0.87	0.60*	0.46*	0.71*	0.64*	0.54*	0.75*	0.77*	0.69*	1									
Q10	5.04 (1.48)	5	-0.47	2.29	2.19	0.83	0.66*	0.39*	0.73*	0.52*	0.48*	0.71*	0.58*	0.55*	0.79	1								
Q11	4.85 (1.19)	4	0.72	1.89	1.41	0.47	0.30*	0.21*	0.34*	0.36*	0.37*	0.36*	0.30*	0.31*	0.35*	0.44*	1							
Q12	5.95 (1.23)	6	-1.97	7.31	1.50	0.86	0.58*	0.47*	0.75*	0.62*	0.58*	0.85*	0.70*	0.67*	0.77*	0.64*	0.37*	1						
Q13	5.56 (1.23)	6	-1.09	4.66	1.51	0.85	0.61*	0.41*	0.74*	0.57*	0.47*	0.78*	0.63*	0.68*	0.77*	0.64*	0.37*	0.76*	1					
Q14	6.15 (0.96)	6	-1.23	4.07	0.92	0.88	0.69*	0.50*	0.79*	0.65*	0.60*	0.85*	0.66*	0.61*	0.74*	0.67*	0.33*	0.83*	0.75*	1				
Q15	4.73 (1.53)	5	-0.41	2.41	2.35	0.75	0.58*	0.32*	0.66*	0.46*	0.39*	0.69*	0.51*	0.45*	0.63*	0.71*	0.31*	0.52*	0.67*	0.61*	1			
Q16	5.81 (1.19)	6	-1.33	4.59	1.41	0.91	0.63*	0.49*	0.82*	0.65*	0.60*	0.82*	0.73*	0.74*	0.75*	0.74*	0.35*	0.81*	0.79*	0.82*	0.65*	1		
Q17	5.82 (1.98)	6	-1.11	3.68	1.44	0.87	0.64*	0.44*	0.82*	0.54*	0.52*	0.77*	0.64*	0.59*	0.80*	0.75*	0.31*	0.78*	0.76*	0.80*	0.65*	0.84*	1	

P < 0.001 * Level of significance

Both the Bartlett sphericity test ($\chi^2=1311.4$ $p < 0.001$) and the KMO sample adequacy measure of 0.924 showed sample adequacy and suitability for completing a factor analysis. Two dimensions were identified in the EFA using orthogonal with varimax rotation to maximise the distance between dimensions. A scree plot suggested two dimensions in the IBD-TCSQ-patient (see appendix G). Table 3.5 shows the factor loadings and their uniqueness which explains how much each item contributes to the variability of the data matrix.

Table 3.5. IBD-TCSQ-patient rotated and sorted items and corresponding loadings with uniqueness (n=75)

	Item	Dimension 1 (Usefulness)	Dimension 2 (Convenience)	Uniqueness
Q10	I think the care provided over the telephone is as good as the care provided in person	0.8291	0.2506	0.2498
Q15	I prefer using telephone care rather than in-person appointments	0.8010	0.1327	0.3408
Q13	Telephone care is an appropriate way to receive healthcare services	0.7962	0.3693	0.2297
Q03	Telephone care meets my healthcare needs	0.7953	0.3898	0.2155
Q06	I like using telephone care	0.7910	0.4753	0.1484
Q14	I would use telephone care services again	0.7701	0.4471	0.2070
Q09	I felt I was able to express myself effectively using telephone care	0.7461	0.4580	0.2335
Q16	Telephone care is an efficient way to receive care from my provider	0.7429	0.5232	0.1744
Q12	I feel comfortable communicating with the clinician using telephone care	0.7264	0.5015	0.2209
Q01	Telephone care improves my access to healthcare services	0.6987	0.3194	0.4098
Q11	If there were technical issues when using telephone care, they were easily resolved	0.3559	0.2658	0.8026
Q04	It was simple to use telephone care	0.3216	0.8680	0.1431
Q05	It was easy to understand the process to use telephone care	0.2365	0.8575	0.2087
Q08	I could hear the clinician clearly using telephone care	0.3800	0.8328	0.1620
Q07	The clinician could hear me clearly using telephone care	0.4719	0.7683	0.1870
Q02	Telephone care saves me time travelling to a hospital or specialist clinic	0.3545	0.5779	0.5404

Loadings below 0.30 are in grey font

Items 10, 15, 13, 3, 6, 14, 9, 16, 12 and 1 were classified under dimension 1. The most common verb identified among the items in this dimension was “usefulness” and therefore this dimension was titled *TC usefulness*. Usefulness could be understood as the individuals’ perception that TC works, and that it has a positive effect on their health care, including how comfortable an individual feels with using telephone to access care, preference of using it (in person versus TC), willingness to use TC again, improvement of access to care, and the ability of TC to meet health care needs. Item 11 had cross-loading between dimension 1 and 2 with a high communality of 0.82. This item was retained under dimension 1, (*TC usefulness*) as it was focused on resolving technical issues and because all other items on dimension 1 were strongly correlated with this item (item 11).

Dimension 2 included items 4, 5, 8, 7 and 2. Given that this dimension was focused on satisfaction with the convenience of TC and that this was the most common verb among the items in this dimension, the dimension was therefore titled *TC convenience*. *TC convenience* could be defined as the perception of being able to use TC with comfort and little effort or difficulty. *TC convenience* involves ease of use, ability to communicate effectively, time saving, and simplicity to solve issues when using TC. Cronbach’s α reliability coefficient for the two dimensions (*TC usefulness* and *TC convenience*) were also optimal (0.95 and 0.90, respectively).

3.1.6. Levels of telephone care satisfaction among IBD individuals

The mean of the standardised level of TC satisfaction among individuals living with IBD was 5.70 (SD=0.94) on a scale from 1.00 to 7.00. The mean TC satisfaction by dimensions were 5.52 (SD =0.98) for *TC usefulness* (dimension 1) and 6.15 (SD=0.84) for *TC convenience* (dimension 2). *TC usefulness* dimension had a high correlation with the overall TC satisfaction item $r=0.87$ ($P<0.001$), while the *TC convenience* dimension had a moderate correlation with the overall TC satisfaction item $r=0.64$ ($P<0.001$).

3.2. Telephone care satisfaction among gastroenterology care providers

Table 3.6 presents the descriptive statistics (i.e., frequency, mean, SD, and percentages). In total, 6 IBD GCPs participated in the online survey. In this sample, there were 2 women (33.3%) and 4 men (66.7%). Most of the GCPs, 4 (66.7%), were ≤ 50 years of age. The majority of the GCPs had more than five years of working experience (83.3%). Most of the GCPs practiced in Saskatoon (66.7%). The GCPs indicated that before the Covid-19 pandemic, VC options used included Telehealth and TC. 72% of the GCPs said they used VC alternatives after March 2020. 68.1% indicated satisfaction with VC and most of them (83.3%) said VC helped resolve patients' main concerns. Half of the GCPs 3(50%) still preferred in-person visits. Satisfaction with TCSQ had a mean of 5.7 on a scale from 1.0 to 7.0.

Table 3.6. Descriptive characteristics of the sample of gastroenterology care providers (n=6)

Variables	n/mean	% / (SD)
Gender		
Women	2	33.3
Men	4	66.7
Age group**		
≤ 50 years	4	66.7
51 + years	2	33.3
Years of working experience as a GCPs		
Less than 5 years	1	16.67
More than 5 years	5	83.3
Number of years in current position		
Less than 5 years	2	33.3
More than 5 years	4	66.7
City where the office is located***		
Regina	2	33.3
Saskatoon	4	66.7
VC used before covid		
Telehealth	3	50.0
Telephone care	2	33.3
None	1	16.7
VC Currently used		
Telephone	4	66.7
Telehealth and Telephone	2	33.3
Percentage of VC appointments after covid (March 2020)		
Percentage	72	38.54
VC Satisfaction (0-100)	68.17	26.91
VC resolves Patients' main concerns		
Yes	5	83.3
No	1	16.7
Preference between VC and in person		

In-person	3	50.0
No preference	2	33.3
VC	1	16.7
TCSQ (1: Strongly disagree - 7: Strongly agree)		
Telephone care satisfaction	5.7	0.68

GI: Gastroenterologist; VC; Virtual Care; TCSQ; Telephone Care Satisfaction Questionnaire

3.3. Factors associated with TC satisfaction among individuals living with IBD

In the bivariate analysis (Table 3.7), area of residence (rural vs. urban: $\beta=0.47$ [95%CI 0.03 to 0.91], $p=0.03$) and HRQOL (SIBDQ score: $\beta=0.48$ [95%CI 0.08 to 0.88], $p=0.02$) were associated with high levels of TCSQ-patient. In addition, medications for IBD [Biologics and/or immunoregulators, 5-ASA or 5ASA and Corticosteroids] ($p=0.08$), health care professional managing IBD ($p=0.08$), and QOC ($p=0.16$) had p -values <0.25 and were considered in regression model building process (106).

In the multivariable analysis, area of residence and HRQOL were retained in the final model. Health care provider managing IBD (i.e., gastroenterologist only, NP and gastroenterologist, or family physician/non GCPs) was identified as a confounder and included in the model given that this variable changed the model estimates by more than 10%. In addition, gender and age groups were included as potential confounder given the described association with satisfaction with VC in previous studies. (107,108) Type of disease and other study variables did not have evidence of being confounders and were not included in the final model.

Adjusting by gender, age group, health care provider managing IBD, and HRQOL, we identified that the satisfaction with TC was 0.48 (95%CI 0.03-0.93) higher among individuals with IBD living in rural Saskatchewan in comparison to their urban counterparts (Table 3.7). There were no other significant results in the final regression model.

Table 3.7 Linear regression estimates of factors associated with telephone care among individuals living with Inflammatory bowel disease.

Variable	Unadjusted β (95%CI)	Adjusted* β (95%CI)
Gender		
Male	-0.11 (-0.54 to 0.32)	-0.18 (-0.61 to 0.24)
Female	Ref.	Ref.
Residence		
Rural	0.47 (0.026 to 0.91)	0.48 (0.03 to 0.93)
Urban	Ref.	Ref.
Age (years)		
≥60	-0.19 (-0.73 to 0.36)	-0.14 (-0.67 – 0.39)
41-59	-0.28 (-0.79 to 0.22)	-0.13 (-0.69 – 0.44)
18-40	Ref.	Ref.
Type of IBD		
Ulcerative colitis	0.14 (-0.31 to 0.59)	
Crohn’s disease	Ref.	
Years living with IBD		
≥11	-0.01 (-0.62 to 0.60)	
6-10	0.33 (-0.27 to 0.93)	
≤5	Ref.	
Medications for IBD		
Biologics and/or IM	0.66 (-1.13 to 1.45)	
5-ASA or 5-ASA and corticosteroids	0.67 (-1.75 to -1.52)	
None	Ref.	
How often the individual sees a GCP		
13 months or longer	-0.09 (-0.85 to 0.67)	
7-12 months	-0.23 (-0.69 to 0.23)	
Every 1-6 months	Ref.	
Person managing IBD		
NP and Gastroenterologist	0.44 (-0.01 to 0.98)	0.46 (-0.11 to 1.04)
Family physician and other non-GCP	-0.30 (-0.83 to 0.23)	-0.08 (-0.68 to 0.52)
Gastroenterologist only	Ref.	Ref.
Proper control of IBD within the past 12 months		
No	-0.02 (-0.47 to 0.43)	
Yes	Ref.	
Treatment is useful in controlling IBD*		
No	-0.99 (-0.69 to 0.49)	
Yes	Ref.	
SIBDQ (QOL)		
Good QOL (≥50)	0.48 (0.08 to 0.88)	0.42 (-0.16 to 0.85)
Poor QOL (<50)	Ref.	Ref.
QUOTE-IBD		
≥9 and above	0.27 (-0.19 to 0.74)	
<9	Ref.	

IM: immunoregulators; 5-ASA: 5-aminosalicylic acid; GCP: gastroenterology care provider; SIBDQ: Short Inflammatory Bowel Disease Questionnaire; QUOTE-IBD: Quality of Care Through the Patient’s Eyes -Inflammatory bowel Disease. * n=80.

3.3.1. Factors associated with TC Usefulness

Area of residence (rural vs. urban: $\beta=0.56$ [95%CI 0.64 to 1.05], $p=0.03$) and HRQOL (SIBDQ score: $\beta=0.55$ [95%CI -0.10 to 1.00], $p=0.02$) were associated with *TC usefulness* in the bivariate analysis (Table 3.8). Health care professional managing IBD ($p=0.12$), years lived with IBD ($p=0.17$) and QOC ($p=0.22$) and were considered in the multivariable analysis (106).

Variables retained in the final model after the multivariate analyzes were area of residence and HRQOL. Health care provider managing IBD (i.e., gastroenterologist only, NP and gastroenterologist and family physician/ non GCPs) was identified as a confounding variable and included in the model. Gender and age groups were also included as potential confounders VC. (107,108)

Adjusting by gender, age group, health care provider managing IBD, and HRQOL, *TC usefulness* was 0.55 (95%CI 0.05 to 1.05) higher among individuals with IBD living in rural Saskatchewan in comparison to their urban counterparts (Table 3.8).

Table 3.8 Linear regression estimates of factors associated with *telephone care usefulness*

Variable	Unadjusted β (95%CI)	Adjusted* β (95%CI)
Gender		
Male	-0.17 (-0.65 to 0.32)	-0.20 (-0.68 to 0.27)
Female	Ref.	Ref.
Residence		
Rural	0.56** (0.64 to 1.05)	0.55** (0.05 to 1.05)
Urban	Ref.	Ref.
Age (years)		
≥ 60	-0.22 (-0.83 to 0.39)	-0.15 (-0.77 – 0.48)
41-59	-0.29 (-0.85 to 0.28)	-0.19 (-0.78 – 0.40)
18-40	Ref.	Ref.
Type of IBD		
Ulcerative colitis	0.23 (-0.27 to 0.74)	
Crohn’s disease	Ref.	
Years living with IBD		
≥ 11	-0.03 (-0.73 to 0.66)	
6-10	0.41 (-0.27 to 1.10)	
≤ 5	Ref.	
Medications for IBD		
Biologics and/or IM	0.51 (-0.38 to 1.41)	
5-ASA or 5-ASA and corticosteroids	0.56 (-0.40 to -1.51)	

None	Ref.	
How often the individual sees a GCP		
13 months or longer	-0.10 (-0.62 to 0.41)	
7-12 months	0.08 (-0.77 to 0.94)	
Every 1-6 months	Ref.	
Person managing IBD		
NP and Gastroenterologist	0.44 (-0.17 to 1.05)	0.46 (-0.18 to 1.10)
Family physician, Gastroenterologist and other non-GCP	-0.33 (-0.93 to 0.26)	-0.04 (-0.71 to 0.62)
Gastroenterologist only	Ref.	Ref.
Proper control of IBD within the past 12 months		
No	-0.27 (-0.49 to 0.54)	
Yes	Ref.	
Treatment is useful in controlling IBD*		
No	-0.04 (-0.69 to 0.62)	
Yes	Ref.	
SIBDQ (QOL)		
Good QOL (≥ 50)	0.55 (0.10 to 1.00)	0.48 (-0.01 to 0.96)
Poor QOL (< 50)	Ref.	Ref.
QUOTE-IBD		
≥ 9 and above	0.32 (-0.20 to 0.85)	
< 9	Ref.	

IM: immunoregulators; 5-ASA: 5-aminosalicylic acid; GCP: gastroenterology care provider; SIBDQ: Short Inflammatory Bowel Disease Questionnaire; QUOTE-IBD: Quality of Care Through the Patient's Eyes -Inflammatory bowel Disease. * n=80.

3.3.2. Factors associated with *TC Convenience*

Medications taken [Biologics and/or immunoregulators, 5-ASA or 5ASA and Corticosteroids] was associated with *TC convenience* in the bivariate analysis ($p=0.02$). Other variables considered in the model building included health care professional managing IBD ($p=0.07$), years lived with IBD (0.19), QOC ($p=0.12$), Residence ($p=0.16$), frequency of consultation ($p=0.19$) and HRQOL ($P=0.07$)(106).

Medication taken was the only significant variable retained in the final model. Residence, quality of life, age, gender and IBD type were identified as a confounding variable and included in the final model.

Considering area of residence, gender, age group, IBD type, and HRQOL, *TC convenience* satisfaction was higher in the groups of individuals who were taking medications for IBD compared to those without any medications, see Table 3.9 for details.

Table 3.9 Linear regression estimates of factors associated with *telephone care convenience*

Variable	Unadjusted β (95%CI)	Adjusted* β (95%CI)
Gender		
Male	-0.84 (-0.47 to 0.29)	-0.15 (-0.55 to 0.25)
Female	Ref.	Ref.
Residence		
Rural	0.28 (-0.12 to 0.68)	0.25 (-0.15 to 0.66)
Urban	Ref.	Ref.
Age (years)		
≥60	-0.17 (-0.65 to 0.31)	-0.11 (-0.61 to 0.40)
41-59	-0.11 (-0.56 to 0.33)	-0.02 (-0.47 to 0.43)
18-40	Ref.	Ref.
Type of IBD		
Ulcerative colitis	0.23 (-0.27 to 0.74)	0.07(-0.38 to 0.58)
Crohn's disease	Ref.	
Years living with IBD		
≥11	0.18 (-0.37 to 0.73)	
6-10	0.44 (-0.09 to 0.99)	
≤5	Ref.	
Medications		
Biologics and/or IM	0.98** (0.30 to 1.66)	1.39** (0.31 to 2.47)
5-ASA or 5-ASA and corticosteroids	0.93** (0.20 to 1.67)	1.29** (0.22 to 2.36)
None	Ref.	
How often the individual sees a GCP		
13 months or longer	-0.34 (-0.75 to 0.06)	
7-12 months	-0.44 (-1.10 to 0.22)	
Every 1-6 months	Ref.	
Person managing IBD		
NP and Gastroenterologist	0.43 (-0.04 to 0.91)	
Family physician, Gastroenterologist and other non-GCP	-0.24 (-0.71 to 0.23)	
Gastroenterologist only	Ref.	Ref.
Proper control of IBD within the past 12 months		
No	0.37 (-0.37 to 0.44)	
Yes	Ref.	
Treatment is useful in controlling IBD*		
No	-0.29 (-0.81 to 0.23)	
Yes	Ref.	
SIBDQ (QOL)		
Good QOL (≥50)	0.33 (-0.03 to 0.69)	0.20 (-0.20 to 0.60)
Poor QOL (<50)	Ref.	Ref.
QUOTE-IBD		
≥9 and above	0.32 (-0.09 to 0.74)	
<9	Ref.	

IM: immunoregulators; 5-ASA: 5-aminosalicylic acid; GCP: gastroenterology care provider; SIBDQ: Short Inflammatory Bowel Disease Questionnaire; QUOTE-IBD: Quality of Care Through the Patient's Eyes -Inflammatory bowel Disease. *n=77

4. DISCUSSION

The use of VC increased during the Covid-19 pandemic in Canada. (109) Persons living with IBD and GCPs made use of VC in the form of TC during this time. (110,111) To better understand the perceptions and experiences with TC among IBD individuals and GCPs, it was relevant to assess their satisfaction with the use of TC. Several studies have evaluated the satisfaction of individuals and providers with Telehealth or video conferencing. (9,70–72) There are limited studies focused on satisfaction with TC, (112,113) and available studies do not provide detailed information on the reliability and validity of the questionnaires used to measure satisfaction with the different forms of VC. In this study, questionnaires were adapted to evaluate satisfaction with TC among individuals living with IBD and GCPs. We evaluated the psychometric properties of the questionnaire to assess TC satisfaction among individuals with IBD. In addition, high levels of satisfaction with TC were observed among individuals with IBD and GCPs in Saskatchewan. Finally, we identified that rural-urban residence was a factor associated with TC satisfaction among IBD individuals.

4.1 Adaptation of questionnaires to measure TC satisfaction

Using the TUQ, two questionnaires to assess TC satisfaction specific for IBD individuals (IBD-TCSQ-patients) and GCPs (IBD-TCSQ-providers) were adapted. (110) There are, however, differences and similarities between the TCSQ dimensions and those in the TUQ. For instance, the TUQ has five dimensions (i.e., usefulness, ease of use and learnability, effectiveness, reliability, and satisfaction) and 23 items. On the other hand, the TCSQ revealed two dimensions (i.e., *convenience and usefulness*) and included 17 items in total. Also, the TUQ was developed to measure different forms of VC (especially video conferencing and Telehealth), while the TCSQ focused on TC. Both the TCSQ and TUQ assess the convenience and usability dimensions of, respectively, TC and Telehealth.

Both the IBD-TCSQ-Patient and IBD-TCSQ-Provider went through rigorous adaptation steps, including an interdisciplinary committee (consisting of IBD individuals, GCPs, and researchers) that adapted the questionnaire to the TC context and a pilot study which assessed the questionnaire's readability and usability.(114) The committee also evaluated the content validity of the questionnaires before and after the pilot. Evidence of the questionnaire's validity and reliability was also obtained within a sample of individuals with IBD. A strong correlation was observed among all items on the IBD-TCSQ-Patient implying that all the questionnaire

items were indeed related. Construct validity of the questionnaire was confirmed by a strong correlation found between the 16-item standardised score of the IBD-TCSQ-patient and the overall TC satisfaction item. (31,32,67) In addition, the EFA revealed two dimensions of TC satisfaction. Dimension 1 focused on *TC usefulness* (11 items) and dimension2 focused on TC convenience (5 items).

The adaptation process in our study can be compared to a study from Australia in the field of ophthalmology where the Mobile Health App Usability Questionnaire (MAUQ), a 21-item scale, was adapted to measure the usability of the Fitbit mobile app. In this study, the researchers generated the m-MAUQ to evaluate the usability of a mobile app for the promotion of eye donation. Similar to our study, the MAUQ was adapted to the m-MAUQ by a committee of experts (made up of a panel of academics with expertise in ophthalmology, human-computer interaction, and health informatics) who evaluated the content validity of the questionnaire. Pilot testing of the adapted questionnaire was completed among ten patients from an eye clinic, followed by adjustments of the final questionnaire by the committee of experts. Researchers documented evidence of the questionnaire's validity and reliability ($\alpha=0.93$). (115)(113)

Others adaptation steps similar to my study have been reported in the field of public primary health care among long-term stroke survivors and in the field of pharmacy assessing patient satisfaction with pharmacy services in general hospitals. (116,117)

4.2 The properties of the TCSQ-patient

The two dimensions of the IBD-TCSQ-patient (*TC convenience and usefulness*) demonstrated very good internal consistency reliability which were quite similar to the reliabilities of the TUQ dimensions (*usefulness* [$\alpha=0.85$] and *ease of use* [$\alpha=0.93$]). (118)

Factor loadings for all 16 items, exceeded the minimum cut-off of 0.4, indicating that items were representative of underlying dimensions. (119) Item 11 (“If there were technical issues when using TC, they were easily resolved”) did not load as expected as it had a cross-loading on both the dimensions of *TC usefulness* and *convenience*. However, after careful consideration of these findings, the research team decided that the item was a more accurate reflection of *TC usefulness*.

As expected, the dimensions of the original TUQ changed to the TC context in the adaptation process of the questionnaire. A parallel could be drawn between the *usefulness* dimension of the IBD-TCSQ-patient and the *usefulness* and ease of use dimensions of the TUQ. Conversely, the dimensions that we identified in the IBD-TCSQ-patient (i.e., *Usefulness* [$\alpha=0.95$] and *Convenience* [$\alpha=0.90$]) could be contrasted with the dimensions of the TSQ developed by Yip et al. (120) The TSQ is a 14-item questionnaire with two dimensions (i.e., Information Exchange and Patient Comfort) with adequate internal consistency reliabilities (i.e., $\alpha=0.88$ and $\alpha=0.81$, respectively).(120) The TSUQ is another questionnaire that also has two dimensions with high internal consistency (i.e., Video Visits [$\alpha=0.96$] and Use and Impact [$\alpha=0.92$]).(121) Notwithstanding, it is important to highlight that the TSQ and TSUQ, as well as the TUQ, were developed and validated to assess satisfaction with videoconferencing technologies, not TC.

4.3 Satisfaction with TC among individuals living with IBD

The TC satisfaction among individuals living with IBD was high. Most of the respondents were either moderately satisfied or very satisfied with their TC experiences. These findings align with the result of a study from Alberta among individuals with IBD, where 84.3% confirmed they were satisfied with their VC experience. (35) Study participants from Alberta also reported a high level of IBD care satisfaction (mean=82.28, SD=21.29). These high rates of satisfaction with IBD care could be attributed to the convenience of VC in reducing in-person visits during the covid-19 pandemic, as well as to how VC eliminates the cost and distance travelled to see a GCP. The results from this study in Saskatchewan and the ones obtained in Alberta emphasise the importance of VC as a health care alternative to ensure continuous health care during the Covid-19 pandemic. Our data, however, showed that a large majority of individuals with IBD indicated no preference for in-person or VC, while a few preferred VC to in-person visits. A very small percentage of participants indicated they preferred in-person visits with their GCPs for reasons such as having a flare-up and requiring an endoscopy. Previous research that evaluated IBD patient satisfaction with VC services also reported similar preferences among patients with Telehealth.(110,111) In these studies, patients expressed high satisfaction, good perceived quality of care, adequate quality of communication, and a perception that VC is equivalent to in-person visits.(110,111,122,123) TC, as one of the VC forms, could act as a viable option for providing individuals living with IBD, proper medical care during and after the Covid-19 pandemic.

Patients may have no preference for in-person or VC because they find that VC services meet their health care needs to a similar extent as in-person visits do. A study by Poulsen et al. (122) compared the satisfaction of patients receiving medical services through telemedicine versus face-to-face appointments at a remote rheumatology clinic. Patients in the telemedicine group were very satisfied with the service quality provided, but there were no significant differences between the patients who used telemedicine and those who used face-to-face visits. (122) It is important to acknowledge that in our study in-person visits were preferred in specific situations such as flare symptoms, examinations needed (e.g., colonoscopy, ultrasound, laboratory tests), and communication difficulties such as language barriers.

4.4 Satisfaction with TC among GCPs

Results from the IBD-TCSQ-provider showed a high TC satisfaction among GCPs. This result aligns with other studies which have reported high satisfaction among health care providers. (35)(124) For example, the study from Alberta reported 88% of health care providers were satisfied with VC and that these respondents were willing to use it again. (35) A USA study evaluated providers' satisfaction with obstetric Telehealth reported that 98.5% of the participants agreed that Telehealth is an acceptable way to provide health care service, 97.1% said it improves access to health care needs, and 92.5% indicated Telehealth improves the lives of their patients.(124)

Although most GCPs reported that TC appointments resolved the patients' main concerns, half of the GCPs who participated in this study indicated they prefer providing services in-person than doing it using VC. This could be so because in some cases, patients' perception of their illness may not be always congruent with in person assessments done by a GCP. Also, some GCPs would like to know their patients and build a relationship with them. Therefore, TC could only act as an option to complement in person consultation but not replace it. In line with this result, a Canadian study evaluated the satisfaction of health care providers in rural communities with VC during the first half of the Covid-19 pandemic and reported that 67% were satisfied with their VC patient interaction. However, most of the responders indicated, they would use VC for less than 40% of their appointments in the future.(125) In this national study, providers also highlighted important barriers, including connectivity issues, increased administrative work, and security/privacy concerns.(125) Another study among health care providers revealed

that satisfaction with VC was negatively influenced by a lack of administrative support and inadequate remuneration options. (31)

The results from Saskatchewan GCPs provide some insights around their perspectives of TC. However, the data collected in this study were insufficient for further analysis or to draw any conclusions regarding factors affecting providers' TC satisfaction. Further multiprovince studies could assess the psychometric properties of the IBD-TCSQ-provider and explore factors associated with TC satisfaction among GCPs. In addition, qualitative and mixed-method studies could explore when TC is the most suitable form of care and how TC could complement in-person care and other forms of VC.

4.5 Factors associated with higher telephone care satisfaction of IBD individuals

This study identified that area of residence was associated with the levels of TC satisfaction in the multivariable analysis. It was observed that individuals living in rural centres (population <15,000 people) had 0.48 (95%CI 0.02-0.94) higher TC satisfaction when compared to their urban counterparts (population <15,000 people), after adjusting for age, gender, and type of IBD. The higher satisfaction levels with TC among rural residents could be because VC saves time and travel costs for individuals living in rural and remote communities. (126,127). A national survey among USA households reported that 88% and 84% of, respectively, rural and urban participants were satisfied with VC.(128)

A recent study from British Columbia explored VC among rural and urban residents in the summer of 2021. (129) Researchers did not find differences in VC satisfaction between the groups but reported that rural participants were less likely to use videos in communicating with their health care providers compared to those living in urban areas. In addition, the study identified that satisfaction with VC was reduced due to limited access to health care, limited health promotion and prevention options, and a lack of mental health service options. (129) Despite the existing studies around satisfaction with VC among rural versus urban residents, further research needs to be done to improve the services available for individuals living in rural areas.

In addition, studies have reported an association between VC satisfaction and demographic factors such as age and gender (80,130); however, there was limited evidence of an existing association between TC satisfaction and rural-urban residence.

In this study, age, gender, and type of IBD were variables considered in the multivariable regression models. However, we were unable to draw conclusions on an existing association between levels of TC satisfaction and these variables. Previous studies reported that women, individuals in the younger age group, and perception of convenience had different satisfaction with VC.(107,108) . A study conducted in Saudi Arabia by Abdulwahab et al. evaluated satisfaction with telemedicine services among outpatients in various departments at a hospital. This study demonstrated that women were significantly more satisfied with the service compared to men, while age group and level of education did not influence patient's satisfaction. (131)

Health care provider managing IBD was found to be a confounder in the relationship between TC satisfaction and QOL, as well as with area of residence. Residents in rural areas living with IBD may experience barriers in accessing health care and depend on non-specialized health care providers, like family doctors or other health care providers, to manage their IBD which could lead to lower QOL. (132) A low QOL could also be linked to low TC satisfaction.(133)

In addition, this study found an association between rural residence and high levels of *TC usefulness*. There are no studies that have contrasted *TC usefulness* amongst rural vs urban residents. There are however a few studies which have focused on evaluating utilization of VC between rural and urban populations. For example, a Canadian study compared rural-urban utilization of telemedicine among patients in the Ontario Telemedicine Network.(134) Telemedicine utilization in rural northern Ontario had higher annual rates than in urban southern Ontario. Even within Northern Ontario, rates of telemedicine use were higher in rural and less populated populations.(134) Increased TC utilization levels of satisfaction among rural residents could also be attributed to the convenience of VC especially for those living in rural areas who may no longer need to travel long distances to see a specialist. (135) Also, the Covid-19 pandemic might have had an influence on rural/urban TC utilization and satisfaction due to the lockdowns. (136) .

It is important to note that a recent Canadian study in the province of Ontario measured the utilization of telemedicine in rural and urban populations among at risk patient groups prior to

and during the covid-19 pandemic. Researchers reported that most telemedicine users resided in northern (rural) Ontario (71.1% in 2012 and 57.8% in 2016) prior to the Covid-19 pandemic, but telemedicine use grew more in urban populations and decreased in rural populations during the Covid-19 pandemic. (137) Other studies have also reported increased VC utilization among urban residents compared the rural residents.(129,138,139)

TC convenience was associated with IBD medications taken. Individuals taking medications for IBD had higher levels of *TC convenience* satisfaction compared to those not using medications. These study results are in line with previous evidence that telemedicine is an effective means for medication adherence amongst individuals living with IBD. (140) This result could be due to the fact that individuals with IBD on medications find TC to be a convenient means for adherence to medications through regular follow up with their GCPs.(141,142) A study conducted to investigate the impact of Telehealth on medication adherence among individuals with a chronic gastrointestinal disease reported that patients seen through Telehealth had higher prescription fill rates compared to those seen in person. (143) A study in the field of mental health evaluated how telephone call and text message interventions improve adherence to medication among patients with severe schizophrenia. Researchers in this study reported TC can deliver support to patients who are at high risk of progressive nonadherence to their medications after 6 months.(144)

4.6 Study limitations

Regarding the TC satisfaction questionnaires, we could not evaluate other psychometric properties of the IBD-TCSQ-patient. Follow-up measurements and other tools within the online survey are needed. However, follow-up measurements and a longer survey could significantly impact response rates. There is no data on the IBD-TCSQ-provider to make conclusions about its validity and reliability. Further multiprovincial studies could evaluate the psychometric properties of the IBD-TCSQ-provider. This study did not evaluate the existing barriers of TC or negative outcomes related to the use of this form of care; future studies could also focus on such aspects of the use of TC. There could also have been recall bias since study participants had to answer events within the last year. Some patients or providers may have found it difficult to recall events and perceptions. Finally, this study only assessed demographic

factors such as age, residence, gender, and type of IBD. Further studies with larger sample sizes could evaluate other factors which may impact satisfaction with TC.

4.8 Recommendations

Despite the high TC acceptance and satisfaction among IBD individuals and GCPs, there are still existing barriers to access specialized care that need to be improved, especially for those living in rural communities and with limited access to specialized care. (125) TC usage could help maintain continuing care while maintaining good QOC and QOL for individuals living with IBD and could improve the satisfaction of GCPs using VC alternatives to provide care to their patients. The expansion of VC services, particularly TC, could be recommended as an option for patients who may need to travel long distances to access specialized care. Because TC is not heavily dependent on internet connections and can be operated offline, TC is a recommended form of VC to increase accessibility for patients who do not have internet at all or a stable connection, such as those residing in rural and remote areas.(145)

4.9. Conclusion

This study generated two questionnaires to measure TC satisfaction among IBD individuals and GCPs (the IBD-TCSQ-patient and IBD-TCSQ-provider). The IBD-TCSQ-patient was validated, demonstrating to be a valid and reliable measure of TC satisfaction among individuals living with IBD. This questionnaire is the first one adapted and validated to measure IBD patients' satisfaction with TC. In addition, the IBD-TCSQ-patient has two dimensions of satisfaction, the *TC usability and convenience*. This questionnaire demonstrated excellent psychometric properties with evidence of its validity and reliability.

Regarding the factors associated with TC, this study identified that individuals living with IBD in Saskatchewan reported high levels of satisfaction with TC. Rural residence is associated with high levels of TC satisfaction. Rural residence was also associated with high levels of TC usability. In addition, individuals taking medications for IBD had higher levels of *TC convenience* compared to those not using medications.

The study results presented in this thesis could help in the promotion of TC utilization and improve access to specialized IBD care, especially among those living in rural areas. Future

studies could validate the IBD-TCSQ-provider and identify factors affecting TC satisfaction for both IBD individuals as well as GCPs using larger sample sizes. Reasons for low levels of satisfaction with TC could also be evaluated in further studies to identify areas for improvement, understand the place of TC in IBD care and how this form of care can be incorporated alongside in-person care to achieve optimal health care outcomes.

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APPENDIX A



Behavioural Research Ethics Board (Beh-REB) 12-Jul-2021

Certificate of Approval

Application ID: 2704

Principal Investigator: Noelle Rohatinsky

Department: College of Nursing

Locations Where Research

Activities are Conducted: Saskatchewan, Canada

Student(s): Jermia Foncham

Funder(s): Saskatchewan Health Research Foundation

Sponsor: Saskatchewan Health Research Foundation

Title: Exploring the use of virtual care in Saskatchewan in individuals with inflammatory bowel disease and gastroenterologist care providers

Approved On: 12-Jul-2021

Expiry Date: 12-Jul-2022

Approval Of: Behavioural Application Form

Consent form: online survey for gastroenterologist care providers (GCPs)

Consent form: online survey for IBD patients

Consent form: interviews GCPs

Consent form: interviews for IBD patients

Letter of invitation: 2021 gastroenterologists

Letter of invitation: 2021 person with IBD

Recruitment poster: GCP

Recruitment poster: persons with IBD

Appendix B: persons with IBD (data collection demographic form, questionnaires, and interview guide)

Appendix C: gastroenterologists (data collection demographic form, questionnaires, and interview guide)

Acknowledgment Of:

Review Type: Delegated Review

1 / 2

CERTIFICATION

The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TPCS 2 2018). The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this project, and for ensuring that the authorized project is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS

In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month prior to the current expiry date each year the project remains open, and upon project completion. Please refer to the following website for further instructions: <https://vpresearch.usask.ca/researchers/forms.php>.

***Digitally Approved by Diane Martz
Chair, Behavioural Research Ethics Board
University of Saskatchewan***

APPENDIX B

Demographic Form – Individuals with IBD

1. In what year were you born? yyyy
2. What is your gender?
 - Male
 - Female
 - Other
 - Prefer not to disclose
 - Identify as: _____
3. Do you live in an urban center (population more than 15,000) or a rural center (population less than 15,000)?
 - Urban center (population more than 15,000)
 - Rural center (population less than 15,000)?
4. In what city does your gastroenterology care provider (MD or RN/NP) work?
 - Regina
 - Saskatoon
5. What type of IBD have you been diagnosed with?
 - Crohn's disease
 - Ulcerative Colitis
 - Indeterminate colitis
6. What year were you diagnosed with IBD?
yyyy
7. How old were you when you were diagnosed with IBD?
.....
8. List your current IBD medications.
.....
9. Who manages your IBD? Select all that apply:
 - Family physician
 - RN(NP)
 - gastroenterologist specialist
 - other (specify)
10. How often do you see your gastroenterologist?
 - Every 0-6 months
 - 7-12 months
 - 13-18 months

- 19-24 months
- 25 months or longer

11. Do you travel to see your gastroenterologist MD or RN/NP?

- Yes
- No

If yes, how many kilometers do you travel (one way)?

12. Do you believe that your IBD has been well controlled within the past 12 months?

- Yes
- No

13. Do you believe your current treatment is useful in controlling your IBD?

- Yes
- No

14. How many in-person IBD appointments with your gastroenterology care provider (MD or RN/NP) have you had in the past 12 months?

15. How many virtual (example: telephone, Telehealth, or video conference) IBD appointments with your gastroenterology care provider (MD or RN/NP) have you had in the past 12 months?

.....

16. How would you rate the overall control of your IBD in the past 12 months?

(0 – worst possible control; 100 – best possible control)

17. Rate your overall satisfaction with regards to your IBD care in general?

(0 – no satisfaction; 100 – completely satisfied)

18. Prior to the Covid-19 pandemic (March 2020), did your gastroenterology care provider (MD or RN/NP) use virtual care (telephone, Telehealth, video conference) options for your appointments?

- Yes
- No

If yes what options were used?

19. After the start of the Covid-19 pandemic (March 2020), what types of virtual care options for your appointments were used?

- Telephone
- Video conference
- Telehealth
- Other

20. Overall, how satisfied are you with using virtual care (telephone, videoconference, or Telehealth) for IBD appointments during the last 12 months

(0-no satisfaction; 100 – completely satisfied)

21. Do you consider virtual care appointments convenient for you?
- Yes
 - No
22. Do you believe virtual care appointments resolve your main concern most of the time ?
- Yes
 - No
23. Do you have a preference between in person appointments versus virtual appointments?
- I prefer in person appointments
 - I prefer virtual care appointments
 - I do not have a preference
24. Is there a particular instance where you would NOT want to use virtual care and prefer to see your gastroenterologist face to face?
- Yes
 - No
 - Please explain.

APPENDIX C

Demographic Form – Gastroenterology care providers

1. Approximately, what percentage of patients who you care for are diagnosed with IBD? _____
2. Prior to the Covid-19 pandemic (March 2020), what types of virtual care options for patient appointments did you offer? (please list) _____
3. What types of virtual care options for patient appointments do you currently offer? (please list) _____
4. Prior to Covid 19, what percentage of clinic appointments with persons with IBD were completed using virtual care?
0-100
5. After Covid 19, what percentage of clinic appointments with persons with IBD were completed using virtual care?
0-100
6. Overall, how satisfied are you with using virtual care (telephone/videoconference) for IBD appointments during the last 12 months?
(0-no satisfaction; 100 – completely satisfied)
7. Do you consider virtual care appointments convenient for patients?
 - Yes
 - No
8. Do you believe virtual care appointments resolve the patient's main concern most of the time?
 - Yes
 - No
9. Do you have a preference between in person appointments versus virtual appointments?
 - I prefer in person appointments
 - I prefer virtual care appointments
 - I do not have a preference
10. Are there some types of patient situations where you would NOT use virtual care and prefer to use face-to-face interactions?
 - Yes Please specify
 - No
11. In what city is your office based?
 - Regina
 - Saskatoon
 - Other

12. Years of experience as a gastroenterology care provider _____

13. Number of years in current position _____

14. What is your gender?

- Female
- Male
- Prefer not to disclose
- Identify as (please specify if you wish): _____

15. In what year were you born? _____

APPENDIX D

TELEHEALTH USABILITY QUESTIONNAIRE (TUQ)

Parmanto Bambang, Lewis Allen Nelson Jr, Graham Kristin M, Bertolet Marnie H.
 Development of the Telehealth Usability Questionnaire (TUQ). Int J Telerehabil [Internet].
 2016 Jul 1 [cited 2021 Aug 15];8(1):10.

		N/A		1	2	3	4	5	6	7	
1.	Telehealth improves my access to healthcare services.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
2.	Telehealth saves me time traveling to a hospital or specialist clinic.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
3.	Telehealth provides for my healthcare need.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
4.	It was simple to use this system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
5.	It was easy to learn to use the system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
6.	I believe I could become productive quickly using this system	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
7.	The way I interact with this system is pleasant.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
8.	I like using the system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
9.	The system is simple and easy to understand.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
10.	This system is able to do everything I would want it to be able to do.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
11.	I can easily talk to the clinician using the telehealth system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
12.	I can hear the clinician clearly using the telehealth system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
13.	I felt I was able to express myself effectively.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
14.	Using the telehealth system, I can see the clinician as well as if we met in person.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
15.	I think the visits provided over the telehealth system are the same as in-person visits.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
16.	Whenever I made a mistake using the system, I could recover easily and quickly.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
17.	The system gave error messages that clearly told me how to fix problems.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree

18.	I feel comfortable communicating with the clinician using the telehealth system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
19.	Telehealth is an acceptable way to receive healthcare services.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
20.	I would use telehealth services again.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree
21.	Overall, I am satisfied with this telehealth system.	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agree

Please provide comments about the telehealth system:

APPENDIX E

Inflammatory Bowel Disease Telephone Care Satisfaction Questionnaires for patients (IBD-TCSQ-Patient)

Considering the telephone appointments, you have had with your gastroenterologist clinician (MD or NP) for IBD-related care within the last 12 months, state your level agreement with the following statements:

	1=Strongly disagree	2=Disagree	3=Somewhat disagree	4=Neither agree nor disagree	5=Somewhat agree	6=Agree	7=Strongly agree
1. Telephone care improves my access to healthcare services	[]	[]	[]	[]	[]	[]	[]
2. Telephone care saves me time travelling to a hospital or specialist clinic	[]	[]	[]	[]	[]	[]	[]
3. Telephone care meets my healthcare needs	[]	[]	[]	[]	[]	[]	[]
4. It was simple to use telephone care	[]	[]	[]	[]	[]	[]	[]
5. It was easy to understand the process to use telephone care	[]	[]	[]	[]	[]	[]	[]
6. I like using telephone care	[]	[]	[]	[]	[]	[]	[]
7. The clinician could hear me clearly using telephone care	[]	[]	[]	[]	[]	[]	[]
8. I could hear the clinician clearly using telephone care	[]	[]	[]	[]	[]	[]	[]
9. I felt I was able to express myself effectively using telephone care	[]	[]	[]	[]	[]	[]	[]
10. I think the care provided over the telephone is as good as the care provided in person	[]	[]	[]	[]	[]	[]	[]
11. If there were technical issues when using telephone care, they were easily and quickly resolved	[]	[]	[]	[]	[]	[]	[]
12. I feel comfortable communicating with the clinician using telephone care	[]	[]	[]	[]	[]	[]	[]
13. Telephone care is an appropriate way to receive healthcare services	[]	[]	[]	[]	[]	[]	[]
14. I would use telephone care services again	[]	[]	[]	[]	[]	[]	[]
15. I prefer using telephone care rather than in-person appointments	[]	[]	[]	[]	[]	[]	[]
16. Telephone care is an efficient way to receive care from my provider	[]	[]	[]	[]	[]	[]	[]
17. Overall, I am satisfied with telephone care	[]	[]	[]	[]	[]	[]	[]

APPENDIX F

Inflammatory Bowel Disease Telephone Care Satisfaction Questionnaires for gastroenterology care providers (IBD-TCSQ-Provider)

Considering the telephone appointments, you have had with patients within the last 12 months for IBD-related care, state your level of agreement with the following statements:

	1=Strongly disagree	2=Disagree	3=Somewh at disagree	4=Neither agree nor disagree	5=Somewhat agree	6=Agree	7=Strongly agree
1. Telephone care improves access to healthcare services	[]	[]	[]	[]	[]	[]	[]
2. Telephone care saves me time travelling to a hospital or specialist clinic	[]	[]	[]	[]	[]	[]	[]
3. Telephone care meets patients' healthcare needs	[]	[]	[]	[]	[]	[]	[]
4. It was simple to use telephone care	[]	[]	[]	[]	[]	[]	[]
5. It was easy to understand the process to use telephone care	[]	[]	[]	[]	[]	[]	[]
6. I like using telephone care	[]	[]	[]	[]	[]	[]	[]
7. The patient could hear me clearly using telephone care	[]	[]	[]	[]	[]	[]	[]
8. I could hear the patient clearly using telephone care	[]	[]	[]	[]	[]	[]	[]
9. I felt I was able to express myself effectively using telephone care	[]	[]	[]	[]	[]	[]	[]
10. I think the care provided over the telephone is as good as the care provided in person	[]	[]	[]	[]	[]	[]	[]
11. If there were technical issues when using telephone care, they were easily and quickly resolved	[]	[]	[]	[]	[]	[]	[]
12. I feel comfortable communicating with patients using telephone care	[]	[]	[]	[]	[]	[]	[]
13. Telephone care is an appropriate way to provide health care services	[]	[]	[]	[]	[]	[]	[]
14. I would use telephone care services again	[]	[]	[]	[]	[]	[]	[]
15. I prefer using telephone care rather than in-person appointments	[]	[]	[]	[]	[]	[]	[]
16. Telephone care is an efficient way to provide care to my patients	[]	[]	[]	[]	[]	[]	[]
17. Overall, I am satisfied with telephone care	[]	[]	[]	[]	[]	[]	[]

APPENDIX G

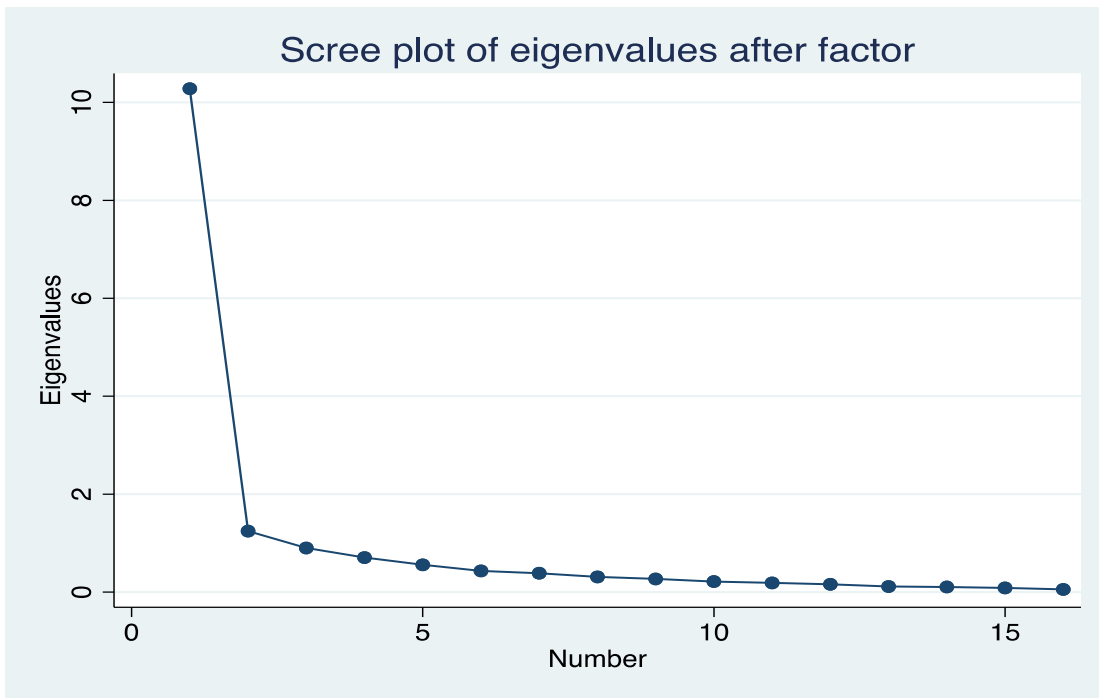


Figure2: Scree plot of factors and their eigen values