

Evaluation of factors associated with trust in telemedicine in patients with inflammatory bowel disease during COVID-19 pandemic: a multicenter cross-sectional survey

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Abstract. – OBJECTIVE: Telemedicine (TM) has had a powerful impact in recent years, particularly on managing chronic diseases such as inflammatory bowel disease (IBD). Knowing patients’ expectations and concerns is essential to increase their confidence in this mode of medical care.

PATIENTS AND METHODS: We interviewed a large cohort of IBD patients enrolled at two Italian tertiary referral centers to investigate their trust in TM.

RESULTS: A total of 376 patients completed the survey and were included in the study: 293 (77.9%) considered TM valuable for managing their disease, and 307 (85%) wanted to have TM service at their center. However, only 99 patients (26.3%) believed that TM guarantees the same level of care as the in-person visit. Among the socio-demographic variables, those independently associated with trust in TM were the higher education qualification ($p=0.02$) and the level of competence in information and communication technologies (ICT) ($p=0.03$).

CONCLUSIONS: Our findings highlighted the importance of equipping IBD patients with basic ICT skills to utilize TM services and increase their confidence in ICT with the help of caregivers. Additionally, to improve the perceived value of TM, it will be helpful to use additional tools

such as telemonitoring of disease activity using patients’ reported outcomes or remote measurement of fecal calprotectin.

Key Words:

Telemedicine, Inflammatory bowel disease, Information and communication technologies, Telemonitoring.

Introduction

Telemedicine (TM), synthetically defined as any form of remote interaction with the patient through information and communication technologies (ICT), represents an essential and promising innovation in the healthcare sector^{1,2}. Although it has been tested and used for over a decade, TM, particularly its application in synchronous mode (represented by telephone or video calls), has found its maximum momentum and innovation with the emergence of the COVID-19 pandemic³. In particular, chronic diseases can benefit the most from TM as frequent monitoring is desirable for achieving therapeutic outcomes and improving patients’ quality of life⁴. Among the

chronic conditions to which TM has been applied there are inflammatory bowel diseases (IBDs), including Crohn's disease (CD) and ulcerative colitis (UC)⁵. In fact, in many referral centers for the care of IBD patients worldwide, the creation or rapid expansion of TM programs integrated with the standard face-to-face visits has grown from the initial goal of protecting patients (and healthcare professionals) from the risk of SARS-CoV-2 infection, especially in the pre-vaccination period⁶. The satisfactory results obtained with TM have led both to technological developments, with dedicated platforms that can access the patient's medical records while protecting their privacy, and to administrative progress (for example, in the field of reservations, reimbursements, etc.) that allows increasingly widespread and safe use of this treatment modality side-by-side with the traditional in-person modality^{6,7}. In this context, the patient's point of view on trust in TM is fundamental, serving to improve and expand this service. Therefore, through a survey conducted in a large cohort of patients with IBD from two Italian tertiary referral centers, the present study aimed at investigating their confidence in TM, including their willingness for or concerns about TM programs, regardless of whether they have had previous specific experiences.

Patients and Methods

Study Design and Population

We conducted a cross-sectional observational survey to investigate the expectations and concerns of the patients with IBD toward TM and assess the socio-demographic factors and ICT competencies associated with trust in TM. The survey included 19 items that were grouped into five areas: (1) socio-demographic data (6 questions), (2) clinical data (1 question), (3) informatics competence, devices, and network utilized for the Internet connection (3 questions), (4) attitude toward TM, including trust in and concerns about TM (7 questions), and (5) the impact of the COVID-19 pandemic on the implementation of TM (2 questions). The anonymous paper questionnaire was administered to all consecutive IBD outpatients observed over four weeks (1-31 October 2021) at two Italian tertiary referral centers for IBD: Policlinico Gemelli (PG) in Rome, Italy, and Casa Sollievo Sofferenza Hospital (CSS) in San Giovanni Rotondo, Foggia, Italy. The questionnaire included only closed questions and was developed in Italian by experts in IBD (gastro-

enterologists, epidemiologists, psychologists) and patient representatives. It had not been previously published. However, survey staff asked a sample of 20 patients from both centers whether the questions included in the survey were understandable and whether the answers present included their condition or opinion. All the responses obtained from the patients in this pilot study confirmed the reliability of the questionnaire. Subsequently, the questionnaire was administered to the other patients enrolled in the study.

The questions in the survey included different answers: descriptive, yes or no, or according to the Likert scale (from questions 4.2 to 4.6). Then we selected from the survey the critical question: "How much do you think telemedicine is helpful to manage your disease?" and evaluated the socio-demographic and ICT competence level associated with a positive answer (defined as the answers "very useful" or "essential").

Statistical Analysis

A descriptive analysis of baseline characteristics was performed. The categorical variables were expressed as absolute and relative frequencies. When indicated, a comparison of the results between the two centers was made using Pearson's Chi-square or Fisher's Exact Test. The association between independent socio-demographic and clinical variables and the trust in TM was determined using univariate and multivariate analyses with a logistic regression model with a backward stepwise selection of terms. The results were given as odds ratios (ORs) with 95% confidence intervals (95% CI). Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, IBM Corp., Armonk, NY, USA) software, and p -values < 0.05 were statistically significant.

Ethical Considerations

All survey responses were collected after obtaining the patient's consent to participate in the study and publication of the results. The responses were anonymous and did not include personal health information or other identifiers.

Results

Of the 520 eligible IBD patients, 376 (72.3%) agreed to complete the survey and were included in the study. Of these patients, 220 (58.5%) came from PG in Rome and 156 from CSS in San

Giovanni Rotondo. A total of 342 patients (90.1%) were aged between 18 and 65; 160 were women (42.6%). Of all patients, 202 had UC (53.7%). The distribution of other socio-demographic characteristics (marital status, educational qualification, and job) is reported in Table I. Regarding the level of ICT skills, overall, 70.4% of IBD patients included in the survey reported a good or optimal level of competence, with a more significant number of patients from PG compared to those from CSS ($p < 0.0001$). Only 38 patients (10.1%) had a previous TM experience, more from PG than from CSS (30 vs. 8, $p = 0.007$). Overall, 293 (77.9%) considered TM valuable for managing their disease, and 307 (81.6%) wanted a TM service at their center, with no significant difference between the two centers. A total of 307 patients (81.6%) desired an online consultation, even with professionals other than gastroenterologists (such as psychologists or dieticians), and 297 patients (79%) agreed with the statement that the ongoing COVID-19 pandemic has a significant impact on the need to implement TM. Regarding confidence in TM, 214 patients (56.9%) partially or entirely agreed that TM could correctly resolve health problems, and 218 (57.9%) agreed that the technologies guarantee these tools as a safe environment for the confidentiality of patient health data. In total, 249 patients (66.2) believed that TM should be developed regardless of the end of the pandemic. However, only 99 patients (26.3%) thought TM provides the same level of assistance as in-person visits.

Socio-Demographic Characteristics and ICT Competencies Associated with the Trust in TM

We evaluated the association of socio-demographic characteristics and ICT competencies with TM trust. Upon univariate analysis, the variables significantly associated with the trust in TM were educational qualifications, level of ICT skills, and previous TM experience (Figure 1 and Table II). However, upon multivariate analysis, only the higher academic qualifications (OR 2.3, 95% CI: 1.4-4.2, $p = 0.02$) and a higher level of ICT skills (OR 2.4, 95% CI: 1.3-4.2, $p = 0.03$) confirmed a significant association.

Discussion

The present survey results indicated that IBD patients trust TM, considering it valuable for

managing their disease. A similar reasonable trust rate in TM was previously reported by Costantino et al⁸, who included in their survey 100 IBD patients who accepted a video consultation despite the alternative option of a traditional face-to-face outpatient visit. However, as reported by the authors, the results of this study suffered from a selection bias since significant trust in TM is presumed among patients who agree to undergo TM as an alternative to an in-person visit as opposed to those who refused. A nationwide patient and physician survey⁹ on TM experiences among IBD patients was recently conducted in France. Patients included in this study, and, to a lower extent, physicians, were satisfied with TM. Still, only 55% of the patients considered the quality of care provided using TM the same as in-person visits⁹.

On the other hand, most of the patients included in the present study were convinced that the pandemic accelerated the implementation of TM and that its use should continue even after the pandemic ends. Concerning data security, most patients believe that current ICT tools guarantee it. Several recommendations have been implemented for the correct use of TM in treating IBD after the pandemic, complementing traditional healthcare pathways regarding privacy and confidentiality of data issues^{10,11}. However, moving to patient satisfaction in TM, only a quarter of the patients in our study believed TM is as effective as a face-to-face visit. Practical measures to increase the value of TM as perceived by IBD patients were the possibility of sharing in real-time both the results of the laboratory tests (e.g., inflammatory markers, such as C-reactive protein) previously requested by physicians and patient-reported outcomes scores¹² and implementing remote patient monitoring of disease activity through home self-measurement of fecal calprotectin (FCP), using a simple device for FCP measurement provided by the IBD center^{13,14}. Several home tests of FCP have been developed in recent years that use a smartphone camera and dedicated software to analyze a collected specimen in real-time¹³. FCP values are then transmitted to the ICT system of the IBD center using a specially created app downloadable on mobile or tablet, which will also generate alerts in the event of out-of-scale values¹⁴.

Interestingly, the results of this survey emphasized that ICT skills represent the most important modifiable factor for increasing confidence in

Table I. Survey questions and comparison of responses rate between the two IBD tertiary referral centers (Casa Sollievo Sofferenza, CSS and Policlinico Gemelli, PG).

Survey questions	Options	CSS N = 156		PG N = 220		p-value
		N	%	N	%	
1.1 Age	18-40 yrs	63	40.38	98	44.55	0.5872
	40-65 yrs	80	51.28	101	45.91	
	> 65 yrs	13	8.33	21	9.55	
1.2 Sex	Male	100	64.10	106	48.18	0.0022
	Female	56	35.90	114	51.82	
1.3 Civil status	Single	48	30.77	82	37.27	0.0149
	Married/registered partnership	100	64.10	110	50.00	
	Divorced/separated	7	4.49	20	9.09	
	Widowed	1	0.64	8	36.64	
1.4 Who supports you in the management of the disease?	Nobody	38	24.36	82	37.27	0.0165
	Parents	44	28.20	58	26.36	
	Brothers/sisters	1	0.64	7	3.18	
	Partner	64	41.03	65	29.55	
	Private nurse	0	-	0	-	
	Others	9	5.77	8	3.64	
1.5 Educational qualification	Primary education	1	0.64	10	4.55	< 0.0001
	Secondary school	55	35.26	45	20.45	
	High school	85	54.49	94	42.73	
	University	15	9.62	71	32.27	
1.6 Type of work	Student	13	8.33	28	12.73	0.0079
	Office worker	54	34.62	102	46.36	
	Freelancer	27	17.31	40	18.18	
	Unemployed	29	18.59	21	9.55	
	Other	33	21.15	29	13.18	
2.1 Type of IBD	Ulcerative colitis	78	50.00	124	56.36	0.2227
	Crohn's Disease	78	50.00	96	43.64	
3.1 What level of computer skills do you think you have?	None	18	11.54	8	3.64	< 0.0001
	Enough skills	48	30.77	37	16.82	
	Good skills	74	47.44	100	45.45	
	Excellent expertise	16	10.26	75	34.09	
3.2 Which equipment do you use to connect to the internet most frequently?	None	2	1.28	7	3.18	0.8385
	PC with Webcam	19	12.18	27	12.27	
	PC without webcam	9	5.77	13	5.91	
	Smartphone	113	72.44	155	70.45	
	At least two of the previous options	13	8.33	18	8.18	
3.3 What kind of connection do you use to access the internet?	None	2	1.28	7	3.18	0.0007
	Landline	60	38.46	68	30.91	
	Mobile network	80	51.28	91	41.36	
	Landline & Mobile Network	14	8.97	54	24.55	
4.1 Have you ever had any experience with telemedicine?	No	148	94.87	190	86.36	0.0070
	Yes	8	5.13	30	13.64	
4.2 How much do you think telemedicine is helpful to manage your pathology?	Not very useful	13	8.33	20	9.09	0.9868
	Indifferent	20	12.82	30	16.64	
	Very useful	111	71.15	153	69.55	
	Essential	12	7.69	17	7.73	

Continued

Trust in telemedicine in patients with IBD

Table 1 (Continued). Survey questions and comparison of responses rate between the two IBD tertiary referral centers (Casa Sollievo Sofferenza, CSS and Policlinico Gemelli, PG).

Survey questions	Options	CSS N = 156		PG N = 220		p-value
		N	%	N	%	
4.3 How much would you like your IBD center to have the opportunity to offer a tel-emedicine service?	Just a little	8	5.13	20	9.09	0.2043
	Indifferent	14	8.97	27	12.27	
	Enough	81	51.92	94	42.73	
	A lot	53	33.98	79	35.91	
4.4 How much would you like to have a tel-econsultation with other figures (psychologist, dietician)?	Just a little	24	15.38	24	10.91	0.5879
	Indifferent	29	18.59	39	17.73	
	Enough	55	35.26	81	36.82	
	A lot	48	30.77	76	34.55	
4.5 I am confident that my health problems can be appropriately resolved with Telemedicine	Strongly disagree	15	9.62	15	6.82	0.8646
	Indifferent	39	25.00	61	27.73	
	Disagree	13	8.33	19	8.64	
	Partially agree	47	30.13	69	31.36	
	Strongly agree	42	26.92	56	25.45	
4.6 What is done in telemedicine mode remains private, and technologies ensure that these tools are safe for my data privacy?	Strongly disagree	11	7.05	17	7.73	0.9974
	Disagree	14	8.97	18	8.18	
	Indifferent	40	25.64	58	26.36	
	Partially agree	49	31.41	68	30.91	
	Strongly agree	42	26.92	59	26.82	
4.7 Do you think that Telemedicine can guarantee the same level of assistance as inperson visits?	Yes	47	30.13	52	23.64	0.3443
	No	70	44.87	104	47.27	
	Yes, but I would instead be visited more often	39	25.00	64	29.09	
5.1 How do you assess the impact of the ongoing pandemic on the need to implement telemedicine?	None	12	7.69	21	9.55	0.6082
	Little impact	47	30.13	73	33.18	
	Relevant impact	97	62.18	126	57.27	
5.2 Would you consider it worthwhile to maintain or introduce some form of telemedicine in the future, regardless of the pandemic?	Yes	98	62.82	151	68.64	0.5003
	No	39	25.00	46	20.91	
	Indifferent	19	12.18	23	10.45	

TM. Therefore, tutorials or face-to-face practical training should be made available to patients to improve trust in TM, increase confidence in the informatics, and provide the essential tools to carry out a tele-consultation with relative ease. Patients' associations can also play an active role in this educational task. In addition, we want to highlight the caregiver's role in helping to increase trust in TM, particularly for those patients with lower academic or ICT levels. We found that the patients from one of the two referral centers involved in the study (CSS), which serves mainly patients from rural centers or small towns, had a lower level of ICT skills than those from PG, which is in a big metropolitan city. Therefore,

the involvement of the caregivers results to be even more critical when these shortcomings are evident.

Limitations and Strengths

Our study has some limitations. First, it was designed to assess patients' perspectives on trust in TM; as a result, providers' opinions were not addressed and deserve further investigation. Secondly, we did not compare patients' expectations and concerns before and after using TM, so it would be helpful in the future to submit an additional survey to patients to obtain adjunctive data after their TM experience.

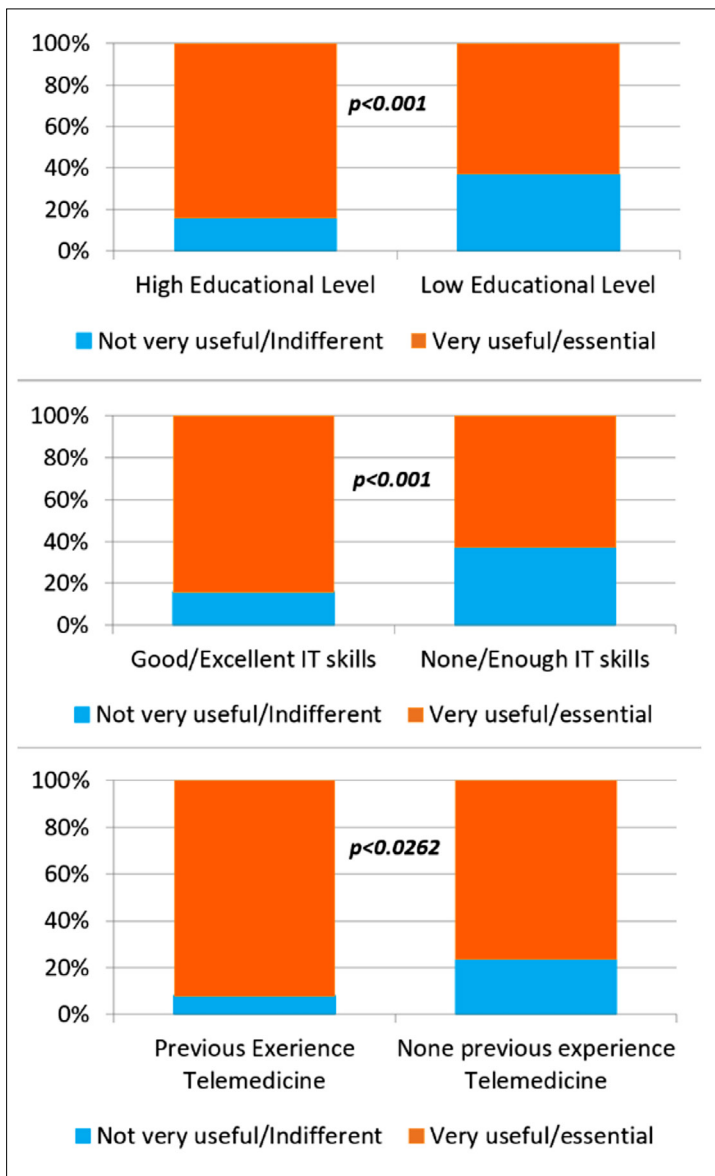


Figure 1. Univariate analysis results of the factors statistically associated with the trust in telemedicine (TM), defined by the answers “very useful” or “essential” to the question: “How much do you think telemedicine is helpful to manage your disease?”

On the other hand, the present study had several strengths, since it included a large cohort of patients with IBD with a very high response rate to the survey. Furthermore, it provides original data from the patients’ perspectives and, as a result, deserves attention from health professionals and health policymakers to increase confidence in TM and reduce concerns.

Conclusions

This study showed that patients with IBD have a significant degree of trust in TM. However, there is still a gap in the perception of the

efficacy of tele-consultations compared to face-to-face visits. Therefore, an effort is needed to bridge this gap for all involved in the care of IBD patients, not only gastroenterologists and nurses but also caregivers, representatives of patients’ associations, and professionals engaged in ICT. Our findings highlighted the importance of equipping IBD patients with basic ICT skills to use TM services better. Additionally, to improve the perceived value of TM, it will be helpful to use additional tools such as tele-monitoring of disease activity using patients’ reported outcomes or remote measurement of FCP. We are, in fact, convinced that the future challenge will be allowing all patients with IBD, regardless

Table II. Univariate analysis on the influence of socio-demographic factors and information and communication technologies (ICT) competencies associated with the trust in telemedicine (TM), inferred from the question “How much do you think telemedicine is useful to manage your pathology?”.

Variables	Options	“How much do you think telemedicine is useful to manage your pathology?”				Univariate analysis p-value
		Very use-ful/ essential n = 293		Not very use-ful/ indifferent n = 83		
		N	%	N	%	
Age	18-40 41-65 > 65	133 137 23	82.61% 75.69% 67.65%	28 44 11	17.39% 24.31% 32.35%	0.0581
Gender	Male Female	153 140	74.27% 82.35%	53 30	25.73% 17.65%	0.0601
Civil status	Single Married/registered partnership Divorced/separated Widowed	106 160 21 6	81.54% 76.19% 77.78% 66.67%	24 50 6 3	18.46% 23.81% 22.22% 33.33%	0.5688
Caregiver	No Yes	90 203	75.00% 79.30%	30 53	25.00% 20.70%	0.3490
Education	Primary school Secondary school High School University	1 69 145 78	9.09% 69.00% 81.01% 90.70%	10 31 34 8	90.91% 31.00% 18.99% 9.30%	< 0.001*
Level of ICT skills	None Enough skills Good skills Excellent skills	15 55 147 76	57.69% 64.71% 84.48% 83.52%	11 30 27 15	42.31% 35.29% 15.52% 16.48%	< 0.001^
Previous experience with telemedicine	No Yes	258 35	76.33% 92.11%	80 3	23.67% 7.89%	0.0262

*High Education Level vs. Low Education level. ^Good/Excellent ICT skills vs. None/Enough ICT skills.

of their social and cultural conditions, to take advantage of TM services by integrating them with in-person services.

Conflict of Interest

F.B. received consulting fee from Janssen, Biogen, and Takeda. The other authors have no conflicts of interest to declare.

Funding

This research received no external funding.

Authors' Contribution

Conceptualization: F.B., A.C., F.Ca., F.P., and A.P.; Acquisition and collection of data: L.M.V., L.R.L., I.M., D.N., and F.C.; analysis and interpretation of data: F.B., M.R.V., M.G., S.C., and A.P.; writing—original draft preparation: F.B., F.P., A.G., and

A.P.; writing—review and editing: F.B., M.R.V., L.M.V., M.G., L.R.L., S.C., I.M., F.C., D.N., A.C., F.Ca., A.G., F.P., and A.P.

Ethics Approval

The study was conducted in accordance with the Declaration of Helsinki. The Ethic committee of Casa Sollievo della Sofferenza Hospital, San Giovanni Rotondo (Fg) approved the study.

Informed Consent

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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