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***Innovation in IBD Care During the COVID-19 Pandemic: Results of a Global Telemedicine Survey by the International Organization for the Study of Inflammatory Bowel Disease***

**Short title: Telemedicine for IBD**

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## Background

The rising incidence of inflammatory bowel disease (IBD) in the developing world and compounding prevalence in the West has increased the demand for IBD care.[1–3] The prevalence of IBD across most of North America and Europe is now 0.7 - 0.8% with the expectation that over 1% of the population will be living with IBD within a decade.[1,2]

The traditional model of IBD care has centered around face-to-face consultations in the out-patient clinic. While Crohn's disease and ulcerative colitis are heterogeneous conditions, most IBD centers offer the same type of routine follow-up visits irrespective of demographics, disease history, geographic location, and distance to the clinic. The only significant variation in the visits are the frequency of appointments dependent on disease phenotype, activity, and current treatment. Additionally, treat-to-target goals and desire for a more holistic approach to care has expanded management to a battery of regular monitoring tests (bloodwork, fecal calprotectin, endoscopy and imaging) and an enhanced multi-disciplinary team: gastroenterologists, surgeons, nurse practitioners, psychologists and dietitians. All of this care has been delivered in often crowded, understaffed clinics.

## COVID-19 pandemic and forced changes in IBD care

Against this backdrop, the COVID-19 pandemic has resulted in a dramatic, unprecedented shift in the provision of medical care, breaking through provider resistance and fueling innovation. Multiple factors have contributed to a global suspension of traditional face-to-face out-patient clinics. Social distancing and lockdown have been central to reducing the transmission rate of SARS-CoV-2, the virus

responsible for COVID-19 disease. Reports from Hubei and Lombardy highlighted that hospitals were hotspots for transmission of the virus. At the time of writing, most countries are past the peak of new COVID-19 cases and deaths. However, the threat of a second wave has necessitated the maintenance of at least partial lockdown in many countries, with social distancing looking to be the new normal until an effective vaccine is available.

Guidance for the management of IBD during the pandemic has focused on maintaining medical therapies to prevent the disease from flaring.[4–8] This has required a number of key strategies including maintaining a functional IBD team (helplines, infusions suites, homecare delivery etc.), on-going proactive monitoring of stable patients and rapid reactive management of flaring patients. Successful implementation of such strategies should minimize the need for systemic corticosteroids, hospital admission and emergency surgery, thus reducing the risk of SARS-CoV-2 infection and the severity of COVID-19 disease.

The challenge faced by IBD teams has been the implementation of new systems of care following the almost overnight closure of out-patient clinics. This occurred while many doctors and nurses were being redeployed to care for patients with COVID-19. Massive hospital reorganization has taken place, with all but emergency endoscopy and surgical activity cancelled. In this climate, the monitoring of stable out-patients, many of which have chronic diseases, has not been a priority. Anecdotally, there has been widespread variation in how different centers have responded to this challenge. For many the only alternative to face-to-face clinics has been the telephone. For others, widespread

change has been more streamlined with the rapid implementation of pre-existing technological solutions. Indeed, a wide range of secure, validated video consultation solutions have existed for some time. In addition to this, a number of IBD specific smartphone applications are available to record patient reported outcomes (PROs) and to facilitate two-way communication between provider and patient. Remote monitoring of gut inflammation can even be facilitated by validated point of care fecal calprotectin assays. In fact, almost all of the components needed to deliver IBD care remotely have been available and underutilized. However, it is unclear how much telemedicine was utilized in the pre-pandemic period. Structured change in healthcare systems is notoriously slow at the best of times. This pandemic however, is perhaps an opportunity to transform systems of IBD care that were increasingly broken.

**IOIBD Telemedicine Survey**

Working as part of a taskforce on telemedicine for the International Organization for the study of IBD (IOIBD), we were interested to answer a number of questions:

- What was the utilization of telemedicine in pre-pandemic times?
- How would telemedicine fill the service provision gap exposed by COVID-19?
- What would the landscape look like after the pandemic had gone?

To address these issues, we designed a 9-item questionnaire on telemedicine in IBD using Google Forms. Following a successful trial amongst IOIBD members (48/64 respondents), we refined our survey questions with a view to obtaining a truly global picture. The modified survey was distributed to IBD teams via email, Twitter and LinkedIn.

**Survey Results**

The survey was open for 10 days and had a total of 802 responses from 56 different countries across North and South America, Europe, Australia, Asia, and Africa. The countries with the largest number of respondents were the United Kingdom (11.6%), the USA (11.0%), Italy (10.9%), Brazil (5.6%), Israel (4.6%), Denmark (4.0%), New Zealand (3.7%), India (3.6%), Romania (3.3%), Canada (3.0%), Spain (3.0%), China (2.6%) and South Africa (2.8%) (full listing in Supplementary Table 1). The survey was mostly completed by gastroenterologists with an interest in IBD (82.4%) and IBD Nurse Practitioners (10.2%), with the remainder (7.5%) comprising surgeons, dietitians and psychologists. Of the respondents, 61.8% worked solely in the public sector, 14.0% solely in the private sector with 22.0% working in both. When asked if reimbursement was an important factor in their clinic setup (face-to-face versus video versus phone consultations) 38.0% said 'yes', 42.7% said 'no' and 19.3% said 'some of the time'. Naturally, responses to the survey vary widely by country and manner in which healthcare is reimbursed.

**Impact of COVID-19 on IBD Service Provision**

The main focus of the survey was designed to document the split in clinic provision between face-to-face, telephone and video consultations pre-, during and post- COVID-19. Figure 1 demonstrates that the most striking result was the almost complete suspension of face-to-face clinics during COVID-19, reducing from >75% beforehand to <25% currently (Figure 1). Pre-pandemic telemedicine consisted of only a fraction by video consultation; this is now approximately 25%. Telephone consultations have seen

the biggest increase and currently account for over half of all IBD consultations. This is largely explained because 53.3% of respondents said they do not have access to a video consultation setup. Of those that did, many used systems either fully integrated into (Epic was the most commonly used) or linked to (e.g. American Well, NHS NearMe/ Attend Anywhere, Doxy.me) the electronic healthcare record (EHR). Many others reported using non-integrated solutions such as Zoom for Healthcare, GoToMeeting, Blu Jeans, Skype for Business, FaceTime, Google, Microsoft Teams, WeChat and WhatsApp. Following COVID-19, we asked how much they anticipated or intended for clinical provision to be offered by the different modalities. Consultation by phone drops back to pre-pandemic levels (approximately 25%). Face-to-face provision remained the most popular format but is lower than at pre-pandemic times. It is noteworthy that a significant proportion of future IBD visits will be by video consultation.

**Regional variation in telemedicine**

We were interested in the provision of telemedicine by video consultation in the current climate and geographical variation (Figure 2). As we expected, the highest proportion of video consultation was in the USA. Interestingly the only other regions that reported almost as much video as phone consultation were South America and India. Other examples were noteworthy. In Sweden there is a newly developed telemedicine capability connected to the National IBD Register (SWIBREG / 1177). In South Africa, it was reported that internet connectivity is a major challenge in impoverished communities.

**IBD patient apps and point of care fecal calprotectin testing**

The use of IBD apps to monitor PROs and communicate with patients was reported in occasional use by 13.2% of health-care practitioners, and regular use by 6.2%. It should be noted that while many reported using dedicated apps including Epic, HealthPromise, IBD Home, My IBD Care, SWIBREG / 1177, Ambuflex, Constant-Care, Haodaifu / Good Doctor and IBD Konsultace, the most commonly used apps for communication were WhatsApp and WeChat. Although the current use of IBD patient apps is relatively low 67.7% - all of whom have no prior experience expressed a desire to implement in their future clinic setup.

Fecal calprotectin has become integral to the management of IBD patients using a treat to target strategy. Reflecting this, 89.0% of our survey respondents reported that they had routine access to laboratory fecal calprotectin testing prior to the pandemic. However, as a result of COVID-19 33.7% reported a decrease and 12.3% a complete suspension in provision of this service. This was attributed to concerns around fecal transmission of SARS-Cov-2 and testing pressures in hospital laboratories.[9–11] A relatively small proportion have been using a point of care fecal calprotectin test (mostly either IBDoc or CalproSmart).[12] Of those that haven't, the overwhelming majority replied that this is something they are interested in adopting. There is no commercial point of care calprotectin test currently approved in the United States.

**Benefits of telemedicine for IBD**

COVID-19 has not only been a global tragedy resulting in significant loss of life, the indirect fallout for individuals and communities will be long-lasting. For our IBD patients this includes a significant amount of fear and anxiety, not least due to the virus itself but

also employment, health insurance and system wide changes that impact every level of their care. However, despite all of the negatives there is also an opportunity - to reimagine IBD care for the better. It is our belief that telemedicine should be a core part of IBD management, and our global survey reflects this opinion. New systems of IBD care that are built on telemedicine will be more patient oriented and less expensive for providers and health systems. The ability to remotely collect both PROs and fecal calprotectin levels using existing systems that automatically pre-populate EMRs will allow a large-scale implementation of treat-to-target medicine. Tools that enable real-time two-way communication between patients and HCPs will allow for a more rapidly responsive service and should help limit unscheduled care (costly for the individual and the provider). Digital systems will enable ready screening of psychological well-being and delivery of solutions such as app based cognitive behavioral therapy. This will help build resilience in patients and free time for HCPs to deliver patient care, in turn limiting physician burnout. Chatbots are already being developed for IBD to collect disease activity, update medications and obtain information on flares. Medical education can continue as most technologies allow the host to move invited participants in and out of the “room” to present. Additionally, telemedicine can be performed with less office support staff and is currently being reimbursed at rates similar to in person visits with equal complexity.  One restriction is that the patient (and provider) must have the equipment and technological skills to participate.  As much of the world is in possession of a cell phone, access should be available to most. Also, current relaxation of rules allowing telemedicine across state lines and reimbursing telephone visits at the same rate as in person visits may revert to pre-pandemic standards, curbing enthusiasm. Yet,

the popularity of telemedicine should prevail given its efficiency and effectiveness in delivering care.

The digital implementation of evidence-based approaches and algorithms to managing IBD can drive up standards of care globally and improve patient outcomes. Over time, a digital service collects data about treatment decisions and outcomes. If we use this opportunity to agree on standard data entry criteria including disease type, history and assessment of disease severity, we can then assemble large datasets ripe for machine learning and artificial intelligence to build predictive models. These can then be implemented to effect a true paradigm shift in IBD management.

**Planning for the next phases of the pandemic**

At the time of writing many countries have passed the peak of the COVID-19 pandemic but remain in lockdown. While vaccines and effective anti-viral therapies are many months off there is a very real threat of a deadly second wave. Some form of social distancing will remain in place for the foreseeable future. It seems inconceivable that we can return to crowded clinic waiting rooms for IBD patients. Through this great tragedy there is also great opportunity. Our IBD clinics have transformed overnight and virtual care is the new normal.  Our global survey demonstrates the importance of telemedicine during the pandemic and desire to continue into the future. Now is the time for a collaborative conversation between providers, payers and patients to determine the best mode of healthcare delivery. Digital technology is still in a state of relative infancy. Limitless growth and innovation will define the telemedicine of tomorrow.

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**Figure Legends**

**Figure 1.** Stacked bar chart showing proportion of IBD clinics that were conducted face-to-face, by telephone and by video consultation pre-COVID-19 (top panel), during the COVID-19 pandemic (middle panel) and anticipated proportions after COVID-19 (bottom panel).

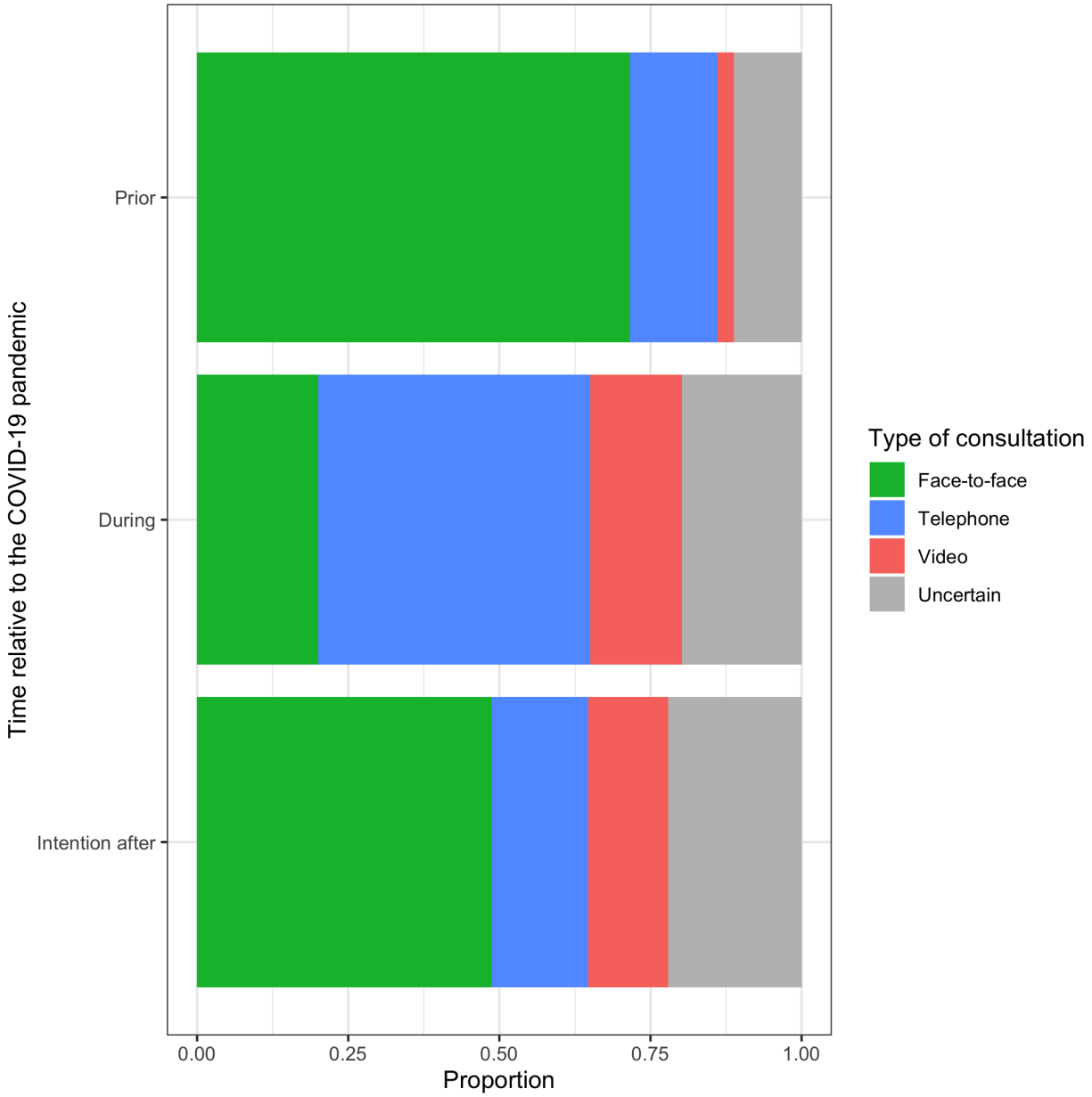
**Figure 2.** Global map showing the proportion of IBD clinics during the COVID-19 pandemic being conducted face-to-face, by telephone or by video consultation. The breakdown of regions (shown in bold and represented by individual pie charts) is as follows: **United Kingdom**, **Western Europe** (Austria, Belgium, Denmark, Faroe Islands, France, Germany, Ireland, Italy, Malta, Netherlands, Portugal, San Marino, Spain, Switzerland), **Eastern Europe** (Bulgaria, Croatia, Czech Republic, Estonia, Greece, Hungary, Lithuania, Republic of Moldova, Poland, Romania, Slovenia), **Scandinavia** (Denmark, Norway, Sweden), **India**, **Middle East** (Israel, Kuwait, Lebanon, Saudi Arabia, Turkey, United Arab Emirates), **East Asia** (China, Hong Kong, Japan, Malaysia, South Korea), **Australasia** (Australia, New Zealand), **United States of America**, **Canada**, **South America** (Argentina, Brazil, Chile, Colombia, Costa Rica), **South Africa**. The division of regions is largely pragmatic and based loosely on geography, healthcare systems and number of respondents to the survey (see Supplementary Table 1 for complete breakdown of countries).

**Supplementary Table 1.** List of countries with number and & of respondents to the Telemedicine and IBD Survey.

| In which country do you practice? | Number | % of total |
|---|---|---|
| United Kingdom | 90 | 11.6 |
| United States | 86 | 11.0 |
| Italy | 85 | 10.9 |
| Brazil | 44 | 5.6 |
| Israel | 36 | 4.6 |
| Denmark | 31 | 4.0 |
| New Zealand | 29 | 3.7 |
| India | 28 | 3.6 |
| Romania | 26 | 3.3 |
| Canada | 23 | 3.0 |
| Spain | 23 | 3.0 |
| China | 22 | 2.8 |
| South Africa | 22 | 2.8 |
| Australia | 13 | 1.7 |
| Greece | 21 | 2.7 |
| Ireland | 21 | 2.7 |
| Kuwait | 17 | 2.2 |
| Saudi Arabia | 17 | 2.2 |
| Belgium | 16 | 2.1 |
| Lebanon | 16 | 2.1 |
| Sweden | 15 | 1.9 |

| | | |
|---|---|---|
| Norway | 12 | 1.5 |
| Hong Kong | 8 | 1.0 |
| Colombia | 7 | 0.9 |
| Japan | 7 | 0.9 |
| Germany | 6 | 0.8 |
| Netherlands | 6 | 0.8 |
| Egypt | 5 | 0.6 |
| Korea, Republic of | 5 | 0.6 |
| Argentina | 0 | 0.0 |
| United Arab Emirates | 4 | 0.5 |
| Croatia | 3 | 0.4 |
| Czech Republic | 3 | 0.4 |
| France | 3 | 0.4 |
| Malaysia | 3 | 0.4 |
| Turkey | 3 | 0.4 |
| Costa Rica | 2 | 0.3 |
| Hungary | 2 | 0.3 |
| Portugal | 2 | 0.3 |
| Switzerland | 2 | 0.3 |
| Tanzania, United Republic of | 2 | 0.3 |
| Algeria | 0 | 0.0 |
| Austria | 0 | 0.0 |
| Bulgaria | 1 | 0.1 |
| Chile | 1 | 0.1 |
| Estonia | 1 | 0.1 |
| Faroe Islands | 1 | 0.1 |

| | | |
|---|---|---|
| Lithuania | 1 | 0.1 |
| Malta | 1 | 0.1 |
| Moldova, Republic of | 1 | 0.1 |
| Niger | 1 | 0.1 |
| Nigeria | 1 | 0.1 |
| Poland | 1 | 0.1 |
| Qatar | 1 | 0.1 |
| San Marino | 1 | 0.1 |
| Slovenia | 1 | 0.1 |


Time relative to the COVID-19 pandemic
Prior
During
Intention after
0.00
0.25
0.50
0.75
1.00
Proportion
Type of consultation
Face-to-face
Telephone
Video
Uncertain