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REVIEW

## Repositioning Gastroenterology Services during COVID-19 Pandemic

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### ABSTRACT

**BACKGROUND:** In COVID-19 pandemic, hospitals become overwhelmed with acute admissions leading to the suspension of outpatient clinics including gastroenterology and endoscopic services. Similarly available resources are channeled to combat the scourge. These diversions of resources coupled with lockdowns and fear of getting infected prevent patients from accessing routine and life-saving gastroenterology services leading to increased gastrointestinal-related morbidity and mortality in at-risk populations. Often, there are delays in the diagnosis and early treatment of gastrointestinal cancers, and high risks of death from gastrointestinal bleeding.

**SUMMARY:** This review discusses COVID-19 risk factors and ways and means of ensuring safe essential gastroenterology services in the setting of COVID-19 pandemic based on available evidence. Telemedicine avoids physical contacts, maximizes safety by reducing the risk of infection to both clinicians and patients, and is conducive to a lockdown, quarantine, or self-isolation environment of COVID-19. It can be used to triage critical cases requiring life-saving endoscopic procedures. The review also explores measures at de-risking endoscopies being high-risk aerosol generating procedures. The emerging technology of non-contact endoscopy in the form of robotic endoscopy raises hope in this direction.

**Key words:** Gastroenterology; Endoscopy; COVID-19

**Key Messages:** Critical gastroenterology patients face double risks

of having severe COVID-19 as well as non-availability of essential services. Similarly, endoscopists are at risk of getting infected with COVID-19 during endoscopic procedures. While the world fights COVID-19, there is a need to ensure that essential gastroenterology services are made available and safe for both clinicians and patients.

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## INTRODUCTION

The World Health Organization (WHO) defines ‘pandemic’ as ‘the worldwide spread of a new disease’<sup>[1]</sup>. Whilst humanity finds itself amidst an ongoing pandemic, this is no new challenge, having previously faced the Bubonic plague, Spanish Flu, cholera, smallpox, HIV, and Ebola as well as outbreaks of the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome coronavirus (MERS-CoV).

In December 2019, reports emerged of a cluster of cases of pneumonia of unknown aetiology in Wuhan, China, and by March 2020, more than 150 countries worldwide were affected. The aetiological agent was found to be a novel coronavirus, later named the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), and on 11 March 2020, the Coronavirus disease 2019 (COVID-19) was declared a pandemic<sup>[2]</sup>.

COVID-19 is mainly transmitted via respiratory droplets. Its basic reproductive number is put at around 1.5 to 3, making it slightly more contagious than influenza, estimated at 1.5 to 2<sup>[3]</sup>. Whilst mild infections constitute about 80% of cases, severe morbidity and mortality have been noted, particularly among adults  $\geq 50$  years of age and those with significant comorbidities<sup>[4]</sup>.

A vulnerable patient population and an abundance of outpatient endoscopic procedures have put the field of gastroenterology in a uniquely challenging position. Many international societies have risen to the challenge and produced guidelines on optimizing gastroenterological care at this time. Many hospitals have put measures in place based on unique population needs. These include distance medicine/online resources such as remote patient monitoring, telemedicine, video conferencing, and virtual clinics as well as measures to reduce the higher risks inherent to endoscopy units<sup>[5]</sup>.

This review will critically explore these measures and discuss ways of improvement for the current and future pandemics.

## RISK FACTORS FOR COVID-19 PANDEMIC

During pandemics, hospitals become overwhelmed with acute admissions leading to the suspension of outpatient clinics. This diversion of resources often leads to increased morbidity and mortality in at-risk populations. As such, it is essential to recognize risk factors for disease acquisition.

Pandemic risk factors fall into either the ‘spark risk’ or the ‘spread risk’<sup>[6]</sup>. The spark risk deals with the likely pandemic focus, while the spread risk looks at the likelihood of spread to susceptible human populations. Urbanization, population displacement, and crowded living conditions, propel pandemics<sup>[7]</sup>. Similarly, socioeconomic factors such as poverty and limited access to healthcare, non-compliance

with governmental advice, and guidelines surrounding isolation and quarantine procedures are significant spread risk factors identified in several studies<sup>[8,9,10]</sup>. Other risk factors include poor planning and coordination, delay in screening and testing, and non-availability of hospital resources, including adequate personal protective equipment (PPE) for healthcare workers<sup>[6]</sup>.

Severe COVID-19 is associated with age over 70, morbid obesity, smoking, and underlying medical conditions such as respiratory diseases, hypertension, cardiovascular diseases, diabetes, and cancer<sup>[11]</sup>. It implies that patients with gastrointestinal (GI) cancers are at risk for severe COVID-19.

## SCALING DOWN GI OUTPATIENT SERVICES DURING COVID-19 PANDEMIC

As pandemics typically involve highly contagious pathogens, this inherently puts vulnerable patients at risk of infection. Therefore, the majority of routine hospital-based healthcare services, including outpatient appointments, are adjusted to minimize face-to-face contact. Hence the need for appropriate preparedness to ensure that critical patients are prioritized. This measure frees up personnel, minimizes medical supplies shortages, and discourages patients from visiting the hospital unnecessarily.

Gastroenterology outpatient clinics are not exceptions. Most gastroenterology outpatient appointments have been converted into telephone consultations to triage patients. Patients requiring urgent attention are then invited for the required examination and procedures.

Gastroenterology patients are categorized according to COVID-19 risk<sup>[12]</sup>. Low-risk patients are those with no symptoms and have no history of travel. Intermediate-risk patients are those with symptoms but have a negative history of traveling to a high-risk area and have no contacts. High-risk patients are those with symptoms and have a positive history of traveling to a high-risk area in the last preceding 14 days.

Similarly, upper GI endoscopic procedures are aerosol-generating and are considered high-risk. Recent evidence suggests that colonoscopy can also be high-risk in COVID-19 patients<sup>[13]</sup>. The virus has been found in stool and rectal biopsy samples of COVID-19 patients. Endoscopy can promote microbial dissemination and bodily fluids may easily splash when manipulating devices in the working channel of an endoscope.

## TELEMEDICINE IN GASTROENTEROLOGY

Telemedicine means delivering medical care at a distance. It enables access to remote medical expertise using telecommunication and information technologies<sup>[14]</sup>. It embraces a wide range of activities, ranging from the sharing of clinical information to consultations via videoconferencing technology.

With recurrent pandemics, there is a strong impetus to explore new models of care provision in gastroenterology. It will not be possible to remove all face-to-face contacts from the system. Some patients will need physical examinations and endoscopy services, which require physical contact. Telemedicine maximizes safety and reduces the risk of pandemics to both clinicians and patients and is conducive to a lockdown, quarantine, or self-isolation environment. It is particularly promising in chronic disease management, where it allows for virtual monitoring and prioritizing of cases. Chronic obstructive pulmonary diseases, diabetes, and heart diseases have been successfully managed using virtual technologies where patients’ symptoms can be easily assessed with standardized proformas<sup>[15,16]</sup>.

The Southampton model demonstrates that inflammatory bowel disease (IBD) virtual clinics have been employed to manage stable IBD patients with a significant reduction in the number of face-to-face consultations and high levels of patient satisfaction<sup>[17]</sup>. Similar virtual clinics have been formed to remotely monitor patients with coeliac disease<sup>[18]</sup>.

Videoconferencing between primary and secondary care clinicians and healthcare providers has been shown to improve the management of patients with chronic liver disease and facilitate the remote delivery of cognitive-behavioral therapy<sup>[19]</sup>. The online monitoring and timely two-way transfer of patient-generated data between caregivers and patients reduce the risk of infection transmission to gastroenterology patients who would have been traditionally admitted to and physically monitored on the wards<sup>[20]</sup>. These patients include cases of chronic gastrointestinal conditions, and those who have had medical or endoscopic procedures.

While virtual clinics generally report high levels of patient satisfaction, it is essential to note that there is little evidence comparing this form of care delivery with the best available clinical care<sup>[21]</sup>. It is increasingly difficult to assess the clinical outcomes of diagnostic telemedicine versus usual best care.

However, existing general telemedicine models may guide clinicians in dealing with the current COVID-19 crisis<sup>[22]</sup>. These models include the Push Doctor, with over 7000 clinicians in the UK providing online primary care consultations, and the Canadian Telehealth Services which have been developed to address the concerns many Canadians have about COVID-19, and to ensure that citizens can access information without having to visit crowded clinics and hospitals. Whilst Push Doctor presents a new model of providing patient consultations, the ‘virtual hospital’ developed at a London NHS trust provides remote triage and coordination of care for general practitioners (GPs) referrals.

These models are promising as ways of avoiding a face-to-face consultation. Over 12 months, Patel *et al.*<sup>[23]</sup> found that fewer than 15% of referrals required an initial face-to-face consultation. The remaining 85% were either referred back to the GP with clinical advice or underwent investigations co-ordinated remotely by a clinician.

## REMOTE PATIENT MONITORING

Remote patient monitoring (RPM) is part of telemedicine that facilitates patient monitoring and timely two-way transfer of patient-generated data between caregivers and patients<sup>[24]</sup>. In RPM, data are collected passively using sensors in medical devices. RPM is particularly useful in a post-discharge setting and between routine clinic visits.

RPM application in gastroenterology during the COVID-19 pandemic will decrease the risk of virus transmission since patients get quick care while they stay home<sup>[20]</sup>. This remote service helps ease anxiety, reduces the need for hospitalization, and free hospital beds to serve emergencies.

RPM’s foremost challenges include cost, result misinterpretation, device malfunction leading to medical errors, and threats to confidentiality and privacy<sup>[25]</sup>.

## LIMITATIONS OF TELEMEDICINE

Telemedicine is less effective in developing countries because of a lack of access to the required technology, such as the internet, computers, and mobile phone technology. Globally, access to regular internet services and smartphone ownership varies widely. At

one end of the spectrum, 94% of South Koreans use the internet regularly or own a smartphone, yet the figure stands at just 8% in Ethiopia<sup>[26]</sup>.

As a result of this, telemedicine has historically been viewed as an agent of discrimination with those from resource-constraint countries or backgrounds not being able to access it. Given that telemedicine can be administered easily using a mobile phone in socially-disadvantaged countries and has the potential to be a significant agent for the democratization of healthcare, the WHO established the Digital Health Technical Advisory Group in 2019 to boost telemedicine in some developing countries<sup>[27]</sup>.

Cultural and local acceptability affects uptake in telemedicine. For example, telehealth is low in Nigeria because only physical consultation and examination are perceived as effective medical care<sup>[28]</sup>. Additionally, clinician acceptability of telemedicine presents a barrier to adoption. An extensive UK survey of GPs found that 86% had no intention of utilizing virtual technology. There are concerns that the provision of care would be compromised by a lack of ability to carry out a physical examination, and a reduced transfer of information as opposed to a face-to-face consultation<sup>[29]</sup>.

Medicolegal concerns have been raised about the growing use of telemedicine. Telemedicine covers a wide range of activities using many technological platforms (such as smartphones, internet, and telephone) across national borders. The legal ramifications of this diversity are complex and may limit telemedicine’s uptake, whilst these complexities and ambiguities remain<sup>[30]</sup>. Issues such as patient confidentiality, data protection, and potential medicolegal issues (arising primarily from the lack of physical examination of the patient) are challenges that may make clinicians wary of using telemedicine in routine practice.

## IMPROVING TELEMEDICINE IN GASTROENTEROLOGY

More widespread telemedicine would require a significant investment to make the technology readily available and train clinicians to deliver care in this emerging way. Beyond pilot studies, telemedicine training is not a regular part of most undergraduate medical education<sup>[31]</sup>. Telemedicine education will need to be delivered rapidly to respond to the COVID-19 crisis. Despite these challenges, greater integration of telemedicine into traditional healthcare models is likely to benefit both patients and doctors, considering the current COVID-19 crisis<sup>[32]</sup>.

5G cutting-edge technology may transform telemedicine dramatically by improving the precision of clinical medicine. This emerging technological breakthrough addresses some of the limitations in telehealth today. It has the potentials of providing opportunities for remote patient examination and virtual medical and diagnostic/therapeutic endoscopic procedures<sup>[33]</sup>.

According to the College of Physician and Surgeons of Alberta Canada, measures at minimizing telemedicine-related medicolegal issues can improve the effective utilization of this technology in gastroenterology<sup>[34]</sup>. These include competence and technological know-how, mandatory continuing professional development, enhanced physician-patient relationship, and display of physician identities such as name, place of practice, registration status, credentials, contact information, and personal health card number. Other measures include meticulous prescription with proper documentation of history, any video-visualized clinical findings, and known allergies and ensuring continuity of care through follow-up and prompt referral of appropriate cases.

## DE-RISKING ENDOSCOPY DURING PANDEMICS

The European Society of Gastrointestinal Endoscopy (ESGE) and The European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA) have recognized that endoscopy workforce is at increased risk of infection due to droplets inhalation, fecal-oral transmission, and conjunctival contact<sup>[35,36,37]</sup>. Many endoscopy bodies have created guidance to ensure the safety of both patients requiring endoscopy and the healthcare professionals working in the endoscopy environment.

### Rescheduling

The British Society of Gastroenterology (BSG) and Joint Advisory Group (JAG) recommend that the patients listed for and being referred for endoscopic procedures should be re-assessed based on the level of urgency<sup>[38]</sup>. Only the following procedures can go ahead: Upper GI bleeds, obstructing lower and upper GI tumors, upper GI foreign bodies, acute biliary obstruction, nutritional support, endoscopic vacuum therapy, and unresolved lower GI bleeds. It is also recommended that any routine procedures be delayed and that 2-week rule suspected cancer referrals must be triaged on a case-by-case basis.

### Risk-Reduction Measures

While absolute elimination of risk may not be achievable, there have been many recommendations to minimize the risk of transmission of COVID-19. Lui *et al.* reviewed the guidelines issued by eight global endoscopy bodies to create the following summary of recommendations: Unit setup, PPE, and screening<sup>[39]</sup>.

**Unit Setup:** Unit setup is essential for minimizing the risks of COVID-19 transmission. Units need to have dedicated areas for the donning and doffing of PPE. “Clean” and “Contaminated” areas should be clearly identified, and separation maintained. The number of staff in procedure rooms should be limited to reduce unnecessary exposure. A dedicated negative-pressure endoscopic rooms and facilities should be set aside for COVID-19 positive patients requiring urgent endoscopies and enhanced preventive measures taken besides complete PPE.

**PPE:** PPE is essential to reducing the risk of infection. Therefore, the BSG and JAG issued full guidance regarding the appropriate PPE levels. Due to the aerosol-generating nature of endoscopic procedures, it was recommended that staff in endoscopy procedure rooms wear filtering-face-piece-3 (FFP3) masks, full-face visor, full-length and sleeved gown, and gloves.

**Screening:** Screening is a core task in reducing both staff and patient exposure to COVID-19 during high-risk endoscopic procedures. Patients should have a point-of-care (POC) real-time reverse transcriptase-polymerase chain reaction (RT-PCR) testing for COVID-19 if undergoing emergency endoscopy<sup>[13]</sup>. For non-emergency endoscopy, patients should be screened using questions regarding potential exposure to a suspected case of COVID-19, symptoms, recent foreign travel, and temperature measurement, and if considered as high-risk, COVID-19 real-time RT-PCR should be performed before the procedure.

### Robotic Endoscopy

Non-contact endoscopy using robots minimizes contacts between patients and endoscopy staff. The first clinical experience of robotic capsule endoscopy for gastric examination during the COVID-19 pandemic was conducted in China on March 16, 2020, using the novel non-contact magnetically-controlled capsule endoscopy system: Ankon Technologies, China<sup>[40]</sup>.

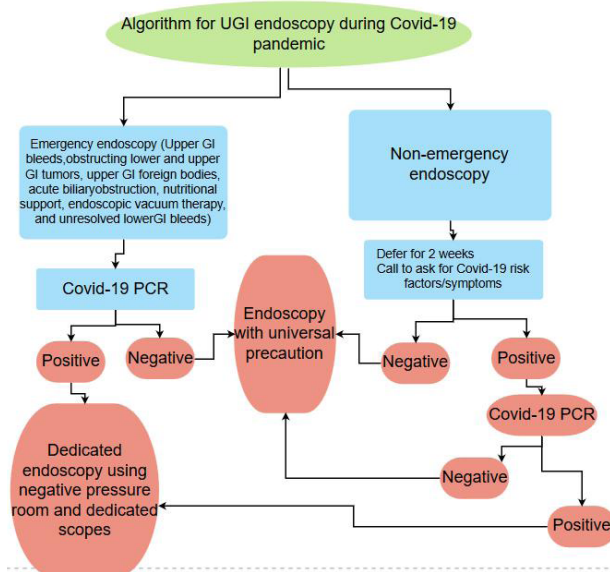


Figure 1 Flow chart for endoscopy during COVID-19 pandemic.

### Safety Tips for Contact Endoscopy

The recommendations for safe contact endoscopy during COVID-19 pandemic are summarized in Table 1 and a simplified flow chart presented to serve as an algorithm in Figure 1<sup>[37,41]</sup>.

### General Preventive Measures (Ecological Approach)

The three necessary steps in pandemic control include controlling infection sources, blocking transmission routes, and protecting susceptible population<sup>[42]</sup>. The source of COVID-19 is usually infected persons, the route of transmission droplet inhalation or contact, and the susceptible population is healthy people. COVID-19 is fast-spreading and difficult to control effectively with just standard or general measures. Therefore, there is a need for isolation and early treatment of cases, contact tracing, and quarantine, persuading people to stay at home, and social distancing.

These social measures were effectively used by the Chinese government to fight COVID-19. There is a need to tailor interventions into local settings to enhance case-finding, contact-tracing, and quarantine<sup>[43]</sup>. Additionally, China enforced frequent hand washing, canceling public gathering, closing schools, restricting festivals, delaying a return to work, and city lockdown.

The efficacy of face mask use by healthy people continues to generate controversies, but community use should not jeopardize adequate supplies for professional use in healthcare settings<sup>[44]</sup>. Face masks should be routinely used by healthcare personnel to protect against droplet infections. Furthermore, respirators such as N95, N99, FFP3, P3, or N100 should be used in high-risk populations. The use of face masks by asymptomatic COVID-19 cases could reduce community transmission of the virus.

## CONCLUSION

COVID-19 pandemic presents an unprecedented challenge to gastroenterology outpatient care and endoscopic procedures. Maintaining essential and life-saving gastroenterology outpatient services without jeopardizing the safety of patients or healthcare staff is an absolute requirement. The emergence of and breakthrough in 5G technology raise hope in revolutionizing telemedicine to enable virtual examination of patients and remote conduct of endoscopic procedures during pandemics. The recommendations in this paper are summarized in

**Table 1** Recommendations for safe contact endoscopy during COVID-19.

Booked patients should be called and asked risk-screening questions.
Use of COVID-19 risk categorization.
Maintaining social distancing whenever possible.
PPE needs to be worn for all procedures.
Create negative pressure rooms for high-risk patients.
Regular disinfection of surfaces need.
Proper hand hygiene should be practiced.
Reception bay should screen patients before entering the waiting area.
All patients suspected to be having COVID-19 should be tested.
Provision of dedicated procedure and observation rooms.
Don and doff PPE in a suitable designated area.
Daily temperature checks of staff.
Limited number of staff for procedures.
Bedside endoscopies for ICU patients.

**Table 2** Highlights of safe gastroenterology outpatient services during pandemics

During pandemics, most gastroenterology outpatient clinics are suspended to manage acute admissions.
Gastroenterology outpatients who are aged 65 years old and above, morbidly obese, smokers, or have underlying medical conditions such as respiratory diseases, hypertension, cardiovascular diseases, diabetes, and cancer are at increased risk.
GI cancers are risk factors for severe COVID-19.
Measures to ensure safe essential gastroenterology outpatient services include:
Telemedicine/Virtual clinics/Videoconferencing
Remote Patient Monitoring
Telephone screening and triaging before appointments
Rescheduling of appointments
Endoscopies limited to GI bleeds, obstructing tumours, foreign bodies, acute biliary obstruction, nutritional support, endoscopic vacuum therapy, and unresolved bleeds.
Safe endoscopy is achievable with unit setup, PPE, and screening.
Personal and community protection with face mask, hand hygiene, hand sanitization, cough/sneezing etiquette, social distancing, and city lockdown.

Table 2. These recommendations may contribute to maintaining safe gastroenterology services during the current and future COVID-19 pandemic.

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