

# World Journal of *Clinical Cases*

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## Clinical presentation, management, screening and surveillance for colorectal cancer during the COVID-19 pandemic

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### Abstract

Management of colorectal cancer (CRC) was severely affected by the changes implemented during the pandemic, and this resulted in delayed elective presentation, increased emergency presentation, reduced screening and delayed definitive therapy. This review was conducted to analyze the impact of the coronavirus disease 2019 (COVID-19) pandemic on management of CRC and to identify the changes made in order to adapt to the pandemic. We performed a literature search in PubMed, Medline, Index Medicus, EMBASE, SCOPUS, Reference Citation Analysis (<https://www.referencecitationanalysis.com/>) and Google Scholar using the following keywords in various combinations: Colorectal cancer, elective surgery, emergency surgery, stage upgrading, screening, surveillance and the COVID-19 pandemic. Only studies published in English were included. To curtail the spread of COVID-19 infection, there were modifications made in the management of CRC. Screening was limited to high risk individuals, and the screening tests of choice during the pandemic were fecal occult blood test, fecal immunochemical test and stool DNA testing. The use of capsule colonoscopy and open access colonoscopy was also encouraged. Blood-based tests like serum methylated septin 9 were also encouraged for screening of CRC during the pandemic. The presentation of CRC was also affected by the pandemic with more patients presenting with emergencies like obstruction and perforation. Stage migration was also observed during the pandemic with more patients presenting with more advanced tumors. The operative therapy of CRC was altered by the



pandemic as more emergency surgeries were done, which may require exteriorization by stoma. This was to reduce the morbidity associated with anastomosis and encourage early discharge from the hospital. There was also an initial reduction in laparoscopic surgical procedures due to the fear of aerosols and COVID-19 infection. As we gradually come out of the pandemic, we should remember the lessons learned and continue to apply them even after the pandemic passes.

**Key Words:** COVID-19 pandemic; Colorectal cancer; Screening; Surveillance; Stage upgrading; Elective surgery; Emergency surgery

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**Core Tip:** Management and screening of colorectal cancer was severely affected by the changes implemented during the coronavirus disease 2019 (COVID-19) pandemic. These approaches resulted in delayed elective presentation, increased emergency presentation, reduced screening and delayed definitive therapy. Though the management of colorectal cancer did not adversely change during the pandemic, modifications of existing guidelines were proposed to minimize the risk of COVID-19 spread while not compromising oncological care and outcome. This review was conducted to analyze the impact of the COVID-19 pandemic on the management of colorectal cancer and to identify the changes made to adapt to the COVID-19 pandemic.

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## INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has altered the lives of people around the world, with a significant death toll in addition to global social, political and economic impact. The rapid spread of the virus has overwhelmed the global healthcare system capacity and impacted the management of patients with cancer and other chronic diseases[1,2]. It was declared a pandemic by the World Health Organization (WHO) in March 2020. Though the case fatality rate was reported as 2.2% in December 2020, there were 509 million infections reported globally with 6.23 million deaths across the globe according to the WHO COVID-19 dashboard as of April 27, 2022[3].

In response to the pandemic, there were global policy decisions like lockdown and stay at home orders that were aimed at preventing the spread of the virus. Unfortunately, these decisions resulted in the inability of patients with chronic diseases to access healthcare[4-6]. There was also redistribution of both human and material resources in the hospital setting to tackle the pandemic. This resulted in suspension or drastic reduction of all non-essential services, cancer care inclusive. The suspension of non-essential services was also aimed at preventing hospital acquired COVID-19 infections among patients presenting to the hospital[4-9].

Epidemiologically, colorectal cancer (CRC) is the third most common cancer in men and second in women. CRC is also the third most common cause of cancer-related deaths across the globe[10]. A malignancy of such incidence and mortality significance, with projected worldwide incidence of 2.5 million new cases by 2030[11,12], should be managed without much delay even in the face of a pandemic. But, management of CRC was severely affected by the changes implemented during the pandemic, and this resulted in delayed elective presentation, increased emergency presentation, reduced screening and delayed definitive therapy[6,8,13-18].

This review was conducted to analyze the impact of the COVID-19 pandemic on management of colon and rectal cancers and to identify the changes made in order to adapt to the pandemic.

## METHODS

A literature search was conducted by three independent researchers. The keywords used for the search were "Colorectal cancer," "Elective surgery," "Emergency surgery," "Stage upgrading," "Screening," "Surveillance" and "COVID-19 pandemic." The keywords were combined using Boolean logic, and the search was conducted in PubMed, Medline, Index Medicus, EMBASE, Scopus, *Reference Citation Analysis* (<https://www.referencecitationanalysis.com/>) and Google Scholar. Only studies published in English



were included. Related articles and reference list were also searched manually to avoid omission. The titles of the studies were screened, and the abstracts were evaluated for inclusion. Only full, original articles written in English were selected. National, regional and international guidelines were also included in the review. Owing to the nature of studies, low in volume and mostly retrospective or reviews, the authors opted to present a narrative review format rather than systematic review and meta-analysis.

## SCREENING AND SURVEILLANCE FOR COLORECTAL CANCER

Screening is aimed at detecting colon and/or rectal cancers before the appearance of clinical sign and symptoms[19,20].

### **Screening before the COVID-19 pandemic**

The recommended screening timeline depends on the risk level of the patients[7,20-25]. For people with no risk factors, screening starts at age 50-years-old. People with a close relative (parent or sibling) with colorectal cancer or polyps will start screening at age 40-years-old or at 10 years before the youngest age at which a relative was diagnosed[7,20-27]. These patients will often undergo screening every 5 years, even if their test is normal. Less common types of inherited colon cancer (hereditary non-polyposis colon cancer and familial adenomatous polyposis) may require more frequent screening, beginning at a much earlier age[7,20-27]. There are various methods of screening as described below.

**Fecal-based tests:** Most precancerous lesions bleed intermittently. So detection of occult blood in the feces may herald the presence of a lesion in the colon or rectum[28-30]. Currently, three types of stool tests are approved for screening of colorectal cancer.

**Guaiaec fecal occult blood test:** Guaiaec fecal occult blood test uses a chemical to detect heme, a component of the blood protein hemoglobin. Because guaiaec fecal occult blood test can also detect heme in some foods (for example, red meat), people must avoid certain foods before having this test. It is supposed to be repeated annually[6,8,13,15,28-30].

**Fecal immunochemical (or immunohistochemical) test:** Fecal immunochemical (or immunohistochemical) test (FIT), also known as immunochemical fecal occult blood test uses antibodies to detect hemoglobin protein specifically. Dietary restrictions are typically not required for FIT. It is more sensitive than guaiaec based tests, and it should also be repeated annually[6,8,13,15,28-31].

**Multitargeted stool DNA testing:** Multitargeted stool DNA testing (also known as FIT-DNA) detects hemoglobin, along with certain DNA biomarkers. The DNA comes from cells in the lining of the colon and rectum that are shed and collect in stool as it passes through the large intestine and rectum. It should be repeated every 3 years[6,8,13,15,20,28-30,32,33].

**Blood-based tests:** A blood-based test assessing methylated septin 9 has been approved for CRC screening in individuals who refuse other CRC screening methods[34-38]. Initial studies reported a sensitivity of 48% for CRC detection and 11% for advanced adenoma detection. However, with enhancements in the test assay, a sensitivity of 62% and a specificity of 90% has been reported[34-38].

Carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 have been investigated as a blood-based screening test for CRC, but their sensitivity and specificity were low, and they were not considered appropriate as screening tools[39-41]. The sensitivity of CEA was 65%-74%, while that of carbohydrate antigen 19-9 was 26%-48%. There were attempts to combine the two biomarkers for screening of CRC, but the evidence was not sufficient for guideline related recommendations[39-42].

**Direct visualization tests:** Direct visualization of the large bowel can also be utilized as a screening test. Flexible sigmoidoscopy allows direct evaluation of the left side of the colon. If adenomas are found, referral for a colonoscopy is required. It should be repeated every 5 years[20,23,43]. Colonoscopy is a screening, diagnostic and therapeutic procedure. It can detect cancers and precursor polyps. It is repeated every 10 years[20,23,43]. Capsule colonoscopy is a painless procedure using a pill camera to view the entire colon and rectum [27,44]. Computed tomography colonography has been shown to have comparable sensitivity and specificity as colonoscopy but lacks the tissue sampling advantage of the colonoscopy[20,23,43].

### **Screening during the COVID-19 pandemic**

At the onset of the pandemic, the policies aimed at reducing the spread of the virus also resulted in decreased access to screening for CRC. This was the direct result of decreased referrals from general practitioners, cessation of most aerosol generating procedures (colonoscopy inclusive) and redistribution of healthcare personnel to tackle the emergencies[7,9,10,21-25,45,46]. This has resulted in delays at scheduled access to CRC screening. Estimation models suggest that a moderate 7-12 mo screening delay will cause a significant increase in advanced cancers at detection (from 26% to 29%). This may be

increased up to 33% in case of more than 12 mo delay[7,9,10,21-25,45-49].

In an effort to mitigate this, some modification for the screening protocol was proposed. Shaukat *et al* [43,50] proposed the use of FIT as a screening tool and reservation colonoscopy only for those in which FIT is positive. Fecal immunochemical test is a good option as it is noninvasive, non-aerosol generating and can be performed at home. The use of FIT-DNA was proposed by Kadakuntla *et al*[25]. It has similar advantages to FIT with the added advantage of increased sensitivity to CRC and precancerous lesions.

Sulbaran *et al*[27] proposed the use of capsule colonoscopy as a screening tool during the COVID-19 pandemic. They found that the diagnostic performance of capsule colonoscopy was similar to that of conventional colonoscopy. However, the lack of the ability to biopsy the detected lesion is a disadvantage.

One of the challenges faced with the use of colonoscopy as a screening tool is the need for preprocedural evaluation by a specialist. This may require multiple hospital visits and may expose the patient to the risk of COVID-19 infection. To reduce this risk, open access colonoscopy was proposed as a screening tool[25,51,52]. This is a service that allows patients to schedule colonoscopies without a preprocedure evaluation by a gastroenterologist. It is a viable solution for addressing the delay in colonoscopy screening, as it allows for navigating the reallocation of gastrointestinal services in the setting of COVID-19. It is convenient for the patient and hospital as it allows patients to bypass a preprocedural specialist visit[25,51,52]. Because of variation in availability of the screening tools mentioned vis a vis the difference in economic situations in different countries, there is a need for clinicians in different countries to individualize the screening tools during the pandemic focusing on the ones readily available in their practice.

### **Surveillance before the COVID-19 pandemic**

People who have precancerous polyps completely removed should have a colonoscopy every 3 years to 5 years, depending on the size, type and number of polyps found. The exam interval will usually depend upon the type of the growth removed. If a polyp is not completely removed by colonoscopy or surgery, another colonoscopy should be done in 3 to 6 mo[20,53].

Most colorectal cancer patients should have a colonoscopy within 1 year of the removal of the cancer. If the whole colon could not be examined prior to surgery, then colonoscopy should be done within 3 mo to 6 mo. If this colonoscopy is normal, then colonoscopy should be done every 3 years to 5 years. Serum CEA can also be used for post treatment surveillance to detect early recurrence[20,53,54]. Patients with ulcerative colitis or Crohn's disease for 8 or more years should have a colonoscopy with multiple biopsies every 1 year to 2 years[20,53,54].

### **Surveillance during the COVID-19 pandemic**

The association of COVID-19 infection with elevation resulted in unreliability of the biomarker for surveillance of CRC during the COVID-19 pandemic. Social distancing and lockdown measures made access to colonoscopy difficult during the pandemic, and the use of open access colonoscopy and capsule colonoscopy in surveillance of CRC was encouraged[25,27,33,50,55].

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## **CLINICAL PRESENTATION OF COLORECTAL CANCER**

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### **Clinical presentation before the COVID-19 pandemic**

Initial symptoms experienced by patients are mostly not specific to CRC. The main symptoms detected in the majority of symptomatic patients are change in bowel habit, hematochezia, rectal fullness and abdominal pain[46,56-59]. Some advanced CRC patients can present as an emergency with intestinal obstruction or peritonitis from perforation of the tumor with no prior symptoms suggestive of CRC. This presentation creates a need for emergency surgery with quite high rates of mortality and morbidity. Emergency presentation is reported to occur in about 20%-30% of CRC with most of these emergencies presenting as acute on chronic intestinal obstruction[46,56-61].

Moghadamyeghaneh *et al*[18] reported that the stage of CRC at presentation depends on the age of the patients, with younger patients having more advanced disease. However, about 21.3% of patients present in stage I, 29.4% present in stage II, 31.7% present in stage III, while 17.6% of patients present in stage IV.

### **Clinical presentation during the COVID-19 pandemic**

The clinical presentation was significantly affected by COVID-19. Meijer *et al*[62] reported a reduction of patients presenting with stage I and stage II CRC from 29.5% and 26.6% to 20.0% and 25.5%, respectively, after the onset of COVID-19 pandemic. They also noticed an increase of patients with stage III and stage IV from 22.2% and 19.0% to 26.8% and 26.2%, respectively[16,62]. These changes were attributed to the delays in screening and diagnosis of CRC that was caused by the COVID-19 pandemic [17,55,62]. The mode of presentation was also affected by the pandemic as Shinkwin *et al*[59] reported an increase in emergency presentation from 28.6% to 36.0%. The increased emergency presentation was

also associated with increased morbidity and mortality[14,16,18,62].

## DIAGNOSIS OF COLORECTAL CANCER

In symptomatic patients or patients who have positive screening results, further work-up is needed to diagnose, stage and plan the treatment. Colonoscopy remains the gold standard for the initial assessment and tissue diagnosis of CRC because it has the highest sensitivity and specificity while also offering the possibility of histopathological diagnosis[63,64]. It is therefore the initial step in the diagnosis of CRC. The entire colon should be assessed, and in cases where this is not possible due to obstruction it is recommended that it should be done within 3-6 mo of intervention to relieve the obstruction[63,64]. Computed tomography of the pelvis, abdomen and chest is also needed to stage the disease by assessment of locoregional and distant metastasis[63,64].

For rectal cancer, magnetic resonance imaging (MRI) of the pelvis is also needed to better characterize the T stage and locoregional extent of the disease[63-65]. Endoscopic rectal ultrasound, though superior to pelvic MRI in assessment of T stage, does not assess the disease relationship to the pelvic wall and adjacent organ invasion. Combined with limited availability and expertise required for endoscopic rectal ultrasound, MRI has become the preferred modality in assessing the rectum cancer. Positron emission tomography scan, though useful in assessment of disease recurrence, has no role in initial assessment and diagnosis of colorectal cancer[63-65].

The pandemic forced clinicians to make some modification like skipping endoscopic rectal ultrasound due to its invasive nature and increased risk for COVID-19 infection[40,55,62-66]. CEA levels should also be measured at presentation for adjunct diagnostic, prognostic and follow-up purposes.

## MANAGEMENT OF COLORECTAL CANCER

### *Management of colorectal cancer before the COVID-19 pandemic*

The management of CRC is multidisciplinary involving surgery, radiotherapy, chemotherapy, targeted therapy and even immunotherapy in selected cases[65]. Despite the histopathologic similarities of the CRC, there is a significant difference in the management approaches between colon and rectal cancers. Radiotherapy that forms a crucial component of rectal cancer has little relevance in colon cancer, whereas neoadjuvant therapy that is also a component of stage II or III rectal cancer is generally not indicated in colon cancer[63,65-67].

**Endoscopic approach:** There is an increase in the diagnosis of lesions at this stage with improved and guided screening of CRC. For early T1 lesions, even with submucosal involvement, advances in endoscopic interventions mean these lesions can be adequately treated with polypectomy, endoscopic mucosal or submucosal resections[68-70]. Endoscopic mucosal resections and endoscopic submucosal resections are indicated in lesions with suspicious characteristics based on mucosal pit patterns, polyp morphology and other endoscopic aspects of colorectal cancers[68-70]. These procedures are both safe and less expensive than surgery[68-70]. In most of these cases histopathological assessment reveals adequate margins, and no further management is needed[68-70]. Close, guideline-based surveillance using the aforementioned screening tools is required.

Endoscopic stenting can also be used to alleviate obstruction symptoms especially in left colon and rectosigmoid tumors. However, the decision for stenting should be multidisciplinary as stenting can limit the later use of targeted therapy such as anti-vascular endothelial growth factor due to the risk of perforation[65].

**Surgical treatment:** Surgery remains the cornerstone of curative intent CRC treatment. It is the definitive curative option for all stage I, II and III CRC and for stage IV disease where indicated either as palliative or curative intent after systemic therapy[63,65].

The surgery can be performed open, laparoscopic or by use of robotic surgery. The surgical procedure performed must be anatomical, oncologically sound and ensure an R0 resection with safe margins. Total mesocolic or mesorectal excisions are now well-defined procedures that guarantee safety of margins (proximal, distal or radial) and adequate lymphadenectomy to further histopathologically stage the disease or achieve better survival outcomes[71,72].

The surgical procedures done for colorectal cancers are right hemicolectomy, left hemicolectomy, anterior and low anterior resections and abdominoperineal resections. Transverse colectomy, though a viable option for transverse colon tumors, poses the risk of inadequate oncologically sound resection due to the nature of the vascular supply to the transverse colon. Therefore, some surgeons advocate for extended left or right colectomy in the management of transverse colon tumors[65,71,72].

Lymphadenectomy, the extent and number of nodes dissected or positive, is an important factor in staging and prognostication of cancer. When done properly, total mesocolic or mesorectal excision ensures adequate nodal dissection but extensive node dissection has not been shown to confer any

oncological benefit while posing increased morbidity risks[65,71,72].

For the subset of emergency cases, either obstruction or perforation, surgery is needed to address the emergency and treat the cancer in certain cases. The emergency procedures range from diversion colostomy for advanced disease to Hartmann procedure or resection with anastomosis in resectable disease. The choice of the procedure is guided by the stage of the disease, extent of the complication and the hemodynamic status of the patient[63,65,71-73].

For patients who received neoadjuvant chemoradiation, the timing to surgery is generally 8-10 wk in order to maximize the benefits of chemoradiation and reduce postoperative morbidity[65].

**Radiotherapy:** Benefits of preoperative radiotherapy in reducing local recurrence of rectal cancer have been proven by several studies[74,75]. The clinical stage of the disease and the quality of the subsequent surgery play an important role in augmenting the benefits of radiotherapy in local disease control. Proper MRI staging to maximize radiotherapy benefits and oncologically sound surgical procedure cannot be over emphasized[74,75].

In rectal cancer, long course chemoradiation with fluoropyrimidine-based chemotherapy as radiation sensitizer is the mainstay of stage II and III disease management. This regimen achieves downsizing in most patients and complete response in 15%-20% of cases. There is also the option of short radiotherapy sessions (5 × 5 gray) followed by surgery either immediately or after a 4-8 wk delay to maximize the downsizing effect or to assess the nature of the disease in that window[74,76].

In cases of complete clinical response, watch and wait has been proposed as an alternative in a subset of patients but with close surveillance. Though there are worries of oncological safety of such an approach, there is data that supports the strategy in a subset of patients with sustained complete oncological response[65].

Driven by surgical complexity, morbidity and sometimes the life-altering nature of surgery for rectal cancer, there is a trend towards application of radiotherapy for early rectal cancer as an alternative to surgery. The approach has been shown to achieve 50%-60% rectal preservation but poses the problem of overtreatment for the patients who ultimately require rectal surgery[29,77,78].

**Systemic chemotherapy:** Fluoropyrimidine-based adjuvant chemotherapy has been shown to improve survival in stage III and high risk stage II patients[65]. The subset of stage II colon cancer patients who benefit from adjuvant therapy are T4 lesions, presence of perforation or obstruction, poor differentiation features, presence of lymphovascular invasion and where less than 12 lymph nodes were harvested[57, 63,65,79]. In addition to the cytotoxic agents, biologics such as anti-vascular endothelial growth factor and anti-epidermal growth factor receptor, targeted immunotherapy and novel salvage therapy drugs such as regorafenib are currently in use as adjuvant alternative[65].

Tumor characteristics, such as microsatellite instability, RAS and RAF mutations and BRAF-V600E, do not only have prognostic value but guide the need and choice of the chemotherapy agent[65]. Therefore, targeted therapy of biologics such as anti-vascular endothelial growth factor bevacizumab are added to the fluoropyrimidine-based adjuvant therapy where indicated based of the tumor-specific mutations and patient factors[65].

There are certain specific features of the disease to consider such as proven inefficiency of fluoropyrimidines in high microsatellite instability disease and lack of benefit in anti-epidermal growth factor receptor use for right-sided colon cancers. Venook *et al*[80] showed a staggering significant difference in survival benefits of 16.4 mo for right-sided against 37.5 mo for the left-sided tumor location in the use of cetuximab in patients with metastatic colorectal cancer. The duration of chemotherapy for colorectal cancer has traditionally been 6 mo. However, International Duration Evaluation of Adjuvant Chemotherapy Collaboration, drawing on six randomized phase 3 trials, showed that limiting the adjuvant period to 3 mo does not impair the efficacy of the treatment and reduces the cumulative toxicity, especially for non-T4, non-N2 stage III cancers[81].

For rectal cancer, systemic therapy is a component of the neoadjuvant concurrent chemoradiotherapy and as adjuvant therapy but with an emerging trend towards total neoadjuvant therapy for rectal cancer [65].

Systemic therapy is also the mainstay for metastatic stage IV colorectal cancer, both for treatment intent and symptom palliation. Locoregional therapy for oligometastatic disease can be added to the systemic therapy to improve survival and success of surgical intervention[65].

### **Management of colorectal cancer during the COVID-19 pandemic**

The general management of diagnosed and staged CRC has not changed much during the pandemic. However, modifications based on existing trends have been proposed to minimize risk of COVID-19 spread.

**Endoscopic procedure:** During the COVID-19 pandemic restrictions there were a significant drop in elective procedures such as screening and diagnostic colonoscopies. Some studies reported a 50% drop in screening and diagnostic colonoscopy procedures[9,10,21,24,45,47,49,82]. This translates to a considerable drop in early diagnosis and endoscopic procedure for T1 lesions amenable to endoscopic resections such as polypectomy, endoscopic mucosal resections or endoscopic submucosal dissection[9, 10,21,24,45,47,49,82].



However, where diagnosis has been made these procedures should be done as they avert need for more invasive surgery but with risk analysis as endoscopic intervention fall under the “medium priority” subset as per the European Society for Medical Oncology guide modification for the pandemic by Vecchione *et al*[83].

**Surgical management:** Surgery is a major therapeutic option with proven survival benefit in early CRC. Surgery is the only definitive treatment available for emergency presentation such as perforation or obstruction. Surgery for high-risk cases such as perforation or obstruction should not be postponed even during the pandemic. However, to reduce risk of infection and time-sensitive morbidities, acceptable procedures such as Hartmann procedures or diversion colostomies should be preferred[9,10,17,21,45,46,48,55,58,62,67,84-86].

Elective surgery for the procedure is classified as medium priority and can be postponed but not beyond 6 wk due to the risk of cancer progression and impact of survival. Reconstructive procedures such as ostomy reversal are low priority and can wait until such time when appropriate. Prophylactic colon resections for familial syndromes can also be postponed as they are low priority[9,10,17,21,45,46,48,55,58,62,67,84-86].

For patients who with complete clinical response after neoadjuvant therapy watch and wait approach can be adopted for all patients to avoid the risk of infection and postoperative morbidities[9,10,17,21,45,46,48,55,58,62,67,84-86].

The clinician should bear in mind that the delays of surgical procedures might induce psychological distress and may necessitate the need for psychological support *via* telemedicine[83].

**Radiotherapy:** Radiotherapy is a vital component of neoadjuvant chemoradiation for rectal cancer as it helps reduce the risk of disease recurrence especially in patients where the radial margin is threatened. In stage II and III patients, though not indicated in all, short-term radiotherapy (5 × 5 gray) should be considered in all during the pandemic. The response can then be assessed at 8 wk with a chance to extend the waiting period to 12-16 wk if there is a good response. The total neoadjuvant treatment approach will work well in the pandemic era as the length of the treatment and the subsequent assessment period gives the patients and team without compromising on the oncological outcomes[87].

**Systemic chemotherapy:** Because chemoradiation poses the increased risk of infection and related complications due to immunosuppression, measures such as use of oral capecitabine for microsatellite stable stage III and high-risk stage II disease can help mitigate the risks compared to stage IV 5-fluorouracil that requires hospitalization[10]. Since 5-fluorouracil has been shown to be ineffective or even detrimental in high microsatellite instability CRC, microsatellite instability testing should be recommended to avoid ineffective administration therapy, potential side effects and unnecessary exposure to the risk of COVID-19 infection[10].

To minimize the risk of infection due to prolonged immunosuppression caused by standard 6 mo therapy, the non-inferior 3 mo option can be universally adopted especially for a subgroup of patients (stage II and low-risk stage III)[81].

Using chemoradiotherapy where it has been shown to have absolute benefit, dose adjustments and prophylactic granulocyte colony-stimulating factor to reduce grade 3-4 toxicities that require hospitalizations are some of the measures that reduce the risk of exposure and severe COVID-19 disease for the patients[10].

### **Treatment of colorectal cancer emergencies during the COVID-19 pandemic**

A significant number of patients may require emergency intervention for emergency presentations such as obstruction and perforation. Such patients tend to be older with more advanced tumors[73]. These factors contribute to prolonged recovery time and a relatively poor prognosis. The main aim of treatment is to minimize trauma to the patients, reduce hospital stay and to prevent COVID-19 infection. Respiratory screening should be done before surgery to rule out COVID-19 infection[9,73,79,82,88]. Endoscopic colonic stenting using self-expanding metallic stents should first be attempted in patients with obstruction. A successful endoscopic colonic stenting relieves obstruction, which in turn allows commencement of neoadjuvant chemotherapy that may downstage the tumor[9,73,79,82,88]. In patients with low rectal tumor, stenting should be avoided as it may cause incontinence and tenesmus[9].

Operative treatment is still required for patients with intestinal obstruction refractory to endoscopic therapy and for patients with malignant bowel perforation with peritonitis. The main aim of the operative treatment is to resolve the emergency situation. This can be achieved by creating a stoma and diverting fecal flow[66]. Definitive therapy has been associated with prolonged hospital stay and increased risk of COVID-19 infection. However, Ren *et al*[9], recommended definitive surgery in selected patients.

In patients with perforation and peritonitis, irrigation of the peritoneal cavity and limited segmental resection of the perforated segment and proximal stoma are recommended[66]. Laparoscopic approach to surgical intervention has been encouraged by some surgeons as this is associated with less surgical trauma and encourages early discharge[9]. However, at the initial stage of the pandemic, there was reduction in laparoscopy given the uncertainty of airborne and aerosol transmission risks[89,90].

Emergency surgeries should be performed in the designated hospital and operated in a negative pressure (-5 Pa) operating room. The team members should use enhanced protection including wearing medical cups, N95 or higher-level respirators, medical coverall, eye shield, surgical latex gloves, disposable operating coat, protective hood, waterproof shoe covers and disposable shoe covers[89-93]. Anesthesiologists should wear an additional disposable medical face shield as a protection from coughed droplets during trachea intubation and extubating. Treatment meticulous dissection is advised to reduce splash of bodily fluids during surgery[89-92].

## CONCLUSION

The COVID-19 pandemic was a reminder of how adaptable we really are. The adaptability was due to our ability to quickly learn the nature of the disease and to quickly modify our practice to reduce its spread. While we are coming out of the COVID-19 pandemic, there is a need to remember the lessons learned.

### *The need for disaster plan*

Hospitals should have a detailed disaster plan that includes the following[94,95]: What areas of the hospital to expand to and in what order; how to increase the ability to care for incoming patients; and how to gain immediate access to additional staff.

### *Expedited publication of research*

Research during the COVID-19 pandemic have been disseminated promptly, with many researchers using the medrxiv and bioRxiv preprint servers to publish their work. With increased publication comes increased collaboration among different groups aimed at finding an appropriate solution to the pandemic and to see how best to treat chronic diseases not relating to the COVID-19 pandemic[94,95].

### *Telemedicine and role of artificial intelligence*

The pandemic has proven that digital health can be an integrated part of public health[96,97]. This was obvious when social distancing became a requirement. Artificial intelligence helped in combatting COVID-19 and other diseases like CRC. Artificial intelligence has been a very important tool in screening, diagnosing and treating CRC. Telemedicine has played a critical role in the management of CRC during the COVID-19 pandemic. It ensured continuous access to healthcare by the patients, it reduced exposure for staff and patients, it ensured preservation of personal protective equipment, and it reduced demand on facilities[96,97].

### *Stage migration may occur in delay of screening procedures*

With the documented reductions in screening measures and treatment delays occasioned by COVID-19 measures, the medical community should anticipate a general shift in colorectal cancer stage, a negative impact on survival and recurrence of the disease[10,16,48,49,55,58,91,92]. Therefore, there will need to be vigilant and aggressive in screening and prioritizing oncology patients as the world gears towards post pandemic normalization of the health systems albeit some reported surges in COVID-19 cases, especially in Southeast Asia[10,16,48,49,55,58,91,92].

### *Increased use of neoadjuvant therapy*

Due to the aerosol generating nature of surgical procedures, there was an increased use of neoadjuvant therapy especially in tumors that showed significant clinical response. The impact of this increased use on prognosis needs to be assessed over time.

## FOOTNOTES

**Author contributions:** Akbulut S, Hargura AS, Garzali IU and Aloun A performed the majority of the manuscript writing and prepared the figures; Hargura AS and Garzali IU performed data acquisition and manuscript writing; Hargura AS, Garzali IU and Aloun A provided input for writing the paper; Akbulut S and Colak C designed the outline and coordinated the writing of the paper.

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