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Original Research Article

## Impact of COVID-19 pandemic on treatment of colorectal cancer patients

Doua Elamin<sup>a</sup>, Ilker Ozgur<sup>a</sup>, Scott R. Steele<sup>a</sup>, Alok A. Khorana<sup>b</sup>, Xue Jia<sup>c</sup>, Emre Gorgun<sup>a,\*</sup><sup>a</sup> Department of Colorectal Surgery, Digestive Disease and Surgery Institute, Cleveland Clinic, Cleveland, OH, USA<sup>b</sup> Hematology and Medical Oncology, Taussig Cancer Center, Cleveland Clinic, Cleveland, OH, USA<sup>c</sup> Quantitative Health Sciences, Lerner Research Institute, Cleveland Clinic, USA

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## ABSTRACT

**Background:** Modifications to practice during COVID pandemic impacted health maintenance and treatment of cancer patients.**Methods:** We conducted a retrospective cohort study of all consecutive patients presenting to our institution with a new diagnosis of colorectal cancer pre-COVID (January 2017 to December 2019) and post-COVID (January to December 2020).**Results:** The total number of patients with a new diagnosis of CRC was 2196. The pre-COVID period had 1891 patients whereas post-COVID period had 305. The median number of patients diagnosed with CRC per month was 50 and 35.5 pre and post-COVID, respectively. Time to treatment initiation was similar with no difference in stage at presentation for the pre and post-COVID periods.**Conclusion:** There was a significant decrease in colorectal cancer diagnosis number and rate ( $p < 0.01$ ) during the COVID era with no difference in staging at diagnosis or time to treatment initiation.

## 1. Introduction

Colorectal Cancer is the third most common cancer diagnosed annually in the United States.<sup>1</sup> Screening for colorectal cancer via colonoscopy is recommended by the US Preventive Services Taskforce for adults starting at age 45.

Screening is a tool to decrease cancer incidence and doing so with colonoscopy requires access to healthcare facilities. This was not easily available as of early 2020 when COVID was declared a pandemic. People scarcely left their homes and therefore many medical complaints were delayed, and screenings postponed. Constraints provided healthcare institutions more capacity to prioritize COVID-positive patients, often with primary respiratory issues, while deprioritizing routine checkups or screening in effort to maintain safety at a time where protective wear and equipment were scarce.

Overall, an 86% decline in colorectal screening was observed in the USA from the previous average in January 2020.<sup>2</sup> The restriction in hospital visits translated to postponing patient diagnosis and delaying treatment modalities including chemotherapy, radiotherapy, and surgery. This delay was a concern for potential harm, as even a 4-week

delay in time to adjuvant chemotherapy has been associated with a significant decrease in overall and disease-free survival.<sup>3</sup>

To combat any apprehension regarding cancer surgery, the American College of Surgeons recommended that institutions with Tumor Board settings may find it helpful to virtually gather their multi-disciplinary experts to consider individual cases or for institutions with high case volumes to establish triage criteria based on local circumstances, COVID prevalence and/or the availability of alternative, non-surgical therapies.<sup>4</sup>

Our aim is to assess the impact of these changes on the number of cases diagnosed with colorectal cancer as well as the effect on time to treatment initiation (TTI). We hypothesized that a change occurred in the number of new cases diagnosed with colorectal cancer with a resultant increase in TTI for patients diagnosed in the COVID era.

## 2. Materials and methods

This study was approved by our local institutional review board. A retrospective chart review from January 2017 to December 2020 was performed for patients with new diagnosis of colorectal cancer (CRC)

**Abbreviations:** CRC, Colorectal Cancer; TTI, Time To Treatment Initiation.

\* Corresponding author. Colorectal Surgical Oncology, Department of Colorectal Surgery, Krause-Lieberman Chair in Laparoscopic Colorectal Surgery, Digestive Disease and Surgery Institute, 9500 Euclid Avenue, Cleveland Clinic, Cleveland, OH, 44195, USA.

E-mail address: [gorgune@ccf.org](mailto:gorgune@ccf.org) (E. Gorgun).

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managed in Cleveland Clinic main campus. We divided this period to pre-COVID versus post-COVID from January 2017 to December 2019 and January 2020 to December 2020 respectively.

The study compared number of patients diagnosed with CRC as well as their time to treatment initiation. These were patients treated in Cleveland Clinic Main campus after diagnosis of CRC via colonoscopy in any of the Cleveland Clinic facilities or other non-affiliated referring hospitals. Colonoscopies were performed by surgeons and/or gastroenterologists. For all included patients, we also looked at demographics, facility of diagnosis, cancer stage, surgery type, use of chemotherapy and/or radiotherapy.

A scatter plot of the time series with linear smooth was used to identify the underlying trend of number of diagnosed CRC pre and post-COVID. A Poisson regression model for the number of diagnosed CRC per month was used to test the impact of COVID on number of diagnosed CRC, time (month) elapsed since diagnosis and COVID period (Pre vs. Post) were included in the model as independent variables. The interaction between the two terms was also added to check the slope change following COVID. A quasipoisson model was also applied to correct the estimation of the standard errors.

Staging information at diagnosis was reviewed across both time periods. Staging that was marked as missing, unknown, not applicable, or stage 0 was excluded. All other stages were summarized based on their numeric value. All factors were summarized using frequencies and percentages. Comparisons of staging among numerically coded stages were performed using the Wilcoxon rank sum tests.

All demographic and clinical data were presented as mean (standard deviation), median [25th, 75th percentiles] or frequency (percent). The *t*-test or non-parametric Wilcoxon rank sum tests was used for continuous factors and chi-square test, or Fisher exact test was used to compare categorical variables between COVID era (pre vs. post) groups. All comparisons were made at a significance level of 0.05, and all analyses were performed with R version 4.0.2.

### 3. Results

The number of patients with a new diagnosis of CRC between January 2017 and December 2020 was 2196, of which 1891 were diagnosed in the pre-COVID period and 305 were diagnosed post-COVID. The number of colonoscopies pre-COVID from January 2017 to December 2019 was 20719 which averages to 6906 cases per year. Post-COVID, the cases were 5279 in the year 2020.

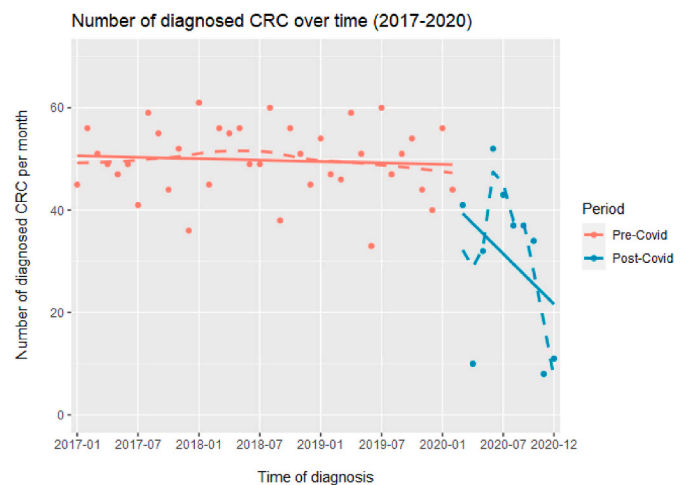
The median number of patients diagnosed with CRC per month was 50 (45–55.8) and 35.5 (16.2–40) pre and post-COVID, respectively ( $p < 0.001$ ) (Table 1). Fig. 1 shows a stable trend in number of patients diagnosed with CRC pre-COVID with a drop at the beginning of March 2020 followed by a decreased trend. Poisson model suggests that there is very strong evidence of a reduction in number of diagnosed CRC in the post-COVID era, with a decrease of 36% in incidence rate ratio (IRR) [0.64; 95% confidence interval (CI) 0.5–0.81;  $P = 0.001$ ].

Of those patients diagnosed with CRC, 94% across both time periods had staging information and when compared, no difference was found between staging in pre and post-COVID periods (Table 2).

Time to treatment initiation, defined as the time from pathology confirmed diagnosis of colorectal cancer to start date of first planned treatment modality, was similar pre (43.0 days) and post-COVID (42.0 days) ( $p = 0.259$ ).

**Table 1**  
Number of diagnosed CRC per month before and after COVID.

	All	Pre-COVID	Post-COVID	p	N
	N = 48	N = 38	N = 10		
Number of diagnosed CRC per month	48.0 [41.0; 54.2]	50.0 [45.0; 55.8]	35.5 [16.2; 40.0]	<0.001	48



**Fig. 1.** Number of diagnosed CRC cases pre and post COVID.

**Table 2**  
Colorectal cancer staging at diagnosis.

Characteristic	N	Overall <sup>a</sup>	Pre-COVID	Post-COVID	p-value <sup>b</sup>
Clinical/Pathologic Staging, n (%)	2066				0.48
1	381 (18)	331 (19)	50 (18)		
2	479 (23)	403 (23)	76 (27)		
3	764 (37)	664 (37)	100 (35)		
4	442 (21)	385 (22)	57 (20)		

<sup>a</sup> n (%).

<sup>b</sup> Wilcoxon rank sum test.

Overall, 1112 (50.6%) patients received adjuvant therapy, 48 were from post-COVID period. The median time to adjuvant therapy was 43 and 42 days pre and post-COVID respectively indicating no significant change after the pandemic (Table 3).

### 4. Discussion

Health maintenance aids in early diagnosis of diseases. Colorectal cancer screening via colonoscopy decreases mortality by identifying cancers at an earlier and more treatable stage.<sup>5</sup> After the pandemic breakout, there has been a decrease in the overall number of newly diagnosed cancer patients in our institution (Fig. 1). The change in that period could be attributed to the restrictions put in place to limit the spread of COVID while providing care to those affected. This translated into a lower number of patients presenting for colonoscopies and hence, lower number of new CRC diagnosis. A study that used medical claims database found that at the peak of the pandemic in April 2020, screenings for breast, colon, prostate, and lung cancers were lower by 85%, 75%, 74%, and 56%, respectively<sup>6</sup>

**Table 3**  
CRC adjuvant therapy.

	All	Pre-Covid	Post-Covid	p	N
	N = 2196	N = 1891	N = 305		
Adjuvant therapy	1112 (50.6%)	964 (51.0%)	148 (48.5%)	0.463	2196
Time to adjuvant therapy (days)	43.0 [27.0; 64.0]	43.0 [27.0; 65.0]	42.0 [26.0; 62.0]	0.435	1112

In March 2020, the American College of Surgeons published a COVID-19 guideline to triage CRC patients. This considered the number of COVID patients, hospital resources and urgency for surgery while offering a roadmap to cases that needed to go to surgery, cases to be deferred and alternative treatment options when possible. Phase I is defined as the semi-urgent/preparation phase with only few COVID patients, hospital resources are not exhausted, and ICU ventilator capacity is still present. Phase II is an urgent setting where many COVID cases exist, ICU and ventilator capacities and OR supplies is limited. Phase III is when all hospital resources are towards COVID patients, no ventilator or ICU capacity are present and OR supplies are exhausted.

Throughout the pandemic, hospitals statuses fluctuated between the different phases described above depending on the number of positive COVID cases and matched hospital resources. To the general population, it meant that presenting to the hospital for screening colonoscopy was not common practice. Although our institution demonstrated the capability to continue screening, we can not comment on this being true for other referring facilities outside Cleveland Clinic system. We attributed the decrease in number of newly diagnosed CRC cases during the pandemic to a lower number of patient visits which matches international trend.

In our institution, we continued to perform all diagnostic and interventional colonoscopies such as management of non-malignant polyps/neoplasia. Cancer and emergency cases were performed with precaution. Elective cases were cancelled when hospital census was high as long as this was not causing immediate danger to patients from a medical standpoint.

Although the number of patients diagnosed with CRC decreased, this did not reflect as advanced staging at diagnosis.

We did not experience delays in treating patients. The time to start treatment after diagnosis of CRC, and that to receive adjuvant therapy was the same as pre-COVID period. Ideally, a short interval from symptoms to diagnosis is recommended with a benchmark of initiation of the first treatment within 6 weeks from diagnosis for 90% of patients.<sup>7</sup> The interval between surgery and adjuvant treatment should ideally be 4 to 6, but less than 12 weeks.<sup>8</sup> Our TTI was found to be within the recommended range both before and after the pandemic. This could be attributed to the fact that our institution is a referral hospital that continued to provide care during the pandemic with as little alteration to workflow as possible, yet in line with safety measures to patients and healthcare professionals alike.

Patients were seen from Cleveland Clinic facilities and referred from other institutions for care at a time when resources were scarce. Being able to provide similar care pre and post COVID is an advantage that we note could have positively influenced the similarity in TTI. To be able to maintain the level of operation, extra bed spaces were established early in the pandemic by converting nonclinical spaces to patient care.

## 5. Limitations

This study has two main limitations. First, colonoscopy indications

being diagnostic versus screening could not be identified and separated for the purpose of this study. This could have affected the urgency of colonoscopies and management planning. Second, this is a single institution study, and it would be useful to reproduce these results in other institutions for comparison.

## 6. Conclusion

Screening is a cornerstone in early detection and treatment of CRC. When ancillary services and care were sparse during the pandemic, rearrangement of resources and modifications of guidelines paved the way for safely resuming care. This should be mirrored when need of practice change occurs, whether temporary or long-term. We agree that elective colonoscopies could be delayed in such circumstances if deemed necessary, as our results confirm no change in staging in these intervals.

## Declaration of competing interest

All authors declare no conflicts of interest related to this publication.

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