Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

RESEARCH LETTER

Colonoscopy Following COVID-19 Delays in Procedures: Risk Stratification for Procedures Is Critical

In the wake of the coronavirus disease 2019 (COVID-19) pandemic, nonurgent procedures, including colonoscopy, were halted. Significant declines in colorectal cancer (CRC) screening were prominent and concerning. CRC screening volume declined by as much as 90% during early 2020.[1,2] COVID-19 significantly affected the incidence of new patient encounters for CRC in 2020, with studies citing reductions from 22% to 54%.[1,3] Declines in screening and diagnostic procedures were multifactorial, including patient hesitation to present to healthcare facilities, provider precautions, and administration policy changes.

Conservative modeling assessing the effects of COVID-19 on cancer screening has raised emerging concerns, including increased excess death and upstaging of disease through 2030.[4] In addition to expanding CRC screening modalities (ie, fecal immunochemical testing), shifting efforts to systematically scheduling patients at higher risk could be another essential mitigation strategy to address the likely increased rates of CRC after COVID-19 scheduling delays.[5] The St. Louis Veterans Affairs (VA) Medical Center utilized a risk stratification tool to aid in scheduling delayed endoscopy procedures with hopes to assign endoscopy resources adequately. We aimed to determine the CRC outcomes after implementing our risk stratification triaging system.

We conducted a single-center, retrospective cohort study within the St. Louis VA Medical Center. The COVID-19 pandemic prompted the St. Louis VA to implement an endoscopy triaging system. This event was used as an independent exposure to determine the association between the exposure, defined by 2 different periods, June 1, 2019 to August 31, 2019 (pre-COVID) and June 1, 2020 to August 31, 2020 (after COVID-related scheduling delays, referred to as COVID-delayed), and the odds of a pathology-confirmed CRC diagnosis. Patients aged 18 years or older who underwent a colonoscopy during each period were included. M.E.P. conducted a manual chart review. This study was exempted by the VA Institutional Review Board as a quality improvement initiative.

In March 2020, the St. Louis VA implemented a risk stratification tool to triage endoscopy during the COVID-19 pandemic. This stratification tool included patient risk factors and procedural urgency.[6] Scores greater than 3 were considered appropriate to defer, while patients with scores less than 3 were offered endoscopy scheduling (Table 1). Continuous variables were expressed as means ± standard deviations. Student's t-tests, or Mann Whitney U test when appropriate, were used to compare means. Categorical data were described as proportions. Analysis of variance, Chi-square test, and Fisher exact test, where necessary, were used to determine the unadjusted odds ratio with a 95% confidence interval (CI). A 2-sided *P*-value of $<.05$ was considered statistically significant. The analysis was conducted in SPSS, version 27.0 (IBM).

A total of 852 patients underwent colonoscopy during the pre-COVID era,

Table 1. Risk Stratification Tool for Endoscopy Scheduling During COVID-19

Patient Factors	Points
Age, y[a]	
<60	0
60–69	1
≥70	2
Comorbidity[b]	
No major comorbidity	0
Immunocompromised	1
Chronic lung disease	1
Chronic kidney disease, heart disease, cancer, hypertension, or diabetes	1
Procedure factors	
Screening	4
Low-risk surveillance (polyp, IBD, etc.)	4
Low-acuity diagnostic (eg, chronic abdominal pain, chronic diarrhea)	3
Moderate-acuity diagnostic (eg, FIT positive)	2
High-acuity diagnostic (eg, red-flag symptoms, abnormal imaging)	0
Therapeutic indication (eg, acute bleeding)	0
Endoscopy stratification	Total Score
Consider deferral of endoscopy	>3
Consider scheduling endoscopy	≤3

COVID-19, coronavirus disease 2019; FIT, fecal immunochemical testing; IBD, inflammatory bowel disease.
[a]Based on World Health Organization (WHO) reports of highest risk individuals,[6] individuals at highest risk for severe disease and death include people aged over 60 years and those with underlying conditions such as hypertension, diabetes, cardiovascular disease, chronic respiratory disease, and cancer….Case fatality rate (CFR) increases with age, with the highest mortality among people over 80 years of age (CFR, 21.9%).
[b]Based on the WHO reports of highest risk groups,[6] "Patients who reported no comorbid conditions had a CFR of 1.4%, patients with comorbid conditions had much higher rates: 13.2% for those with cardiovascular disease, 9.2% for diabetes, 8.4% for hypertension, 8.0% for chronic respiratory disease, and 7.6% for cancer."

and 245 patients underwent colonoscopy during the COVID-delayed era. The average pre-COVID age was 63.2 ± 10.5 years, and the average COVID-delayed age was 62.2 ± 12.6 years. The cohorts were similar in race and family history of CRC. Indication for endoscopy differed between pre-COVID and COVID-delayed cohorts, with 26.1% of the pre-COVID cohort undergoing diagnostic endoscopy compared to 85.3% in the COVID-delayed era. The mean number of days from referral to endoscopy differed between the cohorts and was significantly shorter in the COVID-delayed era (98.1 ± 124.0 days vs 48.0 ± 51.7 days; $P < .001$). Endoscopy timing for just diagnostic colonoscopy demonstrated the pre-COVID cohort still had a longer wait time to endoscopy than the COVID-delayed cohort (59.4 ± 87.4 days vs 44.2 ± 47.4 days; $P = .02$) (Table 2).

Table 2. Demographic and Clinical Characteristics

Patient factors	Pre-COVID[a] N = 852 N (%)	COVID-delayed[b] N = 245 N (%)
Age, y, mean (± SD)	63.2 (10.5)	62.2 (12.6)
Sex		
Male	767 (90.0)	222 (90.6)
Race		
White	543 (63.7)	154 (62.9)
Black	290 (34.0)	83 (33.9)
Other	19 (2.2)	8 (3.3)
Family history of colorectal cancer	79 (9.3)	22 (9.0)
Indication[c]		
Screening	250 (29.6)	3 (1.2)
Surveillance	380 (44.6)	33 (13.5)
Diagnostic	222 (26.1)	209 (85.3)
Days from referral to endoscopy, mean (± SD)[c]	98.1 (124.0)	48.0 (51.7)
Days from referral to diagnostic endoscopy, mean (± SD)[c]	59.4 (87.4)	44.2 (47.4)
Previous endoscopy[c]	693 (82.1)	177 (72.2)
Positive fecal immunochemical testing (FIT)[c]	41 (4.9)	39(15.9)
Colonoscopy finding		
Colorectal cancer[c]	8 (0.9)	9 (3.7)
Polyp	—	124 (50.6)
Colitis	—	3 (1.2)
Colorectal cancer stage		
Stage I	3 (37.5)	1 (11.1)
Stage II	3 (37.5)	3 (33.3)
Stage III	2 (25.0)	2 (22.2)
Stage IV	0	3 (33.3)

COVID-19, coronavirus disease 2019; FIT, fecal immunochemical testing; SD, standard deviation.
[a]Pre-COVID: All St. Louis VA, colonoscopy data from June 2019.
[b]COVID-delayed: All St. Louis VA, colonoscopy data from June 2020 after COVID-related delays in procedures.
[c]Statistically significant difference between the pre-COVID and COVID-delayed groups.

Of the 852 pre-COVID endoscopy patients, 8 (0.9%) were found to have CRC. In comparison, 9 (3.7%) of the 245 COVID-delayed patients were found to have CRC. When assessing the odds of CRC for all indications, CRC appeared to be 4.02 (95% CI = 1.54–10.54) times higher following COVID-related delays. Yet, when assessing only diagnostic colonoscopies, the odds of CRC for pre-COVID (7 of 222; 3.15%) to COVID-delayed patients (9 of 209; 4.31%) was nonsignificant (odds ratio = 1.38; 95% CI = 0.51–3.78). COVID-delayed patients had a trend toward stage III/IV diagnoses, but this finding was not statistically significant (pre-COVID 25.0% vs 55.5% COVID-delayed; $P > .05$). Time to referral did not differ by race or sex ($P > .05$). To our knowledge, there were no COVID-19 exposures or positive cases linked to endoscopic procedures.

In this retrospective cohort study utilizing St. Louis VA data, a risk stratification tool appropriately triaged endoscopic resources, likely mitigating the effect of COVID delays on CRC diagnoses. Due to the implemented triaging process, diagnostic colonoscopies were significantly more likely in the COVID-delayed era, during which the time from referral to endoscopy was significantly shorter. When comparing diagnostic colonoscopies, we did not find an increased odds of CRC after COVID-related delays in procedures. Our findings echo the importance of triaging endoscopic cases appropriately when resources are limited, or cases are backlogged. With hindsight, the risk of proceeding with diagnostic procedures was deemed appropriate, even in the face of local COVID-19 surges.

Prior studies assessing COVID-related delays on CRC outcomes suggest a negative effect on CRC stage and mortality just after a 4-month delay in endoscopy.[7,8] Our data support these findings as the upper limit of any delayed procedure was less than 3 months, and we did not identify a significant difference in CRC stage at diagnosis.

Our study has limitations. This study was conducted as a single-center retrospective cohort design with inherent potential biases and less generalizability. Yet, our endoscopic triaging process, weighing patient and procedural factors, appears to have mitigated the early effect of COVID-related delays on CRC diagnoses. This approach was adopted by many VA medical centers nationally and may be pertinent to several other practices.

Endoscopic delays imposed during the COVID-19 pandemic have the potential to postpone critical CRC diagnoses. Yet, the effects of COVID-19–related delays on CRC diagnoses

and outcomes can likely be mitigated by effective endoscopic triaging strategies. During the most recent COVID-19 omicron surge, we have continued to utilize this risk stratification tool to continue endoscopy. An ongoing assessment of endoscopy triaging strategies is a critical component to improving CRC outcomes as the COVID-19 pandemic continues.

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Abbreviations used in this paper: **CI, confidence interval; COVID-19, coronavirus disease 2019; CRC, colorectal cancer; VA, Veterans Affairs**

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