Cross-sectional Survey Examining Patient Attitudes and Preferences for Rescheduling Screening Colonoscopies Canceled due to the COVID-19 Pandemic

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Abstract

**Background.** Early in the COVID-19 pandemic colonoscopies for colorectal cancer (CRC) screening were canceled. Patient perceptions of the benefits and risks of routine screening relative to health concerns associated with the COVID-19 pandemic were unknown. **Purpose.** Assess patient anxiety, worry, and interest in CRC screening during the COVID-19 pandemic. **Methods.** A random sample of 200 patients aged 45 to 75 y with colonoscopy cancellation due to COVID-19 in March to May 2020 were surveyed. Anxiety, COVID-19 and CRC risk perceptions, COVID-19 and CRC worry, likelihood of following through with colonoscopy in the next month, and interest in alternatives to colonoscopy were assessed. Subsequent screening was tracked for 12 mo. **Results.** Respondents (N = 127/200, 63.5%) were on average 60 y old, female (59%), college educated (62% college degree or more), and White (91%). A substantial portion of patients (46%) stated they may not follow through with a colonoscopy in the next month. There was greater interest in stool-based testing than in delaying screening (48% v. 26%). Women, older patients, and patients indicating tolerance of uncertainty due to complexity reported they were less likely to follow through with colonoscopy in the next month. Greater interest in stool-based testing was related to lower perceptions of CRC risk. Greater interest in delaying screening was related to less worry about CRC and less tolerance of risk. Over 12 mo, 60% of participants completed screening. Patients who stated they were more likely to screen in the next month were more likely to complete CRC screening (P = 0.01). **Conclusions.** Respondents who had a colonoscopy canceled during the COVID-19 pandemic varied in interest in rescheduling the procedure. A shared decision-making approach may help patients address varying concerns and select the best approach to screening for them.

**Highlights**

- In the wake of the first wave of the COVID-19 pandemic, almost half of patients stated they were not likely to follow through with a colonoscopy in the short term, about half were interested in screening with a stool-based test, and only one-quarter were interested in delaying screening until next year.
- Patients who perceived themselves at higher risk of colorectal cancer were less interested in stool-based testing, and patients who were more worried about colorectal cancer were less interested in delaying screening.
- A shared decision-making approach may be necessary to tailor screening discussions for patients during subsequent waves of the pandemic, other occasions where resources are limited and patient preferences vary, or where patients hold conflicting views of screening.

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The first surge of the COVID-19 pandemic in the United States resulted in substantial declines in screening colonoscopies and other elective procedures. When hospitals were able to resume procedures, the new restrictions and regulations imposed to ensure safety and decrease potential transmission of COVID-19 limited their ability to quickly work through the backlog of procedures. Hospitals were eager to get patients back for care and initially prioritized more medically urgent interventions such as diagnostic procedures reflecting higher risk indications over routine preventive screening. However, these initial recovery efforts did not seek to recognize or incorporate patients’ priorities into these triage algorithms. The circumstances of the COVID-19 pandemic, with its major disruption to schedules, family life, and transportation options, had potential for significant changes in how patients considered their options for medical tests and treatments. Public opinion polls at this time found that many patients were reluctant to return for health care issues that were unrelated to COVID-19. Patients at higher risk of COVID-19, or caregivers for those at high risk, may not have felt comfortable returning to hospitals for an elective procedure such as colorectal cancer (CRC) screening with colonoscopy. Worry about COVID-19 exposure risk may have led some patients to continue deferring colonoscopy or to opt for stool-based tests that could be completed at home. However, little is known about patients’ attitudes regarding the resumption of CRC screening and the factors that influence these attitudes. For example, sociodemographic factors such as age may influence patients’ individual risk of serious illness and death from COVID-19 and may thus favor preferences to defer CRC screening. Higher COVID-19 risk perceptions and worry would be expected to have a similar effect, as would lower CRC risk perceptions and worry. Finally, individual trait-level differences in tolerance of uncertainty may also influence patients’ preferences for deferring CRC screening. Uncertainty tolerance has distinguishable subtypes that correspond to the different uncertainties that represent its focus; for example, tolerance of risk focuses on uncertainty arising from the indeterminacy of future outcomes (captured by the concept of probability); tolerance of ambiguity focuses on uncertainty arising from information that is conflicting or otherwise lacking in reliability, credibility, or adequacy (captured by the decision theory concept of ambiguity); and tolerance of complexity focuses on uncertainty arising from features of risk information that make it difficult to understand. Greater tolerance of both risk and ambiguity may have varying effects on patients’ preferences for preventive interventions during the COVID-19 pandemic, depending on which risks (COVID-19 v. other preventable diseases) are more salient for them.

The challenge of rescheduling so many canceled procedures and the uncertainty about patient concerns regarding resuming screening led to the rapid development and deployment of a cross-sectional survey to examine the CRC screening–related attitudes of patients who had previously scheduled colonoscopies canceled during the initial surge of the COVID-19 pandemic. Specifically, we assessed patients’ likelihood of following through with a colonoscopy in the next month, their interest in having a stool-based test, and their interest in delaying screening for a year. In addition, we describe subsequent CRC screening among this sample 12 mo after routine procedures had reopened and explored potential predictors of completing screening. We hypothesized that patients who were older, reported more state anxiety, had lower CRC risk, had little or no prior experience with colonoscopy, or had high COVID-19 worry would be 1) less likely to

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**Keywords**
Colorectal cancer screening, patient preference, covid-19 pandemic, patient centered care, person centered care

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want to follow through with a scheduled colonoscopy, 2) less likely to follow through with actually screening, and 3) more likely to be interested in the other screening strategies.

Methods

Sample

Eligible patients were aged 45 to 75 y and had their screening or surveillance colonoscopy canceled due to the first wave of COVID-19 (March 16, 2020, through May 31, 2020) at an academic medical center in the Northeastern United States. We excluded patients who were scheduled for a diagnostic colonoscopy, were unable to read or write in English, were at very high risk for CRC as indicated by a 1-y follow-up recommendation, or had prior history of CRC.

Design

A random sample of 200 patients was selected from the electronic medical record registry of eligible patients. We mailed selected patients a survey packet in June 2020. The packet included a cover letter, information sheet, incentive ($10 gift card), survey, and self-addressed stamped return envelope. Participants were able to complete the survey via RedCap link in the cover letter or send the enclosed survey back in the mail. Study staff made up to 3 reminder phone calls to nonresponders, mailed a reminder survey packet about 4 wk after the initial packet, and followed up with an additional 3 reminder calls to nonresponders. Consent was implied with return of the survey. Twelve months after the hospital reopened for routine procedures, a chart review was conducted to identify patients screened for CRC in that time frame with either colonoscopy or a stool-based test. This work was funded by the Patient-Centered Outcomes Research Institute (CDR-2017C3-9720) and was reviewed and approved by the hospital’s Institutional Review Board (2020P001579).

Survey Items

Three items developed by the study team assessed primary outcomes regarding CRC screening: 1) “If the doctor was able to schedule your colonoscopy in the next month, how likely are you to follow through and have it?” (5 Likert-type responses, very likely to very unlikely); 2) “If the doctor recommended that you have a stool-based test to screen for colon cancer this year instead of a colonoscopy, how interested would you be in having it?” (5 Likert-type responses, definitely want it to definitely do not want it) and 3) “If the doctor recommended that you postpone your colonoscopy until next year, how interested would you be?” (5 Likert-type responses, definitely want to postpone to definitely do not want to postpone).

We collected information about participants’ reactions to having their colonoscopy canceled using 2 items developed by the study team: 1) “How did you feel when you learned that your colonoscopy would be postponed or delayed?” (5 Likert-scale responses, 1 = very relieved to 5 = very worried); 2) “Has the COVID-19 pandemic changed your interest in colon cancer screening?” (5 Likert-scale responses, 1 = greatly decreased interest, 5 = greatly increased interest).

COVID-19 risk perception and CRC risk perception were measured with 2 items adapted from the Health Information National Trends Survey (HINTS): 1) “How would you rate your chance of getting sick with COVID-19 in the next 30 days?” (5 Likert-scale responses, 1 = very low, 5 = very high); 2) “How would you rate your chance of getting colon cancer at some point in your life?” (5 Likert-scale responses, 1 = very low, 5 = very high).

COVID-19 worry and CRC worry were measured with 2 items developed by the study team, respectively: 1) “How worried are you about getting COVID-19?” (5 Likert-scale responses, 1 = not at all worried, 5 = extremely worried) and 2) “How worried are you about getting colon cancer?” (5 Likert-scale responses, 1 = not at all worried, 5 = extremely worried).

Participants also completed short versions of the Ambiguity Aversion in Medicine scale (3 items, scores range from 5–15, with higher scores indicating lower tolerance of uncertainty due to ambiguity in information), Tolerance for Ambiguity scale (3 items, scores range from 5–15, with higher scores indicating lower general tolerance of uncertainty due to complexity), and Pearson Risk Attitude scale (3 items, scores range from 5–15, with higher scores indicating lower tolerance of uncertainty due to risk). These shortened measures were recently used in other studies of cancer patients and of the general public’s perceptions of COVID-19 risk. Participants completed the single item Medical Maximizer/Minimizer scale (scores range from 1–6, with higher scores indicating greater health care–seeking tendencies), emotional distress PROMIS 4a short form (4 items; t scores with higher scores indicating greater anxiety), a measure of overall health (2 items; PROMIS Scale v1.2-Global Health Physical 2a scored poor to excellent), and the Single Item Literacy Screener. Items also assessed demographic information, number of prior
colonoscopies, family history of CRC, and whether the patient had ever had polyps removed.

Respondents who indicated no family history of CRC and no prior history of polyps were considered “average” risk, and others were considered “above-average” risk for CRC. Staff collected the number of COVID-19 cases reported in each patient’s county of residence for 7 days during the month the surveys were sent (June 14–June 20, 2020). The 7 days of data were then averaged to create an estimate of the cases in the county that month and adjusted based on county populations, creating the number of COVID-19 cases per 100,000 residents.

One open-ended item asked patients to “please explain the 1 or 2 main reasons for your answer about the likelihood to follow through with colonoscopy.”

Analysis

Responders and nonresponders were compared using logistic regression to examine nonresponse bias based on age and sex. We summarized sample characteristics and responses using descriptive statistics. Two-sample test for equality of proportions compared the interest in stool-based testing and delaying testing.

For the 3 outcome variables, we used ordinal regression models to predict each outcome. Univariate models were used to identify potential predictors for our 3 main outcomes (included in Table 1). Predictors that met our threshold (α < 0.10) were included in 3 simultaneous logistic regressions alongside hypothesized predictors—gender, age, prior colonoscopies (0 v. 1 or more prior colonoscopies), CRC risk (above-average v. average), and CRC risk perception—to examine characteristics associated with each outcome. Model assumptions were met for all models, including no incidence of multicollinearity. Missing data were excluded from analysis; a sensitivity analysis using multiple imputation showed no significant differences in associations (see the Supplemental Materials).

Responses to the open-ended item were independently reviewed by 2 researchers (K.D.V. and E.C.), and a list of common themes was brought to the study team. The team agreed on 11 thematic codes to be identified in patient responses. Qualitative data were coded independently by the 2 researchers (K.D.V. and E.C.) for the 11 themes. Researchers intermittently checked to ensure agreement (revised until ≥70% agreement or interclass correlation coefficient ≥0.7) and resolved discrepancies as they went. We used descriptive statistics to investigate if the patient’s mentions of CRC risk as being high or low were calibrated with their actual CRC risk. We were interested in analyzing the relationship between the likelihood to follow through with colonoscopy in the next month variable and codes that were present in at least 10 responses. However, because of the small sample sizes, we chose to dichotomize the likelihood to follow through with colonoscopy in the next month variable for these analyses such that the top 2 responses (i.e., very likely or

| Table 1  | Sample Characteristics a |
|-------------------------------|---------------------------|
| Minimum | Maximum | N = 127 |
| Age, y, x (s) | 45 | 75 | 60 (8) |
| White, non-Hispanic, % (n) | NA | NA | 91 (116) |
| Sex, female, % (n) | NA | NA | 59 (75) |
| College degree or more, % (n) | NA | NA | 62 (78) |
| Prior colonoscopy (1 or more), % (n) b | NA | NA | 82 (86) |
| Average colon cancer risk (no family history and no prior polyps), % (n) | NA | NA | 43 (55) |
| Had COVID-19 (either tested positive and/or thought they had it), % (n) | NA | NA | 7 (9) |
| PROMIS Anxiety, x (s) c | 40.3 | 71.2 | 51 (9) |
| PROMIS Global Health, x (s) c | 29 | 63.3 | 53 (9) |
| Ambiguity Aversion, x (s) | 3 | 15 | 10 (3) |
| Risk Attitude, x (s) | 3 | 15 | 10 (2) |
| Tolerance of Ambiguity, x (s) | 3 | 15 | 9 (2) |
| Medical Maximizer-Minimizer, x (s) | 1 | 6 | 3 (2) |
| High health literacy (never need help), % (n) b | NA | NA | 78 (100) |
| COVID-19 cases per 100,000 residents | 214.3 | 2416.2 | 1688 (568) |

a NA indicates that a minimum or maximum is not applicable given the categorical nature of the item. Cronbach’s alpha was acceptable for all scales: PROMIS Anxiety = 0.91; Ambiguity Aversion = 0.81; Risk Attitude = 0.71; Tolerance of Ambiguity = 0.71.
b One patient was missing data on the item.
c Two patients were missing data on the item.
likely; definitely want or want) were coded as 1 and the 3 other responses (i.e., not sure, unlikely, very unlikely) were coded as 0. Themes that were present in at least 10 responses were analyzed for relationships with the binary likelihood to follow through with colonoscopy in the next month variable using chi-square analyses; Fisher’s exact test was used when cell sizes were small.21

A binary variable was created to indicate whether or not a patient completed screening. The number of days between the hospital reopening routine procedures (June 1, 2020) and the date the participant was screened was identified over a 12-mo period. Descriptive statistics detail the number of patients who screened and the time to screening. Three Cochran Armitage tests for trend were used to identify whether the patient’s self-reported likelihood of completing a colonoscopy in the next month, interest in stool-based testing, or interest in delaying screening was predictive of screening. Univariate logistic models were used to identify potential predictors of our binary screening variable (included in Table 1). Predictors that met our threshold \( \alpha < 0.10 \) were included in a simultaneous logistic regression alongside hypothesized predictors—gender, age, prior colonoscopies (0 v. 1 or more prior colonoscopies), CRC risk (above-average v. average), and CRC risk perception—to examine characteristics associated with screening.

Results

Of the 200 patients surveyed, 127 patients (64%) responded. Of the remaining patients, 13 opted out and 60 were lost to follow-up (see Supplemental Material for CONSORT Diagram). No significant differences were found between responders and nonresponders based on age or sex. Patients in the sample were, on average, 60 y old (range 45–75 y); most identified as White, non-Hispanic; just more than half identified as female; and 62% had obtained a college degree or higher education. Most (82%) had completed 1 or more prior colonoscopies, and 43% were considered average CRC risk (i.e., no family history of polyps and no prior polyps themselves). Seven percent indicated they had been infected with the COVID-19 virus. COVID-19 cases per 100,000 residents in our sample averaged 1688 cases \((s = 568, \text{skew} = -0.42)\) and ranged from 214 to 2416. Additional sample descriptors can be found in Table 1.

Patient Worries about COVID-19 and Cancellation of Colonoscopy

Distributions are detailed in Table 2. About one-third (32%) of patients were extremely or moderately worried about contracting COVID-19; fewer (11%) were

| Key Outcome                                                                 | Response Option                        | % (n) |
|----------------------------------------------------------------------------|----------------------------------------|-------|
| How worried are you about getting COVID-19?a                              | Extremely worried                      | 11 (14) |
|                                                                           | Moderately worried                     | 20 (25) |
|                                                                           | Somewhat worried                       | 23 (28) |
|                                                                           | Slightly worried                       | 33 (41) |
|                                                                           | Not at all worried                     | 12 (15) |
|                                                                           | Extremely worried                      | 5 (6)   |
|                                                                           | Moderately worried                     | 6 (8)   |
|                                                                           | Somewhat worried                       | 29 (36) |
|                                                                           | Slightly worried                       | 35 (44) |
|                                                                           | Not at all worried                     | 25 (32) |
|                                                                           | Very relieved                          | 7 (9)   |
|                                                                           | Relieved                               | 14 (18) |
|                                                                           | Neutral                                | 59 (74) |
|                                                                           | Worried                                | 17 (21) |
|                                                                           | Very worried                           | 2 (3)   |
|                                                                           | Greatly increased interest              | 2 (2)   |
|                                                                           | Slightly increased interest             | 4 (5)   |
|                                                                           | Has not changed interest                | 79 (100) |
|                                                                           | Slightly decreased interest             | 8 (10)  |
|                                                                           | Greatly decreased interest              | 8 (10)  |

aFour patients did not respond to this item.
bOne patient did not respond to this item.
cTwo patients did not respond to this item.
extremely or moderately worried about developing CRC. More than half were neutral about the cancellation of their colonoscopy (59%); the rest were equally split between relieved (22%) and worried (19%). A minority of respondents (16%) reported that COVID-19 decreased their interest in CRC screening, and a majority of people (79%) reported that COVID-19 did not change their screening interest.

Likelihood of Following through with Colonoscopy in the Next Month and Interest in Alternatives

Distributions are detailed in Table 3. About half the sample (54%) indicated they were likely or very likely to follow through with a colonoscopy in the next month. Considering alternatives to colonoscopy, participants were more interested in having a stool-based test (definitely want it or want it) than delaying screening until next year (definitely want to postpone or want to postpone; 48% v. 26%. P < .001).

Table 4 shows factors associated with the likelihood of following through with colonoscopy in the next month, interest in stool-based testing, and interest in delaying screening. Women indicated they were less likely to follow through with colonoscopy in the next month, and as age increased, the likelihood of following through with colonoscopy in the next month also decreased. Patients who indicated lower tolerance of uncertainty due to complexity (measured by the Tolerance of Ambiguity scale) were less likely to follow through with colonoscopy in the next month. As patients’ perceptions of their CRC risk increased, they were less interested in a stool-based test.

Patients who were more worried about CRC tended to be less interested in delaying screening, while patients who reported lower tolerance of uncertainty due to risk (measured by the Pearson Risk Attitude scale) tended to be more interested in delaying screening.

A total of 109 patients responded to the open-ended item related to willingness to follow through with colonoscopy in the next month. Eleven themes were identified and are detailed in Table 5. Themes included 1) being due for screening/their primary care provider (PCP) recommending screening, 2) worry about COVID-19, 3) not being worried about COVID-19, 4) feeling they are at high risk for CRC, 5) feeling that they are at low risk for CRC, 6) worry about the consequences of delaying CRC screening, 7) logistics that make CRC screening difficult, 8) feeling that it is OK to wait/they are in no rush to screen, 9) dislike of the colonoscopy procedure, 10) trust in their hospital/provider, and 11) stool-based tests. The most common themes that patients referenced were that they were due for screening (33%), worried about COVID-19 (29%), and feeling they are at high risk for CRC (24%).

We next investigated whether qualitative perceptions of CRC risk were well calibrated. Twenty-six patients referred to high CRC risk and 3 referred to low CRC risk in their qualitative responses. When comparing the CRC risk (i.e., average v. above average), we found that all patients (3/3) who mentioned being low risk were considered average CRC risk and 22/26 (85%) who mentioned being high risk of CRC were considered above-average CRC risk.

Relationships with the binary variable representing the likelihood of following through with a colonoscopy in the next month were present for themes of being due
for screening/their PCP recommending screening, worry about the COVID-19 pandemic, feeling they are at high risk for CRC, feeling that they are at low risk for CRC, worry about the consequences of delaying CRC screening, and feeling that it is reasonable to wait/they are in no rush to screen. The theme of logistics did not reach significance, and the remaining themes contained too few responses to be analyzed (see Table 5). Ninety-six percent (25/26) of patients who felt they were at high risk of CRC screening stated they would be likely or very likely to complete a colonoscopy in the next month. The 1 patient who did not intend to follow through also noted logistical problems (i.e., they live 2 h from the hospital). Patients were less likely to state they would follow through with a colonoscopy in the next month if they mentioned worry about COVID-19 or feeling that it is reasonable to wait. Ninety-seven percent (31/32) of patients who mentioned worry about COVID-19 indicated they were unlikely to follow through with a colonoscopy in the next month.

**CRC Screening**

Sixty percent (76/127) of our sample screened within 12 mo of our hospital reopening procedures; all patients who screened had a colonoscopy. The average time to screening was 146 d (s = 95 d) and ranged from 16 to 360 d.

Patients who indicated they were more likely to screen in the next month were more likely to complete screening (P = 0.010; see Figure 1a), whereas patients who indicated they were more interested in delaying screening were less likely to complete screening (P = 0.024; see Figure 1b). Screening was not significantly related to interest in stool-based tests (P = 0.800). Although risk attitudes and tolerance of ambiguity were found to be univariate predictors of screening, neither variable was significantly predictive of screening when included in the multivariate model (see Table 6).

**Discussion**

A sample of patients who had scheduled colonoscopies for CRC screening or polyp surveillance canceled at the start of the COVID-19 pandemic and were surveyed shortly after health care services resumed in June 2020 reported considerable worry about COVID-19. While the pandemic did not appear to have dampened enthusiasm for CRC screening, few reported current significant worry about developing CRC, and only half of the patients reported being ready to return for a colonoscopy within the next month. Respondents were

| Table 4 | Factors Associated with High Likelihood of Following through with Scheduled Colonoscopy in the Next Month, High Interest in Stool-Based Test, and High Interest in Delaying Screeninga |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Likelihood of Following through with Colonoscopy in Next Month | Interest in Stool-Based Test | Interest in Delaying Screening |
| Sex (female) | b (95% CI) | P | b (95% CI) | P | b (95% CI) | P |
| Age | −0.71 (−1.40, −0.01) | 0.045 | −0.42 (−1.12, 0.27) | 0.23 | 0.57 (−0.13, 1.27) | 0.111 |
| Prior colonoscopy | −0.05 (−0.11, 0.00) | 0.39 | −0.01 (−0.06, 0.04) | 0.73 | 0.01 (−0.04, 0.13) | 0.59 |
| CRC risk (moderate-high) | 0.37 (−0.61, 1.35) | 0.46 | −0.3 (−1.34, 0.75) | 0.58 | −0.93 (−1.99, 0.13) | 0.087 |
| CRC risk perception | −0.22 (−0.99, 0.55) | 0.57 | 0.24 (−0.52, 0.99) | 0.54 | −0.05 (−0.84, 0.73) | 0.89 |
| Ambiguity aversion | −0.11 (−0.25, 0.04) | 0.148 | NA | NA | 0.04 (−0.11, 0.19) | 0.62 |
| Risk attitude | −0.01 (−0.19, 0.17) | 0.93 | NA | NA | 0.21 (0.01, 0.41) | 0.038 |
| Tolerance of ambiguity | −0.21 (−0.37, −0.06) | 0.007 | 0.13 (−0.01, 0.27) | 0.071 | 0.10 (−0.06, 0.26) | 0.21 |
| CRC worry | 0.33 (−0.06, 0.73) | 0.101 | NA | NA | −0.61 (−1.02, −0.21) | 0.003 |
| COVID-19 risk perception | NA | NA | −0.28 (−0.7, 0.14) | 0.189 | NA | NA |
| Medical minimizer-maximizer item | NA | NA | NA | NA | −0.07 (−0.32, 0.17) | 0.55 |

CI, confidence interval; CRC, colorectal cancer. Bolded entries indicate significant predictors.

*aNA indicates a variable was not significant (α < 0.10) in the univariate models and therefore was not included in the ordinal multivariable models presented here. CRC risk perceptions: higher scores indicate greater perceived CRC risk; Ambiguity Aversion: higher scores indicate lower ambiguity aversion; Risk Attitude: higher scores indicate lower tolerance of uncertainty due to risk; Tolerance of Ambiguity: higher scores indicate lower tolerance of uncertainty due to ambiguity in information; COVID-19 Risk Perception: higher scores indicate greater perceived risk of COVID-19; Medical Maximinzer-Minimizer Item: higher scores indicate more maximizing tendencies.*
interested in alternatives to colonoscopy, with about half interested in stool-based tests and about a quarter interested in delaying screening. Subsequent screening, all with colonoscopies, was completed in 60% of participants, and strength of intention to follow through with colonoscopy in the next month predicted screening behavior.

Several factors were associated with respondents’ intentions toward completing colonoscopy in the next month. As predicted, we did find that as age increased, the likelihood of following through with a scheduled colonoscopy in the next month decreased. This may be due to these patients recognizing they were at a higher risk for COVID-19 infection and therefore being less interested in visiting the hospital setting. Although not predicted, we did find that women stated they were less likely to follow through with a scheduled colonoscopy in the next month. This is consistent with literature showing that women tend to screen for CRC less often than men do. Respondents who were less tolerant of uncertainty due to complexity (measured by the Tolerance of Ambiguity scale) were less likely to follow through with a scheduled colonoscopy in the next month. This finding may reflect the presence of multiple competing risks and issues that need to be considered in this decision. These may vary in salience among participants and include participants’ risk of CRC, their risk of COVID-19, or their risk of being infected with COVID-19 as a result of having a colonoscopy (not assessed). The complexity of these competing risks may discourage pursuit of colonoscopy, particularly

Table 5 Qualitative Themes Relating to Willingness to Follow through with Colonoscopy in the Next Month⁸

| Theme                                | Example Response                                                                 | Overall (n = 109) | Not Likely (n = 47) | Likely (n = 62) | P  |
|--------------------------------------|---------------------------------------------------------------------------------|-------------------|---------------------|----------------|----|
| Due for screening/ PCP recommendation | “I have gone 10 years since last screening.”                                    | 33 (36)           | 13 (6)              | 48 (30)        | <0.001 |
| Worried about COVID-19               | “As the restrictions are becoming relaxed, I would want to see which way the data is trending regarding amount of new cases of COVID-19.” | 29 (32)           | 66 (31)             | 2 (1)          | <0.001 |
| High risk for cancer                 | “This is something I have done every 3 years due to being in a high risk category.” | 24 (26)           | 2 (1)               | 40 (25)        | <0.001 |
| Worry about consequences of delay    | “I have already had to delay my colonoscopy several times. I feel like delaying longer is putting me at greater risk.” | 15 (16)           | 4 (2)               | 23 (14)        | 0.016  |
| Logistics                            | “I have moved to Maine for the summer and do not wish to return to Boston until September unless I have an emergency.” | 12 (13)           | 19 (9)              | 6 (4)          | 0.084  |
| Felt it is OK to wait, no rush       | “I can wait if other people need it more than me.”                              | 11 (12)           | 19 (9)              | 5 (3)          | 0.040  |
| Not worried about COVID-19           | “I’m not too worried about catching COVID-19 through this procedure.”           | 6 (6)             | NA                  | NA             | NA     |
| Dislike colonoscopy                  | “Procedure is very unpleasant.”                                                 | 6 (7)             | NA                  | NA             | NA     |
| Trust the hospital                   | “I feel the caution and care taken in the hospital is most likely trustworthy.” | 4 (4)             | NA                  | NA             | NA     |
| Low risk for cancer                  | “Based on a past colonoscopy I have a sense I am at lower risk.”                | 3 (3)             | NA                  | NA             | NA     |
| Stool-based tests                    | “My insurance company sent me a letter saying they are sending me a stool-based test to use if I want and if my doctor agrees.” | 2 (2)             | NA                  | NA             | NA     |

PCP, primary care provider.
NA indicates that there were too few (i.e., <10) responses to be analyzed for differences in likelihood of follow through.
for individuals who are personally less tolerant of uncertainty due to complexity and are more worried about COVID-19 than CRC. This result might suggest that greater personal aversion to the uncertainty generated by complex problems may discourage some patients from pursuing colonoscopy.

Regarding interest in alternatives to colonoscopy, we found that patients were more interested in a stool-based test if they perceived themselves to be at lower risk for CRC. We also found that patients who were more worried about their CRC risk were less interested in delaying screening. This is consistent with the health belief model and studies that indicate that risk perceptions are related to CRC screening intentions, suggesting that perceived vulnerability to health threats motivates health-protective behaviors.23 In addition, patients who were more risk averse (less tolerant of uncertainty due to risk) were more interested in delaying screening. As noted above, this finding may be due to the differential salience of the various risks that need to be tolerated in deciding about screening colonoscopy (i.e., CRC risk, COVID-19 risk, or even their risk of being infected with COVID-19 as a result of having a colonoscopy—not assessed). The most salient risk for many participants in this sample may have been the risk of being infected with COVID-19, and greater personal aversion to this particular risk may have led these individuals to be more accepting of delaying screening. The potentially high salience of the risk of being infected with COVID-19 may account for similar findings from a 2020 study of the general public, which found that lower tolerance of risk was associated with greater intentions for COVID-19 vaccination.8 Together, these findings suggest a mechanism by which lower personal tolerance of the uncertainty generated by risky outcomes may inhibit—rather than promote—uptake of colonoscopy for some patients.

The qualitative responses provided insight into patients’ rationales for their intentions and were well-calibrated with their actual risk factors. The key issues linked with strong intentions to follow through with

### Table 6 Factors Associated With Higher Likelihood of Screening2

|                       | b     | P     | OR (95% CI)     |
|-----------------------|-------|-------|-----------------|
| Intercept             | 1.65  | 0.173 | 0.57 (0.25, 1.26) |
| Sex (female)          | 0.56  | 0.77  | 1.01 (0.95, 1.07) |
| Age                   | 0.39  | 0.50  | 1.47 (0.48, 4.50) |
| Prior colonoscopy     | 0.30  | 0.48  | 1.35 (0.58, 3.11) |
| CRC risk (moderate-high) | -0.10 | 0.31  | 0.91 (0.375, 1.10) |
| Risk attitude         | -0.08 | 0.38  | 0.93 (0.78, 1.01) |

b, log odds; OR, odds ratio; CI, confidence interval; CRC, colorectal cancer.

*Risk Attitude: higher scores indicate lower tolerance of uncertainty due to risk; Tolerance of Ambiguity: higher scores indicate lower tolerance of uncertainty due to complexity.*

![Figure 1](image-url) (a) Proportion of patients screening across responses to likelihood of screening in next month and (b) proportion of patients screening across responses to interest in postponing screening.
As such, our findings may be useful for structuring why individuals do not follow through with screening during the COVID-19 pandemic immediately following patients' reactions to completing a cancer screening test from their primary care office or gastroenterologist. Instead, the patient would have to request a stool-based test from the gastroenterology scheduling office; addition, at the time of this study, stool-based tests were not offered by the gastroenterology scheduling office; at the hospital and at the time of chart review (12 mo later). In addition, about one-tenth of patients indicated that they were OK with waiting to be screened, with most of these patients indicating they were unwilling to follow through with colonoscopy in the next month. This is consistent with prior work indicating that during times of limited resources, most individuals are willing to delay colonoscopy for a peer at high risk.24

About 60% of our sample completed screening within 12 mo of the hospital's reopening of routine endoscopy services. We did find that intentions toward following through with a colonoscopy in the next month did map onto actual screening completion, and we found that as interest in delaying screening increased, patients were less likely to complete a colonoscopy. The percentage of patients who screened in our sample is higher than in most reports, and all patients who screened did so with a colonoscopy.25 It is possible that as these patients had already been scheduled for a colonoscopy, they were more inclined to follow through with this screening than the general population facing a new decision about completing CRC screening during the COVID-19 pandemic. Also, these patients may be more likely to complete a previously scheduled colonoscopy than to change course to a stool-based test. It is worth noting that 1 patient had a stool-based test ordered, but it was not completed. While stool-based tests were available to these patients as a primary screening method, colonoscopy was the most common recommendation for CRC screening at this hospital and at the time of chart review (12 mo later). In addition, at the time of this study, stool-based tests were not offered by the gastroenterology scheduling office; instead, the patient would have to request a stool-based test from their primary care office or gastroenterologist. This study provides an important snapshot of patients' reactions to completing a cancer screening test during the COVID-19 pandemic immediately following the first surge and may provide broader insights into why individuals do not follow through with screening. As such, our findings may be useful for structuring conversations with patients who are due or overdue for screening. Specifically, our patients indicated a variety of conflicting concerns when thinking about rescheduling their canceled colonoscopy (e.g., wanting to prevent CRC via screening while also being worried about exposure to COVID-19 through health care interactions). Regardless of a patient's prior screening history, clinicians need to inquire about patient concerns, discuss potential options to best resolve these concerns, and be aware that individual differences such as how patients handle ambiguity and risk will frame how patients interpret information and make choices.

The insights into patient perspectives regarding their preference among CRC screening options are likely generalizable, although amplified by COVID. For instance, a patient may hold conflicting views, such as wanting to take action by screening for CRC to ensure early detection but also being anxious about the discomfort associated with a colonoscopy prep, having to arrange transportation from the procedure, or the complications of the colonoscopy. If the clinician is aware that their patient is risk averse and worried about doing a colonoscopy, the patient and clinician could discuss stool-based tests as an option for this patient (with a follow-up colonoscopy if stool testing was abnormal), which may satisfy the patient's desire to take preventive measures while also reducing anxiety.

While the initial surge of COVID-19 and its resultant major care disruptions, such as cancellation of nonemergent procedures, have ended, there is a new understanding by patients of health care–associated infection risk, as well as a persistent backlog of scheduling for routine procedures including colonoscopy. As these factors will continue to influence patients’ decision making about CRC screening for the foreseeable future, clinicians should directly address these new complexities with their patients as they decide on a personalized future plan. Providing patients with the ability to choose how to test for CRC increases the chances that patients will follow through with completing their test.26 Thus, a clear finding from this study is that patients feel differently about these pandemic-related delays in their care, and as a result, triage programs or recovery algorithms that ignore patients' concerns and preferences (e.g., mass mailing of fecal immunochemical tests or triage based on CRC screening risk alone) may not be as effective or efficient as ones that respect and adapt to individual preferences and levels of tolerance of risk and ambiguity. Shared decision making may be particularly helpful by providing a framework to engage patients in these decisions.27 Further, scheduling strategies that consider
patient preferences when offering testing options, including the up-front offering of stool-based tests both in primary care and gastroenterology, are more likely to reduce churn in the test-scheduling process with fewer cancellations and postponements and more likely to result in completed CRC tests of all types.

However, there are some limitations to our study. First, the relatively small, homogeneous sample collected from 1 academic medical center that served as a regional treatment center for COVID-19 patients may limit generalizability. This sample consisted only of patients who had their colonoscopy scheduled and subsequently canceled during the first wave of the COVID-19 pandemic, which limits the generalizability of our findings, especially as all patients who returned to screening chose to do so with colonoscopy. Second, the measures used were designed for this study and were otherwise unvalidated; however, patient partners did review the surveys and assisted in revising items to ensure the measures’ usability. Third, the response rate (64%) was less than desirable; however, no differences between responders and nonresponders were found, and this may simply reflect how complicated patients’ lives were at this time in the pandemic. Fourth, participants were not asked to describe why they were interested or not interested in a stool-based test, which would have been informative to interpret our findings. Fifth, vaccines and effective treatments for COVID-19 have become available since study completion, and worry about severe COVID-19 has likely changed as a result. Sixth, many of our findings were consistent with the perceived susceptibility construct of the health belief model, but other components, such as perceived severity or perceived benefits, were not included here, which may provide a more complete picture of decision making. Finally, it is possible that there were additional variables, such as knowledge about COVID-19 or stool-based tests, or specific concerns about having care at a hospital that was a regional COVID-19 treatment center, that were not included here that may better explain patient responses and preferences. These should be studied further.

Conclusions
Respondents from a single academic medical center who had a colonoscopy canceled due to the first wave of the COVID-19 pandemic varied in their interest in rescheduling the procedure. To address patients’ potentially conflicting worries about COVID-19 and CRC prevention, a patient-centered decision-making approach, such as shared decision making, which aims to tailor conversations to the patient by providing the patients with options, information about the risks and benefits of options, and jointly identifying what matters most to the patient may help. Discussing uncertainties and options with patients may help patients address varying concerns and select an approach to colorectal cancer screening that is best for them.

Authors’ Note
A poster presentation with some of these results was presented at the Annual Society for Medical Decision Making Conference in 2021, the Massachusetts General Hospital Scientific Advisory Committee Meeting in 2021, and the Patient-Centered Outcomes Research Institute (PCORI) Annual Meeting in 2020.

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