RESEARCH

Colorectal cancer screening blood test: awareness and willingness among a national sample of adults post-Federal and Drug Administration approval

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Abstract

Background To assess awareness and willingness of average-risk adults to complete a colorectal cancer (CRC) screening blood test and evaluate test preferences for future screening.

Methods Following approval by the United States Food and Drug Administration, a cross-sectional online survey was conducted in September 2024 of adults ages 45–75 in the United States (*n*=633). An informative statement about the new test was followed by a series of questions. Logistic regression identified correlates of participants' willingness to complete a CRC screening blood test.

Results Only 18.2% of participants were aware of a CRC screening blood test. Most (77.9%) were willing to get the test if free or covered by health insurance, while only 19.2% were willing if it cost $895 out of pocket. Participants were more willing to complete a free CRC screening blood test if they had a high household income (odds ratio [OR]=5.12, 95% confidence interval [CI]: 1.63–16.13), had a routine medical check-up in the last year (OR=2.87, CI:1.44–5.71), and were more wanting to talk to a doctor at their next medical appointment about the new test (OR=2.55, CI: 1.92–3.37). Participants' preferred CRC screening approach for the future was the blood test every three years (53.0%), an annual stool test (31.1%), and a colonoscopy every 10 years (15.8%).

Conclusions The blood test has the potential to increase CRC screening, as most participants were willing to complete the test if it was free or covered by health insurance. Findings can guide the development of programs that include the CRC screening blood test as an option.

Keywords Colorectal cancer, Cancer screening, Cancer early detection, Health surveys

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Background

Colorectal cancer (CRC) is the second most diagnosed cancer among males and females in the United States (U.S.) [1]. An estimated 154,270 individuals will be diagnosed with CRC and 52,900 will die from this disease in 2025 [1]. Screening tests are effective and cost-effective in the prevention of CRC or in the identification of CRC in early stages when it is easier to treat [2]. Current CRC screening recommendations for adults who are ages 45–75 and at average-risk for CRC include both

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stool-based tests and direct visualization tests. Recommended stool-based tests include gFOBT/FIT every year or DNA-FIT every 1–3 years, while direct visualization tests include colonoscopy every 10 years, CT colonography every 5 years, or flexible sigmoidoscopy every 5 years [3].

Only about 60% of age-eligible (45–75 years) adults in the U.S. are up-to-date with current screening recommendations, with screening being more common among people who are ages 50–75 than those ages 45–49 [4, 5]. CRC screening prevalence also tends to be lower among individuals who have no health insurance, or are of lower socioeconomic status, and rates vary by race and ethnicity and by geographic region within the U.S. [4]. Several barriers to CRC screening exist at the patient, provider, organization, community, and societal levels [6–9]. Some barriers apply to all recommended CRC screening tests (e.g., lack of physician recommendation), while others are test-specific (e.g., bowel preparation for a colonoscopy).

In July 2024, the Food and Drug Administration (FDA) approved a new blood-based test (Shield^{TM} by Guardant Health, Inc.) for the primary screening of adults at average-risk for CRC [10]. This blood test has a sensitivity of 83.1% and a specificity of 89.6% for the detection of CRC, and a sensitivity of 13.2% for advanced precancerous lesions [11]. It is suggested that the new blood test, which can be ordered as part of standard blood testing, be completed every three years. Importantly, this new CRC screening test may have the potential to increase CRC screening among unscreened and underscreened individuals since it avoids some common perceived barriers to other CRC screening tests (e.g., messiness with stool-based tests, concerns about bowel preparation for colonoscopy) [12].

Given its recent FDA approval, it is important to assess people's awareness of and willingness to complete a CRC screening blood test, identify potential concerns about the new blood test, and determine preferences for future CRC screening. To our knowledge, no studies have yet examined these key areas following FDA approval. The current study addressed this critical research gap among a national sample of adults in the U.S. Our findings provide information to better guide future multi-level programs to increase CRC screening that includes the new blood screening test.

Methods

Study design
We conducted a cross-sectional online survey in September 2024 about a range of health behaviors including the new CRC screening blood test. Eligibility criteria for the survey included currently living in the U.S. and being 45–80 years of age. A total of 1,043 adults participated in the survey study. In this manuscript, we report data on 633 participants who were ages 45–75 (i.e., the age range of current CRC screening recommendations) and at average-risk for CRC. Participants were considered average-risk for CRC if they reported: a) no personal history of CRC; b) no personal history of genetic conditions that increase the risk of CRC (e.g., Lynch syndrome, familial adenomatous polyposis); c) no personal history of colon polyps or inflammatory bowel disease; and d) no first-degree relative (i.e., parents, siblings, or children) diagnosed with CRC before the age of 60 or fewer than two first-degree relatives diagnosed with CRC at any age.

Participants were recruited using an online national opt-in panel conducted by a survey company (SSRS, Glen Mills, Pa). A convenience sample of panel members were sent an email invitation from SSRS to complete a self-administered online survey. Interested panel members used a weblink in the invitation to first complete an eligibility screener. If eligible, panel members were asked to provide informed consent prior to completing their survey. The mean time to complete the survey was approximately 19 minutes, and participants received a standard incentive from SSRS for completing a survey. The Institutional Review Board at The Ohio State University determined this study exempt from review.

Measures

CRC screening blood test
Survey items about the new CRC screening blood test were developed based on our past cancer screening research [13, 14]. Prior to these items, participants received the following informative statement about the test: "A new colorectal cancer screening test that involves a blood draw was recently approved for use in the United States. For this test, a person has a blood draw from their arm by a doctor or other health care provider. The blood sample is then tested for markers of colorectal cancer by a lab. This blood test is for people ages 45 and older who are at average risk for colorectal cancer. It is suggested that people be screened for colorectal cancer with this blood test every 3 years." Following the statement, participants were asked if they had ever heard of a blood test that can screen for colorectal cancer. For participants who reported that they had heard of a CRC screening blood test, a subsequent question assessed the sources where they had heard or seen information about the CRC screening blood test. Participants could indicate multiple sources from response options that included radio, television, social media, internet but not social media, doctor or other health care provider, family members or friends, newspapers, or magazines.

Next, the survey assessed participants' willingness to screen for CRC with the blood test with two items. The first item asked their willingness if the test was free,

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or the cost was covered by health insurance. The second item asked how willing they would be to screen for CRC if the test cost $895 out of pocket, which was the estimated cost of the test prior to data collection [15]. The ordering of these two items was randomized, and response options for both were: "definitely not willing," "probably not willing," "not sure," "probably willing," and "definitely willing" (coded 1–5). Participants' responses were dichotomized as either "willing" (definitely or probably willing) or "not willing" (all other responses). We then examined any concerns about the CRC screening blood test. Participants could indicate not having any concerns about the blood test or multiple concerns from a predefined list (the blood draw might hurt, anxiety about having an abnormal test results, if I have an abnormal test result, I might then need to have a colonoscopy, I would have to go to a health care facility to get the test done, concerns about cost or health insurance, the test is too new, I would first want to talk with my doctor about the test, I am not at risk for getting colorectal cancer, the test might not be accurate), with the ordering of the concerns rotated. We thought that providing participants with a list of potential concerns was a more user-friendly format than including an open-ended item in the survey.

The next item examined if participants, at their next medical appointment wanted to talk to their doctor about the CRC screening blood test. Response options were on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree" (coded 1–5). The final item focused on which CRC screening test option participants would most prefer for their own health care in the future. Response options included "doing a stool test at home every year," "getting a blood test at a health care facility every 3 years," or "getting a colonoscopy at a health care facility every 10 years."

Demographic and health-related characteristics

The survey assessed several demographic and health-related characteristics. We classified participants as living in a "metropolitan" (Rural-Urban Commuting Area [RUCA] codes of 1–3) or "non-metropolitan" (RUCA codes of 4–10) area using the 2010 RUCA codes [16]. Health literacy was assessed using the Single Item Literacy Screener; "How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?" Response options were: "never," "rarely," "sometimes," "often," and "always." Following the suggested approach [17], participants with responses of never or rarely were categorized as having "adequate" health literacy, while all other responses were categorized as having "limited" health literacy.

We examined if participants had ever had a CRC screening test, then categorized participants as being either currently up-to-date or not up-to-date with CRC screening based on U.S. Preventive Services Task Force (USPSTF) guidelines [3]. A participant was considered up-to-date if they reported any of the following: gFOBT or FIT in the last year, a DNA-FIT in the last 3 years, flexible sigmoidoscopy in the last 5 years, CT colonography in the last 5 years, or colonoscopy in the last 10 years [3]. We also assessed participants' perceived severity of CRC ("not at all," "a little," "moderately," "very," coded 1–4) and their perceived likelihood of getting CRC in the future ("no chance," "low chance," "moderate chance," "high chance," coded 1–4). There were less than 1% missing data for the variables reported in this manuscript, and we recoded missing values to either the mode, mean, or midpoint depending on an item's response scale.

Statistical analysis

We calculated descriptive statistics (e.g., frequencies, means) for all variables. Participants' willingness to get screened for CRC if the blood test was free or covered by health insurance was compared to paying $895 out of pocket using a paired *t*-test. We examined assumptions, including normality, associated with a paired *t*-test. We then used logistic regression to identify correlates of willingness to get a CRC screening blood test if it was free or covered by health insurance. We focused on willingness to get a free test in regression analyses given that CRC screening is recommended by the USPSTF, and when the blood test is included in CRC screening recommendations, then insurers will most likely cover this new CRC screening test. For logistic regression, we entered all variables with $p <$ 0.10 in bivariate analyses into a multivariable model. These models produced odds ratios (ORs) and 95% confidence intervals (CIs). Lastly, we examined preferences for future CRC screening overall and used a chi-square test to assess if preferences differed by whether or not participants were currently up-to-date with CRC screening.

Analyses were conducted using IBM SPSS version 29 (IBM Corp., Armonk, NY). Data were weighted to represent the 45-to-80-year-old residential population of the U.S. (i.e., the target population of this survey study) on several demographic characteristics including age, sex, race/ethnicity, and education level. We report unweighted frequencies and weighted descriptive statistics, ORs, and 95% CIs. Statistical tests were two-tailed with a critical alpha of 0.05.

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Results

Participant characteristics

Slightly over half of participants were female (53.8%) and 47.4% reported being a minoritized racial/ethnic identity (Table 1). Half of participants reported being married or living with a partner (50.0%), 54.9% had a high school education or less, and 65.4% reported a household income of less than $50,000. Political party affiliation included 34.0% being a Democrat, 30.7% were Republican, and 35.3% reported being an Independent or some other affiliation. Many participants (68.9%) reported that religion was fairly, very, or extremely important to them, most participants (93.2%) identified as being straight or heterosexual, and 83.7% were classified as living in a metropolitan area. Many participants had health insurance (88.2%), completed a routine medical check-up within the last year (69.9%), and adequate health literacy (87.3%). Almost half (46.0%) of the participants were categorized as not up-to-date with CRC screening, including 39.4% who had never completed screening and 6.6% who had been screened in the past but were not up-to-date with CRC screening.

Awareness and willingness to complete a CRC screening blood test

Overall, 18.2% (120/633) of participants were aware of a CRC screening blood test prior to the survey. Among the 120 participants who were aware of the CRC screening blood test, the most common sources where they had heard or seen information were a doctor or other healthcare provider (40.2%), television (39.4%), the internet but not social media (25.3%), and social media (16.7%). All other sources were indicated by fewer than 10% of participants.

Participants reported higher levels of willingness to have a CRC screening blood test if the test was free or covered by health insurance (mean=4.23, standard error [SE]=0.06) than if the test cost $895 out of pocket (mean=2.26, SE=0.08) ($p<0.001$). This included 77.9% definitely or probably willing to have a blood test for CRC screening if the test was free compared to only 19.2% if the test cost $895 out of pocket (Fig. 1). Conversely, only 6.5% of participants were definitely or probably not willing to have a blood test for CRC screening if the test was free, whereas 60.0% of participants were definitely or probably not willing if the test cost $895 out of pocket.

In multivariable analyses (Table 2), participants were more likely to be willing to have a free blood test to screen for CRC if they reported a high ($90,000 or more) annual household income (OR=5.12, 95% CI: 1.63–16.13), had a routine medical check-up within the last year (OR=2.87, 95% CI: 1.44–5.71), were more wanting to talk to a doctor

Table 1 Demographic and health-related characteristics of participants (*n* = 633)

	n (weighted %)
Demographic characteristics	
Sex	
Female	329 (53.8)
Male	304 (46.2)
Age (years)	
45–54	238 (33.8)
55–64	223 (37.4)
65–75	172 (28.8)
Race/ethnicity	
Non-Hispanic white	297 (52.6)
Non-Hispanic black	50 (16.0)
Hispanic	266 (21.2)
Non-Hispanic other	20 (10.2)
Marital status	
Never married	167 (22.7)
Married/civil union or living with partner	262 (50.0)
Divorced, separated, or widowed	204 (27.3)
Education level	
Less than high school degree	73 (12.8)
High school degree	213 (42.1)
Some college	188 (18.9)
College degree or more	159 (26.1)
Household income	
Less than $50,000	432 (65.4)
$50,000 to $89,999	123 (17.8)
$90,000 or more	78 (16.9)
Political party affiliation	
Democrat	256 (34.0)
Independent/other	189 (35.3)
Republican	188 (30.7)
Religiosity	
Not at all or slightly important	182 (31.1)
Fairly, very, or extremely important	451 (68.9)
Sexual identity	
Straight or heterosexual	595 (93.2)
Some other identity	38 (6.8)
Metropolitan status	
Metropolitan	534 (83.7)
Non-metropolitan	99 (16.3)
Region of residence	
Northeast	116 (17.1)
Midwest	103 (19.5)
South	272 (40.3)
West	142 (23.1)
Health-Related Characteristics	
Health insurance	
No	78 (11.8)
Yes	555 (88.2)

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Table 1 (continued)

	n (weighted %)
Routine medical check-up within the last year	
No	198 (30.1)
Yes	435 (69.9)
Up-to-date with colorectal cancer screening guidelines	
No	298 (46.0)
Yes	335 (54.0)
Health literacy	
Limited	69 (12.7)
Adequate	564 (87.3)

Percentages may not sum to 100 due to rounding

at their next medical appointment about the CRC screening blood test (OR=2.55, 95% CI: 1.92–3.37), had greater perceived likelihood of being diagnosed with CRC in the future (OR=1.56, 95% CI: 1.01–2.40), or had greater perceived severity of CRC (OR=1.73, 95% CI: 1.28–2.34).

Concerns about a blood test for CRC screening

The most common concerns about the CRC screening blood test were first wanting to talk with their doctor about the test (35.6%), cost/insurance issues (32.4%), the test might not be accurate (25.4%), anxiety about having an abnormal test result (22.3%), and potentially needing a colonoscopy after an abnormal test result (17.7%). All other concerns were reported by less than 15% of participants. Overall, 26.8% of participants reported having no concerns about the CRC screening blood test.

Preference for future CRC screening

More than half (53.0%) of participants indicated having a blood test at a health care facility every three years as their preferred future CRC screening approach, with 31.1% indicating a stool test at home every year, and

15.8% indicating a colonoscopy at a health care facility every 10 years. Preferences for future CRC screening did not differ between participants who were up-to-date with CRC screening and those who were not (p = 0.18; Fig. 2).

Discussion

Colorectal cancer screening prevalence is suboptimal and below the target national prevalence of 72.8% listed in Healthy People 2030 Objectives [18]. The new CRC screening blood test has the potential to increase CRC screening and has been positively highlighted in the lay press [19, 20]. Patients and healthcare providers have previously reported the acceptability of a blood test to screen for CRC, but these studies occurred prior to FDA approval of the new test [12, 21–24]. In the current study, which occurred a few months after FDA approval, most participants had not previously heard of the CRC screening blood test, but a large majority of participants were still willing to get the test if it was free or covered by health insurance. Furthermore, more than half of the participants indicated having a blood test every three years as their preferred CRC screening approach moving forward. This finding may reflect preferences for both how the test is administered and the screening interval included in the survey item. Interestingly, preferences for future screening were similar between participants who were currently up-to-date with CRC screening and those who were not. Our findings not only provide an early estimate of the potential impact that the blood test can have on CRC screening but also have several implications for future programs to increase CRC screening that include the new blood test as an option.

First, providers are likely to play a central role in CRC screening with the new blood test. Indeed, in our study, participants' desire to speak with a provider about the blood test was among the strongest correlates of
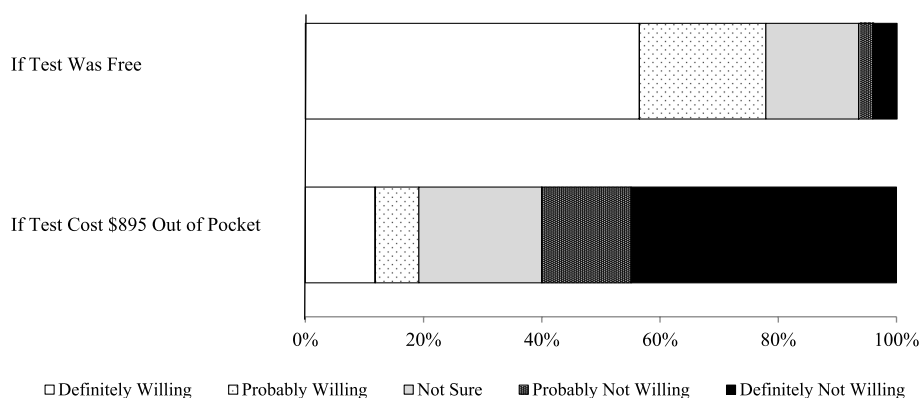

Fig. 1 Willingness to get a blood test for colorectal cancer screening (n = 633)

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Table 2 Correlates of willingness to get blood-based CRC screening (*n* = 633)

	n	Willing: free blood CRC screening test (weighted %)	Not willing: free blood CRC screening test (weighted %)	Bivariate OR (95% CI)	Multivariable OR (95% CI)
Sex					
Female	329	256 (76.7)	73 (23.3)	ref	---
Male	304	246 (79.3)	58 (20.7)	1.16 (0.69–1.97)	---
Age (years)					
45–54	238	182 (76.4)	56 (23.6)	ref	---
55–64	223	177 (78.3)	46 (21.7)	1.11 (0.61–2.01)	---
65–75	172	143 (79.1)	29 (20.9)	1.17 (0.58–2.33)	---
Race/ethnicity					
Non-Hispanic white	297	230 (76.5)	67 (23.5)	ref	ref
Non-Hispanic black	50	37 (74.2)	13 (25.8)	0.89 (0.40–1.99)	0.39 (0.12–1.31)
Hispanic	266	219 (83.7)	47 (16.3)	1.59 (0.96–2.62)[†]	1.05 (0.53–2.08)
Non-Hispanic other	20	16 (78.9)	4 (21.1)	1.15 (0.35–3.77)	1.25 (0.27–5.76)
Marital status					
Never married	167	123 (74.2)	44 (25.8)	ref	---
Married/civil union or living with partner	262	219 (79.8)	43 (20.2)	1.38 (0.72–2.62)	---
Divorced, separated, or widowed	204	160 (77.5)	44 (22.5)	1.20 (0.61–2.38)	---
Education level					
Less than high school degree	73	52 (75.4)	21 (24.6)	ref	ref
High school degree	213	157 (71.5)	56 (28.5)	0.82 (0.37–1.80)	0.91 (0.40–2.11)
Some college	188	153 (79.8)	35 (20.2)	1.29 (0.55–3.02)	0.97 (0.36–2.57)
College degree or more	159	140 (88.1)	19 (11.9)	2.42 (0.96–6.12)[†]	1.35 (0.49–3.77)
Household income					
Less than $50,000	432	325 (73.6)	107 (26.4)	ref	ref
$50,000 to $89,999	123	106 (81.1)	17 (18.9)	1.54 (0.73–3.30)	1.76 (0.60–5.18)
$90,000 or more	78	71 (91.0)	7 (9.0)	**3.61 (1.48–8.84)****	**5.12 (1.63–16.13)****
Political party affiliation					
Democrat	256	217 (83.6)	39 (16.4)	ref	ref
Independent/other	189	141 (70.7)	48 (29.3)	**0.48 (0.25–0.91)***	0.58 (0.25–1.37)
Republican	188	144 (79.8)	44 (20.2)	0.77 (0.40–1.50)	0.99 (0.40–2.49)
Religiosity					
Not at all or slightly important	182	142 (79.3)	40 (20.7)	ref	---
Fairly, very, or extremely important	451	360 (77.3)	91 (22.7)	0.89 (0.50–1.58)	---
Sexual identity					
Straight or heterosexual	595	473 (77.6)	122 (22.4)	ref	---
Some other identity	38	29 (81.9)	9 (18.1)	1.31 (0.51–3.39)	---
Metropolitan status					
Metropolitan	534	419 (77.9)	115 (22.1)	ref	---
Non-metropolitan	99	83 (78.0)	16 (22.0)	1.01 (0.49–2.07)	---
Region of residence					
Northeast	116	89 (77.0)	27 (23.0)	ref	---
Midwest	103	87 (81.4)	16 (18.6)	1.31 (0.53–3.26)	---
South	272	213 (77.5)	59 (22.5)	1.03 (0.50–2.15)	---
West	142	113 (76.3)	29 (23.7)	0.96 (0.42–2.18)	---

Table 2 (continued)

	n	Willing: free blood CRC screening test (weighted %)	Not willing: free blood CRC screening test (weighted %)	Bivariate OR (95% CI)	Multivariable OR (95% CI)
Health-Related Characteristics					
Health insurance					
No	78	44 (55.3)	34 (44.7)	ref	ref
Yes	555	458 (80.9)	97 (19.1)	**3.42 (1.71–6.86)***	1.20 (0.48–3.01)
Routine medical check-up within the last year					
No	198	128 (63.8)	70 (36.2)	ref	ref
Yes	435	374 (84.0)	61 (16.0)	**2.97 (1.73–5.11)***	**2.87 (1.44–5.71)****
Up-to-date with CRC screening guidelines					
No	298	205 (69.8)	93 (30.2)	ref	ref
Yes	335	297 (84.8)	38 (15.2)	**2.43 (1.39–4.23)****	0.95 (0.52–1.74)
Health literacy					
Limited	69	52 (74.8)	17 (25.2)	ref	---
Adequate	564	450 (78.3)	114 (21.7)	1.22 (0.56–2.67)	---
Wants to talk to a doctor about CRC blood test at next medical appointment[a,b]	633	3.80 (0.06)	2.57 (0.14)	**2.56 (1.95–3.36)***	**2.55 (1.92–3.37)***
Perceived likelihood of getting CRC in the future[a,c]	633	2.00 (0.05)	1.56 (0.07)	**2.56 (1.70–3.85)***	**1.56 (1.01–2.40)***
Perceived severity of CRC[a,d]	633	3.26 (0.06)	2.48 (0.15)	**1.81 (1.44–2.28)***	**1.73 (1.28–2.34)***

Multivariable model included all variables with *p*<0.10 in bivariate models. Dashes (--) indicate that variable was not included in the multivariable model

CI Confidence Interval, *CRC* Colorectal Cancer, *OR* Odds Ratio, *ref* Reference Group

[a] Means and standard deviations are reported for continuous variables. ORs for these variables are for a 1-unit increase

[b] Wants to talk to doctor about CRC blood test (range: 1=strongly disagree to 5=strongly agree)

[c] Perceived likelihood of CRC in the future (range: 1=no chance to 4= high chance)

[d] Perceived severity of CRC (range: 1=not at all to 4=very)

[†] *p*<0.10

Boldface indicates statistical significance (**p*<0.05; ***p*<0.01; ****p*<0.001)

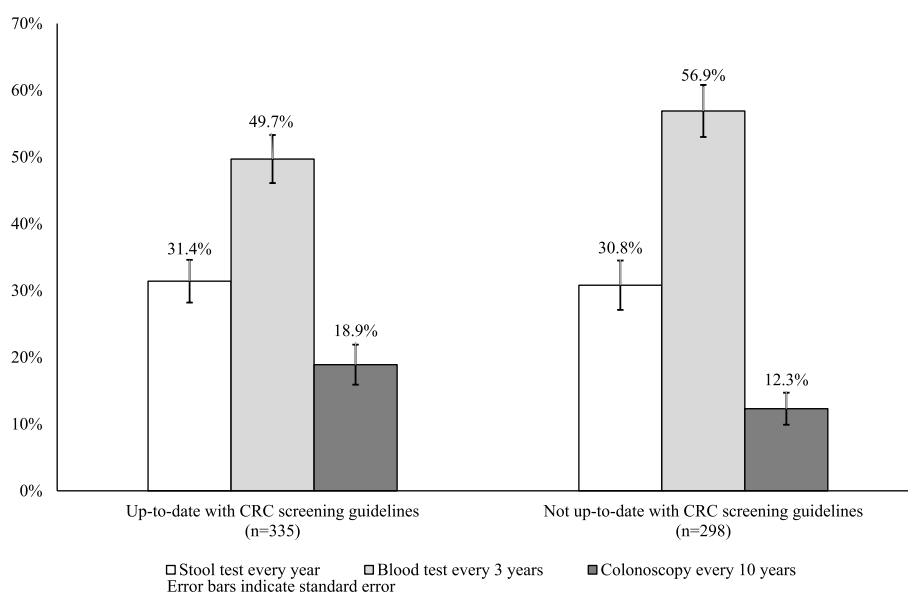**Fig. 2** Participants' most preferred approach for future colorectal cancer (CRC) screening by current screening status (*n* = 633)

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willingness, as well as the most reported concern about the new test. This is similar to recent research examining new blood-based multi-cancer early detection tests [25]. Providers remain a trusted source of health information [26], and the addition of a new screening test may increase patient confusion when presented with different CRC screening test options [27]. Since only one fourth of participants in our study reported that they were concerned about the accuracy of the new blood test, it is important that providers are prepared to explain the benefits and limitations of the CRC screening blood test compared to other screening options. For example, the new blood test has a lower sensitivity for detecting CRC cancers and precancerous lesions compared to a multi-target stool DNA test [28] or colonoscopy [11], and information is currently lacking about the ability of a blood test-based screening program to reduce CRC incidence or mortality. In contrast, the benefit of established CRC screening programs (e.g., colonoscopy, flexible sigmoidoscopy, fecal occult blood test followed by colonoscopy) is that CRC can be prevented. In addition, the different CRC screening tests have different screening intervals, and the optimal screening interval for the blood test is still being determined. In discussing the blood test and other CRC screening options with patients, providers should use plain language since a meaningful portion of the general adult population in the U.S. has basic or below basic health literacy skills [29, 30].

Second, cost could greatly impact utilization of the CRC screening blood test as cost was among the most reported concerns about the blood test in our study. Participants were more willing to get a CRC screening blood test if the test was free or covered by health insurance compared to paying $895 out of pocket. In addition, participants with higher incomes reported being more willing to get a free CRC screening blood test, and this finding may reflect that individuals with higher incomes usually have had access to preventive care and are more accepting of adopting new medical tests [31]. It is worth pointing out that following FDA approval, the cost of the new CRC screening blood test is covered by Medicare Fee-for-Service program once every 3 years for average risk adults [32]. However, commercial insurance coverage of the CRC screening blood test may vary, and patients will need to check for out-of-pocket costs since the blood test has not yet been incorporated into recommended CRC screening guidelines (e.g., USPSTF guidelines). It is also uncertain if the new CRC screening test will increase the current estimated annual CRC screening costs of over $27 billion, including $3 billion by Medicare, Medicaid, and other government insurance plans [33]. As a final point, the cost associated with advancement in medical tests and issues with access to medical care also raise concerns about the potential of the new CRC screening blood test to increase health inequities [34].

Our study also identified health beliefs that may represent modifiable targets for future programs to increase acceptability and eventual use of the CRC screening blood test. Indeed, both perceived severity of CRC and perceived likelihood of getting CRC in the future were correlated with participants' willingness to get the new CRC screening blood test in multivariable analyses. Programs to increase cancer screening usually include these targets since they are constructs in many health behavior theories and have been shown to be important determinants of people receiving other recommended CRC screening tests [35, 36].

Lastly, although the blood test may overcome some barriers associated with different CRC screening tests, additional common concerns reported by participants in our study were anxiety about having an abnormal test result or needing a colonoscopy after an abnormal test result. Interventions to reduce anxiety prior to CRC screening have been developed, and the challenges associated with the follow-up of an abnormal test with a colonoscopy have been documented with stool-based CRC screening tests, as well as more recently with a CRC screening blood test [22, 23, 37–39]. This follow-up care is critical because a delay in completion of a colonoscopy after an abnormal CRC screening test increases risk of CRC incidence and mortality [38].

The study has several important strengths including a large sample of participants from throughout the U.S. and that the survey was conducted only a few months after the new CRC screening blood test was approved by the FDA. Limitations of the study include using a cross- sectional study design and the self-report of previous CRC screening behaviors. In examining willingness, we did not provide participants with some information that could have affected their responses (e.g., potential co-pays, abnormal test result would lead to a diagnostic colonoscopy). In assessing preferences for future CRC options, we did not provide all potential CRC screening options (e.g., DNA-FIT every three years, flexible sigmoidoscopy every five years). Given the convenience sampling approach used for this study, we do not know the total number of individuals approached to participate, and we lack information about survey non-respondents. The generalizability of our findings is also not known, though the data were weighted to represent the U.S. population. Members of this online panel complete surveys on a regular basis, which could have affected their responses.

Conclusions

The addition of a CRC screening blood test as an option to present to average-risk adults raises hope that more age-eligible individuals will complete screening. The current study provides early insight about the willingness for adults to complete a CRC screening blood test and their preferences for CRC screening in the future. The findings also highlight key correlates and other considerations involving this new screening approach. Our results can be used to guide the development of multi-level programs for patients and healthcare providers that will become increasingly important as the blood test continues to emerge as a recommended screening approach.

Abbreviations

CRC	Colorectal cancer
U.S.	United States
FOBT	Fecal Occult Blood Test
FIT	Fecal Immunochemical Test
CT	Computed Tomography
FDA	Food and Drug Administration
RUCA	Rual-Urban Commuting Area
OR	Odds Ratio
CI	Confidence Interval
IBM SPSS	International Business Machines Statistical Package for Social Sciences

Data availability
The data analyzed are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
All participants provided informed consent prior to completing their study survey. The Institutional Review Board at The Ohio State University adheres to the Declaration of Helsinki and determined this study to be exempt from review.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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