

## Implementing an Organized Colorectal Cancer Screening Program: Lessons Learned From an Academic–Community Practice



Amanda Kimura, MPH,<sup>1</sup> Ari Bell-Brown, MPH,<sup>1</sup> Nkem Akinsoto, MSc,<sup>2</sup> Jerry Wood, CHES,<sup>2</sup> Amy Peck, RHIT,<sup>2</sup> Victoria Fang, MD,<sup>3</sup> Rachel B. Issaka, MD, MAS<sup>1,4,5</sup>

**Introduction:** The effectiveness of mailed fecal immunochemical test outreach might be enhanced through an organized colorectal cancer screening program, yet published real-world experiences are limited. We synthesized the process of implementing a colorectal cancer screening program that used mailed fecal immunochemical test outreach in a large integrated academic–community practice.

**Methods:** Data from a pilot mailed fecal immunochemical test program were shared with healthcare system leadership, which inspired the creation of a cross-institutional organized colorectal cancer screening program. In partnership with a centralized population health team and primary care, we defined (1) the institutional approach to colorectal cancer screening, (2) the target population and method for screening, (3) the team responsible for implementation, (4) the healthcare team responsible for decisions and care, (5) a quality assurance structure, and (6) a method for identifying cancer occurrence.

**Results:** The Fred Hutch/UW Medicine Population Health Colorectal Cancer Screening Program began in September 2021. The workflow for mailed fecal immunochemical test outreach included a mailed postcard, a MyChart message from the patient's primary care provider, a fecal immunochemical test kit with a letter signed by the primary care provider and program director, and up to 3 biweekly reminders. Patients without a colonoscopy 3 months after an abnormal fecal immunochemical test result received navigation through the program. In the first program year, we identified 9,719 patients eligible for outreach, and in an intention-to-treat analysis, 32% of patients completed colorectal cancer screening by fecal immunochemical test or colonoscopy.

**Conclusions:** Real-world experiences detailing how to implement organized colorectal cancer screening programs might increase adoption. In our experience, broadly disseminating pilot data, early institutional support, robust data management, and strong cross-departmental relationships were critical to successfully implementing a colorectal cancer screening program that benefits all patients.

*AJPM Focus 2024;3(2):100188. © 2024 The Authors. Published by Elsevier Inc. on behalf of The American Journal of Preventive Medicine Board of Governors. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).*

From the <sup>1</sup>Hutchinson Institute for Cancer Outcomes Research, Fred Hutchinson Cancer Center, Seattle, Washington; <sup>2</sup>UW Medicine Primary Care and Population Health, University of Washington, Seattle, Washington; <sup>3</sup>Division of General Internal Medicine, University of Washington School of Medicine, Seattle, Washington; <sup>4</sup>Public Health Sciences Division, Fred Hutchinson Cancer Center, Seattle, Washington; and <sup>5</sup>Division of Gastroenterology, University of Washington School of

Medicine, Seattle, Washington

Address correspondence to: Rachel B. Issaka, MD, MAS, Fred Hutchinson Cancer Center, 1100 Fairview Avenue North, Mail Stop M3-B232, Seattle WA 98109. E-mail: [rissaka@fredhutch.org](mailto:rissaka@fredhutch.org).

2773-0654/\$36.00

<https://doi.org/10.1016/j.focus.2024.100188>

## INTRODUCTION

Owing to the effectiveness<sup>1</sup> and cost-effectiveness<sup>2</sup> of colorectal cancer (CRC) screening, the U.S. Preventive Services Task Force recommends screening for average-risk individuals aged 45–75 years.<sup>3</sup> However, only 58% of eligible adults are up to date with screening,<sup>4</sup> well below the National Colorectal Cancer Roundtable goal of 80%. In addition, late-stage CRC and mortality rates are disproportionately high among racial and ethnic minority groups,<sup>5,6</sup> individuals of lower SES,<sup>7</sup> and other populations cared for by safety-net health systems and federally qualified health centers.<sup>8</sup>

Simulation modeling suggests that 46%–63% of CRC deaths in the U.S. are due to missed screening<sup>9</sup>; thus, there is great interest in interventions and strategies that could improve screening completion, especially in populations with the poorest outcomes, including Black and American Indian/Alaskan Native people<sup>5,6</sup> and low-income populations.<sup>7</sup> Although colonoscopy is the primary modality for CRC screening in the U.S.,<sup>10,11</sup> there is increased use of stool-based screening tests, including the fecal immunochemical test (FIT). FIT requires no bowel preparation and can be completed at home; up-front costs are less than those of direct visualization tests;<sup>11</sup> and mailed outreach increases CRC screening participation by a median of 21.5% (IQR=13.6%–29.0%).<sup>12–15</sup> Therefore, increasing implementation of mailed FIT outreach has the potential to engage populations that might not otherwise seek care and address persistent disparities in CRC outcomes.<sup>11,16</sup>

The effectiveness of mailed FIT outreach might be additionally enhanced through organized CRC screening programs. These programs provide centrally coordinated services to increase screening completion, with the goal of reducing CRC incidence, increasing early diagnosis, and decreasing CRC mortality.<sup>17</sup> The International Agency for Research on Cancer (IARC) framework for an organized screening program stipulates the following features: (1) a policy with specified age categories, method, and interval for screening; (2) a defined target population; (3) a management team responsible for implementation; (4) a healthcare team for decisions and care; (5) a quality assurance structure; and (6) a method for identifying cancer occurrence in the population (Figure 1).<sup>18</sup> The exploration, preparation, implementation, and sustainment (EPIS) framework provides an implementation framework to guide this process.<sup>19</sup>

Between 2017 and 2019, our health system piloted a stand-alone mailed FIT outreach project, which improved CRC screening rates by 16 percentage points, but increases in screening were not observed in all patient demographic groups. Subsequently, the coronavirus disease (COVID-19) pandemic delayed nonurgent and elective procedures,



**Figure 1.** IARC framework for an organized screening program. CRC, colorectal cancer; IARC, International Agency for Research on Cancer.

leading to dramatic declines in CRC screening and diagnoses locally and nationally. To overcome these challenges and prepare for future disruptions, our healthcare system sought to increase the use of mailed FIT outreach through an organized CRC screening program and to increase screening participation equitably. Despite literature on the impact of mailed FIT programs<sup>12–15</sup> and emerging guidance documents,<sup>15,17</sup> published real-world experiences that detail the process of implementing mailed FIT as part of organized CRC screening programs are sparse.<sup>20,21</sup> In this study, we describe the process of implementing an organized CRC screening program that uses mailed FIT outreach in a large integrated healthcare system informed by the IARC and EPIS frameworks.

## METHODS

### Program Setting

UW Medicine is the health system affiliated with the University of Washington (UW) and includes 5 medium-to-large clinic networks, including Harborview Medical Center (HMC)—a safety-net health system. These clinics are integrated with a single electronic health record (EHR) system (Epic). Across ambulatory practices, UW Medicine conducts 1.8 million annual outpatient visits in >30 primary care practices for over 300,000 empaneled patients.<sup>22</sup> Empaneled patients are individuals assigned to a primary care provider (PCP) in the health system. Fred Hutchinson Cancer Center (Fred Hutch) is an independent, nonprofit research institution and one of the National Cancer Institute–designated Comprehensive Cancer Centers. Fred Hutch together with UW Medicine leads a collaborative program that spans cancer prevention to surveillance after treatment through clinical care, basic, translational, and population-based research. The Fred Hutch/UW Medicine Population Health Colorectal Cancer Screening program

was launched in September 2021 as a cross-institutional collaboration.<sup>23</sup> Applying a learning health system<sup>24</sup> approach, our program obtained IRB approval to evaluate and disseminate learnings.

## Exploration

**Partner engagement and preimplementation program planning.** Some members of the program team conducted informal meetings with primary care leadership to understand opportunities for embedding the organized CRC screening program within existing efforts. Information from these meetings was used to identify key partners necessary for program implementation, including UW Medicine population health analytics (data extraction), laboratory services (ordering and processing FITs), mail services (mailing FIT kits), communications (automated reminders), EPIC information technologies (EHR reports), and interpretation services (program material translations and interpretation of live patient calls).

To obtain institutional alignment on the resources necessary to successfully launch the organized CRC screening program, learnings from the informal meetings and results from a mailed FIT pilot<sup>25</sup> were summarized in an SBAR (situation, background, assessment, and recommendation) document and shared with institutional leaders. The SBAR included a budget impact analysis and dollar amounts needed to start the program, including staff salaries, FIT mailing supplies, translation services, and more. This document was iterated and ultimately approved by leadership.

## Preparation

**Defining the colorectal cancer screening policy.** Similar to many health systems in the U.S., UW Medicine previously used an opportunistic approach for CRC screening

whereby screening and follow-up of abnormal results were managed solely by PCPs. In the fall of 2021, in partnership with a centralized population health team and primary care, the CRC screening program defined an institutional population-based approach to CRC screening. The program recommended an annual mailed FIT as the primary screening strategy; however, patients could complete colonoscopy-based screening through the CRC screening program or as ordered by the PCP. The health system uses OC-Auto Micro 80 FIT with a positive result reported when >100 ng/mL of hemoglobin is detected in the buffer. A workflow for mailed FIT outreach was finalized through an iterative process with primary care and included best practices from other programs.<sup>25–27</sup>

**Defining the target population.** In the first year of the program, patients aged 50–75 years who were empaneled; were not up to date with screening by December 31, 2021; had a billable primary care encounter in the prior 3 years; and belonged to a clinic with CRC screening rates at or below the 75th percentile of the National Commission on Quality Assurance (NCQA)'s Healthcare Effectiveness Data and Information Set benchmark as of December 2021<sup>28</sup> were eligible for outreach. NCQA benchmarks vary on the basis of the eligible patient population and payor plan. Additional inclusion and exclusion criteria are defined in Table 1. On the basis of inclusion and exclusion criteria, 75% of safety-net clinics and 38% of non-safety-net clinics were included in the first outreach year. Patients aged 45–49 years were excluded from Year 1 outreach because most insurance plans were not consistently covering screening for this group at the time.

**Preparing for mailed outreach.** Eligible patients and clinics were identified by the UW Medicine Population Health Analytics team who queried the UW Electronic

**Table 1.** Year 1 Mailed FIT Outreach Patient Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>• Aged 50–75 years</li> <li>• Empaneled at UW Medicine</li> <li>• Primary care encounter at UW Medicine in the past 3 years</li> <li>• Patient at a clinic with CRC screening rates below the 75th NCQA benchmark</li> <li>• English or Spanish speaking</li> <li>• Due for CRC screening as of December 31, 2021               <ul style="list-style-type: none"> <li>◦ No colonoscopy in 10 years</li> <li>◦ No flexible sigmoidoscopy in 5 years</li> <li>◦ No mt-sDNA in 3 years</li> <li>◦ No FIT in 1 year</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Up to date with CRC screening</li> <li>• Diagnosis of 1 (or more) of the following:               <ul style="list-style-type: none"> <li>◦ Colorectal cancer/total colectomy</li> <li>◦ Metastatic cancer</li> <li>◦ Myocardial infarction in the last 6 months</li> <li>◦ Inflammatory bowel disease in the last year</li> <li>◦ Congestive heart failure and ischemic vascular disease in the last year</li> <li>◦ Chronic obstructive pulmonary disease (with oxygen use) in the last year</li> </ul> </li> <li>• Advised to discontinue CRC screening</li> </ul>

CRC, colorectal cancer; FIT, fecal immunochemical test; mt-sDNA, multitarget stool DNA; NCQA, National Commission on Quality Assurance; UW, University of Washington.

Data Warehouse—a validated EHR platform with integrated clinical data and laboratory reports dating back to 2004—to extract clinic details and patient demographics, prior CRC screenings, and comorbidities that could influence eligibility.<sup>29,30</sup> An in-house vendor (UW Creative Communications) was contracted for printing, labeling, and mailing materials. FITs were purchased by the Department of Laboratory Medicine and Pathology in coordination with the central laboratory at HMC. The program team worked with the UW Communication Technologies team to finalize reminder telephone and text message scripts and a schedule for sending patient reminders. A Health Insurance Portability and Accountability Act of 1996—approved shared drive was used to transfer data files to the UW Creative Communications and the UW Communication Technologies teams. All print materials and recordings were translated into Spanish during the first program year.

### Management team responsible for implementation.

The CRC screening program is operated by a cross-institutional team, including the CRC screening program director, the UW Medicine Primary Care (UWPC) director of primary care and population health, the UWPC assistant director of primary care and population health, a Fred Hutch project manager, a Fred Hutch program manager, and UWPC program navigators (Figure 2). The program director is a gastroenterologist and CRC researcher with faculty appointments at both institutions. Together with the UWPC director of primary care and population health, an internist with an active primary care clinic, the UWPC assistant director

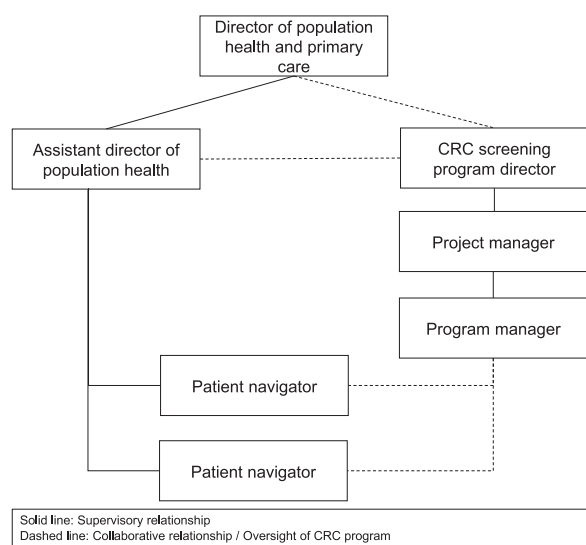
of primary care and population health, the project manager, and the program manager, they advocate on behalf of the program to executive leadership, champion the program to primary care colleagues, and facilitate introductions to key collaborators.

The assistant director of primary care and population health has deep institutional knowledge, supervises the team of program navigators, and shares insights from other population health programs across the health systems that she oversees. The project manager works to obtain regulatory approval with the program director, who bridges quality improvement efforts with research opportunities and supervises the program manager. The program manager and navigators are responsible for the day-to-day implementation of the CRC screening program with input from the entire team. The program manager provides direction to the program navigators and is responsible for creating data management tools and oversight of data collection and data analysis, whereas the navigators are responsible for communications with healthcare providers and patients, data collection, and care coordination.

### Healthcare team responsible for decisions and care.

Members of the CRC screening program team are responsible for programmatic decisions, whereas PCPs are responsible for decisions related to patient care. For example, the program team orders and signs all FIT kits distributed through the program. Once FIT kits are completed, PCPs are responsible for communicating the results to patients. In the first program year, PCPs opted to follow up abnormal FIT results for the first 3 months. This meant that within the first 3 months of any abnormal result, only PCPs communicated with patients and coordinated follow-up colonoscopies. Program navigators assisted with care coordination if a follow-up colonoscopy was not completed during this period.

**A quality assurance structure.** The program was approved by the UW Medicine Patient Safety and Quality Executive Committee. The quality assurance structure includes all members of the CRC screening program (Figure 2) and reflects the cross-institutional nature of the program. For example, given the need to access clinical systems, the program navigators were hired by UW Medicine and directly reported to the UWPC assistant director of population health but executed daily tasks and functions with the program manager's direction. Quality improvement goals were set by the screening program, with input from all members, and cascaded throughout the team. Once finalized, these were shared with primary care leadership and a Health Equity Working Group,<sup>31</sup> which included members of



**Figure 2.** CRC screening program structure. CRC, colorectal cancer.



the Population Health Data Analytics Team, UW Medicine, Fred Hutch, and community members with a vested interest in improving CRC outcomes. Finally, the team's performance is summarized in an annual report shared with leadership across both institutions.

**A method for identifying cancer occurrence in the population.** To identify cancer occurrence and related information in the population that received mailed FIT outreach, we extracted the abnormal FIT result date, colonoscopy order date, colonoscopy completion date, bowel preparation quality, number of polyps identified, polyp size(s), pathology results (including cancer and cancer precursors), and follow-up recommendations from the EHR. To identify cancer diagnoses that might occur outside of our healthcare system, the program navigators reviewed Care Everywhere, a secure platform that enables the exchange of information across healthcare organizations.<sup>32</sup>

**Data management and analysis.** The CRC screening program team developed a shared data management system and a standard operating procedure for program-related data tracking. The team used Microsoft Excel as its preferred data management system; documents were stored on a secure drive, shared with team members across the institutions, and served as the landing page for data analysis. Specifically, data management tools included a schedule for tracking deadlines and

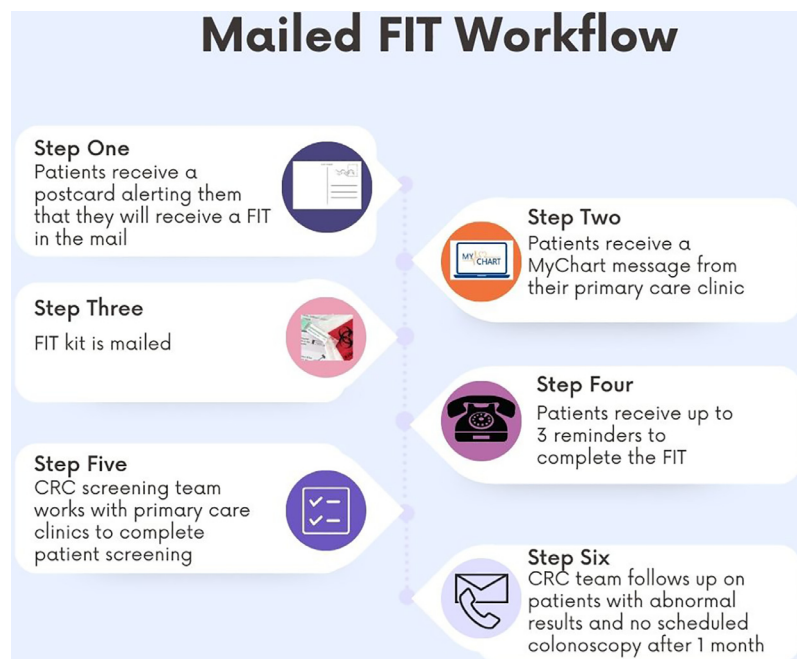
milestones, an issue log for recording issues and solutions, and a task tracking worksheet that outlined when team members could begin tasks that occurred sequentially.

Although detailed outcomes of mailed FIT outreach as part of the CRC screening program are not the focus of this manuscript, preliminary data, including FIT completion rate, rate of abnormal FIT results, follow-up colonoscopy completion, and pathology outcomes, are described here as proportions or medians and IQRs in an intent-to-treat analysis.<sup>33</sup>

## RESULTS

### Implementation

**Mailed fecal immunochemical test workflow.** The final mailed FIT workflow (Figure 3) included the following. First, patients received a postcard (Appendix Figure 1, available online), which introduced the CRC screening program, shared reasons why an individual might complete screening with colonoscopy instead of FIT, and included the contact number of the program navigator so that patients could opt out of the program. The postcard also served as a way for the program to identify incorrect addresses if returned by the postal service. Second, approximately 2 weeks later, patients received a pre-outreach message through Epic MyChart. Patients who did not have access to MyChart received a message through mail or phone, depending on their preferred



**Figure 3.** Mailed FIT workflow.

CRC, colorectal cancer; FIT, fecal immunochemical test.

method of communication. Third, 4–6 weeks after receiving the postcard, patients received an OC-Auto Micro 80 FIT and a prepaid envelope for FIT return along with a letter signed by their PCP and the CRC screening program director ([Appendix Figure 2](#), available online).

The letter included information about CRC screening and wordless instructions developed by Coronado et al.<sup>34</sup> and adapted by Wang and colleagues<sup>35</sup> or a quick response link to a video on how to complete a FIT.<sup>36</sup> Patients who did not return their FIT received up to 3 reminders in 2-week intervals after the mailed FIT. The first 2 reminders were automated phone calls or text messages, depending on the patient's preferred communication as indicated in the EHR. For the automated call, patients could speak with the CRC screening program navigator if they had questions. Patients who received text messages could respond to a brief form through an embedded link. The final reminder, if needed, was a live phone call from the program navigator. For patients with abnormal FIT results, program navigation to colonoscopy began if a patient did not complete a colonoscopy within 3 months of their abnormal FIT result, as previously described. The program navigator tracked patients up to 1 year after their abnormal results.

**Fecal immunochemical test processing.** Completed FITs were processed by a single laboratory at HMC. Patients had the option to return their completed FIT kits through mail, directly to the lab, or during a primary care visit. For any unusable tests (e.g., expired media), laboratory staff canceled the FIT order and notified the ordering staff member and authorizing provider (CRC screening program director). The navigator then contacted the patient to repeat the test, mailed another kit, and placed a new order for the authorizing provider to sign.

**Data management.** The data-tracking spreadsheet, in addition to tracking FIT completion and outcomes, also tracked postcard mailing attempts and outcomes, reminder attempts and outcomes, reasons for not completing mailed FIT, and reasons for not completing a follow-up colonoscopy ([Table 2](#)).

**Year 01 mailed fecal immunochemical test program implementation.** In the first CRC screening program year, mailed outreach beginning with postcards occurred between January 2022 and June 2022. Among 22,721 patients not up to date with CRC screening across UW Medicine, we identified 10,604 patients who were eligible for mailed FIT outreach. After mailing postcards, we identified an additional 885 patients who were not

**Table 2.** Mailed FIT Outreach Data Tracking Template

Columns	Data source
Primary mailed FIT tracker	
Medical record number	Epic
Last name	Epic
First name	Epic
Primary care provider	Epic
Assigned primary care clinic location	Population Health Analytics
Empaneled patient	Population Health Analytics
Last visit date	Population Health Analytics
Last CRC screen date	Epic
Last FIT result	Epic
Last colonoscopy date	Epic
Postcard returned	Program team
FIT sent?	Program team
FIT mail date	Program team
Letter type (English/Spanish, QR/image)	Program team
Completed FIT date	Epic
Completed FIT results	Epic
Scheduled follow-up colonoscopy date	Epic
Completed follow-up colonoscopy date	Epic
First reminder outreach date	Communication Technologies
First reminder outcome	Communication Technologies
Second reminder outreach date	Communication Technologies
Second reminder outcome	Communication Technologies
Third reminder outreach date	Program team
Third reminder outcome	Program team
Final outcome	Program team
Date of birth	Epic
Age	Epic
Patient status (alive or deceased)	Epic
Sex	Epic
Language	Epic
Race	Epic
Ethnicity	Epic
Marital status	Epic
Sexual orientation	Epic
Primary financial class (insurance)	Epic
Patient address	Epic
City	Epic
State	Epic
ZIP code	Epic
Preferred phone number	Epic
Patient communication preference (text, mail, phone)	Epic
UW Medicine text consent	Epic

(continued on next page)

**Table 2.** Mailed FIT Outreach Data Tracking Template (continued)

Columns	Data source
Patient portal status (has the patient activated MyChart?)	Epic
Abnormal FIT tracker	
Medical record number	Epic
FIT mail date	Program team
Positive FIT result date	Epic
Order for colonoscopy	Epic
Referral status	Epic
Scheduled colonoscopy date	Epic
Completed colonoscopy date	Epic
Reason for not completing colonoscopy	Program team
Reason for declining colonoscopy	Program team
CRC program navigator involved in outreach?	Program team
Outreach date(s)	Program team
Person outreached(s)	Program team
Program navigator note(s)	Program team
Pathology tracker	
Medical record number	Epic
Sex	Epic
FIT mail date	Program team
Positive FIT date	Epic
Colonoscopy date	Epic
Bowel preparation quality	Epic
Number of polyps	Epic
Size of polyps	Epic
Pathology findings	Epic
Recommendations for continued follow-up	Epic
Colonoscopy outcome	Program team

CRC, colorectal cancer; FIT, fecal immunochemical test; QR, quick response; UW, University of Washington.

appropriate for outreach (Figure 4). We mailed 9,719 FIT kits to patients due for CRC screening, and by December 2022, 30% ( $n=2,874$  of 9,719) of patients completed CRC screening by FIT. An additional 2% ( $n=228$  of 9,719) of patients opted to complete a screening colonoscopy. The FIT positivity rate was 6% ( $n=175$  of 2,874) (Figure 5). Program navigation for those with abnormal FIT results is ongoing. CRC screening rates across UW Medicine increased from 68% as of December 2021 to 70% as of December 2022. We observed a 7% increase among Native Hawaiian or other Pacific Islander patients, a 3% increase among American Indian/Alaskan Native patients, a 2% increase among Black patients, and a 2% increase among White patients.

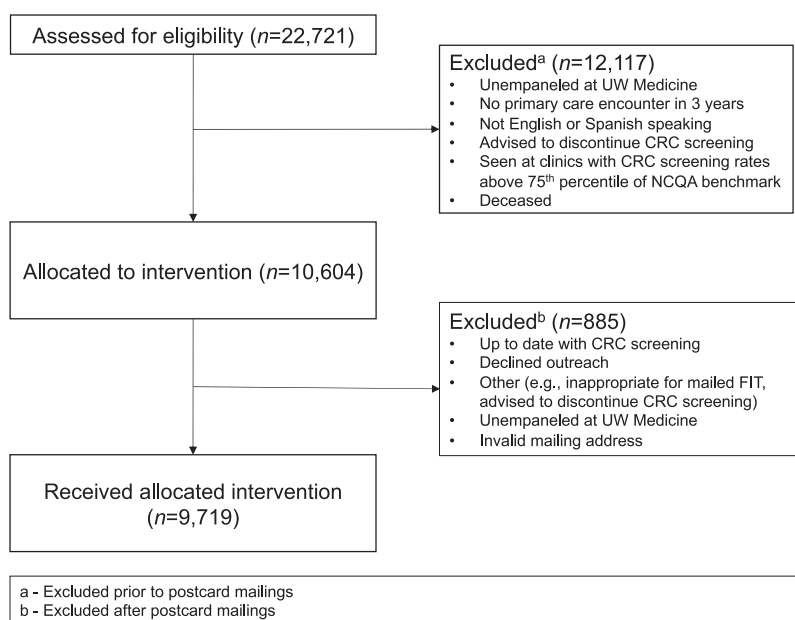
## DISCUSSION

We successfully implemented an organized CRC screening program that included mailed FIT outreach in a large integrated academic–community practice. In our first year, in an intention-to-treat analysis, 32% of outreached patients completed screening by FIT or colonoscopy. Our FIT return rate was comparable with that of our pilot project<sup>25</sup> and with those of other mailed FIT outreach programs.<sup>27,37</sup> However, unlike the pilot project, we saw increases in CRC screening completion across all sociodemographic groups. Using the IARC and EPIS frameworks, our process of defining the CRC screening policy, method, and interval for screening; the target population; a management team responsible for implementation; a healthcare team for decisions and care; a quality assurance structure; and a method for identifying cancer occurrence can be replicated in other healthcare systems. In our experience, (1) dedicated resources to fund the CRC screening program, (2) robust data tracking and management, and (3) strong cross-departmental relationships and communications were essential to successfully launching an organized CRC screening program.

### Sustainment

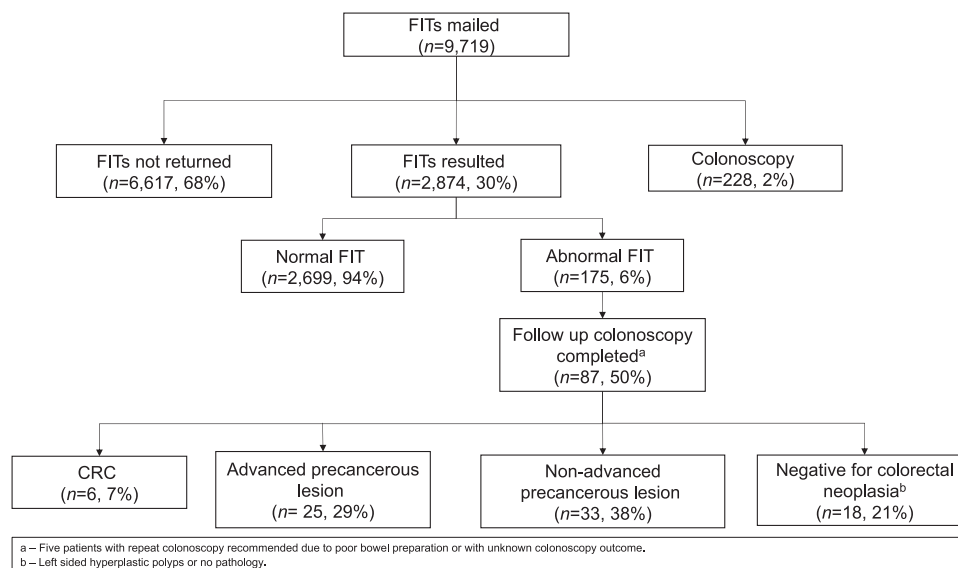
**Program costs and funding.** Implementing an organized CRC screening program requires substantial start-up and maintenance costs, which might not be reimbursed in the traditional fee-for-service model.<sup>15</sup> In a Washington state health system, CRC screening cost \$39.81 per returned FIT, with one third of expenses due to start-up tasks, such as staff training.<sup>37</sup> Within a San Francisco safety-net health system, implementing mailed outreach cost \$23 per patient and \$112 per additional patient screened.<sup>33</sup> Despite these costs, mailed FIT programs are cost-effective, and start-up expenses may be offset by costs saved from preventing cancers and cancer deaths.<sup>38</sup> Our healthcare system was motivated by pilot data that demonstrated that an organized approach to CRC screening could increase NCQA's Healthcare Effectiveness Data and Information Set<sup>39</sup> and Medicare Stars ratings.<sup>40</sup> Organized CRC screening also provided an opportunity to participate in Medicaid Quality Incentive Programs.<sup>15,41,42</sup> As the U.S. healthcare system continues to shift from fee-for-service to value-based models, quality of care is becoming an increasingly important metric that might justify the upfront and maintenance costs of similar organized screening programs.<sup>42–44</sup>

**Data management.** A stand-alone model and an embedded model have been proposed for tracking data in mailed FIT outreach efforts.<sup>15</sup> A stand-alone model



**Figure 4.** CONSORT flowchart for mailed FIT outreach.

CRC, colorectal cancer; FIT, fecal immunochemical test; NCQA, National Commission on Quality Assurance; UW, University of Washington.



**Figure 5.** Outcomes of mailed FIT outreach.

CRC, colorectal cancer; FIT, fecal immunochemical test.

“requires the creation of a tracking database to capture outcomes of all steps required for mailed outreach,” whereas an embedded model inserts “the tracking functions for mailed outreach directly into the electronic health record.”<sup>15</sup> As a best practice, Gupta et al.<sup>15</sup>

recommend that databases identify eligible patients, track milestones in the screening process, and follow navigation to colonoscopy. To date, our program has used a stand-alone model because certain data elements (e.g., reminder attempts and outcomes) could not be



entered directly into the EHR. Although using a stand-alone model provided flexibility during the data management system development, it also added steps in the workflow. Moving forward, our health system is evaluating an embedded model that could serve multiple cancer prevention programs.

**Cross-departmental relationships and communications.** In addition to the team structure and primary care partnerships described earlier, we identified 6 cross-departmental relationships necessary for implementing an organized CRC screening program: (1) population health analytics (identification of eligible population), (2) laboratory services (ordering and processing FITs), (3) printing and mailing services (mailing FITs), (4) EHR information technologies (generating EPIC patient reports), (5) communication technologies (automating patient reminders), and (6) interpretation services (interpreting live patient calls and translating materials). Establishing and maintaining these relationships reduced the work burden on the CRC screening program team by leveraging existing expertise to streamline outreach efforts. These relationships also kept partners aligned on the program's progress and identified risks that the program could mitigate. For example, through our partnership with laboratory services, we ensured that all mailed FITs had a 1-year expiration date to provide patients with a longer return window.

**Addressing health equity.** There is evidence that racial disparities can be improved through organized CRC screening programs that use mailed FIT outreach.<sup>45,46</sup> In Kaiser Permanente Northern California, an organized CRC screening program increased screening to 80% among Black and White patients and reduced the CRC mortality difference between groups from 21.6 of 100,000 cases to 1.6 of 100,000 cases over a 10-year period.<sup>45</sup> Although overall screening in our health system has yet to reach the 80% target, in the program's first year, we reached 88% screening completion among commercially insured individuals in 1 site<sup>47</sup> and observed increases in CRC screening across all racial and ethnic minority groups. These trends were not achieved in the mailed FIT pilot that was not embedded in an organized CRC screening program. Moving forward, our program will expand outreach to non-English- or non-Spanish-speaking patients and ensure that groups with the greatest gaps in screening or follow-up receive earlier assistance through navigation and other interventions. To date, program materials have been translated into Arabic, Chinese, Khmer, Russian, Somali, and Vietnamese for the program's second year. In addition, to reflect updates in insurance

coverage, patients aged 45–49 years will be included in subsequent outreach years.

### Limitations

There were limitations to our program. First, similar to other mailed FIT outreach efforts (stand-alone or through an organized CRC screening program), most individuals did not return their FIT. Data analysis to determine the factors associated with returning or not returning a FIT kit is ongoing. Our goal is to identify modifiable targets for future interventions to improve overall screening participation. Second, follow-up colonoscopy completion was low in the first program year. Inadequate follow-up colonoscopy completion after abnormal FIT results is well described in the literature.<sup>48,49</sup> Barriers include but are not limited to lack of comprehensive health insurance, competing health issues, and logistical barriers such as lack of transportation.<sup>48</sup> Despite a 2021 Centers for Medicare and Medicaid Services rule that eliminates cost sharing for colonoscopy after an abnormal FIT result,<sup>50</sup> many patients continue to face insurance barriers to screening and follow-up. In our program, navigators connected patients with insurance barriers to financial assistance resources. Overall, program navigators assisted 54% of patients with abnormal FIT results and increased colonoscopy completion by 16%. Third, we discovered that although PCPs almost immediately placed EHR orders for follow-up colonoscopies, our initial workflow did not permit program navigation until 3 months after the abnormal result. In communication with primary care, we have updated the workflow to begin navigation to colonoscopy within the first month of an abnormal result. Finally, we have not obtained feedback from patients about their experience with the CRC screening program in a systematic fashion. This is an area of interest as we continue to refine the program.

### CONCLUSIONS

Detailing the process of implementing an organized CRC screening program might increase the adoption of this evidence-based intervention. In our experience, successfully implementing a program that incorporated mailed FIT outreach across a large health system required early institutional support; strong cross-departmental relationships; and robust data management, including analyses of patient demographic factors that could be associated with inequitable outcomes. To reduce the burden of CRC and eliminate persistent disparities in screening and outcomes, policies and resources that support the implementation of organized CRC screening programs in the U.S. are severely needed.

## ACKNOWLEDGMENTS

The content of this paper is solely the responsibility of the authors and does not necessarily represent the official views of the NIH, Fred Hutchinson Cancer Center, or UW Medicine. The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The datasets generated during and/or analyzed during the current study are not publicly available owing to protected health information.

This work was supported by the National Cancer Institute of NIH (Grant Number K08CA241296 for RBI) and institutional funding from the Fred Hutchinson Cancer Center and UW Medicine.

Declaration of interest: none.

## CREDIT AUTHOR STATEMENT

Amanda Kimura: Formal analysis, Investigation, Project administration, Visualization, Writing—original draft. Ari Bell-Brown Supervision, Resources, Writing—review & editing. Nkem Akinsoto: Supervision, Resources, Writing—review & editing. Jerry Wood: Investigation, Writing—review & editing. Amy Peck: Investigation, Writing—review & editing. Victoria Fang: Funding acquisition, Supervision, Writing—review & editing. Rachel B. Issaka: Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Writing—review & editing.

## SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.focus.2024.100188](https://doi.org/10.1016/j.focus.2024.100188).

## REFERENCES

- Winawer SJ, Zauber AG. The advanced adenoma as the primary target of screening. *Gastrointest Endosc Clin N Am*. 2002;12(1):1–v. [https://doi.org/10.1016/S1052-5157\(03\)00053-9](https://doi.org/10.1016/S1052-5157(03)00053-9).
- Ran T, Cheng CY, Misselwitz B, Brenner H, Uebels J, Schlander M. Cost-effectiveness of colorectal cancer screening strategies—a systematic review. *Clin Gastroenterol Hepatol*. 2019;17(10):1969–1981.e15. <https://doi.org/10.1016/j.cgh.2019.01.014>.
- Preventive Services Task Force US, Davidson KW, Barry MJ, et al. Screening for colorectal cancer: U.S. Preventive Services Task Force recommendation statement [published correction appears in JAMA. 2021;326(8):773]. *JAMA*. 2021;325(19):1965–1977. <https://doi.org/10.1001/jama.2021.6238>.
- Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. *CA Cancer J Clin*. 2023;73(1):17–48. <https://doi.org/10.3322/caac.21763>.
- Carethers JM. Racial and ethnic disparities in colorectal cancer incidence and mortality. *Adv Cancer Res*. 2021;151:197–229. <https://doi.org/10.1016/bs.acr.2021.02.007>.
- Pankratz VS, Kosich M, Edwardson N, et al. American Indian/Alaska Native and black colon cancer patients have poorer cause-specific survival based on disease stage and anatomic site of diagnosis. *Cancer Epidemiol*. 2022;80:102229. <https://doi.org/10.1016/j.canep.2022.102229>.
- Manser CN, Bauerfeind P. Impact of socioeconomic status on incidence, mortality, and survival of colorectal cancer patients: a systematic review. *Gastrointest Endosc*. 2014;80(1):42–60.e9. <https://doi.org/10.1016/j.gie.2014.03.011>.
- Hrebinko KA, Rieser C, Nassour I, et al. Patient factors limit colon cancer survival at safety-net hospitals: a National analysis. *J Surg Res*. 2021;264:279–286. <https://doi.org/10.1016/j.jss.2021.03.012>.
- Meester RG, Doubeni CA, Lansdorp-Vogelaar I, et al. Colorectal cancer deaths attributable to nonuse of screening in the United States. *Ann Epidemiol*. 2015;25(3):208–213.e1. <https://doi.org/10.1016/j.annepidem.2014.11.011>.
- Shaukat A, Levin TR. Current and future colorectal cancer screening strategies. *Nat Rev Gastroenterol Hepatol*. 2022;19(8):521–531. <https://doi.org/10.1038/s41575-022-00612-y>.
- Jain S, Maque J, Galoosian A, Osuna-Garcia A, May FP. Optimal strategies for colorectal cancer screening. *Curr Treat Options Oncol*. 2022;23(4):474–493. <https://doi.org/10.1007/s11864-022-00962-4>.
- Murphy CC, Halm EA, Zaki T, et al. Colorectal cancer screening and yield in a mailed outreach program in a safety-net healthcare system. *Dig Dis Sci*. 2022;67(9):4403–4409. <https://doi.org/10.1007/s10620-021-07313-7>.
- Issaka RB, Avila P, Whitaker E, Bent S, Somsouk M. Population health interventions to improve colorectal cancer screening by fecal immunochemical tests: a systematic review. *Prev Med*. 2019;118:113–121. <https://doi.org/10.1016/j.ypmed.2018.10.021>.
- Schlichting JA, Mengeling MA, Makki NM, et al. Veterans' continued participation in an annual fecal immunochemical test mailing program for colorectal cancer screening. *J Am Board Fam Med*. 2015;28(4):494–497. <https://doi.org/10.3122/jabfm.2015.04.140241>.
- Gupta S, Coronado GD, Argenbright K, et al. Mailed fecal immunochemical test outreach for colorectal cancer screening: summary of a Centers for Disease Control and Prevention-sponsored Summit. *CA Cancer J Clin*. 2020;70(4):283–298. <https://doi.org/10.3322/caac.21615>.
- Rabeneck L, Chiu HM, Senore C. International perspective on the burden of colorectal cancer and public health effects. *Gastroenterology*. 2020;158(2):447–452. <https://doi.org/10.1053/j.gastro.2019.10.007>.
- Somsouk M, Lee B, Potter MB. Opportunity and promise of stool-based organized colorectal cancer screening programs. *Tech Innov Gastrointest Endosc*. 2023;25(3):259–268. <https://doi.org/10.1016/j.tige.2023.02.003>.
- Dominitz JA, Levin TR. What is organized screening and what is its value? *Gastrointest Endosc Clin N Am*. 2020;30(3):393–411. <https://doi.org/10.1016/j.giec.2020.02.002>.
- Moullin JC, Dickson KS, Stadnick NA, Rabin B, Aarons GA. Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework. *Implement Sci*. 2019;14(1):1. <https://doi.org/10.1186/s13012-018-0842-6>.
- Selby K, Jensen CD, Levin TR, et al. Program components and results from an organized colorectal cancer screening program using annual fecal immunochemical testing. *Clin Gastroenterol Hepatol*. 2022;20(1):145–152. <https://doi.org/10.1016/j.cgh.2020.09.042>.
- Green BB, Fuller S, Anderson ML, Mahoney C, Mendy P, Powell SL. A quality improvement initiative to increase colorectal cancer (CRC) screening: collaboration between a primary care clinic and research team. *J Fam Med*. 2017;4(3):1115. <https://doi.org/10.26420/jfam-med.2017.1115>.
- Peterson E, Harris K, Farjah F, Akinsoto N, Marcotte LM. Improving smoking history documentation in the electronic health record for lung cancer risk assessment and screening in primary care: a case study. *Healthc (Amst)*. 2021;9(4):100578. <https://doi.org/10.1016/j.hjdsi.2021.100578>.
- Population health colorectal cancer screening program. Fred Hutchinson Cancer Center. <https://www.fredhutch.org/en/research/institutes-networks-ircs/population-health-colorectal-cancer-screening-program.html>. Updated September 7, 2023. Accessed September 20, 2023.
- Agency for Healthcare Research and Quality. About Learning Health Systems. Rockville, MD: Agency for Healthcare Research and Quality; 2019. <https://www.ahrq.gov/learning-health-systems/about.html>. Accessed July 20, 2023.

25. Issaka RB, Akinsoto NO, Strait E, Chaudhari V, Flum DR, Inadomi JM. Effectiveness of a mailed fecal immunochemical test outreach: a Medicare Advantage pilot study. *Therap Adv Gastroenterol*. 2020;13:1756284820945388. <https://doi.org/10.1177/1756284820945388>.
26. Deeds SA, Moore CB, Gunnink EJ, et al. Implementation of a mailed faecal immunochemical test programme for colorectal cancer screening among Veterans. *BMJ Open Qual*. 2022;11(4):e001927. <https://doi.org/10.1136/bmjoq-2022-001927>.
27. Coronado GD, Petrik AF, Vollmer WM, et al. Effectiveness of a mailed colorectal cancer screening outreach program in community health clinics: the STOP CRC cluster randomized clinical trial [published correction appears in *JAMA Intern Med*. 2019;179(7):1007]. *JAMA Intern Med*. 2018;178(9):1174–1181. <https://doi.org/10.1001/jamainternmed.2018.3629>.
28. Skolnick AA. JCAHO, NCQA, and AMAP establish council to coordinate health care performance measurement. Joint Commission on Accreditation of Healthcare Organizations, National Committee for Quality Assurance, American Medical Accreditation Program. *JAMA*. 1998;279(22):1769–1770. <https://doi.org/10.1001/jama.279.22.1769-jmn0610-2-1>.
29. Van Eaton EG, Devlin AB, Devine EB, Flum DR, Tarczy-Hornoch P. Achieving and sustaining automated health data linkages for learning systems: barriers and solutions. *EGEMs (Wash DC)*. 2014;2(2):1069. <https://doi.org/10.13063/2327-9214.1069>.
30. Devine EB, Capurro D, van Eaton E, et al. Preparing electronic clinical data for quality improvement and comparative effectiveness research: the SCOAP CERTAIN automation and validation project. *EGEMs (Wash DC)*. 2013;1(1):1025. <https://doi.org/10.13063/2327-9214.1025>.
31. Health equity working group. Fred Hutchinson Cancer Center. <https://www.fredhutch.org/en/research/institutes-networks-ircs/population-health-colorectal-cancer-screening-program/health-equity-working-group.html>. Updated September 7, 2023. Accessed September 20, 2023.
32. Care everywhere. Healthcare Information and Management Systems Society. <https://www.himss.org/resource-environmental-scan/care-everywhere>. Updated September 7, 2023. Accessed September 20, 2023.
33. Somsouk M, Rachocki C, Mannalithara A, et al. Effectiveness and cost of organized outreach for colorectal cancer screening: a randomized, controlled trial. *J Natl Cancer Inst*. 2020;112(3):305–313. <https://doi.org/10.1093/jnci/djz110>.
34. Coronado GD, Sanchez J, Petrik A, Kapka T, DeVoe J, Green B. Advantages of wordless instructions on how to complete a fecal immunochemical test: lessons from patient advisory council members of a federally qualified health center. *J Cancer Educ*. 2014;29(1):86–90. <https://doi.org/10.1007/s13187-013-0551-4>.
35. Wang A, Rachocki C, Shapiro JA, Issaka RB, Somsouk M. Low literacy level instructions and reminder calls improve patient handling of fecal immunochemical test samples. *Clin Gastroenterol Hepatol*. 2019;17(9):1822–1828. <https://doi.org/10.1016/j.cgh.2018.11.050>.
36. Bakhai S, Ahluwalia G, Nallapeta N, Mangat A, Reynolds JL. Faecal immunochemical testing implementation to increase colorectal cancer screening in primary care. *BMJ Open Qual*. 2018;7(4):e000400. <https://doi.org/10.1136/bmjoq-2018-000400>.
37. Kemper KE, Glaze BL, Eastman CL, et al. Effectiveness and cost of multilayered colorectal cancer screening promotion interventions at federally qualified health centers in Washington State. *Cancer*. 2018;124(21):4121–4129. <https://doi.org/10.1002/cncr.31693>.
38. Pignone M, Lanier B, Kluz N, Valencia V, Chang P, Olmstead T. Effectiveness and cost-effectiveness of mailed FIT in a safety net clinic population. *J Gen Intern Med*. 2021;36(11):3441–3447. <https://doi.org/10.1007/s11606-021-06691-y>.
39. HEDIS and performance measurement. National Committee for Quality Assurance. <https://www.ncqa.org/hedis/measures/>. Updated September 7, 2023. Accessed September 20, 2023.
40. Centers for Medicare & Medicaid Services. Medicare advantage and Part D star ratings, Department of Health and Human Services. Baltimore, MD: Centers for Medicare & Medicaid Services. <https://www.cms.gov/newsroom/fact-sheets/2023-medicare-advantage-and-part-d-star-ratings>. Published October 6, 2022. Accessed July 20, 2023.
41. Centers for Medicare & Medicaid Services (CMS), HHS. Medicare Program; Merit-Based Incentive Payment System (MIPS) and Alternative Payment Model (APM) incentive under the physician fee schedule, and criteria for physician-focused payment models. Final rule with comment period. *Fed Regist*. 2016;81(214):77008–77831. <https://www.federalregister.gov/documents/2016/11/04/2016-25240/medicare-program-merit-based-incentive-payment-system-mips-and-alternative-payment-model-apm>. Accessed July 20, 2023.
42. Nuckols TK. With the merit-based incentive payment system, pay for performance is now National policy. *Ann Intern Med*. 2017;166(5):368–369. <https://doi.org/10.7326/M16-2947>.
43. Borders TF, Morgan ZJ, Peterson LE. Colorectal cancer screening in rural and urban primary care practices amid implementation of the Medicare Access and CHIP Reauthorization Act. *J Prim Care Community Health*. 2023;14:21501319231177552. <https://doi.org/10.1177/21501319231177552>.
44. Wen L, Divers C, Lingohr-Smith M, Lin J, Ramsey S. Improving quality of care in oncology through healthcare payment reform. *Am J Manag Care*. 2018;24(3):e93–e98.
45. Doubeni CA, Corley DA, Zhao W, Lau Y, Jensen CD, Levin TR. Association between improved colorectal screening and racial disparities. *N Engl J Med*. 2022;386(8):796–798. <https://doi.org/10.1056/NEJMc2112409>.
46. Lee B, Keyes E, Rachocki C, et al. Increased colorectal cancer screening sustained with mailed fecal immunochemical test outreach. *Clin Gastroenterol Hepatol*. 2022;20(6):1326–1333.e4. <https://doi.org/10.1016/j.cgh.2021.07.022>.
47. Community checkup report. Washington Health Alliance. <https://wahealthalliance.org/alliance-reports-websites/community-checkup/>. Updated September 7, 2023. Accessed September 20, 2023.
48. Issaka RB, Bell-Brown A, Kao J, et al. Barriers associated with inadequate follow-up of abnormal fecal immunochemical test results in a safety-net system: a mixed-methods analysis. *Prev Med Rep*. 2022;28:101831. <https://doi.org/10.1016/j.pmedr.2022.101831>.
49. Escaron AL, Garcia J, Petrik AF, et al. Colonoscopy following an abnormal fecal test result from an annual colorectal cancer screening program in a federally qualified Health Center. *J Prim Care Community Health*. 2022;13:21501319221138423. <https://doi.org/10.1177/21501319221138423>.
50. Centers for Medicare & Medicaid Services. Transparency in Coverage Final Rule Fact Sheet (CMS-9915-F). Baltimore, MD: Centers for Medicare & Medicaid Services. <https://www.cms.gov/newsroom/fact-sheets/transparency-coverage-final-rule-fact-sheet-cms-9915-f>. Published October 29, 2020. Accessed July 20, 2023.