


BMJ Open Quality **Barriers and facilitators of implementing a multicomponent intervention to improve faecal immunochemical test (FIT) colorectal cancer screening in primary care clinics, Alberta**

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ABSTRACT

Background and objective Colorectal cancer (CRC) screening is effective at reducing the incidence and mortality of CRC. To address suboptimal CRC screening rates, a faecal immunochemical test (FIT) multicomponent intervention was piloted in four urban multidisciplinary primary care clinics in Alberta from September 2021 to April 2022. The interventions included in-clinic distribution of FIT kits, along with FIT-related patient education and follow-up. This study explored barriers and facilitators to implementing the intervention in four primary clinics using the Consolidated Framework for Implementation Research (CFIR).

Methods In-depth qualitative semistructured key informant interviews, guided by the CFIR, were conducted with 14 participants to understand barriers and facilitators of the FIT intervention implementation. Key informants were physicians, quality improvement facilitators and clinical staff. Interviews were analysed following an inductive–deductive approach. Implementation barriers and facilitators were organised and interpreted using the CFIR to facilitate the identification of strategies to mitigate barriers and leverage facilitators for implementation at the clinic level.

Results Key implementation facilitators reported by participants were patient perceived needs being met; the clinics' readiness to implement FIT, including staff's motivation, skills, knowledge, and resources to implement; intervention characteristics—evidence-based, adaptable and compatible with existing workflows; regular staff communications; and use of the electronic medical record (EMR) system. Key barriers to implementation were patient's limited awareness of FIT screening for CRC and discomfort with stool sample collection; the impacts of COVID-19 (patients missed appointment, staff coordination and communication were limited due to remote work); and limited clinic capacity (knowledge and skills using EMR system, staff turnover and shortage).

Conclusion Findings from the study facilitate the refinement and adaption of future FIT intervention implementation. Future research will explore implementation barriers and facilitators in rural settings and from patients' perspectives to enhance the spread and scale of the intervention.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The evidence suggests that colorectal cancer (CRC) screening is effective at reducing the incidence and mortality of CRC, as well as costs related to treatment. While there are effective screening modalities, such as the faecal immunochemical test (FIT) available for early detection, recent estimates from Alberta, Canada indicate suboptimal screening rates. The factors associated with the adoption of CRC screening interventions is an area for process improvement.

WHAT THIS STUDY ADDS

⇒ There is existing literature that explores the factors that influence the successful uptake and implementation of CRC screening interventions, such as the FIT. However, most quality improvement initiatives do not employ a rigorous theory and evidence-based approach to understanding the underlying barriers and facilitators to FIT implementation. This study uses the Consolidated Framework for Implementation Research to more fully explore how the characteristics of this particular intervention and the context of implementation may impact implementation, and thus, address low screening rates for CRC.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study provides practical guidance to refine and inform ongoing and future efforts to integrate CRC screening into primary care through the identification of barriers and facilitators to FIT implementation. Strategies can be developed that mitigate barriers and leverage facilitators to promote adoption and optimise implementation of multicomponent CRC screening interventions. This has important implications for early detection of CRC, patient outcomes and costs to the healthcare system.

BACKGROUND

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the



second most common cause of cancer death worldwide, including Canada.^{1–3} In the province of Alberta in 2019, 2500 people were projected to be diagnosed with CRC, with 780 expected to die from it.³ CRC screening is highly effective at reducing the incidence and mortality of CRC, through the early detection of precancerous polyps, and facilitating their early management and treatment.^{1 4 5} If detected early, more than 90% of CRC cases can be successfully treated and 5-year CRC-associated mortality after diagnosis is also significantly reduced. Earlier diagnosis also results in significant reductions to the cost of treatment.^{6 7}

Endoscopy-based (colonoscopy or sigmoidoscopy) and stool-based (faecal immunochemical test (FIT)) tests are the most commonly used effective screening modalities for the early detection of CRC.^{1 7} In Alberta, the FIT is the recommended first-line screening test for early detection of CRC or precancerous polyps in people aged 50–74 at average risk for CRC, which represents approximately 75% of the eligible population.^{8 9} Colonoscopy/sigmoidoscopy is only recommended in Alberta, for the population with increased risk (eg, family history of CRC) or those who have a positive result on the FIT.^{8 10 11} The most recent estimate of the provincial CRC screening participation rate is 58%, including both endoscopic-based and stool test-based screening methods involving people of all CRC risk levels.⁵ The FIT participation rate, on its own, is less than 40% of eligible (average risk) people in Alberta.¹²

Overall, the barriers affecting patients' FIT participation are complex, multilevel and interrelated (health system or organisational processes and practices, providers' service provision and patients' perception).¹ In Alberta, the typical FIT process for CRC screening poses inconveniences for patients and family physicians, which are causing missed opportunities for screening. Additionally, patients' fear of being diagnosed with CRC, and limited understanding of the importance of CRC screening, all negatively affect patients' acceptability of the FIT.¹

A multicomponent intervention approach is effective in increasing CRC screening and FIT participation, and the application of this approach has been recommended by the Community Preventive Service Task Force.^{13–16} Multicomponent interventions combine two or more patient-targeted interventions to promote cancer screening, through three strategies: increasing demand, access and delivery of screening services.^{15 16} The Cancer Prevention and Screening Innovation team within Alberta Health Services (Alberta's provincial health service delivery organisation) piloted a patient-centred, multicomponent intervention influencing different levels of the FIT process to address barriers, and sustainably modify patients' FIT participation behaviour to increase FIT participation.

Implementation of interventions into routine primary care can be influenced by a wide range of factors including those related to clinic context, intervention characteristics, providers' behaviour, patient needs and the implementation process.¹⁷ A comprehensive understanding of

these factors provides a foundation for planning implementation strategies.^{17–19} A recent systematic review reports that many of the existing studies had limited use of implementation science frameworks to guide a comprehensive theory and/or evidence-based understanding of the implementation factors specific to CRC screening interventions in primary care.²⁰

In this paper, we present the barriers and facilitators to implementing a multicomponent intervention in four primary clinics using the Consolidated Framework for Implementation Research (CFIR).¹⁷ The CFIR was chosen to understand the implementation of the FIT intervention at the clinic level, recognising the importance of how implementation processes impact individual behaviour change within a specific context.¹⁷ The CFIR was developed from a synthesis of the implementation literature, incorporating theory as well as empirical evidence regarding the factors that influence implementation.¹⁷ In particular, the framework provides comprehensive guidance in assessing contextual factors that may impact the success of implementing an intervention in the real world. The CFIR includes five core domains to guide the assessment of implementation barriers and facilitators: the individual characteristics, the inner setting, the outer setting, the implementation process and the characteristics of the innovation itself.¹⁷

METHODS

Study design

This is a qualitative descriptive study using semistructured key informant interviews with 14 participants involved in the multicomponent FIT implementation. As our guiding theoretical framework, the CFIR was used to inform the development of our interview guide and analysis of the implementation barriers and facilitators.¹⁷ Interviews were conducted following the 6-month implementation period, to obtain an in-depth understanding of the barriers and facilitators to implementation.²¹ This study was part of a larger implementation-effectiveness study, which has not yet been published.

FIT intervention components

The FIT intervention was developed based on implementation evidence regarding multicomponent CRC screening innovations.²⁰ In-clinic distribution of FIT kits was designed to reduce organisational structural barriers for FIT access for patients aged 50–74 visiting pilot primary care clinics who are eligible for FIT according to Alberta CRC screening guidelines (ie, average-risk population, FIT not completed within the last 2 years; screening colonoscopy or sigmoidoscopy not completed within the last 10 years). Along with patients' access to FIT kits in clinics, patient education was designed to educate patients on the importance of CRC screening/FIT and the FIT sample collection and return procedure. Patient follow-up and reminder phone calls were designed to support patients' timely FIT sample collection and return

for FIT completion within 1 month of accessing a FIT kit from the pilot primary care clinics. Online supplemental appendix 1 illustrates usual practice regarding the use of FIT for CRC screening in Alberta compared with the quality improvement initiative described in this paper.

Intervention implementation setting

We piloted these interventions in four primary care clinics in urban Alberta from September 2021 to April 2022. A total of 32 participants involving 11 physicians, 9 medical office assistants (MOAs), 3 quality improvement facilitators (QIFs), 2 clinic managers, 2 licensed practical nurses (LPNs), 2 electronic medical record (EMR) consultants, a registered nurse (RN), a panel management assistant (PMA) and a proactive office encounter technician (POET) from 4 participating clinics implemented the FIT intervention.

Participant recruitment and data collection

The interviewer, a member of the project implementation research team, sent emails to all 32 primary care staff from the 4 participating clinical sites, requesting their participation. The interviewer, a PhD trained researcher, with expertise in evaluation methods, was not directly involved in the implementation of the initiative and had not previously worked with the participants. Fourteen participating key informants of the 32 invited consented to be interviewed. The participants were four physicians, three QIF, two clinical managers, two MOAs, an RN, a PMA and a POET, representing all four clinics that participated in the intervention.

In-depth semistructured interviews were conducted virtually from February to April 2022 at the participant's convenience, and were audio recorded, and transcribed using MS Teams by the research team members who were not directly involved in implementation. The CFIR informed the development of the semistructured interview guide. First, 17 interview questions were developed to represent the relevant CFIR constructs. These questions were then summarised into five semistructured interview questions with prompts (see online supplemental appendix 2 for the interview guide). Interviews were conducted with consideration of the busy clinical schedules of participants, lasting between 20 and 40 min. Of the 14 interviews, 12 were conducted one to one, 1 interview involved 2 participants to fit the participants' busy clinical schedule and 1 participant declined to be recorded but permitted the interviewer to take detailed notes of the conversation. To ensure the accuracy of the transcripts, audio recordings were compared with the transcript during the transcript review.

Data analysis

A combined inductive and deductive approach was used to identify barriers and facilitators to the FIT intervention. NVivo Pro V.12 was used to organise and code data for thematic inductive analysis. Themes were generated from codes using thick description and iteratively

analysed by two individuals for redundancy through a process of comparison to ensure each theme was distinct: MP coded the first three interviews and SM ensured codes were distinct and accurately interpreted. The rest of the interviews were coded iteratively back and forth using the same process until all the interviews were coded.

These themes were organised into barriers and facilitators of FIT intervention implementation. Once themes for barriers and facilitators were identified, themes were refined and reorganised through the process of deductively mapping the themes to the CFIR framework to understand how the inductively identified barriers and facilitators related to existing theory and evidence regarding the determinants for implementation.

Patient and public involvement

Patients and the public were not involved in this study.

RESULTS

Six overarching themes regarding facilitators and barriers to FIT implementation were identified. The results are presented as facilitators or barriers under each theme. These themes have also been categorised according to the relevant CFIR constructs, along with select illustrative quotes in tables 1–5 following the description of each theme below.

Theme 1: meeting patient needs through the FIT intervention Facilitators

The primary facilitator was patient convenience. In-clinic FIT kit distribution removed the obstacle of requiring patients to take a test requisition to a laboratory location to pick up a FIT kit.

Another benefit of in-clinic distribution of FIT kits was that clinic staff gave the kit to patients and provided education on its importance and how to complete the kit (eg, expiry dates, cleanest way to collect sample, where to take the sample) for those that had not completed one before. This proactively addressed patient hesitancy. Staff appreciated the opportunity to endorse and discuss the FIT with patients.

First-time users found the printed one-page summary helpful as an additional education source. Some staff highlighted sections of the instructions to ensure that patients would follow the appropriate steps for collection and document necessary information (eg, date and time of collection) for the sample. Staff suggested that prehighlighted printed resources could reduce staff workload because not all patients needed verbal instructions to complete the FIT. One clinic that served a large Punjabi-speaking patient population provided written instructions in Punjabi, which bridged the language barrier and improved patient education on FIT completion.

The clinic used follow-up reminder calls at 4 and 8 weeks after FIT distribution when patients had not completed the test.

Table 1 Barriers and facilitators related to Consolidated Framework for Implementation Research (CFIR) outer setting of the faecal immunochemical test (FIT) intervention

CFIR subdomain	Theme	Facilitators	Barriers
Patients' needs and resources	Meeting patient needs through the FIT intervention	<ul style="list-style-type: none"> ▶ Patient convenience ▶ Staff were able to give kit to the patient and provide education on how to complete it ▶ Printed resources providing a one-page summary (easy to understand, highlighted important information, in multiple languages to reduce language barrier) <p>“It’s just a concern over time. [FIT] is needed or used by all the patients that are required or asked to have a fit test. ... The kits are held at the DynaLife Lab. They have to be picked up and [patients] return the [sample]. So when a person is set for blood work or labs in the natural course of a complete physical, they have to return the FIT kit on another day at another time. So simply stated, if you multiply two hours of a critical time, times all the FIT tests that are done under the guidance of physicians across this area, that’s a lot of inconvenience, cumulatively speaking.” (P112)</p> <p>“We were able to show and have a test kit and show the patient exactly how to do it and a lot of patients really loved that because they were never taught at the Dyna labs on how to specifically do it. They were just given the kit and asked to follow the instructions in the kit. And so having the patient come in and explain it to them face to face and asking them if they have any questions that really helped the patient actually go and get it done and do it at home.” (P100)</p> <p>“It is critical that, not, that we have those languages that we have the education material and instructions in different languages” (P110)</p>	<ul style="list-style-type: none"> ▶ Patient awareness around importance of screening ▶ Not having resources in other languages ▶ Pandemic impacted patient appointments and patients nervous to go into lab to drop off FIT <p>“Some of it was COVID but because we were in the Omicron phase earlier this year and they didn't want to go out. But others just they just said no, I'm not doing it. And she couldn't get a reason but she did say some of it was due to Covid-19.” (P110)</p>

Barriers

While clinics provided education for patients and tried to alleviate the discomfort around FIT completion, common patient barriers still prevented some from completing a FIT. Completion was dependent on: patients' awareness of the importance of screening; fear of finding out they have CRC from the FIT kit; feelings of embarrassment carrying the FIT outside the clinic; forgetting to complete the FIT; feeling too busy; or feeling uncomfortable with sampling (eg, think that it is dirty to 'play with poop').

Some patients had other pressing health challenges that caused staff to deprioritise CRC screening at the time. While one clinic provided patient resources to support non-English speakers, other clinics did not have resources in other languages, so English language and FIT instruction comprehension and literacy were barriers for some patients. Additionally, the pandemic impacted patient appointments by disrupting communication between providers and patients (from in-person to online or phone appointments), closing waiting rooms, creating staff shortages and availability due to work from home, and creating fear of in-person appointments. For some patients, the fear of COVID-19 prevented them from returning their FIT sample to a laboratory location, despite receiving the FIT at their clinic appointment.

Theme 2: clinic staff motivation to adopt and implement FIT intervention

Facilitators

Participants understood the importance and value of the kits and were motivated to incorporate FIT distribution and tracking within their clinics. They believed it would be effective in increasing patient FIT screening. Physicians were motivated to improve screening rates because they believed in the effectiveness of FIT screening for early detection.

Generally, clinics had a culture of improving patient care and the FIT screen was part of the work clinics were already doing with patients. Some participants felt that the size of the clinics and staffing capacity of clinics affected their ability to undertake initiatives for improving patient health. Feedback reports on FIT completion rates and seeing early CRC detections in patients motivated clinicians because they saw the improvements and positive outcomes of FITs.

Barriers

Challenges arose when staff could not fulfil their roles in the processes of the intervention. This was often related to not understanding the importance of the intervention. When QIFs clearly explained the purpose of the practice change, the reason for data collection, and how it could be done, staff came on board.

Table 2 Barriers and facilitators related to Consolidated Framework for Implementation Research (CFIR) intervention characteristics of the faecal immunochemical test (FIT) intervention

CFIR subdomain	Theme	Facilitators	Barriers
Evidence strength and quality	Staff motivation to adopt and implement FIT	<ul style="list-style-type: none"> ▶ Staff motivated to implement due to effective evidence “We all want the best for our patients and you know the earlier detection of cancers and so yeah, I think we can all foresee the benefits of doing it this way (P103)” 	None reported.
Relative advantage	Staff motivation to adopt and implement FIT	<ul style="list-style-type: none"> ▶ Staff saw that distributing FIT kits in the same place that patients received the requisition saved everyone time 	None reported.
Adaptability	Compatibility of FIT workflow processes	<ul style="list-style-type: none"> ▶ Flexible workflow adapted to each clinic 	None reported.
Complexity	Staff motivation to adopt and implement FIT	<ul style="list-style-type: none"> ▶ Staff motivated to implement due to its ease and convenience 	None reported.
Design quality and packaging	Compatibility of FIT workflow processes	<ul style="list-style-type: none"> ▶ Staff thought additional work associated with intervention was simple, easy and minimal ▶ Patient information and requisitions easily printed in the clinic <p>“There was a very easy flowing out workflow that was easy to follow. It wasn't like overbearing it wasn't this huge piece of paper, it was just like two, three steps, and it was just taped to the computer and it was easy for them to just quickly glance over if they forgot.” (P100)</p>	None reported.
	Use of the EMR to track FIT patient information impacted implementation processes	<ul style="list-style-type: none"> ▶ EMR prompts for staff to screen and complete follow-up calls with patients ▶ Tracking sheet was easy to use, and simple to follow for inputting and extracting information ▶ Easy extraction of patient data if clinics needed to track patient information or pull reports <p>“It's nice that it doesn't need to be done manually that it's enabled right through the EMR and then the little notifications come at the proper time to the proper team members (P111)”.</p>	None reported.

EMR, electronic medical record.

Theme 3: compatibility of FIT workflow processes

Facilitators

Physicians viewed the FIT intervention as compatible with their ongoing process improvement as they already had FIT screening built into their practice. Furthermore, non-physician clinic staff perceived that additional work like distributing FIT kits and follow-up calls was easy to add on to their existing work.

The multicomponent FIT intervention could be flexibly integrated into clinical workflow in each clinic. For example, some clinics used paper-based tracking for FIT screening and follow-up reminder phone calls; others used excel spreadsheets, word documents or their EMR. Using a simple workflow chart in the clinics provided clarity on staff roles for the intervention implementation. Additionally, patient information and requisitions were easily printed in the clinic, which supported clinics to carry out the intervention.

Barriers

Some issues did arise, such as too many requisitions for patients to take with them; the FIT required a separate

requisition or form (from all laboratory tests). Additionally, multiple follow-up phone calls were hard for staff to complete (two calls 1 month apart). Inconvenient storage places for kits also added more time to implementation. However, due to the process improvement approach used in the project, clinics addressed these issues by testing different ways to manage these tasks, for example, adding FIT to a common requisition form used for all laboratory tests; setting a limit on the number of follow-up calls that would be made; and storing kits in the appointment rooms.

Theme 4: communication among staff was important for FIT implementation and quality improvement

Facilitators

Communication within the clinic was important to support quality improvement for the FIT intervention, and address any issues that arose. Staff communication facilitated effectively carrying out the FIT interventions and following the same key implementation steps and supported them in addressing barriers to implementation. Recurring internal meetings in clinics provided staff

Table 3 Barriers and facilitators related to Consolidated Framework for Implementation Research (CFIR) inner setting of the faecal immunochemical test (FIT) intervention

CFIR subdomain	Theme	Facilitators	Barriers
Structural characteristics	Communication among staff was important for FIT implementation and quality improvement	<ul style="list-style-type: none"> ▶ Smaller clinics with fewer staff facilitated communication within the team “They are a small clinic and they're very tight knit. They are very welcoming to other options and how to make patient care better for the patient and also the processes in the clinic.” (P100) 	None reported.
Networks and communication	Clinic capacity to implement FIT	<ul style="list-style-type: none"> ▶ Quality improvement facilitators helped to educate staff on FIT distribution, delivery of FIT and FIT workflows 	<ul style="list-style-type: none"> ▶ High personnel turnover created gaps in communicating EMR knowledge, work process, responsibilities and time to implement and sustain changes to FIT process ▶ Confusion around length of time to deliver kits, how to order them (ie, online) and how many to order
	Use of the EMR to track FIT patient information impacted implementation processes	<ul style="list-style-type: none"> ▶ EMR prompts for staff to screen and complete follow-up calls with patients 	None reported.
	Communication among staff was important for FIT implementation and quality improvement	<ul style="list-style-type: none"> ▶ Communication was important for quality improvement within the project and making sure staff were on board and carrying out FIT interventions 	<ul style="list-style-type: none"> ▶ Lack of informal communication between staff to troubleshoot workflow issues ▶ Working offsite during COVID-19 restrictions ▶ Poor internet access affected virtual communication
Culture	Staff motivation to adopt and implement FIT	<ul style="list-style-type: none"> ▶ Clinic culture of improving patient care: FIT seen as a part of the work clinics do with patients 	None reported.
Implementation climate: compatibility	Compatibility of FIT workflow processes	<ul style="list-style-type: none"> ▶ Physicians already had FIT screening built into practice so did not perceive that FIT added to their workload 	None reported.
Implementation climate: relative priority	Clinic capacity to implement FIT	<ul style="list-style-type: none"> ▶ None reported. 	<ul style="list-style-type: none"> ▶ When clinics were busy, staff had tight time constraints and less time to follow-up with patients which occasionally led to missed FIT screening opportunities “It's either that they're busy and they forgot, they just don't think of it, or the patient comes in sometimes with multiple concerns and then they can only deal with so many things, you know (P104).”
Implementation climate: goals and feedback	Communication among staff was important for FIT implementation and quality improvement	<ul style="list-style-type: none"> ▶ Recurring internal meetings with staff provided opportunities for discussion around project progress, results and QI 	<ul style="list-style-type: none"> ▶ Meetings were not used to troubleshoot challenges with FIT or to ensure discussion around project progress
Readiness for implementation: available resources	Compatibility of FIT workflow processes	<ul style="list-style-type: none"> ▶ Use word document, paper, excel spreadsheet to track FIT distribution to patients ▶ Use EMR to prompt, track and follow-up with patients ▶ Patient information and requisitions easily printed in clinic 	None reported.
	Clinic capacity to implement FIT	<ul style="list-style-type: none"> ▶ Support and buy in from those in health system involved with initiating and carrying out FIT project “If we didn't have the PMA, we might still do it. But we would be more work certainly for the front staff. So having the PMA is, it makes it easy (P101)”. 	<ul style="list-style-type: none"> ▶ Staff working from home meant fewer staff at clinic to distribute kits to patients ▶ When gaps in workflow existed, tended to fall on other staff to pick up the slack leading to increased workload ▶ Not enough staff trained to carry of FIT intervention

Continued

Table 3 Continued

CFIR subdomain	Theme	Facilitators	Barriers
Readiness for implementation: access to knowledge and information	Clinic capacity to implement FIT	<ul style="list-style-type: none"> ▶ Quality improvement facilitator helped to educate staff on FIT distribution, delivery of FIT and FIT workflows 	<ul style="list-style-type: none"> ▶ Staff did not feel that they had sufficient information to begin or continue a task
	Use of the EMR to track FIT patient information impacted implementation processes	<ul style="list-style-type: none"> ▶ None reported. 	<ul style="list-style-type: none"> ▶ Not familiar or comfortable with using EMR “It’s a little labour intensive...it [would] be easier if we could just do it on the EMR when the patient comes in rather than having to write it down every time. But, that being said, some of the physicians, our clinic aren’t too keen on the electronic stuff as well. They’re not as tech savvy or that kind of thing...” (P104)

EMR, electronic medical record; PMA, panel management assistant.

with opportunities to discuss implementation progress and issues, and review clinic results (ie, FIT kit distribution rates; test completion rates)

Barriers

The lack of clinic process improvement meetings meant that there were fewer opportunities to troubleshoot challenges with FIT implementation or to discuss project progress and barriers. The lack of informal communication between the clinical team to troubleshoot workflow issues hindered delivery of FIT. COVID-19 public health restrictions, that resulted in some staff working offsite

during the study period, led to decreased opportunities for informal communications to troubleshoot workflow issues ‘in the moment’ as well. While use of virtual communication technologies helped clinic teams to maintain communication, their use was limited at times by poor internet (unstable) access.

Theme 5: clinic capacity to implement FIT

Facilitators

Partnership support and buy-in from health system stakeholders important to the new FIT processes facilitated implementation in the clinics (eg, laboratory services

Table 4 Barriers and facilitators related to Consolidated Framework for Implementation Research (CFIR) characteristics of the individual of the faecal immunochemical test (FIT) intervention

CFIR subdomain	Theme	Facilitators	Barriers
Knowledge and beliefs of the individual	Staff motivation to adopt and implement FIT	<ul style="list-style-type: none"> ▶ Staff believed it would be effective in increasing patient FIT screening ▶ Engaging staff around the importance helped bring them on board 	<ul style="list-style-type: none"> ▶ Not understanding importance of the project “I think just for this pilot, it was just difficult to have the clinic, understand exactly what we were trying to capture and. But I have to say they, after a while, they did get it you know they understood and I think it was just getting into a rhythm of the collection.” (P110)
	Meeting patient needs through the FIT intervention	<ul style="list-style-type: none"> ▶ None reported. 	<ul style="list-style-type: none"> ▶ Patient awareness around importance of screening
Self-efficacy	Clinic capacity to implement FIT	<ul style="list-style-type: none"> ▶ None reported. 	<ul style="list-style-type: none"> ▶ Staff turnover was an issue for training Ensuring understanding of a person’s role in the implementation process
Individual state of change	Meeting patient needs through the FIT intervention	<ul style="list-style-type: none"> ▶ None reported. 	<ul style="list-style-type: none"> ▶ Patients felt embarrassed to carry FIT kits outside the clinic. ▶ Patients’ fear of finding out they have CRC ▶ Discomfort with sampling: perception that it is dirty or ‘playing with poop’ ▶ Patients with other pressing health challenges “Most of the patients are nervous to essentially play with their poop...They don’t like doing that and they find that to be very very uncomfortable even if they were in their homes ...I mean if they really hesitate to do it we can’t force them so just reiterating that it is important, really has that goes into their head saying okay yes my physician wants me to complete this test so I will go ahead and do that. So, most of the time it’s really, you know, touching their bowel movements is not what they’re happy to do.” (P100)

CRC, colorectal cancer.

Table 5 Barriers and facilitators related to the Consolidated Framework for Implementation Research (CFIR) process of the faecal immunochemical test (FIT) intervention

CFIR subdomain	Theme	Facilitators	Barriers
Engaging	Staff motivation to adopt and implement FIT	► Improvement facilitators explaining project importance, process and workflow to get staff buy-in	None reported.
Executing	Staff motivation to adopt and implement FIT	► Physician routinely talked to patients about FIT screening	None reported.
	Compatibility of FIT workflow processes	► Flexibility of intervention allowed for troubleshooting workflow issues	► Lots of requisitions for patients to take with them (due to separate requisition for FIT) ► Number of follow-up phone calls ► Having kits stored in inconvenient places in clinic “Just that step of writing down the patient’s name and I could have the kits directly in my examination room and I could just give it to them with the lab req [requisition]. Again, this is minor.” (P103)
	Clinic capacity to implement FIT	► Staff coordination for FIT distribution	► Due to staff turnover, there was a need for risk mitigation and change management Ensuring understanding of a person’s role in implementation process
	Use of the EMR to track FIT patient information impacted implementation process	► Tracking sheet was easy to use, and simple to follow for inputting and extracting information	► Problems with access/setup of EMR during the project ► Data for implementation difficult to retrieve for those not familiar with EMR “We did have a few mishaps with that so again having that manual log helped because we weren’t able to capture the correct data within the EMR at the beginning. Anyway, but as far as the data I think everything. It was just really hard to to, you know, work with the clinic on exactly what we need to capture and when because it may not have been at the exact times that we wanted. But I think, I think we finally got it.” (P110)
Reflecting and evaluating	Staff motivation to adopt and implement FIT	► Staff able to see positive outcomes from intervention through feedback reports	None reported.
	Use of the EMR to track FIT patient information impacted implementation processes	► Allowed for data extraction for measuring FIT distribution to help staff see impact on patient screening	► Data for implementation difficult to retrieve for those not familiar with EMR

EMR, electronic medical record.

(DynaLife), primary care networks (PCNs) provided EMR consultants and panel managers), and physicians' involvement. Additionally, QIFs supported staff with EMR set-up, ordering FIT kits or printed resources, which ensured processes were in place for project roll-out and made tasks simple and manageable. Some clinics had additional supports for staff, which facilitated implementation and made the continuity of the FIT intervention possible. These supports included: clinic office managers, clinic MOAs, EMR consultants, panel managers and PMAs, who assessed and ordered FIT kits online, taught patients how to use kits, completed patient calls and tracked patient sign out of kits. When these staff assumed some of the work, it reduced the workload for other staff and enabled project feasibility.

Barriers

Barriers arose when staff did not feel they had sufficient information to begin or continue a task, especially with

regards to ordering FIT kits from laboratory services. There was confusion about the expected lag time between ordering and receiving FIT kits, how to order them (ie, online) and how many to order.

When clinics were busy, staff had tight time constraints, so they had less time to follow-up with patients, which occasionally led to missed FIT screening opportunities. Occasionally, FIT processes were impacted by busy clinic schedules, not enough staff trained, and thus not having capacity to talk to every eligible patient. The pandemic also impacted FIT screening by encouraging staff to work from home, which meant fewer staff could distribute kits and education to patients.

High staff turnover and gaps in training in the clinics led to disruptions in the implementation as new staff needed to be oriented to the intervention processes. As a result, other staff had to pick up the slack, leading to

increased workload for them until new staff were fully oriented to the workflow. Staff turnover highlighted the need for risk mitigation and change management. For example, use of the EMR for FIT helped to document the FIT screening processes and ensuring that each member of the clinical team was clear on their role in the implementation process, including who will complete patient follow-up and outreach.

Theme 6: use of the EMR to track FIT patient information impacted implementation processes

Facilitators

Automated prompts within the clinic EMRs increased the ease and reliability of the intervention by prompting staff to screen and complete follow-up calls with patients. The EMR also enabled easy patient data extraction when clinics needed to track patient information or create reports so that staff could see the impact of their improvement efforts. Staff appreciated the automated system and recognised its time saving quality.

Barriers

While the EMR reduced workload in some clinics, others chose to use manual information tracking instead because they were not familiar or comfortable with using their EMR. Some clinics wanted to incorporate the EMR, but they faced challenges with incorporating the automated system. Consequently, data for project implementation was difficult to retrieve. Clinics that worked with an EMR consultant, however, could easily develop patient data collection and alert clinical staff on necessary patient follow-up. Clinics without an EMR consultant struggled with setting up information management through their EMR and thus found the intervention labour intensive. In the clinics that were not able to use their EMR to track and manage their intervention, the project provided a manual tracking sheet to record FIT distribution, follow-up calls and test completion. Clinics that used the manual tracking sheet found it was easy to use of inputting and extracting the information they needed.

DISCUSSION

Key findings and interpretation

This study explored the barriers and facilitators to implementing multicomponent interventions to improve CRC screening (FIT) in four primary clinics in Alberta using semistructured interviews with 14 participants involved in the intervention implementation. Key facilitators to implementation included: perception of patient needs being met, a clinics' readiness to implement (including staff's motivation and capacities (eg, skills, knowledge, resources)), the design and perceived quality of the intervention (eg, evidence-based, practical, compatible with existing workflows) and the use of the EMR system to track patient information regarding their FIT screening.²² Participants also described the following barriers impacting the implementation of the FIT intervention: patient awareness regarding the importance of

FIT screening and discomfort with stool sample collection, impacts of COVID-19 (ie, restricted in-person patient appointment, limited coordination and communication between staff related to remote work), and limited clinic capacity (ie, skills using the EMR system, staff turnover and shortage).

According to our recent systematic review of 12 studies that synthesised the barriers and facilitators to CRC screening; engagement of the clinic team, leadership team and partners; clinics' motivation to improve CRC screening rates; use of the EMR system with continuous monitoring and feedback; and a supportive environment for implementation were the most commonly reported implementation facilitators.²⁰ Limited time for the clinic team to devote to a new project, challenges in getting accurate, timely data related to CRC screening, limited capacity/support to use the EMR system and disconnection between clinic team members were the most commonly reported implementation barriers. While this study corroborates many of the findings from the systematic review, we have also identified other specific contextual factors that impacted implementation, including the role of additional support staff to facilitate implementation.

Strong evidence exists on the effectiveness or benefits of a multicomponent intervention to improve CRC screening participation rate.¹³⁻¹⁶ Our project effectiveness findings also show the improvement in the FIT participation rate compared with the preimplementation participation rate (absolute increase of 13%). In addition, the clinics who implemented the FIT intervention have reported that the newly adopted FIT kit processes are now routine practice in their clinics. As such, while barriers may have challenged aspects of implementation, many of the facilitators described by participants supported overall successful implementation of the FIT intervention.

Using the CFIR, we identified several facilitators related to the intervention characteristics; participants were motivated by the FIT intervention's strong evidence base and promoting convenience and access to patients. Offering patients the FIT kit at their clinic visit can reduce barriers for accessing FIT kits by promoting timely/easy access of FIT kits, and reducing the extra patient travel steps associated with the usual access to FIT in Alberta. Physician distribution of FIT kits also offers the opportunity for face-to-face interaction between patients and providers about FIT.

Considering factors related to the 'Outer Setting' of the CFIR: patient's lacking awareness of the importance of FIT screening resulted in incomplete FITs. Participants reported that the intervention provided opportunities for educational conversations between patients and providers. Patient engagement is critical in promoting the importance of CRC screening and FIT to improve their knowledge and change their fatalistic beliefs and fears about CRC and screening.²³ Furthermore, availability of information provided in multiple languages



promoted FIT completion in historically marginalised or underserved populations.²⁴

While the COVID-19 pandemic influenced patient appointments for completing a FIT and increased their hesitations to go to a lab, the pandemic also impacted the clinic implementation context (CFIR Inner Setting). Disruptions to clinic staffing impacted intervention training for available staff and capacity for FIT intervention activities from reduced clinic team sizes. A systematic review on the impact of COVID-19 on CRC screening found that CRC screening decreased from 28% to 100% in different countries after the onset of the pandemic.²⁵ This has important implications for early detection and reduction of mortality due to CRC. Contextual adaptations are needed to support implementation of CRC screening programmes in primary care during a pandemic.²³ In the context of the FIT intervention in the four clinics, staff capacity limitations were countered by support from key stakeholders and partners, including PCNs (who provided support for EMR patient information tracking), Alberta Health Services (Provincial Colorectal Cancer Screening Program who championed the initiative), as well as other administrative clinic staff (who completed additional tasks related to FIT kit orders and patient follow-ups).

Using the CFIR enabled identification of a multitude of facilitators and barriers across and within constructs, demonstrating a complex picture of challenges and opportunities while implementing an evidence-based intervention in primary care. This study has provided an in-depth understanding of the specific contextual factors that will guide future implementation, spread and scale of the FIT initiative in primary care in Alberta. This work is essential to move forward, given setbacks in CRC screening due to the COVID-19 pandemic.

At 6 months after the project intervention period, all pilot clinics reported that the intervention was now routine practice for them. This suggests that ensuring that the intervention was codeveloped and adapted to fit individual clinic workflows promoted long-term sustainability of the intervention. Following the success of this project, the project team codesigned and tested an implementation guide intended to aid in the spread of the intervention across Alberta with relevant stakeholders. The guide includes resources for the target audience explaining the rationale of the intervention, tools and resources for implementation, implementation strategies and performance measurement to gauge implementation success within a clinic. The final implementation guide will be hosted on the online platform for the Alberta Cancer Screening Program and will be readily accessible to the clinics interested in implementing interventions to improve FIT participation rates. The Alberta Cancer Screening Program is currently championing the spread of this intervention as part of its own Strategic Plan objective to increase CRC screening participating rates in the province.

Strengths and limitations

Our previous systematic review identified few studies exploring barriers and facilitators to CRC screening and a lack of studies employing implementation science approaches to understand how to enhance implementation efforts.²⁰ This study uses an implementation science framework, the CFIR, for data collection, analysis, organisation and interpretation, which has facilitated an understanding of a wide range of factors within a given context that influenced implementation of the FIT intervention, from a strong empirical and theoretical basis. However, there are also important limitations to note. First, while this study interviewed diverse (various roles) clinical providers to obtain varied perspectives related to implementation, we were unable to recruit LPNs due to their unavailability to participate in the study. Second, this study does not include patients' perspective and implementation factors in rural settings. While this study draws on clinical staff perspectives, patient perspectives are a key factor in guiding the development of patient interventions. Clinics in rural settings can face different or additional barriers and inequity in cancer screening due to fewer resources and challenges in access. Finally, data about the clinic's overall patient load, the number of eligible patients visiting the clinics during the study period and the patients' characteristics were not collected. Hence, limiting the interpretation of our findings, as we are unable to assess how implementation factors may have been impacted by these characteristics. Including a trained, dedicated person for the primary data collection and the EHR data extraction as part of the implementation team may help address this issue.

Future research

Next phases of this research will be to incorporate the findings of this study into the refinement and adaptation of FIT intervention strategies for application in other primary care settings, including rural settings in Alberta and the patient perspective regarding barriers and facilitators to inform future implementation efforts.

CONCLUSION

Our findings suggest that the FIT intervention's strong evidence base, convenience for patients, compatibility with existing workflows and clinic's readiness to implement were key factors in facilitating implementation. Limited clinic capacity, particularly during COVID-19, and lack of patient awareness and beliefs around CRC screening were important barriers. Efforts to enhance patient education and materials, in addition to leveraging supports from project partners, helped to mitigate implementation challenges.

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Appendix 1: CRC FIT Semi-structured Interview Guide

1. What was your role in the CRCS-FIT-PC project? How confident were you that your clinic would be able to successfully implement the intervention?

[**Prompt:** EMR knowledge (panel manger); knowledge and beliefs regarding FIT intervention to prevent colorectal screening (physicians)]

2. What are the benefits and challenges of the CRC FIT-PC intervention for your patients over other types of interventions? **This question is only for clinicians.**

[**Prompt:** evidence-based to decrease CRC over time, easy to use, feasible, resource intense]

3. What kinds of supports and resources were available to you to help implement the intervention? Would you make any changes to these resources and why?

[**Prompt:** FIT teaching kits, AHS sampling collecting instructions, IFs support, process document, data tracking sheet, EMR setup for reminder calls 1 and, 2, feedback reports, monthly meetings with project team and stakeholders, 1:1 with IFs]

4. How has the CRC FIT been received in clinic? What are the benefits or challenges of using the CRC FIT? Does your clinic have a policy or practice of embracing new innovations to improve patient care?

[**Prompt:** challenges or enablers: competing priorities, communication and coordination challenges around CRC FIT, capacity or workload challenges, EMR skills needed, management support, feedback reports, negative or positive ramifications]

5. Has your clinical made it a routine practice to distribute colorectal screening FIT kits and FIT educational materials and utilize reminder calls 1 &2? If no, what changes are needed to make these become routine practice? If yes, what is your clinic doing to make this practice a reality?

[**Prompts:** FIT kits supply, time management, providing FIT requisitions, EMR prompts to identify eligible patients for clinical staff /FIT and for follow up reminder calls]

6. What were the barriers and opportunities you encountered while delivering the FIT intervention? How did your team overcome the barriers or recognize the opportunities for the FIT intervention? **This question is only for IFs, panel managers, clinic managers, MOAs.**

[**Prompts:** FIT ordering / inventory, retrieving baseline data (pre-intervention), retrieving intervention data from EMR tracking]

7. In your opinion, how engaged were the clinical team and AHS stakeholders (CPSI, screening department) on this project? What are some of the challenges or successes that you observed? **This question is only for IFs.**

Appendix 2: Comparison of Usual FIT Pathway and FIT Intervention Pathway

