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Data Challenges in Identifying Patients Due for Colorectal Cancer Screening in Rural Clinics

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Abstract

Introduction: Colorectal cancer (CRC) incidence and mortality are disproportionately high among rural residents despite the availability of effective screening methods. Outreach activities can improve CRC screening rates but rely on accurate identification of patients due for screening. We report on data challenges in rural clinics and Medicaid health plans in Oregon in identifying patients eligible for CRC screening, in a large project implementing mailed fecal immunochemical tests (FIT) and patient navigation.

Methods: We analyzed data from clinic intake surveys and administrative claims. Clinics were asked to identify total population numbers relevant to CRC screening and follow-up. Health plans also identified enrollees eligible for CRC screening in Spring, 2021. Clinic staff validated patient lists for eligibility using their electronic health records (EHR).

Results: EHR features varied across the 29 participating and 28 responding clinics. Among the 28 responding clinics, 21 were able to report their Medicaid population (75%), 19 reported the number of patients aged 50 to 75 (68%) and the number screened for CRC in the last year (68%). Only 8 (29%) were able to report screening details such as number screened by FIT and 9 were

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able to report on patients with an abnormal FIT or colonoscopy completed after FIT (32%). Health plans had challenges properly identifying where enrollees received care and had missing data for race and ethnicity (range 22 to 34% unknown race, <1% to 24% unknown ethnicity).

Discussion: Most participating rural primary care clinics and Medicaid health plans experienced challenges identifying the population due for a CRC screening outreach program. Better EHR functionality and data reporting capabilities could help rural clinics apply population-based strategies and ultimately attenuate disparities in cancer screening and follow-up.

Keywords

Cancer Screening; Colonoscopy; Colorectal Cancer; Electronic Health Records; Oregon; Population Health Management

Background

Colorectal cancer (CRC) incidence and mortality are disproportionately high among residents of rural areas.[1,2] Screening to detect CRC in early stages is a highly effective evidence-based practice; however, people living in rural areas are less likely than their urban counterparts to be up to date on CRC screening.[3–6] Yet rural populations have greater risk for CRC and higher CRC related death rates, due in part to differences in behavior patterns (including higher rates of smoking and obesity and lower screening rates) and more difficulty accessing health care resources.[7–11]

CRC screening rates can be improved using approaches during a visit as well as through population-based outreach strategies such as mailing fecal immunochemical tests (FITs), making reminder phone calls to patients due for screening, or using patient navigation to help patients overcome barriers to completion.[12,13] Prior studies demonstrate that population outreach and visit-based strategies are present in clinics with higher CRC screening rates.[6,14] Visit-based strategies alone are not sufficient to maintain consistent screening patterns due to competing demands during the visit as well inconsistent use of primary care visits. Both visit-based as well as population outreach strategies are contingent on the ability of a clinical practice to accurately identify patients due for CRC screening.

For individual clinics, implementing population-based outreach strategies requires adequate staffing and information to support outreach without labor-intensive processes.[14,15] Electronic health record (EHRs) can aide in identifying patients due for screening and in tracking patient outcomes. EHRs may have reporting capacity as part of the standard packages, where some require additional payment for use. Clinics may also have to fund someone to build a query using external reporting systems that sit on top of the EHR.

Clinical decision support tools (such as alerts, reminders or order sets) can give health care providers patient-specific, actionable clinical recommendations, and reports from these tools can aid in targeting outreach and interventions.[16] However, these tools are limited in many EHRs, especially with respect to data from specialty providers such as colonoscopists.[17] Often, the data systems used by colonoscopy providers and primary care clinics are not interoperable, making it difficult to identify patients' CRC screening status.[18–20]

Improving the accuracy of CRC screening data and the ease with which it can be accessed could help enable screening outreach and ultimately reduce disparities in CRC outcomes between those living in rural and urban areas. The Screening More Patients for CRC through Adapting and Refining Targeted Evidence-based Interventions in Rural Settings (SMARTER CRC) pragmatic trial is implementing a collaborative outreach intervention involving mailed FIT and follow-up patient navigation in rural primary care clinics in Oregon.[21] Outreach approaches improve screening rates, but they require the ability to identify patients that need to be reached. The purpose of this article is to assess clinics' ability to generate CRC screening lists and identify barriers and facilitators to conducting population health management. In this article, we evaluate challenges in accessing data experienced by participating rural clinics and health plans when seeking to identify patients due for CRC screening using administrative claims and EHR data.

Methods

We analyzed data from the SMARTER CRC trial's clinic intake survey and administrative claims to identify data challenges clinics faced in identifying the number of patients eligible for CRC screening and follow-up, as well as characteristics of these patients.

The SMARTER CRC intervention combines targeted mailed FIT outreach and patient navigation with the goal of improving CRC screening rates for patients with Medicaid insurance in rural areas.[21] The SMARTER CRC project is being conducted within 3 Medicaid Health Plans and 29 clinics; eligibility and recruitment details are described elsewhere.[22] Briefly, Medicaid health plans in Oregon were eligible if they were serving clinics in rural areas as designated by RUCA code or the Oregon Office of Rural Health. Clinics within the eligible health plans needed to meet rurality criteria, have more than 30 eligible Medicaid or dual-eligible Medicaid/Medicare patients, and have a CRC screening rate less than 60% in 2019.[22]

Because we anticipated that rural clinics would not always have data on their full patient population, the intervention used a collaborative approach between health plans, clinics, and the research team to support patient identification.[23] This also reduced clinic administrative burden.[25,26] Implementation support for executing the SMARTER CRC project was provided by the research team through practice facilitation, health plan and clinic training, and workflow assessments. Practice facilitation supported implementation strategies including the development of quality monitoring systems and implementation tools for quality monitoring, providing local technical assistance and ongoing consultation, and conducting ongoing training.

The intervention included a mailed FIT program conducted by the health plan, reminder calls or prompts, and a follow-up patient navigation program conducted by clinics. Clinics were free to adapt the intervention to some extent. Clinics adapted staffing, timing of intervention components, number of reminders to return mailed FITs, and whether and how they implemented patient navigation.

As the clinics were unable to create lists of eligible patients, the health plan generated lists of eligible enrollees (using claims data), by identifying age eligible patients and excluding patients with prior screening claims. People were determined eligible if they were age 50 to 75, enrolled in Medicaid or dually enrolled in Medicaid and Medicare, and due for CRC screening (no claims evidence of colonoscopy within past 10 years, flexible sigmoidoscopy, or CT colonography within 5 years, FIT within the past year, or FIT DNA in the past 3 years).

These lists were provided to clinics, whose staff reviewed the lists and removed any patients who were ineligible. The updated lists were then sent to a vendor that mailed FIT outreach components (intro letter, FIT kit, reminders) to enrollees on the list. The research team validated the lists provided to the clinics, checked the expected numbers of eligible patients against prior years, and removed patients who were ineligible. The removed patients included those removed due to being out of the eligible age range (n = 104), patients removed because claims showed they were up to date with screening (n = 1398), and duplicate patients (n = 24).

We analyzed data from clinic intake surveys and health plan claims. Survey items were completed by clinic staff, and included data to meet reporting requirements and data used in prior studies.[13,24,25,27,28] The survey gathered information about EHR systems used, the clinic's ability to use the EHR to identify eligible patients, CRC clinical practices before the intervention, and data on patient population characteristics relevant to CRC screening (total number of patients 50 to 75 years of age, total number of Medicaid enrollees, proportion of patients up to date with CRC screening). Data on patient characteristics allow clinics to create a census of the patient population to be targeted by outreach activities. Clinic staff provided this population-level data by running queries on their EHR and/or billing data systems. Within the survey, a series of questions were also asked which were guided by the consolidated framework for implementation research (CFIR).[29]

Clinic intake surveys were distributed to all participating clinics (n = 29). The survey was used to verify contact information (name, address, phone number) and obtain detailed information with 3 sections: 1) Facility Survey, 2) Current CRC Screening Practices, and 3) Context Survey. The Facility Survey section consisted of 18 questions related to facility/clinic type, federal designation, clinic affiliation, EHR used and its functionality, quality reporting metrics, patient population and CRC screening rates. The Current CRC Screening Practice section consisted of 17 questions related to CRC services available in the clinic, how CRC guidelines are communicated to providers, if their clinic uses a FIT—and if so, which one—how providers feel about FITs with a 1 to 10 scale, their preferred screening modality, how the EHR is utilized to capture referrals and results, if a previsit validation is conducted regularly, and endoscopy provider information. The Context Survey consisted of 7 questions related to management and staff support for CRC screening; 6 response options ranged from completely disagree to completely agree and a not applicable option.

Each of 3 practice facilitators on the study team distributed the survey to their assigned clinics between January and April of 2021. The survey was made available as a Microsoft Word form as well as electronically using REDCap, a secure, web-based software platform designed to support data capture for research studies.[30,31] Practice facilitators asked clinics their preference for the survey modality and continued outreach over several months to support survey completion. The timing and method of outreach varied by practice facilitator and clinic and was informed by the facilitator's knowledge of the clinic's competing priorities, level of engagement, and communication preferences. In some cases, practice facilitators helped complete survey items using publicly available data (eg, clinic EHR, federal designation).

For clinics assigned to the intervention arm (n = 15), the research team securely shared the list of eligible patients then asked the clinic to validate the lists for eligibility using their EHR. A 1-hour virtual training for the clinic on how to validate the enrollee list was led by the research team and held twice (May and June 2021). At least 1 representative from each clinic attended. The training content is available on our website.[32,33] The training addressed that it is important to validate the patient list to prevent unnecessary mail and calls to patients who are not due for screening. The training also defined who is eligible for FIT screening (50 to 75, no recent screening, and exclusions of other medical conditions), and directions for how to update the list. In addition to medical reasons for excluding patients during the validation, clinics were also given the option of removing someone because they were deemed "not a current patient." This option was left to the discretion of the clinic and could include Medicaid enrollees who had not yet established care or enrollees who had not had a recent clinic visit (eg, in the past 12 months).

Descriptive analyses were conducted to assess clinic and health plan characteristics. We classified clinics based on federal designation (Rural Health Clinic (RHC), Federally Qualified Health Center (FQHC), Indian Health Services (IHS), none, (determined based on survey responses and public data)[34,35] and by clinic network structure (individual clinic with a single location, clinic with multiple locations, hospital-affiliated clinic, health-care-network affiliated clinic). Determination of clinic network structure was a 2-stage process: Members of the research team independently reviewed and classified clinics using survey responses and public data. We then resolved discrepancies and refined categories and definitions through a consensus-building discussion with input from a third team member, using our knowledge of clinics and systems. In addition, we report here on 2 Likert scale questions from the survey.

SMARTER CRC was approved by the Oregon Health & Science University Institutional Review Board (# STUDY00020681). Along with the clinic intake survey, participating health plans and clinics were given an information sheet outlining the project purposes and risks and were instructed to contact the research team with questions; completion of the clinic intake survey constituted informed consent.

Results

All but 1 clinic responded to the clinic baseline survey (97% response). The level of support needed to complete the survey varied widely, with some clinics needing minimal to no support, and others needing a virtual 1-on-one meeting with a practice facilitator to clarify survey questions, facilitate use of the REDCap interface, and discuss where information may be found (eg, ways in which other clinics had located specific information).

Characteristics of 29 participating clinics are summarized in Table 1. Using the Rural-Urban Area Commuting (RUCA) codes, 66% (n = 19) of clinics were classified as micropolitan, 31% (n = 9) were classified as rural and 3% (n = 1) was classified as urban.[36–38] Nearly two-thirds of the participating clinics had a federal designation: 41% (n = 12) were Federally Certified Rural Health Clinics, 17% (n = 5) were Federally Qualified Health Centers (FQHCs), and 1 (3%) was a Tribal Health Center; the remaining 11 (38%) had no federal designation. In terms of clinic network structure, hospital-affiliated clinics made up the largest proportion of the participating clinics (48%; n = 14), with the remaining clinics being split between health-care-network-affiliated clinics (14%; n = 4), clinics with multiple locations (21%; n = 6), and clinics with a single location (17%; n = 5). Participating clinics reported using 9 different EHR systems, the most common of which were Epic (41%), OCHIN Epic (14%) and Greenway Intergy (14%); the remaining EHR systems were used by only 1 or 2 participating clinics. Clinics had used their current EHR systems for as many as 201 years and as little time as less than 1 day; however, 45% had their current EHR for 3 to 10 years.

Clinic staff who completed the survey were asked to rate their agreement with statements about their clinic’s CRC screening experience and general clinical practices (Table 1). Seventeen clinic respondents (59%) *agreed* or *strongly agreed* that their “clinic provides providers with assessment and metrics regarding CRC screening.” Thirteen clinics (45%) *agreed* or *strongly agreed* that their “clinic has a staff member or administrator who champions colorectal cancer screening initiatives.”

Clinics varied in what EHR features they had access to and used for identifying patients eligible for CRC screening. The most commonly available features were patient reminders (75%) and provider reminders (79%) and “the ability to automate identification of patients due for CRC screening” (71%). Only 32% of clinics were able to identify patients who had been referred to screening colonoscopy, and only 39% had a cancer screening dashboard or page in the EHR. Few clinics had access to gastroenterology patient portals (14%, n = 4), the automated ability to identify patients with an abnormal FIT result (18%, n = 5), or an automated system to track patients with abnormal FITs for colonoscopy referral (11%, n = 3).

Many clinics were unable to identify basic characteristics of their patient population due for CRC screening (Table 2). Of the 28 responding clinics, 89% were able to enumerate their total patient population. Most clinics were able to report population-level data for their patients aged 50 to 75: 68% were able to report the number of patients ages 50 to 75, 75% could report the number of Medicaid enrollee patients, and 68% were able to report the number of patients ages 50 to 75 who had been screened for CRC in the last year. Most clinics were unable to report number of patients screened by screening modality: only 29% reported the number of patients screened by FIT in the past year, and only 32% were able to identify the number of patients with an abnormal FIT, or patients who completed a colonoscopy within 1 year following an abnormal FIT. There was little difference in the ability to report population-level data among clinics with an EHR site specialist (data not shown, n = 13 reporting clinics with an EHR specialist): 69% were able to report the age eligible screened population, 31% could report patients screened by FIT in the prior year, and 38% could report on abnormal FIT results and colonoscopy follow-up.

Like the clinics, health plans also varied in their capacity to generate lists of patients due for CRC screening in each clinic (Table 3). All 3 health plans (100%) were able to pull eligible enrollee lists, which ranged in size from 1705 to 2036 enrollees. However, information on race was missing for 22%, 40% and 34% of enrollees and information on ethnicity was missing for 18%, <1%, and 24% of enrollees at health plans 1 to 3, respectively. Health plan 2 reported missing language information for 10% of enrollees, while the others only reported 1% missing data for language.

During the validation process, the clinics excluded 34%, 43%, and 50% of patients provided in the health plan lists respectively (data not shown). The majority of exclusions by clinics were due to a health plan enrollee not being a current patient at that clinic (60%) or being up to date on screening (27%). Patients were also excluded if they were medically inappropriate for screening (4%), had moved out of the area (2%), or for other reasons (7%). The mailing vendor excluded an additional 1%, 2% and 7% of patients from the 3 health plan lists due to bad addresses. Ultimately, 45%, 52%, and 41% of enrollees from the original lists of eligible patients were removed because of exclusions found after manually reviewing charts or because of bad address information. The remaining eligible patients were sent FIT kits.

Discussion

Through survey and claims data, we identified key challenges faced by rural primary care clinics and partnering health plans in identifying patients due for CRC screening. Nearly all the 29 rural primary care clinics and 3 health plan partners participating in the SMARTER CRC pragmatic trial had trouble collecting at least some data on their eligible patient population, making CRC screening outreach complex and labor intensive. Nineteen clinics (68%) were able to report overall CRC screening rates, and only 29% were able to identify those screened by FIT versus other screening modalities.

The SMARTER CRC trial designed a collaborative model of patient identification (where Medicaid health plans generate lists of eligible enrollees that are reviewed by the clinic) with the intention of overcoming anticipated challenges in patient identification and mailing coordination across 29 rural clinics.[26] These anticipated challenges indeed emerged: clinics used a number of distinct EHR systems, and some had limited capacity to identify eligible patients. However, the data we report here show that health plans also struggle to generate accurate lists of patients seen by particular clinics who are due for CRC screening. While all 3 health plans were able to identify a list of patients they deemed eligible for mailed FIT outreach, they had high missing data rates for race, ethnicity, and preferred language (Table 3). This demographic information is important if clinics or health plans want to tailor outreach efforts to targeted populations by providing language specific materials, or culturally tailored information.

In addition, based on the high numbers of patients marked “not a current patient” by clinics during eligible patient list review (range: 33 to 50%), the health plans seemed to have trouble identifying which enrollees were receiving care from specific clinics. The high numbers of health plan enrollees removed from the list by the clinics could reflect difficulty getting enrollees to establish care, or simply low numbers of patients with a recent clinic visit. The generated lists included many patients who were not current patients of the clinic or were falsely identified as not being up to date on screening. Identifying these patients required a lot of time and manual labor. To generate a valid list would require better ongoing communication between the health plans and clinics, or 2-way data systems that updated screening completion or reasons for not recommending screening. Improvements like this could save time and resources for both clinics and health plans.

The research team used practice facilitation to aid in developing the list of eligible patients at the health plan. The research team essentially validated these lists by checking the data with prior known rates of screening and eligibility within each clinic’s patient population. However, research does not always fit perfectly into practice. For example, the health plan collects and stores data at the health system level, it was difficult in some cases to identify patients by individual clinics or sites. Another problem that likely affected the accuracy of the health plan lists is that claims data are not real-time: it usually has a lag of about 3 months, which may mean that some patients who had been screened were not identified as such in claims data at the time of the eligibility query.

The challenges faced by rural clinics and the health plans in producing lists of patients eligible for CRC screening or follow-up have some key implications for outreach. Mailed FIT and patient navigation are evidence-based interventions that are shown to improve rates of CRC screening and follow-up and reduce observed disparities in various health care settings.[12] Yet, these interventions have not been widely adopted in practice settings. Compared with opportunistic screening, organized outreach has the advantage of reaching populations that do not regularly access care. Mailed FIT outreach has been strongly endorsed as an easy at-home strategy that was successfully implemented during care suspension during the early phases of the COVID-19 pandemic.[50] In some states, certified community health workers performing the role of patient navigators are able to bill insurance for one-on-one patient education. The assessment of follow-up outcomes is especially important in rural clinics, yet because colonoscopy follow-up is completed as specialty care outside of the clinic, recorded follow-up is often incomplete.

Our work supports prior findings of implementation challenges to mailed FIT interventions.[39] It also provides new data on barriers to identifying patients in need of outreach, particularly in rural settings, which has not been widely studied.[40–43] We know from prior research that limited EHR capability is a key implementation concern for clinics implementing quality improvement initiatives as part of the Centers for Disease Control colorectal cancer screening program.[39,44] It may be that researchers tend to recruit clinics with higher functioning EHRs because of their capacity to produce reports and identify patient populations or due to conduct of research in urban-based academic health centers. These settings often have centrally coordinated EHRs and quality improvement systems that do not represent the infrastructure present in most primary care clinics and community settings, particularly for those in rural areas.[39,44] Given that the majority of patients receive primary care services in small to medium health care settings, our exploration of the capacity for patient identification and outreach in these settings is important.[45,46]

As practicing physicians must address a variety of diseases and preventive measures, the need for adequate identification for population health management is necessary. Automated EHR reports or clinical decision support tools to identify patients who are due for CRC screening facilitate the ability to implement outreach campaigns. However, many clinics lack either the EHR capacity or staffing to use these tools. Better EHR reporting capabilities and clinical decision support tools could also allow clinics to look at screening rates over time and address social determinants of health.[47] Specifically, being able to identify the modality of CRC screening (eg, colonoscopy vs FIT vs FIT-DNA) would allow clinics to offer mailed FIT to only those patients in need of screening.

We do not know how much of the missing data in our survey responses was caused by lack of time to complete the survey, adequate staffing or lack of a dedicated EHR specialist. An EHR specialist is typically a clinic employee who manages the EHR system, and has expertise to resolve issues within the EHR, and design reports for clinic staff. Fewer than half the clinics surveyed had a person dedicated to EHR support, meaning clinical or other administrative staff would have needed to provide this information. Even before the COVID-19 pandemic, primary care clinics struggled with having enough staff time to deliver preventive care interventions.[48] Prior research on screening and referral to treatment has highlighted the compounded challenges that small rural clinics face in implementing evidence-based interventions,[49] and post-COVID staff turnover and burnout have amplified these stressors.

The broad adoption and use of clinical decision support tools that has occurred over the past 2 decades has created tremendous opportunity to deliver population-based outreach and improve patient care, yet important gaps remain. A recent report from the US President’s Cancer Panel outlines several goals to close the gaps in cancer screening, including the creation and deployment of effective interoperable clinical decision support tools for cancer risk assessment and screening.[51] The panel recommended prioritizing support for screening, including clinical decision support tools in standard EHR systems, and reducing barriers to interoperability between data systems. These actions could go a long way toward expanding the capacity of clinics to provide preventive care services. However, clinics continue to battle with a lack of alignment between EHR functionality and providing evidence-based care.[52] Interoperability is especially important for CRC screening, which could take place in either a specialty care setting (for colonoscopy) or a primary care setting (for FIT or FIT-DNA testing).

Clinical decision support tools may facilitate population-based outreach, but development and use of these tools requires attention to baseline characteristics of the settings in which they are implemented. Standard, one-size-fits-all approaches to implementing clinical decision support tools also has the potential to exacerbate organizational and thus population-level inequities if additional resources and attention are not provided to clinics that display inadequate reporting capacities with their EHR systems. The tendency for research and policies to focus on urban populations (termed “structural urbanism”) can also limit the ability to implement interventions in rural settings.[53] For example, effective clinical decision support requires staff with capacity and expertise. Thus, recommendations prioritizing the use of clinical decision support tools should consider adding in supports for staffing and training needs for rural and remote clinics. Effective and interoperable tools managed by trained staff can expand the reach of interventions like ours to deliver outreach to all eligible clinic patients, irrespective of insurance status, leading to improved quality and satisfaction with care.

The findings reported here can inform funders, researchers, and practitioners about needed improvements to clinical decision support tools, EHR functionality, and data reporting capabilities to help rural clinics successfully implement population-based outreach to attenuate disparities in cancer screening and follow-up. For example, EHRs could be required to include discrete fields for colonoscopy results, preventive health tracking tools that automatically update when a completed FIT result is entered in the EHR, automated reports of CRC screening and follow-up, health information exchanges that allow streamlined reporting of specialty care data into primary care records, and closed loop referral systems. EHRs could also generate training for staff to record screening outcomes, auditing, and feedback for providers to systematically enter data in the EHR, and training opportunities for EHR specialists. These improvements may require additional funding or reimbursement for smaller clinics to support EHR specialists, or regulations on EHR vendors to require improved functionality. These findings also have implications for policy makers to consider when instituting quality metrics reporting, such as supporting staffing and requiring minimal EHR reporting capacities.

While these findings are informative, there are opportunities for further study. More robust analysis for small sample sizes (eg, Configurational Comparative Methods) could determine the combination of clinic and health plan characteristics that are linked to successful identification of eligible patients.[54–56] Research could also explore what kinds of EHR supports would benefit clinics with limited staff, or the potential for interoperable clinical decision support tools to enhance other innovations, such as health information exchanges, centralized EHR systems across multiple clinics (ie, OCHIN, “not an acronym”), or the use of remote digital devices that link to health records. Future qualitative research is needed to understand the additional key barriers and facilitators to population-level data reporting and what changes could facilitate data reporting on patients due for preventive care. In addition, research in areas outside of CRC screening would be helpful to see if population identification is also difficult for other types of preventive care outreach. It is likely that additional resources will be needed for clinics, and rural clinics in particular, to help address data infrastructure needs.

This project has several strengths, including the large number of participating clinics and near-complete response to the clinic intake survey. There are also important limitations. First, our sample of clinics had all agreed to participate in the SMARTER CRC pragmatic trial and may not have been representative of all rural clinics: these clinics may have had more resources or greater EHR functionality than nonparticipating clinics. Thus, the challenges in patient identification and data collection we noted may be more acute for nonparticipating clinics, and these clinics could also face additional challenges. Second, despite the relatively high number of participating clinics, our study only included clinics from 3 health plans, limiting our ability to generalize to other health plans. In addition, our results were focused on CRC screening only; we did not explore data gaps in other reporting areas. Finally, due to low numbers, we were unable to statistically link characteristics of clinics and health plans with the ability to use decision support tools.

Conclusion

Most rural primary care clinics and health plan partners participating in the SMARTER CRC pragmatic study experienced challenges identifying the full population of clinic patients due for CRC screening and follow-up. These challenges include limited EHR functionality, lack of decision support tools for population management, and/or lack of EHR expertise or support staff. Health plans also had difficulty identifying patients seen by specific clinics. Innovations are needed to make decision support tools accessible to help rural clinics conduct population-based preventive care outreach to attenuate disparities in cancer screening and follow-up. In the meantime, future intervention research with small and/or rural clinics should consider and address limitations in data gathering and identification of eligible patients.

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Table 1.

Participating Clinic Characteristics

Clinic Characteristic	Clinics n (%)
Total clinics	29
Rurality, defined by RUCA codes[a]	
Micropolitan (RUCA codes 4 to 6)	19 (66%)
Rural (RUCA codes 7 to 10)	9 (31%)
Urban (RUCA code 2)	1 (3%)
Clinic categories	
Federal designation[b]	
Rural Health Clinic	12 (41%)
Federally Qualified Health Center	5 (17%)
Tribal Health Center	1 (3%)
No Federal Designation	11 (38%)
Clinic network structure[b]	
Hospital-affiliated clinic	14 (48%)
Health care network-affiliated clinic	4 (14%)
Clinic with multiple locations	6 (21%)
Individual clinic (single location)	5 (17%)
Patient-Centered Primary Care Home Program Accreditation (Oregon)	
Tier 3	6 (21%)
Tier 4	17 (59%)
Tier 5	6 (21%)
Electronic Health Record (EHR)	
EHR vendor	
Epic[c]	16 (55%)
Greenway Intergy	4 (14%)
eClinicalWorks	2 (7%)
Athenahealth	2 (7%)
NextGen	2 (7%)

Clinic Characteristic	Clinics n (%)
Other[d]	3 (10%)
Length time with current EHR	
3 years or less	7 (24%)
3 to 10 years	13 (45%)
More than 10 years	7 (24%)
Unknown	2 (7%)
EHR site specialist (yes)	14 (48%)
Quality systems questions	
Clinic provides providers with assessment and metrics regarding CRC screening (agree)	17 (59%)
Clinic has a staff member or administrator who champions colorectal cancer screening initiatives (agree)	13 (45%)
EHR features to help with identifying eligible patients[e] (% yes) (n = 28)	
Provider reminder functionality	22 (79%)
Patient reminder functionality	21 (75%)
The ability to automate identification of patients due for CRC screening	20 (71%)
Automated identification of patients who are referred for a screening colonoscopy appointment	9 (32%)
Cancer screening summary page/dashboard	11 (39%)
Access to gastroenterology patient portals that show colonoscopy appointments	4 (14%)
Automated identification of patients with a positive FIT result	5 (18%)
Automated identification of patients with a positive FIT who have been referred for a colonoscopy	3 (11%)

Abbreviations: RUCA = Rural-Urban Commuting Area; FIT = fecal immunochemical test.

[a] All Oregon sites (RUCA codes 2 to 10) are classified as rural or frontier by the Oregon Office of Rural Health (ORH).

[b] Indicates that research team determined categorization.

[c] Includes OCHIN EPIC (n = 4) is a national nonprofit provider of EHR systems, providing equitable health care innovations and solutions - https://ochin.org/.

[d] Single clinics used GE Healthcare (Centricity), AdvancedMD, or RPMS.

[e] One clinic did not provide this information and are excluded from the denominator (denominator for these items: n = 28).

Table 2.

Baseline Survey Data Availability

Patient Population Characteristic	**Clinics Able to provide information (of responding clinics n = 28)**
Total number of patients	25 (89%)
Number of patients aged 50 to 75	19 (68%)
Number of Medicaid patients	21 (75%)
Race of the population	21 (75%)
Hispanic or Latino (ethnicity of the population)	17 (61%)
Number of patients ages 50 to 75 screened for CRC in the prior year	19 (68%)
Number of patients screened by FIT in the prior year	8 (29%)
Number of patients with an abnormal FIT, or abnormal FIT with colonoscopy completed w/in 1 year	9 (32%)

Abbreviations: FIT = fecal immunochemical test.

Table 3.

Health Plan Patient Population Identification

Patient Population Characteristics	Health Plan 1	Health Plan 2	Health Plan 3	Overall n (%)
Total Number of Eligible Patients based on Health Plan list[*] (n)	1705	1875	2036	5616
Female	55%	49%	53%	2949 (53%)
Age (mean)	58.8	56.9	58.8	58.2
Ethnicity				
Hispanic	4%	7%	5%	303 (5%)
Unknown Ethnicity	18%	<1%	24%	799 (14%)
Race				
White	73%	56%	61%	3519 (63%)
Non-White	5%	4%	5%	263 (5%)
Unknown Race	22%	40%	34%	1834 (33%)
Language				
English	95%	85%	96%	5173 (92%)
Non-English	4%	5%	3%	226 (4%)
Unknown Language	1%	10%	1%	217 (4%)

[*] Population includes all eligible patients.