COLORECTAL CANCER RISK ASSESSMENT IN RURAL PRIMARY CARE: A QUALITY IMPROVEMENT PROJECT

by

Danielle Lynn Grubb

A scholarly project submitted in partial fulfillment
of the requirements for the degree

of

Doctor of Nursing Practice

in

Family Nurse Practitioner

MONTANA STATE UNIVERSITY
Bozeman, Montana

May 2026

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my Lord and Savior, Jesus Christ, for life, health, and His faithfulness through my educational journey. Secondly, I couldn't have made it without my amazing husband and his unwavering support, commitment, and hard work in keeping our family afloat while I pursued my dreams. Your guidance and encouragement have been instrumental in my success, and I would not be where I am today without you. I would also like to extend my sincere gratitude to my project chair, Dr. Stacy Stellflug, and the faculty at Montana State University for their encouragement, expertise, and guidance throughout my graduate studies. Finally, I would like to thank the project site for their dedication, collaboration, and participation in this quality improvement project, and for graciously allowing me the opportunity to implement and complete this work within their organization

TABLE OF CONTENTS

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

ABSTRACT

Background: Colorectal cancer (CRC) remains a leading cause of cancer-related morbidity and mortality in the United States. Early-onset CRC among individuals under 50 years is increasing, while screening rates remain below national targets. Rural populations experience additional disparities due to limited healthcare access, lower preventative care utilization, and reduced screening rates.

Local Problem: At a rural primary care clinic in north central Montana, only 27% of eligible patients were current with colorectal cancer screenings (CRCS). A new electronic health record further limited providers' ability to identify patients due for screening.

Methods: This quality improvement project utilized the Institute for Healthcare Improvement framework to implement a structured colorectal cancer (CRC) risk assessment process based on American Cancer Society guidelines. Adult patients aged 21–75 presenting for annual wellness or establish-care visits during a six-week implementation period received a CRC risk assessment form at registration. Completed assessments were used to inform individualized screening recommendations. Project outcomes were evaluated using descriptive statistics.

Results: All full-time staff (n=3, 100%) completed pre-implementation education. Of 33 eligible patients, 25 of the 33 (75.7%) completed the risk assessment form. Nine patients out of the 25 (36%) were identified as needing screening; screening orders were placed for three patients of those nine patients (33%).

Conclusion: Implementing a structured CRC risk assessment in a rural primary care setting was feasible and improved the identification of patients needing screening. Integrating risk assessment into routine clinic workflow may support earlier identification of at-risk individuals and help address persistent colorectal cancer screening disparities in rural populations.

CHAPTER ONE

INTRODUCTION, BACKGROUND, & LITERATURE REVIEW

Introduction

Colorectal cancer (CRC) ranks among the leading causes of cancer-related deaths in the United States (U.S.). Rural populations are known to experience even higher risks, including a higher likelihood of death from CRC, being diagnosed at a younger age, and having more advanced-stage cancer by the time it is diagnosed (Byreddi et al., 2024; Oh et al., 2024; Tan et al., 2024a; Zahnd et al., 2021). Disparities clearly exist and highlight the need for evaluation, understanding, and reduction of the CRC screening barriers faced by rural populations.

Colorectal cancer screening (CRCS) plays a critical role in detecting early signs of cancer and diagnosing the disease at more treatable stages. Screening can be performed through several methods, including direct visualization of the colon or stool-based tests, and has been shown to significantly reduce both mortality and health care costs (Issaka, Chan, & Gupta, 2023). Guidelines for CRCS consider risk factors such as age, family history, and overall health. Despite proven benefits of CRCS, overall screening rates remain below national benchmarks, with rural populations experiencing even greater disparities compared to their urban counterparts (Carmichael et al., 2020; Sepassi et al., 2024).

Healthy People 2030 has set a national target of 72.8% CRCS among eligible adults (Office of Disease Prevention and Health Promotion [ODPHP], n.d.). The National Colorectal Cancer Roundtable aims even higher, striving for an 80% screening rate in age-eligible adults as outlined in the *80% in Every Community Strategic Plan* (n.d.). Current national rates fall below

these benchmarks, and in states designated rural, such as Montana, only an estimated 62.6% of adults ages 45-74 are up to date on screening (United Health Foundation, 2025). Rural residents face unique barriers to screening, including limited access to specialty care, a reduced perception of risk, long travel distances, concerns regarding privacy, and embarrassment about undergoing screening (Wang et al., 2019). The barriers described contribute to delayed or missed opportunities for timely CRCS in rural populations.

Within a rural North Central Montana primary care clinic, stakeholders have identified a potential gap in CRC risk assessment, screening uptake, and accurate documentation and tracking of screening results. The stakeholders in the primary care clinic note there is no standardized process for documenting and tracking CRC screening, coupled with the absence of systematic risk assessment, resulting in failure to identify patients meeting criteria for CRCS. Without targeted assessment and risk-based screening, patients face a higher risk of developing preventable CRC and may miss the opportunity for early-stage diagnosis. Implementation of a CRC risk assessment tool during adult annual wellness exams, alongside integration of a standardized documentation and tracking process, is essential to improving screening uptake and reducing disparities in CRC outcomes within rural populations.

Background and Significance

Colorectal cancer ranks as the second leading cause of cancer-related death in the United States and is known to have improved morbidity and mortality if diagnosed at an early clinical stage. Late-stage CRC diagnoses often result in higher treatment costs, reduced quality of life, and increased risk of treatment failure or death (Brown et al., 2025; McGarvey et al., 2022; Siegel et al., 2023). The American Cancer Society recognizes CRC staging as I-IV, with a higher

number indicating more disease spread (2020). CRC in stages I and II involves localized disease confined to one area of the bowel, differing mainly by how deeply the tumor has penetrated the bowel wall, while stage III extends through the outermost layer of the colon but has not reached any other nearby organs (*Colorectal cancer stages | Rectal cancer staging | Colon cancer staging*, 2020)Stage IV indicates the cancer has spread to adjacent tissues, organs, or distant sites such as the liver or lungs (American Cancer Society, 2020). In a study of 655 patients diagnosed with CRC, the most common presenting symptoms were abdominal pain, weight loss, and hematochezia (Madkhali et al., 2025). Notably, only 8% of the patients were diagnosed at stage I, while over 48% presented at stage III-IV (Madkhali et al., 2025). Unfortunately, when CRC symptoms first appear, the disease has typically progressed beyond stages I and II. According to Siegel et al. (2020), 5-year survival rates for individuals diagnosed with early, localized colorectal cancer are as high as 90%, but drop to only 14% for those diagnosed at stage IV. Furthermore, healthcare costs associated with a Stage IV diagnosis are four times higher than those for a CRC diagnosed at stage II or earlier (Smith et al., 2024). Costs can accumulate due to expensive treatments, the need for extensive surgical interventions, and prolonged periods of missed work caused by illness, thus reinforcing the importance of early-stage diagnosis.

Considering the elevated CRC mortality rates in rural versus urban populations, as well as the higher frequency of late-stage diagnosis and increased health-care costs, addressing screening disparities is critical to achieving equitable healthcare outcomes and highlights the need for increased access to and utilization of CRCS in rural areas (Carmichael et al., 2020; Dressler et al., 2025; Fairfield et al., 2025; Fu et al., 2024). Recommended screenings not

only improve early CRC diagnosis and treatment but also play a pivotal role in prevention, improved survival rates, and favorable health outcomes (Zheng et al., 2023).

Standards of Care for Preventive Screenings

CRCS functions as a preventive strategy aimed at detecting cancerous lesions in asymptomatic individuals. Since age is recognized as one of the major risk factors for the development of CRC, it is a main indicator for when screening should begin (Issaka, Chan, & Gupta, 2023). The American Cancer Society and the United States Preventive Services Task Force (USPSTF) recently lowered the initial screening age from 50 to 45 years due to an increasing incidence of early-onset CRC (Force, 2021; Qaseem et al., 2023; Sinicrope, 2022). Screening options include stool-based tests, such as high-sensitivity gFOBT (guaiac fecal occult blood test), FIT (fecal immunochemical test), or sDNA-FIT (single-strand DNA fecal immunochemical test), and direct visualization methods, including colonoscopy, CT (computed tomography) colonography, and flexible sigmoidoscopy (Force, 2021). The American College of Physicians recommends fecal FIT or gFOBT every two years, colonoscopy every 10 years, or flexible sigmoidoscopy every 10 years combined with a FIT test every two years for average-risk adults: (Qaseem et al., 2023). Meanwhile, the American Cancer Society (2024) recommends colorectal cancer screening through stool-based tests, FIT or gFOBT yearly, FIT-DNA/MT-sDNA every three years, or direct-visualization methods, including colonoscopy every 10 years, CT colonography every five years, or sigmoidoscopy every five years.

Although specific recommendations vary slightly across professional organizations, there is consensus that screening is essential for the early detection of CRC. Because certain screening methods may be less appropriate depending on a patient's medical history, it is important to

prioritize shared decision-making during clinical encounters. Providing education further empowers patients to select the screening modality they are most likely to complete.

Risk Factors for Colorectal Cancer

Risk factors for many diseases often fall into two categories. Modifiable risks include things individuals can change through lifestyle or behavior, while non-modifiable risks remain beyond individual control. Modifiable risk factors for CRC include alcohol consumption, smoking, obesity, sedentary behavior, unhealthy diet, and psychological stress (Roshandel, Ghasemi-Kebria, & Malekzadeh, 2024). Alcohol intake shows a proportional positive association with CRC risk, with the highest risk seen in heavy drinkers, defined as consuming more than 50 g of ethanol daily. Increased CRC risk is strongly linked to smoking, with risk rising linearly with the number of cigarettes smoked per day; each additional 10 years of smoking increases CRC risk by approximately 9.5%, and a history exceeding 40 pack-years raises risk by 50% or more (Botteri et al., 2020; Lee et al., 2019).

Researchers have linked obesity to a 30%–70% increased CRC risk, particularly with greater amounts of visceral or abdominal fat (Bardou et al., 2022). Higher physical activity levels, in contrast, correlate with a 19%–30% reduction in CRC risk compared with low activity levels (McTiernan et al., 2019). The National Comprehensive Cancer Network recommends at least 30 minutes of moderate-intensity activity on most days for cancer prevention (McTiernan et al., 2019). Dietary risk also plays a significant role. Frequent consumption of refined grains, added sugars, and red or processed meats elevates CRC risk, whereas higher intake of fruits, vegetables, whole grains, and dietary fiber lowers CRC risk (Vernia et al., 2021)

Non-modifiable risk factors for CRC include age, sex, genetic predisposition, family history, prior abdominopelvic radiation, certain medical conditions, and intestinal microbiota (Roshandel, Ghasemi-Kebria, & Malekzadeh, 2024). Age stands out as one of the strongest predictors, with incidence rising sharply in adults over 45. Male sex also plays a role, with men having a higher risk than women, with a male-to-female ratio of approximately 1.4:1 (Roshandel, Ghasemi-Kebria, & Malekzadeh, 2024). A family history of CRC or advanced adenoma further increases risk, with one population-based study reporting a 1.4- to 2.3-fold increased CRC risk after adjusting for other family history and lifestyle factors (Isaaka, Chan, & Gupta, 2023). Researchers found an even higher risk if the relative was diagnosed before age 50, or if multiple first-degree relatives were affected (Issaka, Chan, & Gupta, 2023). Hereditary syndromes, such as Lynch syndrome, confer even higher risk, prompting guideline recommendations for starting colonoscopy screening as early as age 20 and repeating it every 1-2 years (Giardiello et al., 2014). Emerging research also suggests that increased presence of specific organisms within the gastrointestinal (GI) tract, such as *Fusobacterium nucleatum* and toxigenic *Bacterioids fragilis,* are associated with increased CRC development and may aid in CRC staging, predicting treatment response, and identifying patients at high risk for recurrent (Ionescu et al., 2025).

Recognition of CRC risk factors plays a critical role in identifying individuals at elevated risk and guiding timely, personalized screening strategies. While age remains a well-established predictor of CRC, relying on age alone can miss patients whose risk increases due to other modifiable and non-modifiable risk factors such as family history, genetic syndromes, lifestyle behaviors, and gut microbiome profiles (Giardiello et al., 2014; Ionescu et al., 2025; Roshandel, Ghasemi-Kebria, & Malekzadeh, 2024). Incorporating risk factors into routine assessment

enables clinicians to recognize high-risk patients sooner and recommend earlier or more frequent screenings, such as colonoscopy for those with hereditary syndromes or significant family histories (Issaka, Chan, & Gupta, 2023). This approach moves screening from a one-size-fits-all model based solely on age to a targeted strategy that improves detection, optimizes screening resources, and may ultimately reduce CRC incidence and mortality.

Rural Context of CRC Risk

Understanding CRC risk in relation to rurality is essential for improving screening uptake, early detection, and overall health outcomes. While all populations may experience skepticism about screening efficacy, fear of procedures, and limited health literacy, rural communities encounter additional challenges (Peng, Huang, & Mao, 2024). Researchers have found an increased CRC incidence and mortality in rural residents over urban populations, largely due to delayed diagnosis, limited specialty care access, transportation barriers, and fewer local endoscopy facilities (Lee et al., 2023; D. N. Owusu et al., 2025; Sepassi et al., 2024). Furthermore, disparities in CRCS are influenced by factors such as income level, insurance status, and access to a personal healthcare provider (Owusu et al., 2025). Rural populations often face greater challenges, as they typically have lower household incomes and lower rates of insurance coverage than their urban counterparts (Derrick Nyantakyi Owusu et al., 2025).

Health Professional Shortage Areas (HPSA) are designated areas with insufficient numbers of healthcare providers, including primary care providers, mental health providers, and dentists (*Montana health professional shortage area (HPSA) designations*, n.d.). Only five of Montana's 56 counties lack HPSA designation, making it one of the states with the highest designations due to its rurality and provider shortages (*Montana health professional shortage*

area (HPSA) designations, n.d.; Streeter et al., 2020). Lack of health care providers means longer wait times for appointments and procedural interventions such as colonoscopies, and longer distances to and from provider services. Rurality itself can act as an independent risk amplifier through structural barriers that may delay detection, diagnosis, and treatment of CRC.

Modifiable risk factors are further intensified in rural populations, where higher rates of tobacco and alcohol use are commonly reported. In Montana specifically, the state ranks among the highest nationwide for the percentage of adults who report binge drinking within the past 30 days (Excessive Drinking in Montana, 2023). Approximately 15% of adults report current smoking, and 7.5% use smokeless tobacco, while the national average for smokeless tobacco use is 3.4% (*Tobacco use in Montana* 2024). Some of these factors may contribute to the rates of early onset CRC not only being higher in rural populations, but also rising faster, with incidence increasing by 35% in rural areas between 2000 and 2016, compared to 20% in urban areas (Zahnd et al., 2021). The findings underscore the importance of incorporating rural-specific considerations into CRC risk assessments to better identify high-risk individuals and tailor interventions in primary care clinics such as those in North Central Montana.

Based on the information discussed, CRC risk screening integrated into the workflow and EHR at a local, rural primary clinic is necessary and desirable. Not only will this intervention assist in collecting data needed to update the EHR to reflect CRCS history, but it will also facilitate a patient-provider discussion on risk factors for the development of CRC, allowing for risk mitigation and lifestyle management education, provision of screening options at the time of visit, and an order to be placed for an appropriate screening intervention if needed.

An exhaustive literature review was conducted to identify relevant, peer-reviewed studies and articles. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and rigor in study selection. A PRISMA flow diagram was used to outline the search, screening, and inclusion process, providing a visual summary of how studies were identified, evaluated, and included in the final analysis.

Search Strategy

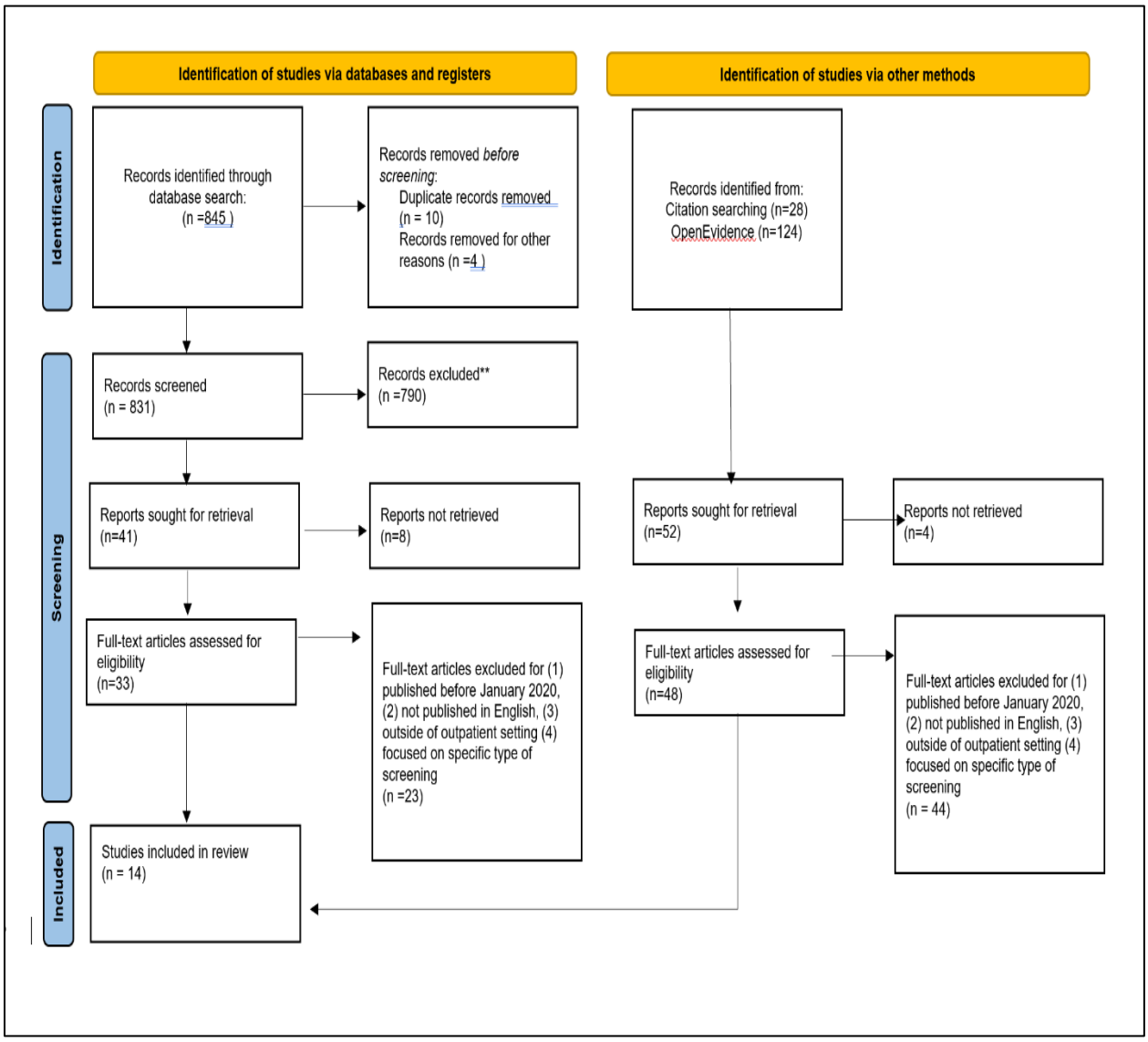
The search occurred from September 10th to September 26th, 2025. Databases included in the search included CINAHL, Web of Science, and Google Scholar, and were supplemented with the use of OpenEvidence, a medical artificial intelligence (AI) platform with access to the New England Journal of Medicine, Journal of American Medical Association (JAMA), and the JAMA Network, including access to their 11 specialty journals (OpenEvidence, 2025). Key search terms included “colorectal cancer screening OR CRC screening”, “rural primary care OR primary care”, “EMR OR EHR OR EHR tracking”, “risk assessment OR risk stratification” and was supplemented with the help of the University Librarian.

Inclusion Criteria

Articles included in the literature synthesis were peer-reviewed and published within the last five years in the English language. In addition, articles were selected that discussed risk assessment and stratification specific to CRCS and were completed in outpatient settings. Excluded articles were those that studied specific interventions aimed at improving colorectal cancer screening rates, and articles including the study of other preventative cancer screenings,

such as cervical or lung cancer. Initially, the search was for studies specific to rural primary care, however, there was a clear gap in research specific to rural populations. Therefore, the search was expanded to include any primary care setting. The screening process is outlined within the PRISMA diagram in Figure 1.1.

Figure 1.1: Study PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Flow Diagram



Results

A total of 845 articles were identified through the database search, of which 831 met the initial inclusion criteria. Further narrowing was completed by screening the title and abstract, of which 790 were excluded for not being applicable to the study. Forty-one articles were sought for retrieval, with eight no longer accessible for evaluation. Of the remaining 33 articles, after full-text analysis, 23 were excluded, and ten articles from the database search were retained for synthesis.

Citation searching and OpenEvidence brought forth 152 articles, however, after evaluation of title and abstract, 52 articles were sought to be retrieved, four of which were unavailable. After screening for inclusion and exclusion criteria, only four were retained for synthesis, leading to a total of 14 articles, including the addition of the 10 selected articles from the database search as mentioned earlier.

Overview of Studies

Selected studies included three systematic reviews, one randomized controlled trial, two cohort studies, five observational and qualitative studies, and three expert reviews for a total of 14 articles, all published within the last five years. Five articles had a focus on the implementation of risk assessment strategies for CRCS, six discussed the importance and utilization of EHR data for CRCS, and five discussed workflow optimization and standardization in CRCS uptake. The Johns Hopkins criteria for literature quality guided the evaluation process, while the Polit and Beck hierarchy of evidence was used to rank each study according to its level of evidence, ranging from Level I to Level VII (Page et al., 2023). Four studies ranked level I or II, providing robust evidence for effective interventions, risk-stratification, and symptom

recognition (Adhikari et al., 2022; Agunwamba et al., 2023; Demb et al., 2024; Emery et al., 2023). Two studies were ranked level III, providing insight into real-work screening benefits and disparities through cohort studies (Abualkhair et al., 2020; Wang et al., 2021). Five studies utilized observational and studies offering practical insight into workflow, implementation challenges, EHR use, and sustainability (Baus et al., 2020; Dias et al., 2024; Mojica et al., 2022; Petrik et al., 2023; Sharma et al., 2025). The remaining studies provide context for clinical practice and emerging strategies (Hull et al., 2020; Issaka, Chan, & Gupta, 2023; Waddell, Keenan, & Frizelle, 2024).

Literature Review

The literature review identified numerous barriers to CRCS, many of which demand targeted interventions and tailored solutions. To address the challenges reported at the project site clinic, the review prioritized risk assessment and was further supplemented by an examination of EHR utilization and workflow standardization. These areas were the focus identified as key barriers locally and are often critical to the successful implementation of risk assessment strategies and screening uptake.

Risk Assessment

The rising incidence of early-onset colorectal cancer (EOCRC) has prompted discussions regarding a paradigm shift in screening methods from the traditional age-based approach to an emphasis on risk-stratification and assessment. A growing body of evidence highlights the effect of genetics, modifiable risk factors, and diagnostic practices in CRC incidence, mortality, and disparities in early detection (Hull et al., 2020; Issaka, Chan, & Gupta, 2023; Wang et al., 2021). Risk assessment using validated tools or decision aids is correlated with improved risk-

appropriate screening, increased patient knowledge, and reduced decisional conflict regarding which screening to use (Emery et al., 2023; Hull et al., 2020; Issaka et al., 2023).

Wang et al. demonstrated that a comprehensive risk score including family history of CRC, body mass index (BMI), smoking status, alcohol use, diet, aspirin use, and physical activity can identify individuals who may benefit from CRCS earlier than the standard age-based recommendation of 45 years (2021). Similarly, other researchers emphasize age alone is an insufficient predictor of CRC risk and advocate for models that integrate demographic, lifestyle, and clinical factors to better target screening and make appropriate individualized starting ages and intervals for CRC screening (Hull et al., 2020; Issaka, Chan, & Gupta, 2023).

Expected benefits of risk-based screening include greater yield per colonoscopy with higher diagnostic and preventative benefits in high-risk groups with improved cost-effectiveness; improved patient knowledge, intention, and uptake of screening when risks are clearly communicated; and prevention of a proportion of CRC cases by targeting modifiable risk factors either by lifestyle and diet education, or by means of directed colonoscopy and polypectomy (Wang et al., 2021). Importantly, risk assessment must be paired with robust symptom-driven diagnostic screening pathways to ensure patients presenting with red-flag symptoms such as hematochezia, abdominal pain, or unexplained weight loss receive timely diagnostic evaluation with the recognition of the possibility of early onset CRC even in younger populations (Demb et al., 2024; Waddell, Keenan, & Frizelle, 2024)

Researchers have indicated that risk-based CRCS integrated into routine primary care with symptom-driven evaluation offers a practical and cost-effective strategy to improve early

detection, reduce mortality, and optimize use of colonoscopy resources (Emery et al., 2023; Hull et al., 2020; Issaka, Chan, & Gupta, 2023; Wang et al., 2021).

EHR Utilization

EHR integration and utilization function as a prominent enabler for CRCS by making patient identification, outreach, tracking, and documentation possible. The potential benefits of EHR integration depend greatly on data quality, functionality, and support. Researchers have reported improved opportunities for screening with the use of EHR-enabled prompts and reminders, as well as when the system can reliably identify patients in need of screening (Agunwamba et al., 2023; Sharma et al., 2021). Similarly, EHRs that can capture screening modality, date, and results allow clinics to target screening outreach (for example, mailing FIT only to those not up to date by colonoscopy), track referrals and follow-up, and measure program performance over time (Baus et al., 2020; Petrik et al., 2023).

Unfortunately, limited EHR functionality, poor interoperability between primary care and specialty services, and inconsistent data entry can create major barriers. Rural and smaller clinics frequently lack reporting capabilities and specialty results oftentimes do not flow back into primary care records. As a result, there is often misclassification of screening status and incorrect outreach lists (Petrik et al., 2023; Baus et al., 2020). EHR design and usability also shape adoption. A poorly designed EHR reminder system or cumbersome processes can overwhelm staff and reduce uptake, even if the capability exists (Dias et al., 2024). Researchers have consistently highlighted the negative implications of incomplete or inconsistent EHR documentation, recognizing it as a critical barrier to identifying patients overdue for CRC screening, tracking test history, and ensuring follow-up of abnormal results (Baus et al., 2020;

Petrik et al., 2023; Adhikari et al., 2022; Dias et al., 2024). Practice implications for the discussed literature include the prioritization of standardized data capture including the screening modality and date with consistent documentation, and improvement in interoperability between primary care offices and specialty providers.

Workflow Standardization

Workflow design refers to the process of defining who performs specific tasks, when they are performed, and how they are carried out within the clinical team. Workflow design determines whether EHR tools translate into completed documentation, tracking, and screenings. Researchers have shown that standardized, role-based workflows integrating screening tasks into routine visits have the potential to increase screening completion rates (Adhikari et al., 2022; Baus et al., 2020; Mojica et al., 2022). Furthermore, practices implementing clear visit-based workflows and empowering medical assistants (MAs) to discuss and review FIT instructions show higher screening uptake and completion rates than practices with variable processes (Mojica et al., 2022).

Workflows and EHR utilization interact in that prompts and reminders are only useful when aligned to practical tasks and staffed roles. Clinics lacking staff capacity or standardized processes still fall short even in the midst of effective EHR reminders, which can be ignored or overlooked (Dias et al., 2024; Adhikari et al., 2022). Higher rates of success would include an EHR reminder with standardized steps of action to a trained team member. As an example, a reminder to an MA trained to place a FIT order can educate the patient on doing the test and document completion in a standardized area within the EHR. Mapped processes and refined workflows accelerate EHR adoption and utilization with improved documentation practices

(Baus et al., 2020). Sustainable interventions aimed at increasing CRCS rates require a multicomponent approach, including workflow modification and increased access to care interventions (Adhikari et al., 2022; Sharma et al., 2025).

Discussion & Conclusion

With increasing rates of early onset CRC and continued screening disparities in rural communities, risk assessment and targeted CRCS not only improve early detection but also help optimize resources like colonoscopy (Demb et al., 2024; Emery et al., 2023; Waddell, Keenan, & Frizelle, 2024). In rural areas where few providers, if any, are trained to complete colonoscopy procedures, it becomes important to ensure high-risk individuals are prioritized for colonoscopy screening. Furthermore, with higher rates of younger individuals being diagnosed with CRC, it stands to reason there will be an increasing number of young adults in need of CRCS for risk factors other than age. While age has long been established as a major risk factor for CRC, it is most definitely not the only one in need of clinician's attention.

Risk assessment also prompts the unique opportunity to discuss modifiable risk factors for the development of CRC and educate patients regarding their personal role in CRC prevention, which has been associated with higher screening uptake (Emery et al., 2023). Risk assessment of all adult patients presenting to a primary care clinic is an attainable goal, however, is reliant on EHR utilization and workflow standardization to ensure implementation, and more importantly, sustainability over time.

CHAPTER TWO

QUALITY IMPROVEMENT PROPOSAL

Introduction

Colorectal cancer (CRC) is the second leading cause of cancer-related death in the United States (U.S.), with more than 150,000 new diagnoses and approximately 52,000 deaths projected for 2025 (*Key Statistics for Colorectal Cancer*, 2025). Prognosis is strongly influenced by the cancer stage at diagnosis, as late-stage disease is associated with higher treatment costs, poorer quality of life, and increased mortality (Brown et al., 2025; McGarvey et al., 2022; Siegel et al., 2023). Colorectal cancer screening (CRCS) is therefore essential for early detection and improving outcomes, prompting Healthy People 2030 to establish a national screening target of 72.8% among age-eligible adults ages 45-75 (King et al., 2025). However, current national screening rates fall well below the benchmarks, with even lower participation among rural populations due to unique barriers such as limited access to care, reduced perception of risk, long travel distances, and concerns regarding privacy and embarrassment about undergoing screening (Wang et al., 2019).

Early-onset CRC, defined as diagnosis before age 50, has risen sharply in recent decades, increasing by 63% increase between 1988 and 2015, in contrast to the declining rates of later-onset CRC (Sinicrope, 2022). The most dramatic increases occurred among individuals under age 40, and projections suggest by 2030, early-onset CRC could account for 15-20% of all CRC cases (Jayakrishnan & Ng, 2025a; Sinicrope, 2022; Villaroman, Cuartas, & Gupta, 2024).

Notably, rural populations face a disproportionate burden, with early-onset CRC incidence rising 35% in rural areas compared to a 20% increase in urban areas (Zahnd et al., 2021).

With rising CRC rates among young adults, it is increasingly evident that screening should move beyond age-based criteria. Emerging evidence supports a shift from traditional age-based screening towards risk-stratified approaches that incorporate demographic, lifestyle, and clinical factors to determine individualized screening start ages and intervals. Risk assessment and awareness of risk-based screening algorithms accounting for family history are associated with improved risk-appropriate screening, increased patient knowledge, and increased CRCS completion (Emery et al., 2023; Hull et al., 2020; Issaka, Chan, & Gupta, 2023; National Colorectal Cancer Roundtalbe & American Cancer Society, 2024). Literature suggests age alone is an insufficient predictor of CRC risk, underscoring the need for models integrating multiple risk factors to better target screening and make personalized recommendations (Hull et al., 2020; Issaka, Chan, & Gupta, 2023).

Problem Statement

CRC screening rates continue to fall below national targets. In Montana, an estimated 59% of adults ages 45-75 are up to date with screening according to U.S. Preventative Services Task Force (USPSTF) guidelines (American Cancer Society, 2023). For uninsured Montanan's, only 27% of adults ages 45-64 are current with screening recommendations (Alteri, 2025). Researchers have found that risk assessment plays a critical role in identifying individuals who require screening, facilitating patient-provider discussions about CRC risk factors, and increasing screening uptake (Emery et al., 2023; Hull et al., 2020; Issaka, Chan, & Gupta, 2023; Wang et al., 2021). Furthermore, with rising rates of early-onset CRC, there is a growing population in

need of screening initiation before the standard age of 45. Without systematic risk assessment and stratification, these individuals are at a heightened risk of being overlooked for screening and early intervention.

At the identified project site in Northcentral Montana, CRCS rates were found to be approximately 27%, which is below both state and national goals. Stakeholders identified multiple contributing factors to low screening rates, including but not limited to a lack of a standardized process for CRC risk assessment documentation and tracking screening history, coupled with the absence of a systematic risk assessment tool to identify patients who meet screening criteria. Without risk-based screening and targeted assessment, patients face a higher risk of developing preventable CRC and may miss the opportunity for early-stage diagnosis and treatment.

The quality improvement project seeks to address these gaps through a structured intervention aimed at (1) improving identification of patients in need of additional screening based on recommendations of an evidence-based risk assessment tool, (2) increasing documentation of CRC screening status, (3) streamlining clinical workflows, and (4) clarifying team roles to improve CRCS completion.

Organizational Microsystem Assessment

The project site is a rural health clinic (RHC) located in Northcentral Montana, serving a rural population situated more than 60 miles from the nearest population center and higher-level healthcare facility offering specialty services. Patients in this area face considerable travel barriers due to the absence of public transportation and hazardous weather-related travel conditions, including heavy snowfall, high winds, and extreme cold. Within the community, only

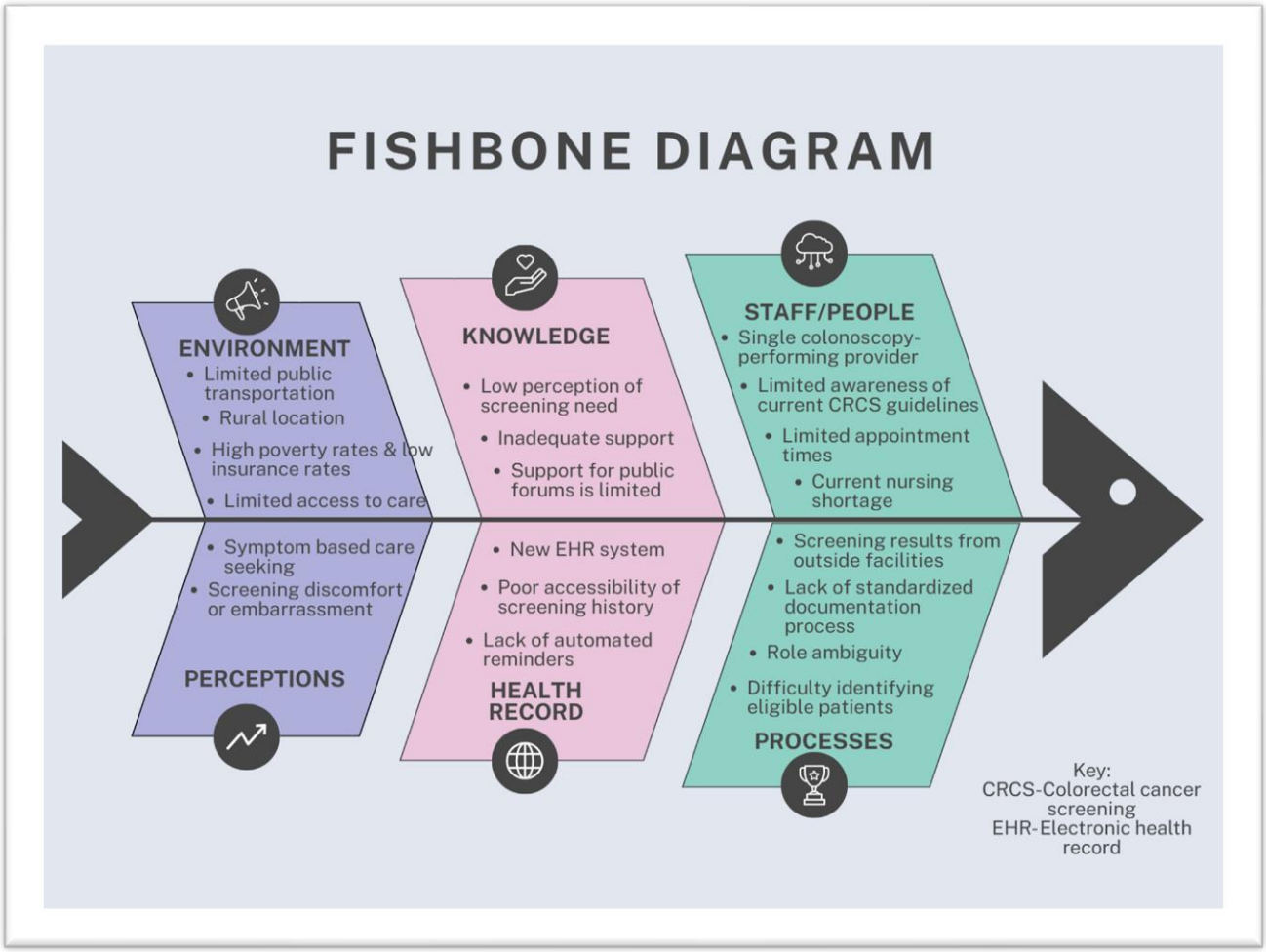
one provider performs colonoscopies, resulting in prolonged wait times and presenting additional challenges for patients who may feel uncomfortable undergoing an invasive, intimate procedure with a clinician they personally know and frequently encounter.

The median household income for the rural community where the clinic is located is approximately $47,000, which is about one-third lower than the statewide median for Montana, with nearly 20% of residents living below the poverty line, which is nearly 1.5 times the statewide poverty rate (*Census and Target Rate*, n.d.; ********, MT*, n.d.). Household income levels are a critical factor, as lower income is strongly associated with decreased CRCS participation, higher incidence of CRC, and increased likelihood of late-stage diagnosis compared to higher-income populations (Jalili et al., 2024; Lawler et al., 2025). The clinic does accept Medicare, Medicaid, and private insurance.

The healthcare clinic has 17 exam rooms and includes four full-time primary care practitioners, one part-time pediatric practitioner, and one full-time dermatologist, and serves a rural community containing roughly 2500 residents. Immediately before project implementation, the facility will also have transitioned to a new electronic health record (EHR) system. The EHR transition has the potential to create significant knowledge gaps related to documentation processes and may affect the accessibility of prior screening histories, making EHR education and workflow standardization essential components of project success. The quality improvement project will focus on a single nurse practitioner practicing at the clinic, allowing the primary investigator (PI) to focus the evaluation and change to a smaller subset of patients and staff prior to expanding to include other providers in the clinic, especially since the project site will simultaneously be undergoing a recent substantial change by transitioning to a new EHR system.

Figure 2.1 portrays the multifaceted barriers related to CRCS uptake specific to the chosen project site in Northcentral Montana.

Figure 2.1: Fishbone Diagram



Quality Improvement Framework

The Quality Improvement (QI) project aims to enhance the assessment of CRC risk factors, identify patients needing CRC screening, streamline clinic workflow, and improve

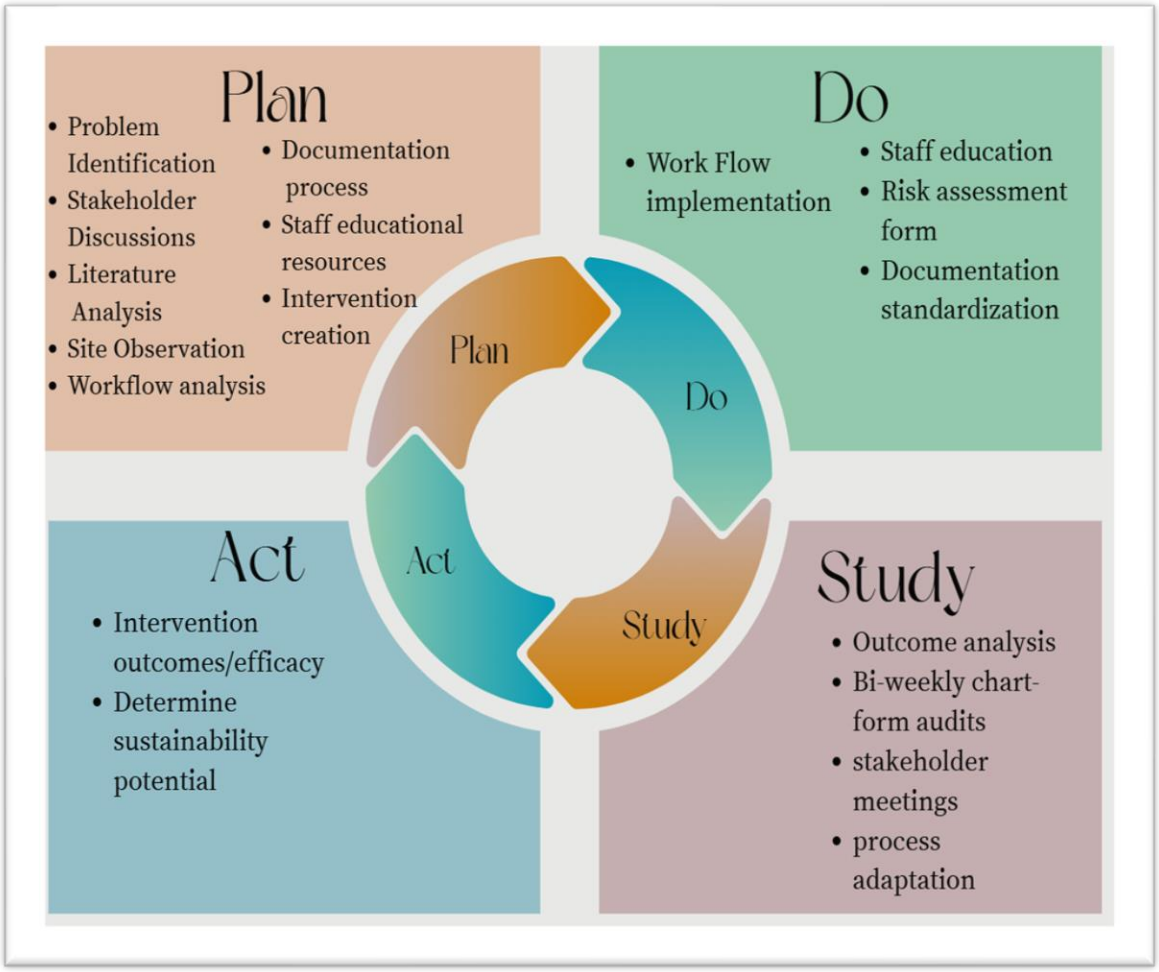
documentation of screening within the patient records. The Institute for Healthcare Improvement (IHI) *Quality Improvement Essentials Toolkit* will be used to guide the planning and implementation process (Institute for Healthcare Improvement, 2017). The cycle includes four distinct phases that will support the successful introduction and adaptation of the desired new clinical processes while encouraging continuous quality improvement through frequent check-ins, iterative adjustments, and stakeholder collaboration. The PDSA approach ensures barriers are promptly addressed, recommendations are integrated in real time, and effective changes are sustainable beyond the project period.

The "Plan" phase will allow the primary investigator to identify the problem through data analysis, stakeholder input, and review of current evidence to guide intervention development. Education tools, such as the CRC risk assessment form, will be created based on established tools, and integrated into practice to promote consistent health history reviews, CRC screening history, and identification of modifiable risk factors, as well as to promote consistent documentation and improve workflow efficiency. The "Do" phase will involve the rollout of the intervention and staff education, ensuring all team members understand project goals, role expectations, and procedures for implementation and accurate data collection.

The "Study" phase allows for ongoing evaluation through regular data collection and stakeholder meetings to assess compliance, identify barriers, and review progress. Finally, the "Act" phase will guide the PI and stakeholders in conducting a comprehensive final review of project effectiveness and impact, determining the feasibility of long-term integration into standard clinic workflows, and evaluating whether the intervention should be expanded to

additional provider teams within the facility. Figure 2.2 provides insight into the specifics of each phase and will be discussed in further detail in future sections.

Figure 2.2: Plan Do Study Act (PDSA) Cycles



Specific Aims and Purpose Statement

As previously discussed, the project aims to enhance CRCS completion, ultimately contributing to reduced CRC prevalence, morbidity, and mortality. The project focus is on

implementing a CRCS risk assessment process for adults aged 21–75 in a rural primary care clinic in Northcentral Montana. The specific aims of the project include: (1) improving identification of patients in need of additional screening based on recommendations of an evidence-based risk assessment tool, (2) increasing documentation of CRC screening status, (3) streamlining clinical workflows, and (4) clarifying team roles to improve CRCS testing uptake and completion.

Short-term goals, expected to be implemented at the start of the project, include educating the project team clinic staff on goals and aims, as well as educational materials on CRC and concerns specific to rural populations, the American Cancer Society (ACS) CRCS algorithm, and a proposed process flow chart with clear role delineation. Mid-term goals to be achieved by the end of the project's timeline are for 80% of adult patients aged 21–75 who present for an Annual Wellness Exam (AWE) or Medicare Wellness Exam (MWE) will have a completed risk assessment form, updated colorectal cancer screening history, and screening procedure ordered based on risk assessment findings. The goals support the aim of the quality improvement project, namely, identification of individuals who need CRC screening, improved documentation and tracking of CRCS status, and standardizing staff workflows. See Table 1 for a more detailed explanation of each SMART goal.

Table 1. Quality Improvement (QI) Project Specific, Measurable, Achievable, Relevant, and Time Bound (SMART) Goals

<table>
<tr><td colspan="3">SMARTIE Goal #1: By week 2 of the project, 100% of project team clinic staff will receive project and educational materials via email and through a face-to-face meeting:
Identified problem, aims, population of interest, and goals of QI project
American Cancer Society (ACS) Colorectal Cancer Screening (CRCS) guidelines/algorithm
Workflow/Process Analysis
Risk Assessment form w/ instructions</td></tr>
<tr><td colspan="3">Description of strategies to be utilized to accomplish the goal, including any needed resources.

Information created or utilized by the primary investigator:
CRC information sheet (Appendix A)
ACS CRCS algorithm (Appendix B)
Process/workflow analysis (Appendix C)
Risk assessment form with verbal instructions for use (Appendix D)
-Information is emailed to the project team clinic staff list obtained from the clinic site manager
-Personal face-to-face meeting with regularly staffed members, including receptionists, nurses, and MAs, and the selected provider for this initial pilot quality improvement project.
-Verbal education on the population needing to receive the risk assessment form at registration: 21-75 aged adults presenting to see the chosen provider for an AWE or MWE.
-Discussion with nurses and provider on where to store completed risk assessment forms.</td></tr>
<tr><td>Data to be collected</td><td>Process Method of Collection and Responsible Party</td><td>Planned data analysis</td></tr>
<tr><td>Numerator: Providers, Nurses, and MAs who are part of the project team who opened the sent email and participated in an in-person meeting with the PI
Denominator: All clinic staff within the project team to whom the email was sent</td><td>A staff list will be obtained from the clinic manager. The primary investigator will be responsible for verifying that emails are sent to the appropriate clinic staff, and verifying that the emails are opened and read, and that each staff member participated in a brief in-person meeting with the PI. This information will be documented and stored within an Excel spreadsheet.</td><td>The percentage rate of completion, measured by an opened and verified email and a personal meeting with the primary investigator, will be analyzed.</td></tr>
</table>

Table 1. SMART Goals Continued

<table>
<tr><td colspan="3">SMARTIE Goal #2: By project completion, 80% of adults presenting for an annual wellness exam (AWE) or Medicare wellness exam (MWE) will have a completed risk assessment form.</td></tr>
<tr><td colspan="3">Description of strategies to be utilized to accomplish the goal, including any needed resources.
Completion of goal #1
Receptionists appropriately distribute risk assessment forms as educated on
Designated folder for completed risk assessment forms.
Risk assessment form audit completed based on completed forms and de-identified information logged into the designated Word document (Figure 4).</td></tr>
<tr><td>Data to be collected</td><td>Method of Collection & Responsible Party</td><td>Planned data analysis</td></tr>
<tr><td>Numerator: Adults meeting inclusion criteria (ages 21-75 years old presenting to the project provider for an AWE or MWE) during the designated 8-week implementation period with a completed risk assessment form
Denominator: All adults meeting inclusion criteria presenting during the 8-week implementation period for an AWE or MWE.</td><td>The primary investigator will extract the total number of patients presenting for AWE or MWE by a retrospective visit history review during weekly and bi-weekly site visits and correlate the numbers with completed risk assessment forms. This information will be logged into the chart audit sheet in a Word document (Figure 4)</td><td>Percentage rate of completed risk assessment forms at bi-weekly site visits.</td></tr>
</table>

Table 2. SMART Goals Continued

<table>
<tr><td colspan="3">SMARTIE Goal #3: By project completion, 80% of adults presenting for an annual wellness exam (AWE) or Medicare wellness exam (MWE) who are found to need updated CRCS per ASC guidelines, will have an order placed for a screening test.</td></tr>
<tr><td colspan="3">Description of strategies to be utilized to accomplish the goal, including any needed resources.
Completion of goal #1
Receptionists appropriately distribute risk assessment forms as educated on
Designated folder for completed risk assessment forms.
Risk assessment form audit completed based on completed forms and de-identified information logged into the designated Word document (Figure 4).</td></tr>
<tr><td>Data to be collected</td><td>Method of Collection & Responsible Party</td><td>Planned data analysis</td></tr>
<tr><td>Numerator: Adults meeting inclusion criteria during the designated 8-week implementation period who are found to need screening per ACS screening guidelines and have an order placed for a CRCS test.
Denominator: All adults meeting the inclusion criteria during the designated 8-week implementation period who are found to need updated CRCS per ACS screening guidelines.</td><td>The primary investigator will extract the total number of patients presenting for AWE or MWE that need updated CRCS, by a retrospective visit history review during weekly and bi-weekly site visits and correlate the numbers with how many of the identified patients have an order placed for a CRCS modality. This information will be logged into the chart audit sheet in a Word document (Figure 4)</td><td>Percentage rate of appropriately ordered CRCS tests per ACS CRC screening guidelines</td></tr>
</table>

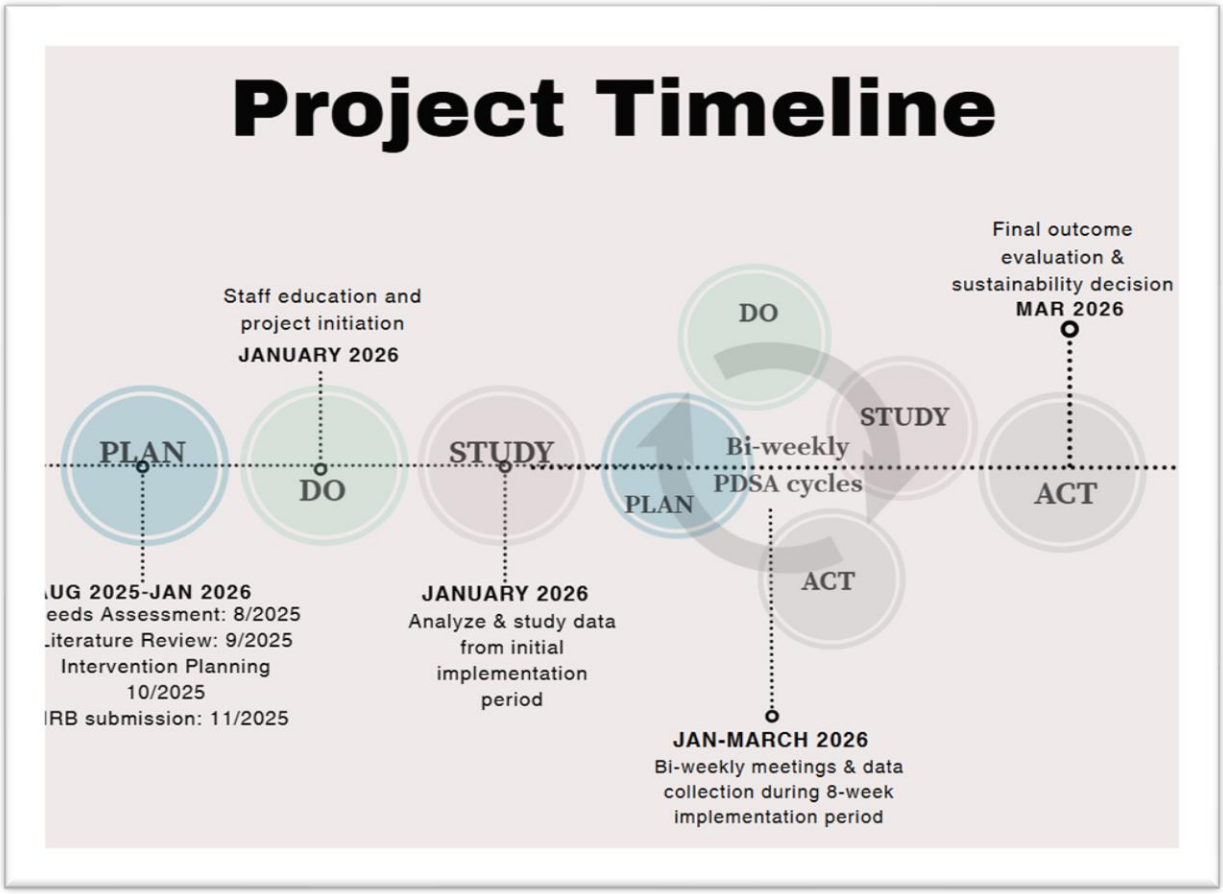
Methods

Implementation Summary

The quality improvement program will be completed at a rural primary care clinic in Northcentral Montana, with a project implementation period of eight weeks. The population of

interest will include adult patients aged 21-75 presenting for an annual wellness exam (AWE) or Medicare wellness exam (MWE), however, significant portions of the project will include facility staff education and workflow standardization. The intervention is the integration of a CRC evidence-based risk assessment form (Appendix D) that assesses personal and family history of CRC, screening history, and modifiable CRC risk factors. Workflow analysis (Appendix C) will be standardized to ensure successful implementation of the new intervention. During the implementation period, the PI will collect data at the project site weekly for the first two weeks, and then bi-weekly. Data collection will include the collection of completed risk assessment forms and analyzing if appropriate patients are receiving and completing the forms, as well as helping to identify individuals in need of CRCS. Stakeholder feedback regarding possible needed changes or modifications for improvement will be included, resulting in a PDSA cycle with each new change needed for success. PDSA cycles and evaluation through bi-weekly meetings will continue throughout the implementation period, and after 8 weeks, one final evaluation will be conducted with the entire team to review project progress toward objectives and determine future steps. See Figure 2.3 for an overview of the planned timeline within the planned PDSA cycles.

Figure 2.3: Project Timeline



Intervention and Implementation

Plan Phase. The plan phase began with identifying the problem within the project site through an analysis of preventative care screening data and discussions with key stakeholders. Conversations revealed inconsistencies in CRC risk assessment, patient identification of individuals needing screening, and documentation of screening history. Upon review, current CRCS rates were approximately 27%, which is significantly below the national benchmark of nearly 80%. To better understand site-specific barriers, a fishbone diagram was developed to identify factors contributing to low screening rates (Figure 1).

Site observation revealed variability in staff roles and workflow responsibilities, as well as infrequent documentation of CRCS history, and a lack of risk assessment for the identification of patients during wellness exams who are in need of CRCS. Additionally, the implementation of a new EHR system on November 1st, 2025, presents a potential challenge related to workflow consistency and documentation practices. To address this, a workflow analysis was conducted, and a process map was developed to clarify implementation steps, define team roles, and ensure consistent documentation. A staff educational handout was also developed summarizing current CRCS guidelines from the ACS and the USPSTF, along with key facts about screening importance and eligibility, and how risk relates to rural populations (Appendix A &B).

A review of literature underscored the importance of implementing risk assessment to effectively identify patients at risk and in need of CRCS. Evidence indicates risk assessment supports more efficient use of limited colonoscopy resources, improves screening completion, promotes meaningful patient-provider communication about CRC risk factors, and identifies individuals who may require early screening due to personal or family medical history suggestive of an increased risk for early-onset CRC. A comprehensive risk assessment form was adapted from the *Best Practice Toolkit for Colorectal Screenings* patient questionnaire, with modifications to wording to reflect the ASC-NCCRT Screening algorithm and the NIH Colorectal Cancer Risk Assessment Tool (2019; 2024; Windfelder, 2024). While the NIH Colorectal Risk Assessment Tool inquires about much of the same information, it is currently in an electronic, online format, which is not accommodating to the workflow or electronic capabilities of the project site. It also could potentially have increased barriers to completion due to slow internet access, unfamiliarity with technology, and difficulty with printing and obtaining

the results. The *Best Practice Toolkit for Colorectal Cancer Screenings* survey was considered to be solely implemented, however, it lacks inquiry about past CRCS history, which is a large component of the site-specific needs, since stakeholders have expressed concern about the capability of the new EHR system to transfer patients' formerly documented preventative screening history into the new medical record.

Focused staff education included distribution of the risk assessment form with verbal education via in-person meetings with receptionist staff about the project's population of interest and who should be given the form during registration, namely, any adult aged 21-75years arriving to see the project provider for an annual wellness exam (AWE) or Medicare wellness exam (MWE). Nurse and MA staff who work with the project-chosen provider received the educational handout (Appendix A), the workflow process map (Appendix C), and the risk assessment form (Appendix D) in paper and electronic formats. Verbal education was given during an in-person meeting to review goals and aims of the project, the population of interest, and how to assist patients with filling out the risk assessment form, if needed. The provider received the same education as the nurse and MA staff, with the additional education and review of the ACS CRCS algorithm (Appendix B).

Do Phase. The do phase commenced following Montana State University Institutional Review Board approval. The do phase involved the distribution of education materials, the ACS screening algorithm, and a process map, as well as education and implementation of the risk assessment form. Educational materials were emailed to all the project team clinic staff working with the identified project provider. Subsequently, in-person meetings were scheduled with key personnel who held FTE (full-time equivalent) positions within the practice site clinic, including

the two main receptionists, the two main nurses, and the provider. Receipt of the educational materials was monitored by tracking email open rates, while attendance at in-person meetings was documented by the primary investigator as completed or not completed.

The implementation period officially began after all educational materials had been distributed, staff questions addressed, and a three-ring binder containing printed copies of the educational handout, the process map, and a risk assessment form was placed beside the risk assessment form collection area, as well as emailed to the project team clinic. The binder served as a quick reference guide for all staff in the absence of the primary investigator.

During the "Do" phase, the main intervention, implementation of the CRCS risk assessment form (Appendix D), was distributed by receptionists to patients aged 21-75, presenting to see the project provider for an annual wellness exam or Medicare wellness exam. The forms were to be completed in the waiting room while waiting to be taken into an exam room, with instructions located at the bottom of the form directing the patient to give the completed form to the provider during their visit. The project provider was educated to collect the completed forms during the visit, which would prompt a discussion about form responses and CRC risk with the patient. The project provider was then instructed to discuss screening options with the patient based on risk assessment findings and then place an order for screening as recommended by the provided algorithm. Completed risk assessment forms were then placed in the designated form collection area for the PI to review during site visits. No patient health information was removed from the project site during the project.

Study Phase. During the implementation phase, the primary investigator conducted weekly site visits for the first two weeks, followed by bi-weekly visits thereafter. For each

patient visit meeting project inclusion criteria, data were collected, compliance monitoring was completed, and evaluation of progress towards project goals was assessed. Ongoing discussions with stakeholders helped identify challenges, address questions, and gather feedback for improvement. Adjustments were made on an as-needed basis based on staff input and the success of project implementation, following the PDSA framework. The site visits served as opportunities to conduct mini PDSA cycles, with changes implemented and evaluated during each interval. Following each cycle, modifications were reassessed for effectiveness and further refined for the subsequent time period.

Data collection during site visits involved retrieving the completed risk assessment forms and comparing them to the total number of annual wellness exams and Medicare wellness exams seen by the chosen provider during the selected time period. The process ensured the risk assessment forms were distributed to eligible patients meeting project inclusion criteria, and the forms were being completed. Data collection also allowed the primary investigator to evaluate how many patients were seen by the project provider and identified by the risk assessment form as needing CRCS. Information was logged into the Chart Audit Word document by the primary investigator during site visits and data collection (Figure 2.4). The gathered data was then analyzed to obtain the frequency of completion rates, specifically, how many total patients were seen by the project provider for an annual wellness exam or Medicare wellness exam, how many of those patients received and completed a risk assessment form, and how many of the presenting individuals were found to need updated CRCS based on the completed risk assessment form.

Figure 2.3: Chart Audit Form

Adult patients 21-75 presenting for AWE or MWE

Patient number	Date of Visit	Risk assessment form completed?	Was CRC Screening required?	If CRCS was needed, was an order placed?
1				
2				
3				
4				
5				
6				

Act Phase. Throughout the intervention period, the "Act" phase was integrated into each mini PDSA cycle conducted during site visits. The ongoing cycles enabled continuous refinement of processes through stakeholder discussions, observed barriers, and identified implementation gaps. Following each site visit, adjustments were made to address emerging needs, improve efficiency, and enhance staff compliance. The repetitive cycle of planning, doing, studying, and acting ensures improvements are data-driven and responsive to real-time feedback from the project team and clinic staff.

At the conclusion of the project, the final "Act" phase included a final stakeholder meeting held to evaluate the overall effectiveness of the implementation of the risk assessment form and to determine whether the process should be continued, adapted for integration into standard workflow, or discontinued. The meeting also allowed for reflection on project outcomes, stakeholder collaboration, and sustainability planning, focusing on strategies to maintain and support the intervention long-term within the clinic's routine operations and across all primary care providers within the facility.

Budget

No additional personnel or equipment were required to implement this intervention. The only direct costs involved printing materials for staff education and the risk assessment forms, including paper and ink. If a paid position had been used for the primary investigator role, approximately 270 project hours would need to be budgeted. At an estimated average rate of $27.50 per hour, this would result in a projected cost of $7,425 for project implementation. Because the project was completed as part of a DNP program, these costs were effectively a savings to the project site.

Barriers

Several challenges could impact the successful implementation of this project. The three primary barriers identified may include staff resistance, staff shortages, and low patient volumes. The transition to a new EHR system has disrupted normal workflows and may require additional time for staff to develop proficiency and establish a routine. The drastic change may also reduce staff acceptance of a new implementation due to already feeling like they have increased responsibilities without the addition of another item to complete, even though the changes may be minor.

Additionally, staffing challenges, including high turnover rates and reliance on temporary or new PRN staff, may result in inconsistent personnel availability. New or irregular staff members may be less familiar with the workflow and risk assessment process, further complicating consistent implementation. The intervention will also be implemented at the very beginning of a new year, which after a busy holiday season, may lead to fewer wellness exams

being scheduled. Few visits would not only lead to very small sample sizes but also risk skewing data results.

Evaluation and Analysis

Evaluation of the project will occur continuously throughout the implementation period at scheduled intervals. During the first two weeks, weekly site visits will be conducted with concurrent data collection. After the initial period, site visits and data collection will occur bi-weekly, or every two weeks, until the completion of the eight-week implementation period. The schedule aligns with each PDSA cycle, allowing for process adjustment based on findings from the previous interval, with changes implemented and re-evaluated during the subsequent visit.

Risk assessment forms will be cross-referenced with visit histories to ensure forms were completed for all patients meeting project inclusion criteria and if the form assisted in the identification of patients needing CRCS, and if so, aided in the implementation of a screening order. Frequency and percentage calculations will be used to evaluate measured outcomes. Table 1 outlines each project goal along with corresponding data management strategies and evaluation methods.

Safety and Confidentiality

To ensure patient safety and confidentiality, the QI project was reviewed and approved by the Montana State University Institutional Review Board (IRB). The project was conducted in close coordination with the clinic site representative, who also served as the Director of Clinical Services and provided written consent for project implementation. The initiative was classified as

a process improvement project rather than a clinical study and focused on implementing and evaluating evidence-based practices to enhance care processes.

Completion of the risk assessment form by patients was entirely voluntary and did not include the collection of any information not standardly discussed during standard wellness visits. Completed risk assessment forms were stored in an opaque folder behind the nurses' station, within a locked and secure patient-care area separate from public or waiting spaces. Risk assessment form information was de-identified and logged within the chart audit Word document (Figure 4). The audit tool included only the visit date and birth month to prevent any potential linkage to individual patients. Data collected included completion of the risk assessment form, whether or not CRCS was needed, and if so, was there a corresponding order for the required CRCS test. No patient names, birth dates, or medical record numbers were extracted from the EHR at any point. The de-identified audit data were stored on the principal investigator's password-protected computer, and the completed risk assessment forms were shredded following data collection that occurred only within the chosen healthcare facility.

CHAPTER THREE

QUALITY IMPROVEMENT MANUSCRIPT

Contribution of Authors and Co-Authors

Manuscript in Chapter 3

Author: Danielle Grubb, DNP-FNP Graduate Candidate

Contributions: The author assessed and identified a care gap at the project's site, conducted discussions with stakeholders, completed a literature review, planned and initiated an evidence-based intervention, and completed data collection and analysis.

Co-Author: Dr. Stacy Stellflugg, PhD, APRN, FNP-BC

Contributions: Completed editorial review and provided guidance for project design and content approval.

Co-Author: Dr. Annie Brown, PhD, MSN, RN

Contributions: Provided content design guidance and second editorial review.

Manuscript Information

Danielle Grubb, Stacy Stellflug, Annie Brown

Colorectal Cancer Risk Assessment in Rural Primary Care: A Quality Improvement Project

Status of Manuscript:

☑ Prepared for submission to a peer-reviewed journal

☐ Officially submitted to a peer-reviewed journal

☐ Accepted by a peer-reviewed journal

☐ Published in a peer-reviewed journal

Introduction

According to a 2026 JAMA study analyzing national mortality data, colorectal cancer (CRC) is now the leading cause of cancer-related death among individuals younger than 50 years in the United States (Siegel, Wagle, & Jemal, 2026). Rates of early onset CRC (EOCRC), defined as diagnosis before age 50, continue to rise annually and now account for nearly 14% of all CRC cases, with the most pronounced increases in individuals under 40 years of age (Jayakrishnan & Ng, 2025b; Siegel, Wagle, & Jemal, 2026). Notably, among the five leading causes of cancer death, CRC is the only malignancy with increasing mortality, with deaths rising by 1.1% annually since 2005, while mortality from brain, breast, leukemia, and lung cancers declined (American Cancer Society, 2023; Jayakrishnan & Ng, 2025b). Although CRC rates are rising nationally, rural populations face a disproportionate burden, including steeper increases in EOCRC and poor screening uptake compared to urban populations (Zahnd et al., 2021).

CRC screening (CRCS) significantly reduces morbidity and mortality, however, screening rates consistently remain below the Healthy People 2030 benchmark of 72.8% among age-eligible adults ages 45-75 (King et al., 2025). Approximately three in four individuals diagnosed with CRC before age 50 present with advanced disease. Because of this trend, the recommended screening initiation age was reduced to 45 years, which underscores the need for improved awareness and earlier risk assessment (Patel et al., 2022; Siegel, Wagle, & Jemal, 2026).

Rural populations experience disproportionate disparities in CRC outcomes, including lower CRCS rates, more advanced stages of cancer at diagnosis, and higher mortality rates (Byreddi et al., 2024; Oh et al., 2024; Tan et al., 2024b; Zahnd et al., 2021). Barriers in rural

settings include limited access to care, long travel distances, privacy concerns, and reduced perception of risk, which may contribute to lower screening completion in rural primary care settings (Wang et al., 2019). As a result, strategies that support more consistent assessment of CRCS needs may be particularly important in rural practice environments. Because CRC often develops insidiously, screening is essential for early detection and timely intervention, most commonly through removal of precancerous lesions or early-stage malignancies via polypectomy. Delayed identification is associated with higher treatment costs, reduced quality of life, and increased risk of treatment failure and mortality (Brown et al., 2025; McGarvey et al., 2022; Siegel et al., 2023).

Risk factors for CRC have long been associated with increased age, however, family history, genetic predispositions, presence of inflammatory bowel disease, gut microbiome, and lifestyle behaviors are also significant risk factors (Ionescu et al., 2025; Issaka, Chan, & Gupta, 2023; Roshandel, Ghasemi-Kebria, & Malekzadeh, 2024). Unfortunately, researchers have reported less than 4% of medical records contain adequate family history documentation for appropriate CRC risk stratification, and only 40% of individuals with a positive family history of CRC discuss it with their healthcare provider (National Colorectal Cancer Roundtalbe & American Cancer Society, 2024). The findings underscore the importance of evaluating risk factors beyond age and evaluating individual risk of CRC development.

Literature Review

A scoping review of the literature was conducted to identify extant literature regarding CRC screening. Historically, advanced age has been recognized as a primary risk factor for CRC,

however, rising rates of EOCRC are prompting a paradigm shift in CRCS away from the traditional age-based screening criteria towards a risk-based approach. These approaches incorporate factors such as genetic predisposition, family history, body mass index (BMI), alcohol use, physical activity, and other lifestyle variables (Wang et al., 2021). Rather than relying on age alone, earlier individualized risk assessment may help identify patients who warrant additional screening discussions before the standard screening age of 45 years.

Evidence also reveals risk assessment has been shown to increase patient knowledge regarding CRC, improve screening uptake, and reduce screening modality decisional burden among patients (Emery et al., 2023; Hull et al., 2020; Issaka, Chan, & Gupta, 2023). Wang et al. (2021) demonstrated a comprehensive risk score, including family history of CRC, BMI, smoking status, alcohol use, diet, aspirin use, and physical activity, was effective in the identification of individuals who may benefit from CRCS earlier than the standard age-based recommendation of 45 years. Collectively, the literature suggests that age alone is an insufficient predictor of CRC risk and advocate for models integrating demographic, lifestyle, and clinical variables to guide individualized screening initiation and interval recommendations (Hull et al., 2020; Issaka, Chan, & Gupta, 2023). Furthermore, with a higher incidence of EOCRC, there is a previously unrecognized growing population in need of screening initiation before the standard age of 45. In patients younger than 45 years, reliance on age alone may increase the risk of missed EOCRC in individuals with additional risk factors.

Implementation of structured risk assessment in primary care has the potential to improve alignment of screening recommendations with individual risk profiles, promoting more targeted and personalized colorectal cancer screening. Additionally, risk-based approaches may improve

patient-provider communication, increase screening uptake through clearer risk stratification, and support prevention efforts by targeting modifiable risk factors and facilitating removal of precancerous polyps via colonoscopy and polypectomy (Wang et al., 2021). Overall, integration of risk-based CRCS into primary care practice may improve early detection and facilitate more targeted use of colonoscopy resources, with potential to improve screening efficiency and downstream patient outcomes (Emery et al., 2023; Hull et al., 2020; Issaka, Chan, & Gupta, 2023; Wang et al., 2021).

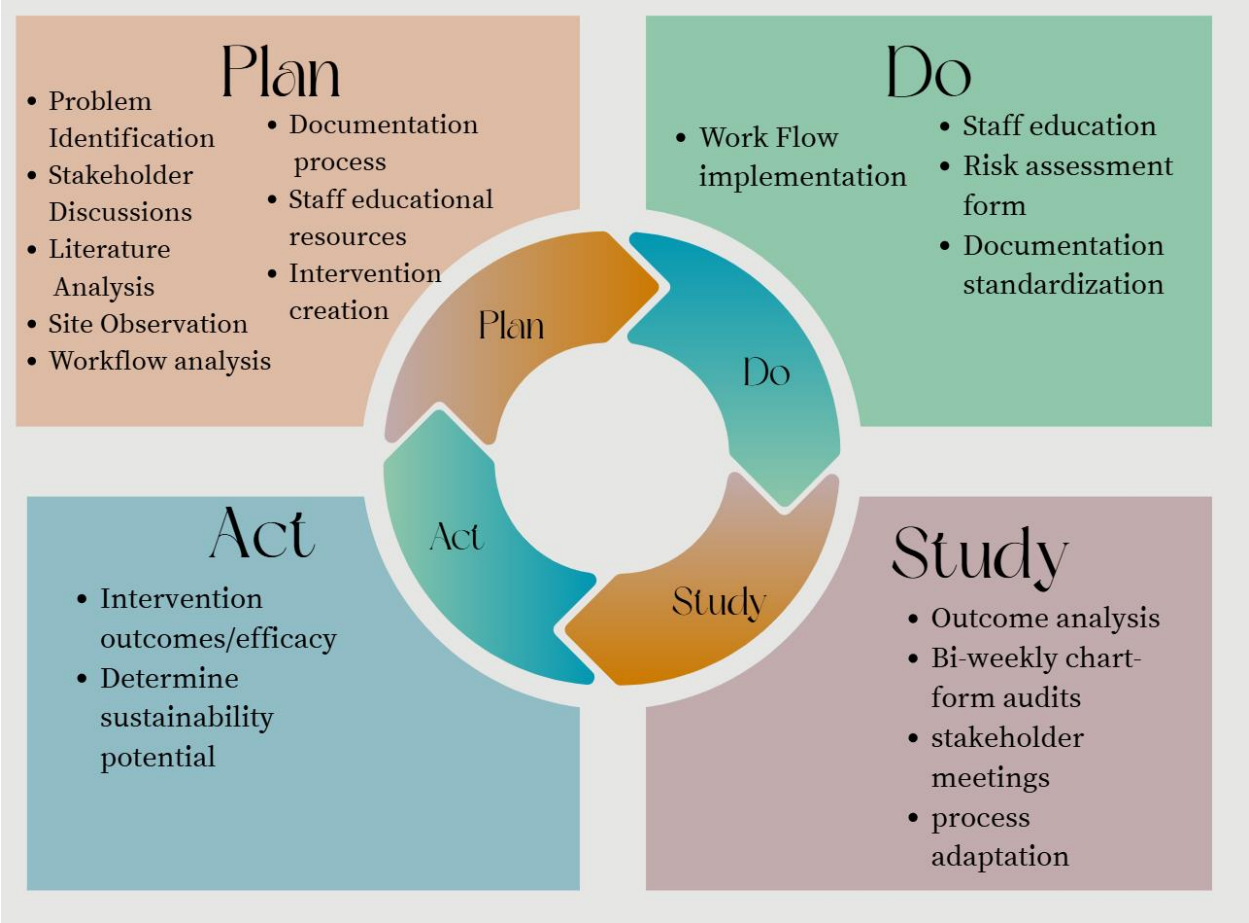
Theoretical Framework

The theoretical framework used to guide the project was the *Institute for Healthcare Improvement Quality Improvement Essentials Toolkit,* specifically the Plan-Do-Study-Act (PDSA) approach (Institute for Healthcare Improvement, 2017). The four phases of the PDSA cycle promote continuous evaluation, adaptability, and stakeholder engagement by allowing incremental changes to be tested and refined throughout the project. The structured approach supports timely identification and mitigation of barriers, incorporation of stakeholder feedback, and reinforcement of effective interventions to enhance sustainability beyond the project period.

The “Plan” phase included identification of the problem at the project site through data analysis, stakeholder inquiry, and literature review. It also allowed the primary investigator (PI) to create educational handouts, a risk assessment form, a workflow diagram, and a data collection plan. The “Do” phase included staff education and distribution of the risk assessment form to the population of interest over a 6-week period. The “Study” phase allowed for evaluation and data collection, as well as stakeholder meetings to assess staff compliance and

review project success. The PDSA cycles were repeated throughout the six-week intervention period to support ongoing data collection and for small workflow adjustments as needed. The "Act" phase was completed during a comprehensive final review after project completion, including the PI and stakeholders, to determine the feasibility of long-term integration into standard workflows and options for expansion to other provider teams within the facility. Figure 3.1 summarizes the activities associated with each phase of the PDSA cycle.

Figure 3.1: Overview of Project Plan Do Study Act (PDSA) cycles



Aims and Purpose

The quality improvement (QI) project aimed to implement a structured CRC risk assessment of adults aged 21-75 to improve recognition of CRC risk factors. Additional aims were to identify patients eligible CRCS and support provider ordering of appropriate screening in accordance with American Cancer Society guidelines.

Methods

Context

The improvement (QI) project was conducted in a rural primary care clinic located in North Central Montana, approximately 60 miles from the nearest higher-level healthcare facility, serving a community of roughly 2,500 residents. The median household income within the clinic's immediate surrounding population was approximately $47,000, which is about 35% lower than Montana's state median of $72,500 (*Census and Target Rate*, n.d.; United States Census Bureau, 2024)). An estimated 20% of the population lives below the poverty line, which has been strongly associated with lower CRCS rates, higher rates of CRC, and a higher likelihood of late-stage diagnosis (*Census and Target Rate*, n.d.; Jalili et al., 2024; Lawler et al., 2025). The project population included adult patients aged 21–75 years who presented to an identified provider for a wellness examination.

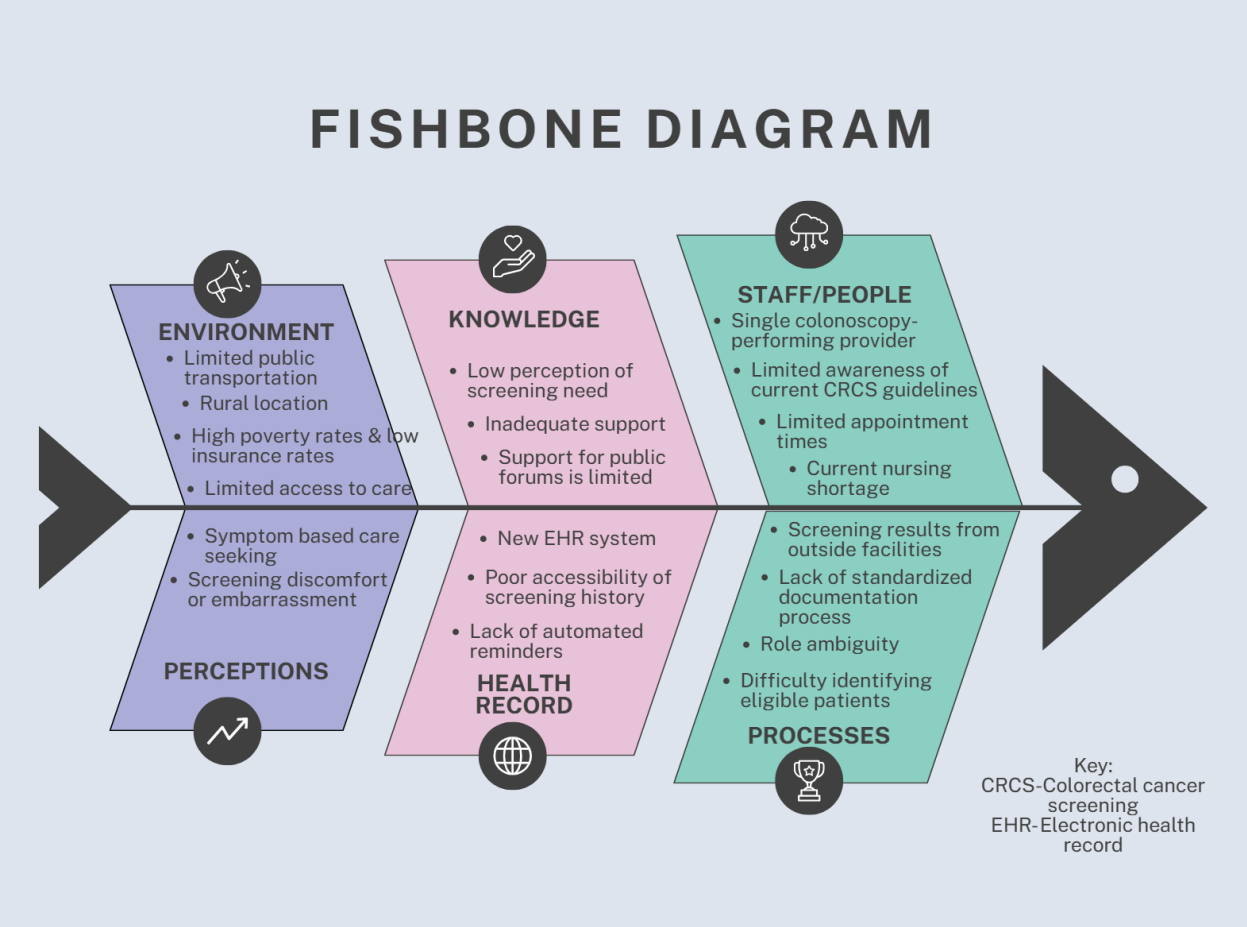
In November 2025, the clinic transitioned to a new electronic health record (EHR) system, which introduced additional workflow challenges. Staff reported difficulty accessing prior preventive health information, documenting screening data accurately, and transferring historical screening records into the new system. As a result, many patient charts displayed

incomplete or blank preventive wellness histories, even when prior screening had been completed. Providers also expressed difficulty identifying patients due for screening, as the new system did not reliably capture or update previous CRCS dates.

A retrospective review of EHR data across primary care providers at the project site found that approximately 27% of screening-eligible patients aged 45-75 years with established care had an up-to-date CRCS documented within their medical record, a rate substantially below established national benchmarks. The team extracted this data from the original electronic health record (EHR) system, ensuring that the subsequent transitions to a new EHR platform did not influence the findings. These results underscore suboptimal screening rates at the practice site, whether due to true under-screening or inconsistent and incomplete documentation practices.

Additional barriers are presented in Figure 3.2.

Figure 3.2: Fishbone Diagram of Colorectal Cancer Screening Barriers at Project Site



Intervention

Based on stakeholder input, the identified project problem, and the supporting literature, a comprehensive CRC risk assessment form was adapted from the *Best Practice Toolkit for Colorectal Screenings* patient questionnaire (Windfelder, 2024). The form was modified to reflect the most recent American Cancer Society screening algorithm and the National Institutes of Health (NIH) Colorectal Cancer Risk Assessment Tool (National Cancer Institute, 2019; National Colorectal Cancer Roundtalbe & American Cancer Society, 2024; Windfelder, 2024). The NIH Colorectal Cancer Risk Assessment Tool was available only in an electronic format and

was not easily integrated into the clinic workflow. Early in the Plan phase, an issue with the new EHR was identified. The new EHR did not reliably contain patients' most recent screening histories; therefore, the form included a section for patients to self-report prior screening history rather than relying on the EHR for accurate documentation. The risk assessment form integrated into the project site workflow is shown below in Figure 3.3.

Figure 3.3: Risk assessment form

Name: _____
DOB: _____
Gender: _____

	YES	NO
1. Do you have a family history of colorectal cancer?		
2. Do you have a personal history of colorectal cancer or colorectal polyps?		
3. Have you been diagnosed with Ulcerative Colitis or Crohn's Disease (Irritable Bowel)?		
4. Do you have a personal or family history of Lynch syndrome or Familial Adenomatous Polyposis (FAP)?		
5. Do you have concerns about bloody stools, unexplained weight loss, persistent abdominal pain or a change in bowel habits?		

see screening recommendations on reverse if answered YES to any question

If **NO** to all, then proceed to the *average risk* requirements for colorectal cancer screenings beginning at age 45:

- Colonoscopy screening every 10 years
- FIT (stool-based test) annually
- FIT-DNA (Cologuard) test every 3 years

Have you ever completed any prior screening for colorectal cancer? Yes/No (Circle one)

If so, complete information below:

Colonoscopy- Date: _____ Results: _____Healthcare facility: _____

FIT (stool test)- Date: _____ Results_____

FIT-DNA (Cologuard)- Date: _____ Results_____

Modifiable Risk Factors: Circle Yes or No

Do you eat a diet low in fruit, vegetables, fiber, but high in fats and processed meats? YES/NO
Do you currently smoke or have a history of smoking or using smokeless tobacco? YES/NO
How many alcoholic beverages do you consume weekly? _____
How many days per week do you participate in moderate physical activity >30 minutes? _____

******(please give completed form to your primary care provider during your visit)

Over a six-week period from January to March 2026, the QI project team distributed CRC risk assessment forms to adults aged 21-75 who presented to the project provider for an

annual wellness exam (AWE), Medicare wellness exam (MWE), or an establishing care visit. Prior to implementation, education was provided to all full-time equivalent (FTE) staff through face-to-face discussions, printed materials, and email. Educational content included CRCS screening importance, eligibility, rural-specific implications, and the American Cancer Society (ACS) screening algorithm. A workflow map was also created to visually represent and explain the process of implementation. The clinic receptionist received a binder containing CRC education, the workflow map, and multiple copies of the risk assessment form for patient distribution. Nursing staff and the project provider received CRC education, the workflow map, ASC screening algorithm, and the risk assessment form.

The risk assessment form was then retrieved by the project provider during the patient visit to facilitate a conversation about prior screening history, current risk, and lifestyle practices. If a patient was identified as due for screening, the provider discussed available screening options, and an order was placed in the EHR, or a refusal was documented in the note if applicable. Completed forms were stored in an opaque folder located in the provider's office until weekly data collection by the PI.

The PI reviewed completed risk assessment forms weekly and consulted with project staff about any barriers or issues encountered during implementation. The risk assessment forms were de-identified, and project-related measures were collected and logged into a data collection form. The PI also sought ongoing input from clinic staff to support engagement and workflow refinement throughout implementation.

Measures

The short-term goal of the QI project included assessing the number of staff who received education prior to project initiation, including an in-person meeting with the PI, as well as an email containing the project materials. The mid-term goal measured the number of patients who received and completed a risk assessment form. The second mid-term goal was to measure the number of patients who completed the risk assessment form and were found to need updated CRCS to be in compliance with ACS screening guidelines. The number of patients with a screening order was also measured.

Analysis

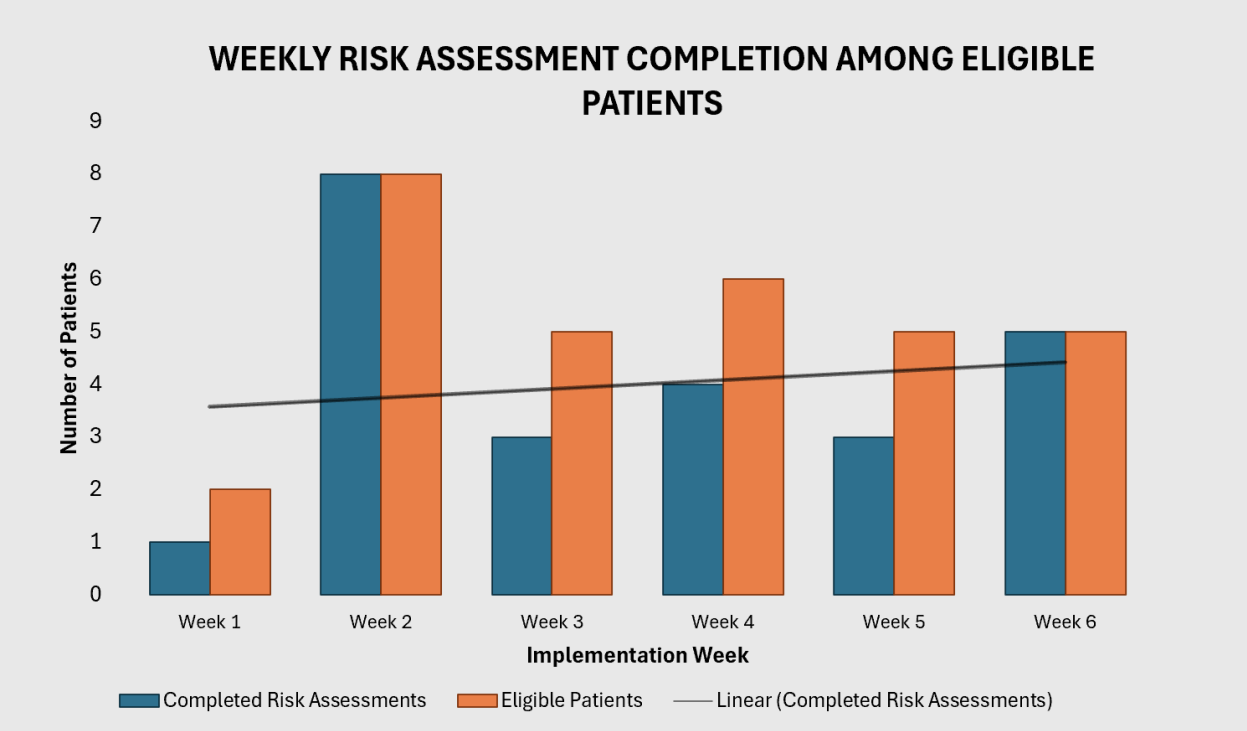
Data were analyzed using descriptive statistics, including frequencies and percentages, to summarize staff education completion, risk assessment form distribution and completion rates, the number of patients identified as needing colorectal cancer screening (CRCS), and the number for whom screening orders were placed. Descriptive statistics were selected because the purpose of the QI project was to evaluate process implementation and identify observable trends in practice, rather than to test statistical significance.

Results

Education completion was defined as participation in a face-to-face meeting and receipt of an email containing project educational materials to all FTE-holding staff associated with the project provider. Education was completed by the project provider, the full-time nurse, and the full-time receptionist (n = 3, 100%).

During the 6-week implementation period, 33 patients presented to the clinic and met inclusion criteria, which included being an adult aged 21-75 presenting for an annual wellness exam or establishing care visit with the project provider. Of the 33 eligible patients, 25 (75.7%) completed the colorectal cancer risk assessment form, while 8 patients (24.3%) did not receive or complete the form. See Figure 3.4 for a visual representation of screening-eligible patients and completed CRC risk assessment forms during the six-week implementation period.

Figure 3.4: Weekly Risk Assessment Completion Among Eligible Patients

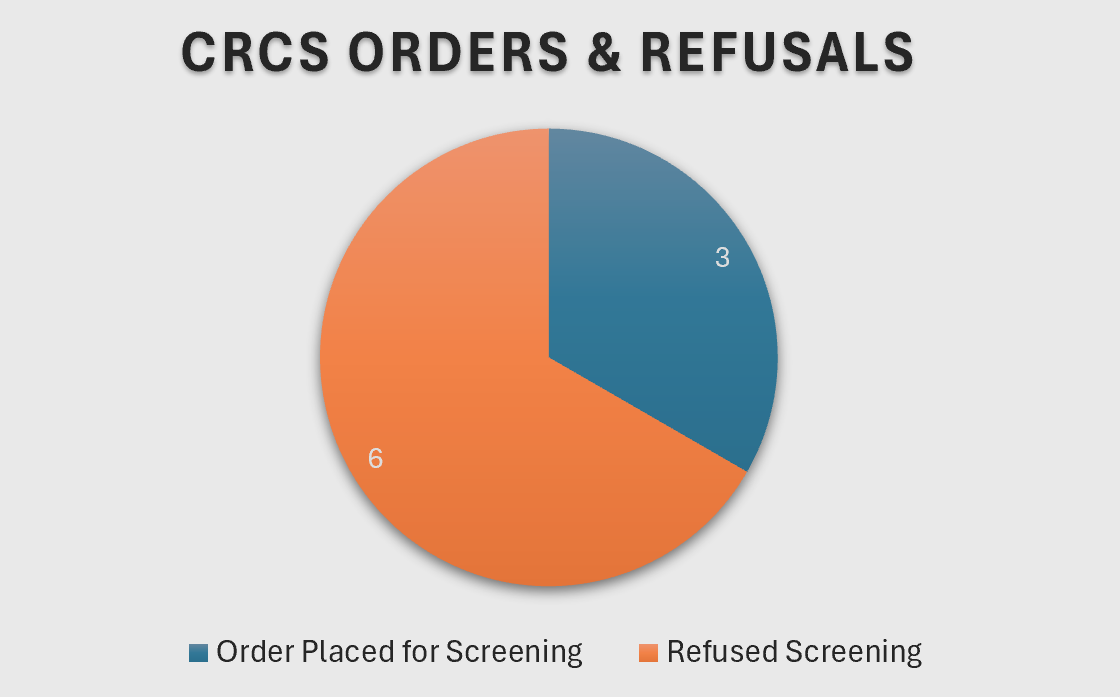


Among the 25 patients who completed the form, 36% (n=9) were identified as meeting criteria for updated colorectal cancer screening (CRCS), while 64% (n=16) did not require screening based on the guidelines at the time of the visit. Of the 16 patients who did not require updated CRC screening, it was determined that they either did not meet the standard screening age of 45, had no qualifying risk factors for early screening, or were already up to date with

screening according to the ACS colorectal cancer screening guidelines (American Cancer Society, 2024).

Of the nine patients identified as needing updated screening, 33% (n=3) had a screening order placed in the EHR. The remaining 66% (n=6) had a documented refusal, indicating they declined colorectal cancer screening at the time of their visit, see Figure 3.5.

Figure 3.5: CRCS Orders and Refusals



Discussion

This QI project focused on the implementation of a CRC risk assessment tool with the goal of improving the identification of patients who require CRCS in accordance with recommendations from the ACS. Initially, the population of interest was limited to patients presenting for an AWE or MWE. However, at the time of project implementation, a primary care

provider within the clinic retired, resulting in a substantial influx of establish-care visits as patients transferred care to the project provider. The shift reduced the number of scheduled wellness visits while increasing the number of patients presenting for visits during which preventive health needs were appropriate to review. As a result, after the first PDSA cycle, the project population was expanded to include establish-care visits in addition to AWEs and MWEs. The resulting increase in patient volume is reflected in Figure 1, which demonstrates a noticeable rise in eligible patient visits following the change after week one.

The initial low number of annual wellness visits was likely exacerbated by the provider shortage within the clinic; however, the observation is also consistent with extant literature indicating rural populations have lower rates of annual wellness visits compared with urban populations (Hamer et al., 2023). Lower utilization of preventive visits among rural residents has been identified as a contributing factor to reduced delivery of preventive healthcare services (Hamer et al., 2023).

Over the six-week implementation period, the overall completion rate for CRC risk assessment forms was approximately 76%, which fell slightly below the project goal of 80%. Despite not reaching the targeted benchmark, completion rates did show a positive trend from week one through week six, suggesting staff familiarity with the workflow improved over time (see Figure 1). Further evaluation of staffing patterns during weeks with the lowest completion rates, specifically weeks two and five, revealed per diem reception staff not previously trained in the project workflow, covered several shifts during these periods. In these instances, risk assessment forms were not consistently distributed to eligible patients. The findings highlight

how inconsistent staffing can negatively impact project implementation and workflow reliability. Workforce instability, including challenges with recruitment and retention, is a well-documented issue in rural healthcare settings. When staffing shortages occur, continuity of processes and adherence to new initiatives may be disrupted, particularly when training opportunities are limited.

Another key finding from this project was the proportion of patients identified as needing updated CRC screening based on ACS guidelines. Thirty-six percent of the patients assessed were found to require screening. Even more striking was the high rate of screening refusal among these individuals. Sixty-six percent of patients who were identified as needing screening, either because their screening was overdue or because they had never previously completed screening, declined to have an order placed. While the project allowed for a brief discussion regarding modifiable risk factors associated with CRC, the primary focus was on risk assessment and identification rather than providing extensive patient education or detailed risk counseling. Therefore, patient responses likely reflected typical clinical decision-making without substantial additional persuasion or educational intervention.

The finding aligns with existing research demonstrating patients' perception of risk, as well as their level of knowledge and understanding about CRC screening, are significant predictors of screening completion. Studies indicate that individuals who perceive themselves to be at lower risk or who lack adequate education regarding CRC screening are less likely to participate in recommended screening programs (Farr et al., 2022; Maheri et al., 2022; Zhu et al., 2022). The findings suggest future interventions aimed at increasing CRCS rates may benefit

from incorporating more robust patient education and risk communication strategies alongside systematic screening identification processes. Research specific to why rural populations decline CRCS may also shed light on the low uptake of CRC screening in this specific population.

Limitations

Several limitations should be considered when interpreting the findings of the QI project. The project was conducted within a single rural primary care clinic focusing on one provider, which limits the generalizability of the findings to other settings or populations. Rural healthcare settings often have unique characteristics, including staff limitations, smaller patient populations, and variable access to care services, which may influence both implementation and outcomes.

In addition to limited generalizability, the project implementation period was relatively short, over a six-week period. While an upward trend in completion of the CRC risk assessment form was observed, a longer implementation period may have allowed additional time for workflow adjustments, staff education, and process improvement that could have further increased compliance with form distribution and completion.

Inconsistent receptionist staffing during the project period also posed a limitation. One full-time receptionist was on maternity leave, increasing reliance on per-diem staff. Although a per-diem who covered most shifts completed the project training, she was excluded from reported statistics as she was not a full-time equivalent (FTE). Other per-diem staff lacked formal training, resulting in inconsistent distribution of risk assessment forms and likely contributing to lower completion rates. While this staffing variability reflects the workforce instability

commonly experienced in rural healthcare settings, it nonetheless represents a limitation in the consistency of project implementation.

Recommendation

Based on the findings of the QI project, recommendations can be made for improvement in future implementation and sustainability of CRCR assessment. Continued use of the CRC risk assessment tool would be recommended, as it demonstrated effectiveness in identifying patients who were overdue for screening, and brought to light individuals' prior screening history. Incorporating the risk assessment tool into routine workflows during primary care wellness exams can help ensure that CRC screening compliance is consistently reviewed during patient encounters.

Increasing staff education and standardizing education during the onboarding process for new staff could be implemented to improve consistency in risk assessment distribution and completion, since lower completion rates were correlated with per diem and untrained staff coverage. Developing a standardized training protocol for all front desk personnel, including temporary staff, could improve adherence to project workflow and reduce missed opportunities for risk assessment.

Another future initiative could also incorporate more structured patient education regarding CRC risk and the importance of screening, as it was found that a large proportion of patients meeting criteria to have screening declined testing when offered. Evidence suggests patients’ perception of personal risk and their understanding of screening benefits strongly influence screening participation. Incorporating brief educational materials, decision aids, or

structured counseling during visits may improve patient understanding and increase acceptance of recommended screening.

Another recommendation is the integration of risk assessment tools and screening reminders into the EHR to prompt the distribution of paper forms for eligible patients to improve consistency. Electronic integration may also support long-term sustainability of the intervention and reduce the impact of staffing variability and high workloads.

Finally, extending the implementation period and expanding the project to additional providers or clinics may provide further insight into the effectiveness and scalability of the intervention. A longer implementation period would allow for continued refinement of workflow processes and better evaluations of long-term trends in risk assessment completion and CRCS rates.

Conclusion

This QI project evaluated the implementation of a CRC risk assessment tool in a rural primary care clinic to improve the identification of patients in need of screening per ACS recommendations. Over six weeks, integrating the tool into clinic workflows successfully identified many patients requiring screening. Although completion rates fell slightly below the project goal, they improved over time, reflecting growing staff familiarity. Challenges included staffing variability and patient screening refusal, highlighting the influence of workforce stability and patient education on preventive care delivery. Despite these challenges, structured risk assessment proved effective for identifying patients who may benefit from CRCS. Future efforts combining systematic risk assessment with enhanced patient education and workflow integration

may further increase screening uptake, supporting early detection and prevention of CRC in rural populations.

CHAPTER FOUR

ADVANCED NURSING ESSENTIALS REFLECTION

Introduction

Over the past four years, while pursuing a Doctor of Nursing Practice (DNP) in Family Practice at Montana State University, I received a comprehensive and rigorous education through both didactic coursework and clinical training focused on patient care across the lifespan and in diverse clinical settings. My education included foundational content in pediatrics, geriatrics, women's health, and family medicine. Clinical experiences were completed in a variety of valuable settings, including rural primary care clinics, urgent care centers, outpatient oncology, an oncology-focused young adult camp, and both rural and urban emergency departments.

Collectively, these clinical experiences, combined with my didactic education, provided exposure to a wide range of practice environments and patient acuity levels. Through my formal education, I developed the ability to deliver evidence-based, patient-centered care across multiple settings. This review will evaluate four key foundational competencies outlined by the American Association of Colleges of Nursing (AACN) and describe how each competency was achieved throughout my educational journey at Montana State University.

Domain 2: Person-centered Care

The domain of person-centered care focuses on providing holistic, compassionate, respectful, evidence-based care that is grounded in a collaborative, team-based approach between

the provider and the patient (AACN, 2021). The domain emphasizes the importance of individual beliefs, values, and perceptions, as well as the need for shared decision-making.

Throughout my education at Montana State University (MSU) while completing the Doctor of Nursing Practice (DNP) program, I consistently demonstrated and observed this domain in practice. During clinical rotations, I applied empathy and respect in every patient encounter. The emphasis on person-centeredness was especially evident in geriatric discussions in our *Primary Care to the Aging Family* involving quality of life and end-of-life care. As DNP students, we were encouraged not only to provide high-quality care, such as chronic disease management, health promotion, and prevention, but also to recognize that goals for health and wellness, particularly in older adults, are often highly individualized. We learned patients may not always choose the option we, as providers, would prefer, yet it is our responsibility to respect and support their decisions after offering thorough discussions of risks, benefits, and supporting evidence for recommended care.

A subdomain of this essential includes the development and implementation of an evidence-based intervention to improve patient outcomes and safety. The domain was met during my doctoral final project, which implemented a colorectal cancer (CRC) risk assessment screening tool to help identify patients in need of CRC screening. The process included evaluating the practice site for current gaps in care, conducting a thorough literature review of peer-reviewed articles, and initiating an evidence-based intervention aimed at improving care outcomes. The goal of my chosen project was to increase CRC screening rates and ultimately,

support earlier detection, improved treatability, and reduced morbidity and mortality associated with colorectal cancer.

The completion of this domain not only led to a successful project aimed at improving a critical care gap in a rural community but also broadened my understanding of quality improvement projects and the impact an advanced practice registered nurse (APRN) can have on initiating effective, sustainable change. The process also improved my ability to appraise evidence, conduct a literature search across various databases, and recognize the intricacies of implementation. The education and experience I gained through the process have prepared me to continue recognizing areas for positive change, knowing how to prepare and conduct quality improvement projects, as well as motivating me to continue searching and utilizing evidence-based literature to shape my practice and decision-making as an APRN.

Domain 5: Quality and Safety

The domain of quality and safety focuses on the enhancement and provision of both safe and effective care by means of adopting, integrating, and disseminating current care guidelines and evidence-based interventions (AACN, 2021). Quality and safety were emphasized as core priorities throughout the DNP curriculum. A quality improvement project was developed following a comprehensive evaluation of current care gaps and a needs assessment at the selected project site. An intervention was then chosen based on current evidence-based literature supporting its effectiveness in improving the quality of care delivered.

My project addressed a recognized gap in colorectal cancer (CRC) screening rates and the multifaceted barriers contributing to under-screening. The project sought to implement a

structured risk assessment to appropriately identify individuals in need of CRC screening who may otherwise have been overlooked. The overarching goals included improving patient morbidity and mortality through early detection of CRC at a more treatable stage, while demonstrating improved patient outcomes through an evidence-based quality improvement initiative.

The pharmacology course, along with the clinical courses, fostered a culture of safety by emphasizing the importance of using validated, evidence-based resources for accurate diagnosis, treatment, and disease management. Clinical faculty stressed the identification of red-flag and "can't-miss" symptoms, encouraged the expansion of differential diagnoses to include a broad range of possibilities, and reinforced the importance of avoiding premature diagnostic closure to reduce the risk of missing critical conditions.

As a future APRN, the domain of quality and safety challenged me to intentionally commit to a practice grounded in lifelong learning and continuous improvement. I strive to be a constantly evolving clinician who remains a student of the profession, actively seeking to stay current with evidence-based care guidelines, emerging trends in healthcare, and advancements in clinical research. This commitment ensures that my clinical decision-making is guided by the best available scientific evidence, with patient safety, quality outcomes, and ethical practice at the forefront. By integrating ongoing education, evaluation of research, and reflective practice into my professional role, I aim to deliver high-quality, safe, patient-centered care.

Domain 7: Systems-Based Practice

Systems-based practice involves delivering high-quality, efficient, and sustainable care across complex health systems, individual practices, and diverse populations (AACN, 2021). Within the MSU DNP curriculum, the Healthcare Design course was a significant contributor to the development of this competency. In this course, we examined the complexities of providing care across multiple specialties and departments. We were tasked with evaluating a specific healthcare delivery setting, identifying existing gaps in care, and proposing strategies to improve the quality, effectiveness, and efficiency of care delivery. To support this work, we used fishbone diagrams to analyze potential root causes and process maps and flow diagrams to visualize current workflows and role delineation.

These systems-based approaches, along with considerations of cost-effectiveness and sustainability, were also central to my final DNP projects. Through collaboration with key stakeholders and analysis of clinical data, I identified a significant care gap related to low colorectal cancer (CRC) screening rates. I then worked to implement an intervention across multiple departments aimed at improving screening rates and patient outcomes. Financial incentives and potential healthcare cost reductions were evaluated to increase stakeholder buy-in and enhance the feasibility and sustainability of the project.

The system-based domain has worked to broaden my understanding of the complexities of healthcare and the difficulty of creating change. It highlighted the importance of adequate preparation and process evaluation, as well as recognition of stakeholder goals and staff needs before implementation can be successful. In my future practice as I strive to continue quality

improvement initiatives, I will recognize the importance of effective communication, integrating interprofessional goals, and process analysis as critical roles for staff buy-in and project success.

Domain 9: Professionalism

The domain of professionalism includes development and maintenance of a professional identity by means of practicing with emotional intelligence, promoting social justice, and demonstrating ethical courage and moral strength (AACN, 2021). During the DNP curriculum at MSU, educators and faculty consistently emphasized and modeled professionalism. Professional conduct was outlined as an expectation in all course syllabi and was required for successful completion of each class. Clinical coursework reinforced the importance of compassion, kindness, respect, and inclusivity in patient interactions, as well as integrity, humility, and honesty in relationships with preceptors and interprofessional team members. Throughout my clinical rotations, every patient encounter was approached with respect and empathy, using my clinical knowledge to educate, empower, and motivate patients toward improved health and wellness.

Clinical courses also highlighted the critical role nurse practitioners serve as independent practitioners and the professional responsibility that accompanies full practice authority. Emphasis was placed on safe practice, pursuit of positive patient outcomes, adherence to evidence-based guidelines, and engagement in shared decision-making through comprehensive patient education. Additionally, the DNP curriculum fostered professional identity development through self-reflection, accountability, ethical decision-making, and a commitment to lifelong learning by preparing me to advocate for patients and the advanced nursing profession.

Throughout my DNP education, I consistently demonstrated professionalism by maintaining a professional appearance, using appropriate nonverbal communication, and prioritizing strong first impressions with both patients and preceptors. I made a concerted effort to arrive fully prepared for each clinical placement by reviewing placement-specific materials in advance. For example, before emergency department rotations, I completed Emergency Medicine Bootcamp course modules to ensure familiarity with site-specific expectations and care practices.

Additionally, I intentionally prepared for each patient encounter by reviewing the chief complaint and conducting an evidence-based review of potential differential diagnoses before entering the room. This approach guided my history-taking and physical examinations and helped ensure that important information and less obvious diagnoses were not overlooked. By expanding my diagnostic awareness beyond what I might naturally consider as a student, I was able to engage in more thorough and informed discussions with patients regarding their concerns. Overall, this preparation enhanced my professional interactions with both patients and preceptors and allowed me to approach each clinical situation with confidence and competence.

Conclusion

In summary, the essentials of person-centered care, quality and safety, systems-based practice, and professionalism have shaped my vision of healthcare and informed my understanding of my role and potential impact as a future nurse practitioner. Through my education, I have learned to value my professional position and to actively pursue opportunities to drive positive change and advocate for improved patient outcomes. I recognize the critical role of the advanced practice

registered nurse (APRN) not only in delivering high-quality, patient-centered care, but also in contributing to health policy and healthcare reform, addressing provider shortages, and offering a unique perspective grounded in nursing practice. I look forward to my role as an APRN as I strive to provide equitable, evidence-based, and patient-centered care to individuals across the lifespan.

REFERENCES CITED

Abualkhair, W. H., Zhou, M., Ochoa, C. O., Lacayo, L., Murphy, C., Wu, X.-C., & Karlitz, J. J. (2020). Geographic and intra-racial disparities in early-onset colorectal cancer in the SEER 18 registries of the United States [Article]. *CANCER MEDICINE*, *9*(23), 9150-9159. https://doi.org/10.1002/cam4.3488

Adhikari, K., Manalili, K., Law, J., Bischoff, M., & Teare, G. F. (2022). Interventions to Increase Colorectal Cancer Screening Uptake in Primary Care: A Systematic Review. *The Journal of the American Board of Family Medicine*, *35*(4), 840. https://doi.org/10.3122/jabfm.2022.04.210399

Agunwamba, A. A., Zhu, X., Sauver, J. S., Thompson, G., Helmueller, L., & Finney Rutten, L. J. (2023). Barriers and facilitators of colorectal cancer screening using the 5As framework: A systematic review of US studies. *Prev Med Rep*, *35*, 102353. https://doi.org/10.1016/j.pmedr.2023.102353

Alteri, R., Baptiste, D., Bell, E., et al. (2025). Cancer Prevention and Early Detection Facts a& Figures. *American Cancer Society*. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-prevention-and-early-detection-facts-and-figures/2025-cped-files/cped-cff-2025-2026.pdf

American Cancer Society. (2023). *Colorectal cancer facts & figures 2023-2025*. American Cancer Society. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/colorectal-cancer-facts-and-figures/colorectal-cancer-facts-and-figures-2023.pdf

Bardou, M., Rouland, A., Martel, M., Loffroy, R., Barkun, A. N., & Chapelle, N. (2022). Review article: obesity and colorectal cancer. *Aliment Pharmacol Ther*, *56*(3), 407-418. https://doi.org/10.1111/apt.17045

Baus, A., Wright, L. E., Kennedy-Rea, S., Conn, M. E., Eason, S., Boatman, D., Pollard, C., Calkins, A., & Gadde, D. (2020). Leveraging Electronic Health Records Data for Enhanced Colorectal Cancer Screening Efforts. *J Appalach Health*, *2*(4), 53-63. https://doi.org/10.13023/jah.0204.07

Botteri, E., Borroni, E., Sloan, E. K., Bagnardi, V., Bosetti, C., Peveri, G., Santucci, C., Specchia, C., van den Brandt, P., Gallus, S., & Lugo, A. (2020). Smoking and Colorectal Cancer Risk, Overall and by Molecular Subtypes: A Meta-Analysis. *Am J Gastroenterol*, *115*(12), 1940-1949. https://doi.org/10.14309/ajg.0000000000000803

Brown, K. A., Poppert Cordts, K. M., Medcalf, S., Acquazzino, M., & Lally, R. M. (2025). Quality of Life and Cancer-Related Experiences of Late-Stage and Metastatic Colorectal Cancer Survivors: A Mixed-Methods Study. *Cancer Nurs*. https://doi.org/10.1097/ncc.0000000000001480

Byreddi, L. Y., Atluri, S., Gaddam, S. J., Pothuraju, A., Javvadi, S. L. P., Devarkonda, V., & Grewal, U. S. (2024). Rural-urban disparities in colorectal cancer-related mortality

changes in the United States. *Journal of Clinical Oncology*, *42*(16_suppl), e13714-e13714. https://doi.org/10.1200/JCO.2024.42.16_suppl.e13714

Carmichael, H., Cowan, M., McIntyre, R., & Velopulos, C. (2020). Disparities in colorectal cancer mortality for rural populations in the United States: Does screening matter? *Am J Surg*, *219*(6), 988-992. https://doi.org/10.1016/j.amjsurg.2019.09.027

Census and Target Rate. (n.d.). https://commerce.mt.gov/Infrastructure-Planning/Resources/Census-and-Target-Rateof.

Colorectal cancer stages | Rectal cancer staging | Colon cancer staging. (2020). American Cancer Society. https://www.cancer.org/cancer/types/colon-rectal-cancer/detection-diagnosis-staging/staged.html

Demb, J., Kolb, J. M., Dounel, J., Fritz, C. D. L., Advani, S. M., Cao, Y., Coppernoll-Blach, P., Dwyer, A. J., Perea, J., Heskett, K. M., Holowatyj, A. N., Lieu, C. H., Singh, S., Spaander, M. C. W., Vuik, F. E. R., & Gupta, S. (2024). Red Flag Signs and Symptoms for Patients With Early-Onset Colorectal Cancer [Article]. *JAMA NETWORK OPEN*, *7*(5), Article e2413157. https://doi.org/10.1001/jamanetworkopen.2024.13157

Dias, E. M., Padilla, J. R., Cuccaro, P. M., Walker, T. J., Balasubramanian, B. A., Savas, L. S., Valerio-Shewmaker, M. A., Chenier, R. S., & Fernandez, M. E. (2024). Barriers to and facilitators of implementing colorectal cancer screening evidence-based interventions in federally qualified health centers: a qualitative study. *BMC Health Services Research*, *24*(1), 797. https://doi.org/10.1186/s12913-024-11163-0

Dressler, J., Rasmussen, M., Jørgensen, L. N., & Sopina, L. (2025). Reduced healthcare costs for patients with screen-detected colorectal cancer: A Danish nationwide cohort study. *Public Health*, *239*, 62-69.

Emery, J. D., Jenkins, M. A., Saya, S., Chondros, P., Oberoi, J., Milton, S., Novy, K., Habgood, E., Karnchanachari, N., Pirotta, M., Trevena, L., Bickerstaffe, A., De Abreu Lourenço, R., Crothers, A., Ouakrim, D. A., Flander, L., Dowty, J. G., Walter, F. M., Clark, M., . . . McIntosh, J. G. (2023). The Colorectal cancer RISk Prediction (CRISP) trial: a randomised controlled trial of a decision support tool for risk-stratified colorectal cancer screening. *Br J Gen Pract*, *73*(733), e556-e565. https://doi.org/10.3399/bjgp.2022.0480

Fairfield, K. M., Murray, K., Cloutier, L. M., Daggett, J. L., Felix, B. R., Kapala, C. A., Fay-Leblanc, R. M., Nadeau, A. E., Rauscher, B. K., Rensenbrink, K., Rothenberg, D. A., & Stein, K. D. (2025). Stage at Diagnosis for Common Cancers According to Rurality, Area Deprivation and Insurance, 2017-2021. *Cancer Prev Res (Phila)*. https://doi.org/10.1158/1940-6207.Capr-24-0587

Force, U. P. S. T. (2021). Screening for Colorectal Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA*, *325*(19), 1965-1977. https://doi.org/10.1001/jama.2021.6238

Fu, M.-s., Pan, S.-x., Cai, X.-q., & Pan, Q.-c. (2024). Urban vs. rural: colorectal cancer survival and prognostic disparities from 2000 to 2019. *Frontiers in Public Health*, *12*, 1319977.

Giardiello, F. M., Allen, J. I., Axilbund, J. E., Boland, C. R., Burke, C. A., Burt, R. W., Church, J. M., Dominitz, J. A., Johnson, D. A., Kaltenbach, T., Levin, T. R., Lieberman, D. A., Robertson, D. J., Syngal, S., & Rex, D. K. (2014). Guidelines on Genetic Evaluation and Management of Lynch Syndrome: A Consensus Statement by the US Multi-Society Task Force on Colorectal Cancer. *Gastroenterology*, *147*(2), 502-526. https://doi.org/10.1053/j.gastro.2014.04.001

Hull, M. A., Rees, C. J., Sharp, L., & Koo, S. (2020). A risk-stratified approach to colorectal cancer prevention and diagnosis [Report]. *Nature Reviews Gastroenterology & Hepatology*, *17*, 773+. http://dx.doi.org.proxybz.lib.montana.edu/10.1038/s41575-020-00368-3

Institute for Healthcare Improvement. (2017). *Quality Improvement Essentials Toolkit*. Institute for Healthcare Improvement. https://www.ihi.org/library/tools/quality-improvement-essentials-toolkit#downloads

Ionescu, V. A., Diaconu, C. C., Gheorghe, G., Mihai, M. M., Diaconu, C. C., Bostan, M., & Bleotu, C. (2025). Gut Microbiota and Colorectal Cancer: A Balance Between Risk and Protection. *Int J Mol Sci*, *26*(8). https://doi.org/10.3390/ijms26083733

Issaka, R. B., Chan, A. T., & Gupta, S. (2023). AGA Clinical Practice Update on Risk Stratification for Colorectal Cancer Screening and Post-Polypectomy Surveillance: Expert Review. *Gastroenterology*, *165*(5), 1280-1291. https://doi.org/10.1053/j.gastro.2023.06.033

Jalili, F., Hajizadeh, M., Mehrabani, S., Ghoreishy, S. M., & MacIsaac, F. (2024). The association between neighborhood socioeconomic status and the risk of incidence and mortality of colorectal cancer: A systematic review and meta-analysis of 1,678,582 participants. *Cancer Epidemiol*, *91*, 102598. https://doi.org/10.1016/j.canep.2024.102598

Jayakrishnan, T., & Ng, K. (2025a). Early-Onset Gastrointestinal Cancers: A Review. *JAMA*. https://doi.org/10.1001/jama.2025.10218

Jayakrishnan, T., & Ng, K. (2025b). Early-Onset Gastrointestinal Cancers: A Review. *JAMA*, *334*(15), 1373-1385. https://doi.org/10.1001/jama.2025.10218

Key Statistics for Colorectal Cancer. (2025). https://www.cancer.org/cancer/types/colon-rectal-cancer/about/key-statistics.html

King, S. C., King, J., Thomas, C. C., & Richardson, L. C. (2025). Baseline Estimates of Colorectal Cancer Screening Among Adults Aged 45 to 75 Years, Behavioral Risk Factor Surveillance System, 2022. *Prev Chronic Dis*, *22*, E49. https://doi.org/10.5888/pcd22.250175

Lawler, T. P., Giurini, L., Barbosa Carroll, C., Weiss, J. M., LoConte, N. K., & Warren Andersen, S. (2025). Area-level socioeconomic status is associated with colorectal cancer screening, incidence and mortality in the US: a systematic review and meta-analysis. *Soc Sci Med*, *381*, 118212. https://doi.org/10.1016/j.socscimed.2025.118212

Lee, K. M. N., Hunleth, J., Rolf, L., Maki, J., Lewis-Thames, M., Oestmann, K., & James, A. S. (2023). Distance and Transportation Barriers to Colorectal Cancer Screening in a Rural Community. *J Prim Care Community Health*, *14*, 21501319221147126. https://doi.org/10.1177/21501319221147126

Lee, S., Woo, H., Lee, J., Oh, J. H., Kim, J., & Shin, A. (2019). Cigarette smoking, alcohol consumption, and risk of colorectal cancer in South Korea: A case-control study. *Alcohol*, *76*, 15-21. https://doi.org/10.1016/j.alcohol.2018.06.004

Madkhali, A. M., Almozini, M. A., Alaluan, H. F., Ahmed, M. M., Alnajeim, M. H., Alsaif, N. F., Dher, S. K. B., Alsultan, A. M., & Salah, T. (2025). Symptoms and Outcomes in Colorectal Cancer Patients: A Saudi Tertiary Hospital's Five-Year Analysis. *J Cancer*, *16*(12), 3746-3751. https://doi.org/10.7150/jca.116682

McGarvey, N., Gitlin, M., Fadli, E., & Chung, K. C. (2022). Increased healthcare costs by later stage cancer diagnosis. *BMC Health Serv Res*, *22*(1), 1155. https://doi.org/10.1186/s12913-022-08457-6

McTiernan, A., Friedenreich, C. M., Katzmarzyk, P. T., Powell, K. E., Macko, R., Buchner, D., Pescatello, L. S., Bloodgood, B., Tennant, B., Vaux-Bjerke, A., George, S. M., Troiano, R. P., & Piercy, K. L. (2019). Physical Activity in Cancer Prevention and Survival: A Systematic Review. *Med Sci Sports Exerc*, *51*(6), 1252-1261. https://doi.org/10.1249/mss.0000000000001937

Mojica, C. M., Gunn, R., Pham, R., Miech, E. J., Romer, A., Renfro, S., Clark, K. D., & Davis, M. M. (2022). An observational study of workflows to support fecal testing for colorectal cancer screening in primary care practices serving Medicaid enrollees. *BMC Cancer*, *22*(1), 106. https://doi.org/10.1186/s12885-021-09106-7

Montana health professional shortage area (HPSA) designations. (n.d.). Montana Department of Public Health & Human Services. https://dphhs.mt.gov/ecfsd/primarycare/ShortageAreaDesignations

*******, *MT*. (n.d.). Data USA. https://datausa.io/profile/geo/conrad-mt/

National Cancer Institute. (2019). *Colorectal Cancer Risk Assessment Tool: Online Calculator*. National Cancer Institute. https://ccrisktool.cancer.gov/index.html

National Colorectal Cancer Roundtalbe & American Cancer Society. (2024). *Risk Assessment & Screening Toolkit*. National Colorectal Cancer Roundtable & American Cancer Society.

https://nccrt.org/wp-content/uploads/2024/01/ACS-NCCRT-Risk-Assessment-And-Screening-Toolkit.pdf

Oh, D. L., Wang, K., Goldberg, D., Schumacher, K., Yang, J., Lin, K., Gomez, S. L., & Shariff-Marco, S. (2024). Disparities in Cancer Stage of Diagnosis by Rurality in California, 2015 to 2019. *Cancer Epidemiology, Biomarkers & Prevention*, *33*(11), 1523-1531.

Owusu, D. N., Mensah, E. A., Mamudu, S., Brooks, B., & Shoham, D. (2025). Rural-urban disparities in colorectal cancer screening in United States: Blinder-Oaxaca decomposition analysis of BRFSS data. *Cancer Causes Control*. https://doi.org/10.1007/s10552-025-02071-7

Owusu, D. N., Mensah, E. A., Mamudu, S., Brooks, B., & Shoham, D. (2025). Rural–urban disparities in colorectal cancer screening in United States: Blinder-Oaxaca decomposition analysis of BRFSS data. *CANCER CAUSES & CONTROL*. https://doi.org/10.1007/s10552-025-02071-7

Patel, S. G., May, F. P., Anderson, J. C., Burke, C. A., Dominitz, J. A., Gross, S. A., Jacobson, B. C., Shaukat, A., & Robertson, D. J. (2022). Updates on Age to Start and Stop Colorectal Cancer Screening: Recommendations From the U.S. Multi-Society Task Force on Colorectal Cancer. *Official journal of the American College of Gastroenterology | ACG*, *117*(1), 57-69. https://doi.org/10.14309/ajg.0000000000001548

Peng, W., Huang, Q., & Mao, B. (2024). Evaluating variations in the barriers to colorectal cancer screening associated with telehealth use in rural U.S. Pacific Northwest. *CANCER CAUSES & CONTROL*, *35*(4), 635-645. https://doi.org/10.1007/s10552-023-01819-3

Petrik, A. F., Coury, J., Larson, J. H., Badicke, B., Coronado, G. D., & Davis, M. M. (2023). Data Challenges in Identifying Patients Due for Colorectal Cancer Screening in Rural Clinics. *J Am Board Fam Med*, *36*(1), 118-129. https://doi.org/10.3122/jabfm.2022.220216R1

Qaseem, A., Harrod, C. S., Crandall, C. J., Wilt, T. J., Balk, E. M., Cooney, T. G., Cross, J. T., Jr., Fitterman, N., Maroto, M., Obley, A. J., Tice, J., Tufte, J. E., Shamliyan, T., & Yost, J. (2023). Screening for Colorectal Cancer in Asymptomatic Average-Risk Adults: A Guidance Statement From the American College of Physicians (Version 2). *Ann Intern Med*, *176*(8), 1092-1100. https://doi.org/10.7326/m23-0779

Roshandel, G., Ghasemi-Kebria, F., & Malekzadeh, R. (2024). Colorectal Cancer: Epidemiology, Risk Factors, and Prevention. *Cancers*, *16*(8), 1530. https://www.mdpi.com/2072-6694/16/8/1530

Sepassi, A., Li, M., Zell, J. A., Chan, A., Saunders, I. M., & Mukamel, D. B. (2024). Rural-Urban Disparities in Colorectal Cancer Screening, Diagnosis, Treatment, and Survivorship Care: A Systematic Review and Meta-Analysis. *Oncologist*, *29*(4), e431-e446. https://doi.org/10.1093/oncolo/oyad347

Sharma, K. P., DeGroff, A., Beckman, M., Juzhong, S., Sallyann, C. K., & Djenaba, J. (2025). Sustainability of evidence based interventions implemented in CDC's colorectal cancer control program. *Implementation Science Communications*, *6*(1), 73. https://doi.org/10.1186/s43058-025-00734-9

Sharma, K. P., DeGroff, A., Maxwell, A. E., Cole, A. M., Escoffery, N. C., & Hannon, P. A. (2021). Evidence-Based Interventions and Colorectal Cancer Screening Rates: The Colorectal Cancer Screening Program, 2015-2017. *Am J Prev Med*, *61*(3), 402-409. https://doi.org/10.1016/j.amepre.2021.03.002

Siegel, R. L., Wagle, N. S., Cercek, A., Smith, R. A., & Jemal, A. (2023). Colorectal cancer statistics, 2023. *CA: A Cancer Journal for Clinicians*, *73*(3), 233-254. https://doi.org/https://doi.org/10.3322/caac.21772

Siegel, R. L., Wagle, N. S., & Jemal, A. (2026). Leading Cancer Deaths in People Younger Than 50 Years. *JAMA*, *335*(7), 632-634. https://doi.org/10.1001/jama.2025.25467

Sinicrope, F. A. (2022). Increasing Incidence of Early-Onset Colorectal Cancer. *N Engl J Med*, *386*(16), 1547-1558. https://doi.org/10.1056/NEJMra2200869

Smith, R., Cao, X., Carter, G. C., Pope, A., Fayyaz, I., Ellenberg, P., Miller-Wilson, L.-A., Limburg, P. J., & Pyenson, B. (2024). Use of novel cancer staging model to analyze healthcare costs of commercially insured patients with colorectal cancer. *Journal of Clinical Oncology*, *42*(3_suppl), 35-35. https://doi.org/10.1200/JCO.2024.42.3_suppl.35

Streeter, R. A., Snyder, J. E., Kepley, H., Stahl, A. L., Li, T., & Washko, M. M. (2020). The geographic alignment of primary care Health Professional Shortage Areas with markers for social determinants of health. *PLOS ONE*, *15*(4), e0231443. https://doi.org/10.1371/journal.pone.0231443

Tan, J. Y., Yeo, Y.-H., Ng, W. L., Fong, Z. V., & Brady, J. T. (2024a). How have US colorectal cancer mortality trends changed in the past 20 years? *International Journal of Cancer*, *155*(3), 493-500. https://doi.org/https://doi.org/10.1002/ijc.34926

Tan, J. Y., Yeo, Y. H., Ng, W. L., Fong, Z. V., & Brady, J. T. (2024b). How have US colorectal cancer mortality trends changed in the past 20 years? *International Journal of Cancer*, *155*(3), 493-500.

Tobacco use in Montana (2024). Truth Initiative. https://truthinitiative.org/research-resources/smoking-region/tobacco-use-montana-2023?utm_source=chatgpt.com

United States Census Bureau. (2024). *QuickFacts: Montana*. https://www.census.gov/quickfacts/fact/table/MT/PST045224

Vernia, F., Longo, S., Stefanelli, G., Viscido, A., & Latella, G. (2021). Dietary Factors Modulating Colorectal Carcinogenesis. *Nutrients*, *13*(1). https://doi.org/10.3390/nu13010143

Villaroman, A., Cuartas, M. C., & Gupta, S. (2024). Rising trend of early-onset colorectal cancer in the US: Incidence and projections to 2030. *Journal of Clinical Oncology*, *42*(16_suppl), e15523-e15523. https://doi.org/10.1200/JCO.2024.42.16_suppl.e15523

Waddell, O., Keenan, J., & Frizelle, F. (2024). Challenges around diagnosis of early onset colorectal cancer, and the case for screening [Review]. *ANZ JOURNAL OF SURGERY*, *94*(10), 1687-1692. https://doi.org/10.1111/ans.19221

Wang, H., Roy, S., Kim, J., Farazi, P. A., Siahpush, M., & Su, D. (2019). Barriers of colorectal cancer screening in rural USA: a systematic review. *Rural Remote Health*, *19*(3), 5181. https://doi.org/10.22605/rrh5181

Wang, K., Ma, W., Wu, K., Ogino, S., Giovannucci, E. L., Chan, A. T., & Song, M. (2021). Long-Term Colorectal Cancer Incidence and Mortality After Colonoscopy Screening According to Individuals' Risk Profiles. *J Natl Cancer Inst*, *113*(9), 1177-1185. https://doi.org/10.1093/jnci/djab041

Windfelder, Z. (2024). *Best Practice Toolkit for Increasing Colorectal Cancer Screenings in At-Risk Adults*. https://soar.usa.edu/scholprojects/184/

Zahnd, W. E., Gomez, S. L., Steck, S. E., Brown, M. J., Ganai, S., Zhang, J., Arp Adams, S., Berger, F. G., & Eberth, J. M. (2021). Rural-urban and racial/ethnic trends and disparities in early-onset and average-onset colorectal cancer. *Cancer*, *127*(2), 239-248. https://doi.org/10.1002/cncr.33256

Zheng, S., Schrijvers, J. J. A., Greuter, M. J. W., Kats-Ugurlu, G., Lu, W., & de Bock, G. H. (2023). Effectiveness of Colorectal Cancer (CRC) Screening on All-Cause and CRC-Specific Mortality Reduction: A Systematic Review and Meta-Analysis. *Cancers (Basel)*, *15*(7). https://doi.org/10.3390/cancers15071948

APPENDICES

APPENDIX A

CRC EDUCATION & ALGORITHM

Colorectal Cancer Education

Colorectal Cancer: Risk Assessment QI Project

Overview

Colorectal cancer (CRC) remains the **second leading cause of cancer-related deaths** in the United States. Early detection and risk-based screening are critical for reducing mortality.

Why Early Detection Matters

- The 5-year survival rate for CRC detected at **Stage 1 (localized)** is ~ 90%.
- This drops to ~ 14% for patients diagnosed at **Stage 4 (metastatic)** disease.
- It is estimated that ~ 4,600 lives/year could be saved if younger-age CRC cases (<50 yrs) were diagnosed at a localized stage.

Family History and Increased Risk

- Individuals with a **first-degree relative** (parent, sibling, or child) with CRC are **at least 2× more likely** to develop CRC.
- Approximately **16%** of early-onset CRC cases are attributable to a hereditary condition (e.g., Lynch syndrome), and another ~**14%** have a documented family history of CRC.
- A subset of patients have a family history of **advanced adenomas (>1 cm)**, which also elevates risk.

Emerging Concern: Early-Onset CRC in Younger and Rural Populations

- Rates of early-onset CRC (typically <50 yrs) are increasing even as older-age CRC declines.
- Importantly, the **increase is greater in rural vs. urban populations**:
- Rural areas also have worse **survival outcomes and a higher risk of death**
- Screening rates are lower in rural areas, contributing to later stage of diagnosis.

Implication for clinicians: Younger patients in rural settings — especially those with family history or symptoms — may have a higher and rising risk of early-onset CRC and may present at more advanced stages.

Gaps in Current Practice

- Less than **half** of individuals with a family history of CRC or advanced adenomas receive **personalized screening guidance**.
- Under 40% of individuals with a positive family history talk with a healthcare provider about it.
- Less than ~4% of medical records had enough family history data to assess CRC risk accurately.

Colorectal Cancer Education (cont.)

The Role of Primary Care Clinicians

Primary care clinicians and teams are central to identifying high-risk patients and facilitating early detection via screening. Key actions:

- **Collect comprehensive family history** in all adult patients: document first- and second-degree relatives, age at diagnosis of CRC or advanced adenomas, and known hereditary syndromes.
- **Document** the risk (e.g., "first-degree relative with CRC at age 45") and link it to screening recommendation.
- **Apply risk-based screening intervals**, in line with guideline recommendations (and consider earlier screening for high-risk individuals).
- **Promote symptom awareness**: rectal bleeding, unexplained iron deficiency anemia, new-onset bowel habit changes — even in younger patients, especially rural/sub-urban settings.
- **Address modifiable risk factors**: maintain a healthy weight, promote physical activity, encourage high-fruit/vegetable, low-fat diet, limit alcohol and tobacco use, monitor inflammatory bowel disease conditions.
- **Recognize rural-specific barriers**: distance to care, specialist shortage, lower screening uptake — consider referral to community screening programs or use of non-invasive screening (e.g., FIT) when appropriate.

Lifestyle and Personal Risk Factors

Beyond family history, key modifiable factors include:

- Diet low in fruits/vegetables and high in fat
- Overweight/obesity and physical inactivity
- Tobacco use and excessive alcohol consumption
- Chronic inflammatory bowel disease (e.g., Ulcerative colitis)

Recognizing these in younger and rural populations is especially important given rising incidence.

Take-Away Message

Early, accurate family history collection and risk stratification enable targeted screening — especially critical in younger and rural populations where early-onset CRC is rising and outcomes are worse.
Primary care clinicians play a pivotal role in mitigating this growing threat through awareness, assessment, and proactive management.

Sources:

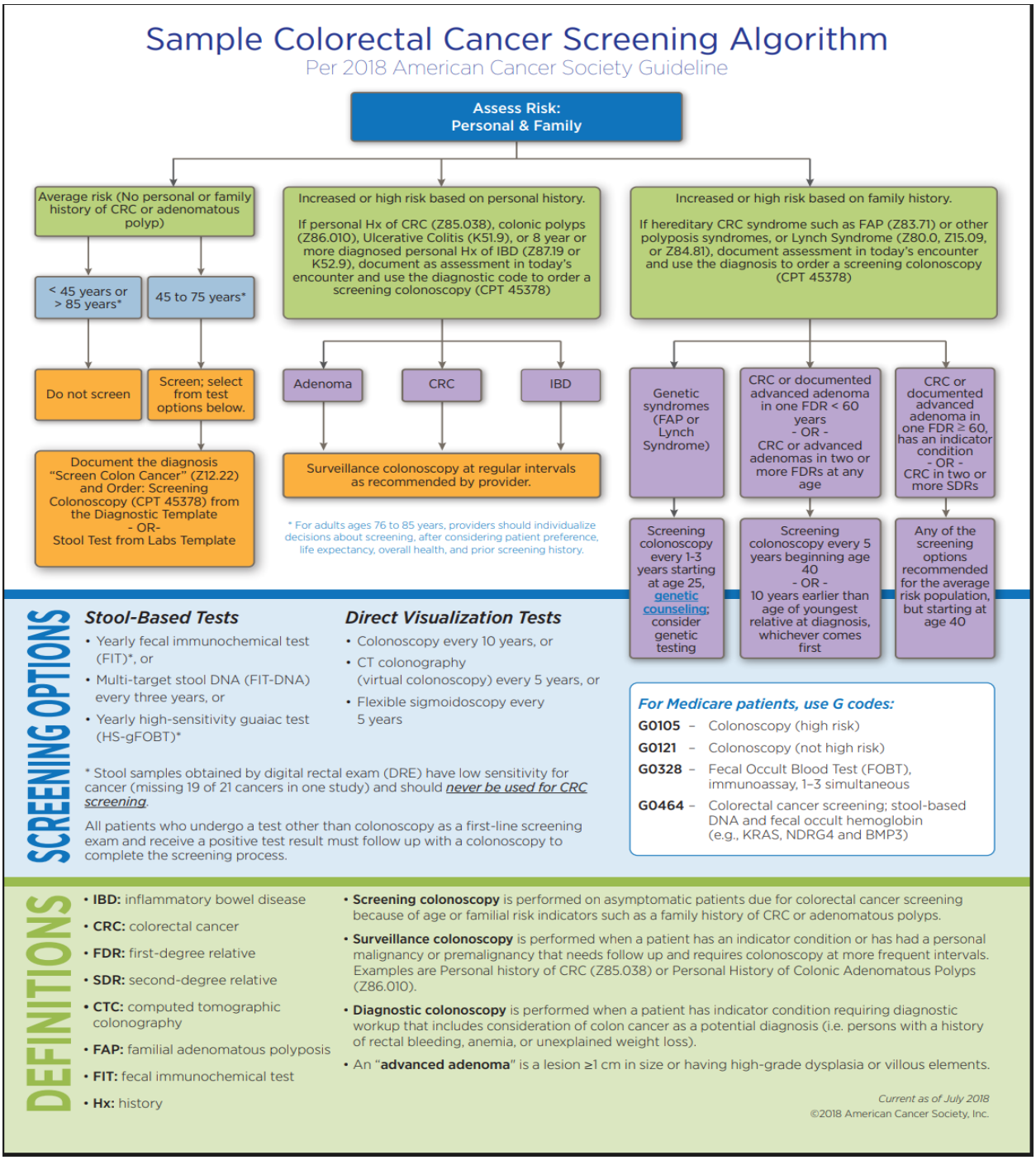
Risk Assessment and Screening Toolkit: Algorithm. (2018). American Cancer Society & National Colorectal Cancer Roundtable https://nccrt.org/wp-content/uploads/2024/01/ACS-NCCRT-Risk-Assessment-And-Screening-Toolkit_Algorithm.pdf

Zahnd, W. E., Gomez, S. L., Steck, S. E., Brown, M. J., Ganai, S., Zhang, J., Arp Adams, S., Berger, F. G., & Eberth, J. M. (2021). Rural-urban and racial/ethnic trends and disparities in early-onset and average-onset colorectal cancer. *Cancer*, *127*(2), 239-248. https://doi.org/10.1002/cncr.33256

APPENDIX B

CRC SCREENING ALGORITHM

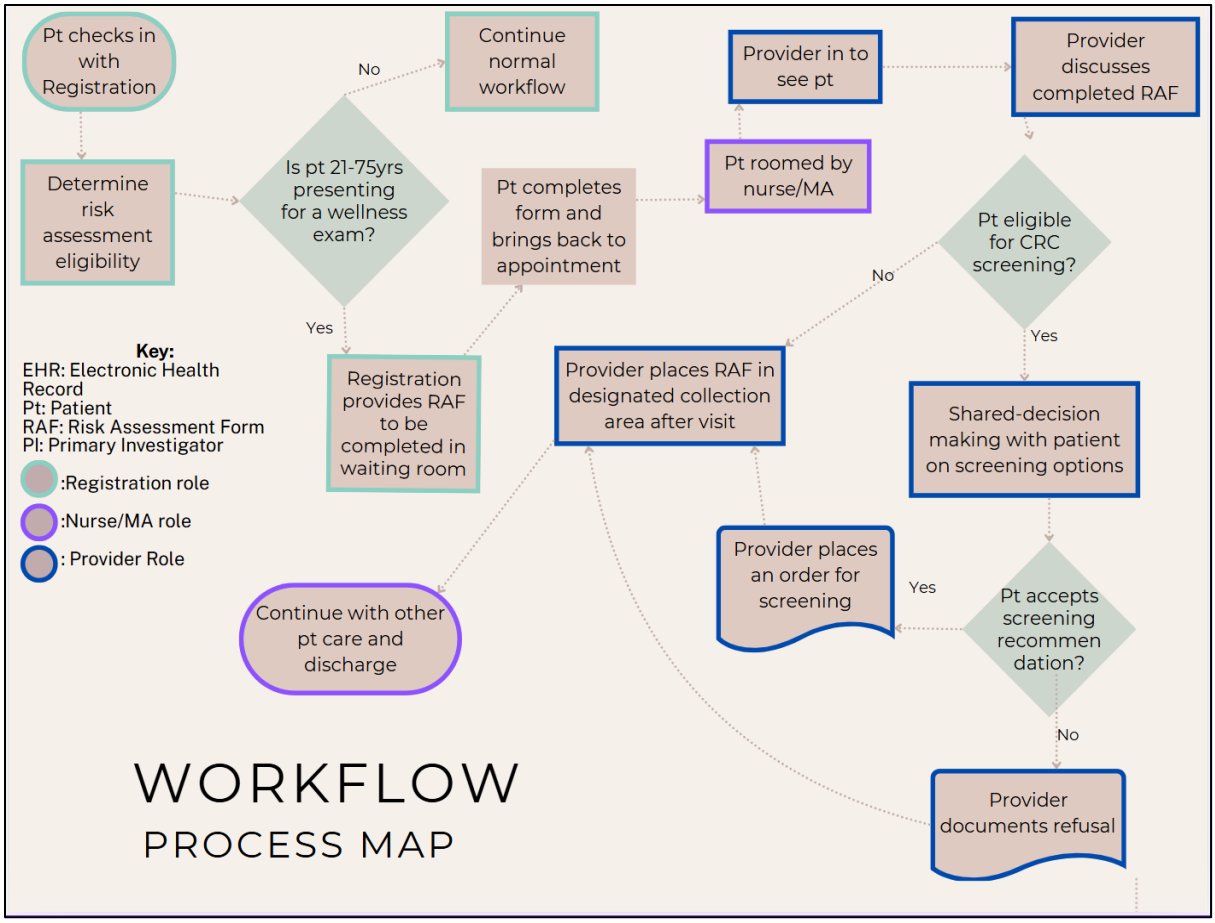
CRC Screening Algorithm



APPENDIX C

WORKFLOW PROCESS MAP

Workflow Process Map



APPENDIX D

RISK ASSESSMENT FORM

Risk Assessment Form

Name: _____
DOB: _____
Gender: _____

	YES	NO
1. Do you have a family history of colorectal cancer?		
2. Do you have a personal history of colorectal cancer or colorectal polyps?		
3. Have you been diagnosed with Ulcerative Colitis or Crohn's Disease (Irritable Bowel)?		
4. Do you have a personal or family history of Lynch syndrome or Familial Adenomatous Polyposis (FAP)?		
5. Do you have concerns about bloody stools, unexplained weight loss, persistent abdominal pain or a change in bowel habits?		

see screening recommendations on reverse if answered YES to any question

If **NO** to all, then proceed to the *average risk* requirements for colorectal cancer screenings beginning at age 45:

- Colonoscopy screening every 10 years
- FIT (stool-based test) annually
- FIT-DNA (Cologuard) test every 3 years

Have you ever completed any prior screening for colorectal cancer? Yes/No (Circle one)

If so, complete information below:

Colonoscopy- Date: _____ Results: _____Healthcare facility: _____

FIT (stool test)- Date: _____ Results_____

FIT-DNA (Cologuard)- Date: _____ Results_____

Modifiable Risk Factors: Circle Yes or No

Do you eat a diet low in fruit, vegetables, fiber, but high in fats and processed meats? YES/NO
Do you currently smoke or have a history of smoking or using smokeless tobacco? YES/NO
How many alcoholic beverages do you consume weekly? _____
How many days per week do you participate in moderate physical activity >30 minutes? _____

******(please give completed form to your primary care provider during your visit)

Risk Assessment From (cont.)

(back-side)

If you **answered YES to questions 1-5,** then proceed with the following screening recommendations:

A: Colorectal cancer or advanced adenoma in one first-degree relative (parents, children, siblings) under 60 years OR Colorectal cancer or advanced adenoma in 2 or more first-degree relatives at any age:

-Colonoscopy screenings should begin 10 years earlier than the age of the youngest relative at diagnosis, or starting at age 40, whichever is first. Repeat every 5 years.

B: Personal history of CRC or colorectal polyps:

-Colonoscopy every 1-3 years depending on staging and removal of polyps, and provider recommendation.

C: Personal history of Irritable Bowel Disease:

-Complete colonoscopy approximately 8-10 years post-diagnosis and recurring every 1-3 years depending on previous findings on colonoscopy

D: Personal or family history of genetic syndromes:

-Screening colonoscopy every 1-3 years. Seek genetic counseling.

E: History of abnormal stools:

-Discuss symptoms with provider to evaluate appropriate diagnostic needs, beyond preventative screening recommendations.

***adapted from the *Best Practice Toolkit for Colorectal Screenings* patient questionnaire, with modifications to wording to reflect the ASC-NCCRT Screening algorithm and the NIH Colorectal Cancer Risk Assessment Tool