COLORECTAL CANCER: INCREASING AWARENESS OF SCREENING IN A RURAL NORTH DAKOTA COMMUNITY

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF NURSING PRACTICE

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ABSTRACT

Colorectal cancer (CRC) is the second leading cause of cancer deaths in the United States, yet only 67% of the eligible population have received screening. Preventative CRC screenings help to reduce mortality and allow CRC to be found at the pre-cancerous or early stages, when the disease is highly curable. The purpose of this clinical dissertation project was to determine whether providing an educational booth with informational handouts and informational PowerPoint set on loop for adults ages 18-75 in the rural community of Grafton, ND increased knowledge and intent regarding CRC screening, as well as assisted to better understand barriers to receiving CRC screening.

An educational booth with handouts and informational PowerPoint was presented to 28 voluntary participants, ages 18-75. Participants were from a convenience sample of eligible adults already attending a community event in a small-town setting in the rural community of Grafton, North Dakota. Post-survey results after the educational session were evaluated with descriptive statistics.

Sixty-four percent of participants (N=28; n=18) indicated increased knowledge on CRC and/or screening modalities. Eighteen participants determined that the educational intervention positively influenced their intent to be screened. Of the ten participants who indicated “no”, the educational intervention did not influence their intent to be screened, eight indicated they had already decided to be screened prior to the intervention. Fifty-three percent of participants (n=15) identified barriers of some form in receiving CRC screening and of these 15 participants, 13 indicated that due to the educational session, they were still likely to begin or continue CRC screening.

The co-investigator through the project implementation helped increase awareness of CRC and screening modalities, as well as positively impacted intent to receive CRC screening in Grafton, ND. This project helped illuminate barriers to receive screening, as well as positively influenced participants to choose to be screened despite identified barriers. Future projects should continue to focus on education to provide knowledge and address barriers. Nurse practitioners (NPs) are well suited to meet the needs of CRC education, identifying and alleviating barriers, as well as encouraging patients to receive CRC, all of which can reduce CRC morbidity and mortality.

ACKNOWLEDGMENTS

I would like to extend a heartfelt thank you to my committee chair and advisor, Dr. Heidi Saarinen, for her encouragement and continued support throughout the process of my dissertation. Her input, organization, guidance, and constant positive attitude were fundamental to the success of my project. The remaining members of my graduate committee, Dr. Dean Gross, Kerri Benning, and Dr. Lisa Montplaisir, were also vital in the success of my project. Thank you all for your contribution of time, input, and knowledge.

I would also like to thank Pastor Cal and his wife Kelly for graciously welcoming me to collaborate with Reach the Heart. It is so inspiring to work alongside two individuals with such a deep passion to serve and love others. The impact their organization leaves on individuals and communities is tremendous and, much like the first ripple in a pond, their actions encourage others to follow suit.

DEDICATION

I dedicate this clinical dissertation project to my husband.

Adam, thank you immensely for supporting me over the last three years, for taking on so many extra responsibilities, for your flexibility, and for continually choosing to serve me and our children. I truly would not have made it through school and through this dissertation process without your tremendous support and encouragement.

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CHAPTER 1: INTRODUCTION

Background and Significance

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the second leading cause of cancer deaths in the United States (American Cancer Society [ACS], 2020c). Preventative CRC screenings help to reduce mortality through early detection. Early detection allows CRC to be found at the pre-cancerous or early stages, when the disease is highly curable. Since the mid-1980s, colon and rectal cancer rates have dropped due to patients getting screened and changing their lifestyle-related risk factors. While the decline is encouraging, CRC continues to be a major health disparity. In 2021, the projected rate for individuals to be diagnosed with CRC is 149,500, and 52,980 individuals are projected to die from CRC (Colorectal Cancer Alliance [CCA], 2021). The Centers for Disease Control and Prevention (CDC) estimates that 68% of CRC deaths could be prevented with screening (Sharma et al., 2020).

Alarmingly, there has been a noticeable increase in early onset colorectal cancer rates (ACS, 2020a). Early-onset colorectal cancer is defined as a diagnosis between the ages of 20-49 years. Since 2007, the rates of CRC in people 55 years or older has decreased by 3.6% each year and increased in people younger than 55 years by 2% each year. Also, the National Cancer Institute (NCI) has found that since 1991, cases of early onset CRC have increased by 51% (NCI, 2020a).

Statistics show that rural areas tend to have lower rates of CRC screening, measuring 58% in comparison with urban areas at 66% (Healthy People 2020, 2018). The lower rates of CRC screening are especially relevant to North Dakota (ND), as nearly 50% of the population are living in a rural area (United States Department of Agriculture Economic Research Service [USDA], 2019). As of 2018, the most recent data available for ND indicates that 35% of

residents are not up to date with CRC screening (North Dakota Colorectal Cancer Roundtable [NDCCRT], 2020). Additionally, ND is considered a "hot spot" for early-onset CRC (NDCCRT, 2020). ND has one of the highest incidence rates for early-onset CRC of any US state, measuring at 54.4% (Schwartz et al., 2019).

Routine colorectal cancer screening is one of the most powerful defenses for preventing colorectal cancer. While there is strong evidence for the success of CRC screening, a gap remains in the number of individuals who are eligible to be screened and those who receive the screening. Numerous barriers can be attributed to this gap, including limited knowledge of family history, lack of knowledge regarding CRC risk and screening, language barriers, mistrust of the health care system, low insurance rates, aversion to the screening process, fear of cancer diagnosis, providers not recommending screenings, limited resources for facilities to perform screenings, limited time to perform screenings, and lack of access for patients to receive screenings (Jackson et al, 2016; May, 2019). Individuals in rural settings often experience the above-mentioned barriers, as well as additional obstacles including insufficient public transport, poor availability of broadband internet services, lack of trained providers, and lack of retained providers to maintain continuity of care (Douthit et al., 2015).

Evidence-based interventions to increase compliance rates of CRC include incorporating education and awareness, offering participants a choice of screening, addressing financial costs, and addressing barriers (Bone et al., 2020). Individuals that completed an education module on the types of CRC screening modalities had a higher rate of reporting intention to screen. Addressing barriers, such as a patient's preconceived notion of what to experience during their screening and sharing positive experiences of getting screenings can make an impact on an individual's decision to pursue screening. Furthermore, identifying patients who are at risk of not

receiving and identifying screening is important, rather than waiting for the patient to show up for a wellness visit. This is often done through an outreach program.

Outreach programs are a means of providing services to any population that may not have access to a particular service (Merriam-Webster, n.d.). These programs are often introduced outside of the clinical setting. Community-delivered educational interventions are effective in reaching under-screened rural populations (Cole et al., 2014; Geng & Gupta, 2013). Educational programs can empower their target audience to care for themselves by increasing their knowledge and skills; thus, outreach programs are often instrumental in improving the health and well-being of a population in a community (Renault, 2021). Also, partnering with a trusted and respected member of the community, such as a pastor or other leader, to implement the outreach program can positively influence the impact of the program.

The National Colorectal Cancer Roundtable (NCCRT) is a national coalition established by the ACS and the CDC. Their mission statement is "dedicated to reducing the incidence of and mortality from colorectal cancer in the U.S., through coordinated leadership, strategic planning, and advocacy" (NCCRT, 2021a). Their overall goal is "to increase the use of proven colorectal cancer screening tests among the entire population for whom screening is appropriate." In 2014, the NCCRT issued a challenge to all states to reach 80% CRC screening rates nationally (NCCRT, 2021b). The NCCRT created six strategies to guide states in taking active steps towards meeting this goal. These strategies focus on sending messages to the unscreened populations, learning about the unscreened, determining effective pathways to reach the unscreened, ways to motivate the unscreened, tools to utilize for reaching the unscreened, and collaborating with partners in reaching this goal. These strategies helped guide the design of this practice improvement project. Implementation of this practice improvement project will include

learning about the unscreened by collecting demographic information and identifying potential barriers.

At a local level, the North Dakota Colorectal Cancer Roundtable (NDCCRT), which is guided by the North Dakota Department of Health (NDDOH) and ACS, has accepted the 80% CRC screening challenge and is continuing to pursue meeting this goal (NDCCRT, 2020). The CDC acknowledges that involving stakeholders, developing strong data collection and reporting systems, and communicating frequently with workgroups have helped institute a strong evaluation and better understanding of contextual factors that affect the data interpretation of CRC (Degroff et al., 2018). The NDCCRT is considered a stakeholder and information received during this practice improvement project was dispersed to them.

Problem Statement

The high death rate of CRC, increasing incidence of early-onset CRC, and ease of prevention, detection, and treatment options, make targeting the strategies set forth by the NDCCRT worth pursuing. Furthermore, the research demonstrating the effectiveness of the strategies indicates a positive outcome for implementation. This clinical project targeted individuals 18 years through 75 years in a rural, ND town to increase awareness of CRC and screening options, better understand barriers to receiving CRC screening, and determine intent to screen. Other possible benefits from the practice improvement project include collecting data on demographics and barriers to screening to be disbursed to potential stakeholders.

North Dakota residents statistically have lower screening rates of CRC and higher incident rates of early-onset CRC (Schwartz et al., 2019). The rural ND town, Grafton, was selected for the trusted relationship the community has with the co-investigator's contact, Pastor Calvin Thompson, who is the founder of a non-profit organization, Reach the Heart. The Reach

the Heart organization travels into smaller rural communities to partner with local churches and health initiatives to meet community needs and offer faith-related events. Focusing on the rural population had the potential to decrease morbidity and mortality rates and increase patient health engagement. The age of 18-75 was selected to encompass the categories of eligible individuals to receive CRC screening based on age, family history, risk factors, and high prevalence of early onset CRC in the state of ND. The implementation of an educational program, use of informational handouts including resources for screening and payment options, and identification of barriers has been shown to increase CRC screening compliance (Geng & Gupta, 2013). Furthermore, if the intervention was determined to be effective, the implementation could emphasize the impact educational outreach programs can have on other health promotion objectives in the rural setting.

Purpose

The purpose of this dissertation topic was to increase awareness of colorectal cancer screening options in rural ND. The project outcomes helped determine whether providing an educational booth with informational handouts and informational PowerPoint set on loop for adults ages 18-75 in a rural community in ND would increase participants' knowledge and influence intent regarding CRC screening, and to better understand barriers to receiving CRC screening.

Objectives

1. Increase participant's' knowledge of CRC and screening options after attending the educational session booth with informational handouts and PowerPoint.
2. Identify potential barriers to CRC screening in the rural community by the end of implementing the educational booth at a rural community event.

3. Evaluate if an educational presentation booth, including hand-outs and a PowerPoint presentation with question and answers, influenced participants' intent to be screened by the end of implementation.

CHAPTER 2: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Once the disparity of decreased CRC screening rates in rural ND was recognized, a plan was formed to address this rural health care gap. The plan for implementation was formed largely by an in-depth review of the literature and synthesis of evidence-based practice (EBP) research. The literature review was conducted to better understand colorectal screening, recommended screening methods, barriers to screening, and methods to increase CRC screening. Once potential methods of increasing CRC screening rates were identified, a nursing theory and model were utilized in the development of this implementation project.

Theoretical Framework

A variety of nursing theories and models were considered to aide in the design of this project. The evidence-based nursing theory selected for this project was the Iowa Model. The nursing model selected was Pender's Health Promotion Model.

Iowa Model

The Iowa Model guides health care providers to implement EBP research into clinical practice and aide decision-making to provide optimal patient outcomes (Iowa Model Collective, 2017). The Iowa Model begins by first identifying a triggering issue or opportunity. The next steps are to state the purpose and determine if the topic is a priority. If the problem is considered a priority, then a team is formed and evidence is assembled and examined. If there is sufficient evidence compiled to indicate making a change, then the team develops and pilots the practice change. The next step is to determine if the pilot practice change is appropriate to adopt into practice. If it is not, then the next step is to consider alternatives or redesign until there is an appropriate change that can be implemented into practice. The last two steps include implementing the change into practice and disseminating the results.

Permission was obtained to utilize (Appendix C) the Iowa Model and the model was used to help design the project. The identified trigger for this project was the gap in CRC screening rates in rural areas, which was determined to be a priority due to the potential reduction in mortality and morbidity rates of CRC when screening is performed. A literature review was conducted to examine evidence indicating that educational interventions and addressing of barriers are effective means to increase CRC screening rates. Evidence also shows that utilizing an outreach program is an effective method to reach the rural populations (Cole et al., 2014; Geng & Gupta, 2013). A dissertation committee was formed and input from the committee, stakeholders, and partnership with the outreach program Reach the Heart was utilized in the design of the plan. Once implemented, the results were evaluated to determine if a change in practice should take place. Dissemination of the results occurred to the committee, stakeholders, and partnering outreach program.

Health Promotion Model

The Health Promotion Model (HPM) was designed by Nola J. Pender, a well-known nursing theorist. Nola Pender hypothesized that a patient's quality of life could be improved by preventing problems before they occurred and health care costs could be decreased by promoting healthy lifestyles (Murdaugh et al., 2019). Pender decided to develop a method focused on positive motivation, thus the HPM was created. The purpose of her model is to guide health care workers to understand what influences a patient's behavior, in order to promote a healthy lifestyle. The HPM also encourages health care providers to examine the patient's environment and variables that can have an impact on the patient's health behavior.

There are three main areas that this model focuses on: individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcomes. Each person has

unique characteristics and experiences that affect their actions. Variables in a person's life can significantly motivate a person's behavior-specific cognition and affect. Within the HPM, there are many variables that affect a person's health behavior: prior related behaviors, personal factors, perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, situational influences, immediate competing demands and preferences, and commitment to a plan of action. These variables can be modified by health care providers and other trusted personnel, thus influencing the persons behavioral outcomes. Health promoting behavior is the desired behavioral outcome.

In the rural setting of ND, individual characteristics and experiences that affect intent to screen may include the long distance to travel to a clinic site, consideration of the time commitment to travel, time commitment for colonoscopy preparation and procedure, and financial considerations of gas and health care costs. This project intended to address these variables by educating the community on CRC screening options that can fit into an individual's schedule and consideration of resources. Behavior specific cognition and affect examples that may impact intent to screen include family members or friends that choose to not get screened, knowing someone who had a poor or positive experience, and perceived expectation of screening to be a hassle based on previous health care experiences. This project addressed these variables by anticipating barriers, providing knowledge of positive experiences and outcomes, and bringing education through trusted sources in the community to build rapport. Potential behavioral outcomes affecting intent to screen include procrastination, lack of knowledge, and individual decisions to not screen. This project aimed to help individuals acknowledge options and recognize that an individual's behavior is what will keep them from being screened, not a lack of knowledge or resources.

This project was designed with a desired outcome of individuals choosing to get screened for CRC, a health promoting behavior. This project utilized the HPM to first determine variables listed above through the use of a pre-screening questionnaire and post-educational survey. An educational program was presented to patients to inform them of ways to modify variables in their life and environment. The educational program also provided individuals an opportunity to commit to a plan of action, thus influencing a health promoting behavior.

Literature Review

A literature review was performed to better comprehend colorectal screening, recommended screening methods, barriers to screening, and methods to increase CRC screening. A search through databases was conducted on PubMed, CINAHL, Web of Science, and the Cochrane Database of Systematic Reviews. Key words used during the search were "colorectal cancer screening", "early onset colorectal cancer", "screening for colorectal cancer", "barriers to screening for colorectal cancer", "barriers to colorectal cancer screening", and "increase colorectal cancer screening rates." Results included 8,489 articles from Pubmed, 6,734 articles from CINAHL, 11,808 articles from Web of Science, and 34 systematic reviews from the Cochrane database. The results were then filtered by dates from 2015 to current. A handful of articles were utilized with data from 2010-2014, as these articles were found through citations of current resources. Only US studies were utilized for research, with the exception of one matched case control study performed in the United Kingdom (UK) on oral antibiotic use and risk of CRC.

Information utilized for the literature review was also obtained from the following websites associated with government and nationally recognized organizations: American Cancer Society, Center for Disease Control and Prevention, Colorectal Cancer Alliance, National Cancer

Institute, North Dakota Colorectal Cancer Roundtable, North Dakota Department of Health, USDA Economic Research Service, and the U.S. Preventative Services Task Force.

Colorectal Cancer Epidemiology

CRC is the second most common cause of cancer deaths in the United States (Siegel et al., 2020). In 2018, the most current year for which incidence rates are available in the United States, 141,074 new cases of CRC were reported and 52,163 deaths from CRC were reported (U.S. Cancer Statistics Working Group [USCS], 2021). From the same 2018 USCS data, 11.8% of the CRC diagnoses and 7% of the deaths involved individuals under the age of 50, also known as individuals affected by early-onset CRC.

Rates of CRC incidence and mortality are declining in individuals over the age of 50, yet increasing in those under the age of 50. US data from 1975-2015 demonstrates decreased incidence rates of CRC by 37% in individuals over the age of 50 and increased by 63% in individuals under the age of 50 (Murphy et al., 2020). Additionally, the mortality rates for CRC decreased by 50% in individuals over the age of 50 and increased by 13% in individuals under the age of 50. With the shift in cases trending towards individuals under the age of 50, the median age of CRC is also trending down. In 2000, the median age was 72 and in 2017, the median age became 66 (American Cancer Society [ACS], 2020c).

Individuals with early-onset CRC are more likely to be diagnosed with advanced stage CRC at a rate of 51.6% compared to 40% of adults age 50 years or older (Virostoko, et al., 2019). In addition, the location of the tumor is statistically significant for early onset CRC. Overall incident rates of CRC are highest for tumors located in the proximal colon (42.6%) and lowest for tumors located in the distal colon. In contrast, for early onset CRC, 21% of tumors occur in the proximal colon, 25% occur in the distal colon, and 37% of tumors occur in the

rectum (Siegel et al., 2020). Furthermore, at a molecular level, early onset CRC has unique presentations from late-onset CRC (Ahnen et al., 2014; Lieu et al., 2019). The differences at the molecular level lend an answer to the histologic differences in the characteristics and location of the CRC tumors. Further research is being conducted at the molecular level to determine causes and to guide appropriate treatments.

North Dakota

In 2017, there were 356 new cases of CRC cancer in ND and 101 deaths from CRC (U.S. Cancer Statistics Working Group [USCS], 2019). This information was not divided by age, so it is unknown how many of these involved individuals with early-onset CRC. ND also has one of the highest CRC incidence rates of any state at 54.4% (Schwartz et al., 2019).

One significant predictor of CRC in ND is the use of non-municipal, or "well" water (Schwartz et al., 2019). Well-water has been known to have numerous contaminants that correlate with colorectal carcinogenesis including water-borne bacteria, by-products from disinfectants, and nitrates. A Danish study found that individuals exposed to nitrates in drinking water at a level as low as 3.87 mg/L reported a significantly increased risk of CRC. The nitrate standard for public drinking water in the US is 10 mg/L and does not apply to private wells, which often surpasses this standard guideline. For example, a survey of 218 samples of water from private and municipal wells in ND found nitrate levels >10 mg/L in 22 samples. Approximately 60% of the population in ND uses well water for public and private drinking water-systems (National Ground Water Association [NGWA], 2019).

Risk Factors

Addressing the risk factors contributing to CRC can decrease incidences and mortalities. Research has long shown that genetics and family history play a significant role in a person's

risk for developing CRC, regardless of age of onset. As the increased incidence of early-onset disease has happened over a relatively short period of time, though, it is less likely to be caused by genetics. Rather, the most likely cause of increased early-onset CRC incidences is changes to the individual's environment and lifestyle exposure (Murphy, Campbell, & Gunter, 2020). The following risk factors discussed below can impact the risk of CRC, regardless of age of onset.

Race and Ethnicity

There are correlations in race and CRC incidence rates, yet the reasons behind are complex and often explained by environmental influences. In the United States, the highest rates of CRC occur in non-Hispanic Blacks, followed closely by American Indians and Alaska Natives. The lowest incidence rates of CRC are in Asian Americans/Pacific Islanders (Siegel et al., 2020). The high incidence of non-Hispanic Blacks is likely due to the disproportionately low socioeconomic status. The high rates of American Indians are likely due to Fit stool testing, the primary method of screening at Indian Health Services, which has limits at preventing and recognizing CRC. The high rates of CRC in Alaska Natives are believed to be related to their diet and high prevalence of *Helicobacter pylori* (*H. Pylori*), as well as limited availability of endoscopic services. In the United States, CRC incidences are highest in parts of the South and Midwest, which is once again believed to be related to diet and environmental factors.

Family and Past Medical History

Known medical risk factors for CRC include either a family or personal medical history of chronic inflammatory bowel disease, Type 2 diabetes, family history of CRC or advanced adenomatous polyps (Ahnen et al., 2014; Schwartz et al., 2019). Having a first degree relative with CRC that occurred before the age of 60 years can increase an individuals' CRC risk up to 4-fold. Additionally, the two most common hereditary CRC syndromes are familiar adenomatous

polyposis (FAP) and Lynch syndrome, also called hereditary nonpolyposis colorectal cancer. Individuals with FAP have a 100% chance of developing CRC if left untreated and the average age of CRC development is 39 years (Stec et al., 2010). The most effective way to prevent CRC in FAP is for the individual to have an early colectomy, a surgery where the colon is removed. Individuals with Lynch syndrome have a 40% chance of being diagnosed with CRC before the age of 40.

Alterations to Gut Flora

Numerous studies have shown a correlation in long-term antibiotic use and colorectal adenomas, as well as correlations of changes to the microbiome of the gut with the presence of CRC (Dik et al., 2015; Virostko et al., 2019). A 2019 study from the United Kingdom has identified a strong association between oral antibiotic use in the preceding 10 years and a diagnosis of CRC (Zhang et al). Research is also starting to identify a correlation in CRC with a decrease in specific protective microbiomes (Dik et al., 2015). The human microbiome consists of 500-100 different species that provide a defense against pathogens, metabolize polysaccharides, produce specific vitamins, and maintain a healthy immune system. The colonic microbiota is responsible for fermenting undigested carbohydrates into short chain fatty acids including butyrate, acetate, and propionate, which have anti-inflammatory, anti-proliferative, and anti-carcinogenic properties. When an individual consumes a diet high in animal meat and fat, there is a noticeable increase in the bacterial production of genotoxic hydrogen sulfide and an increase in bile acid secretion, both of which are metabolized into secondary carcinogen bile acids. Individuals of a high-risk CRC population were noted to have a decreased number of short chain fatty acid-producing bacteria and an increase in secondary bile acid-producing species. While a strong correlation has been made between antibiotics and CRC, further studies are

needed to identify under which conditions the use of antibiotics can cause an increased risk of CRC (Dik et al., 2015; Virostok et al., 2019).

H. pylori is another disease that can affect the gut microbiome. Researchers have found that patients with chronic *H. pylori* have a high risk for stomach cancer and a moderately increased risk for colon cancer (Dash et al., 2019). Researchers from two studies performed in 2019 found that *H. pylori* colonizes gastric mucosa, induces inflammation, and alters gastric microbiota (Butt & Epplein; Dash et al). Therefore, a potential link between alterations to gut microbiota causing intestinal mucosa barrier disruption and early stage colorectal cancer development. Though a correlation of *H. pylori* and CRC can be found, further research needs to be done to determine increased risk versus causation (Butt & Epplein, 2019).

Lifestyle Factors

There are many lifestyle factors that have a correlation of increased CRC including obesity, sedentary lifestyle, type 2 diabetes, smoking, moderate to heavy alcohol use, and specific diets (ACS, 2020d; Liu et al., 2018; Syed et al., 2019). A diet that is high in red and processed meats is linked to metabolic dysfunction, gut dysbiosis, and chronic inflammation all of which raise a person's risk of CRC (Liu et al., 2018). Alternatively, following a diet high in fruits, vegetables, and whole grains and lower in red meats or processed meats likely lowers a person's risk of CRC. Low levels of Vitamin D and melatonin have also been linked to an increased risk in CRC, though more research is needed (ACS, 2020d).

There are also risk factors specific to developing early-onset CRC (Liu et al., 2018). High BMI at the age of 18 with increased weight gain in early adulthood is associated increased risk of early-onset CRC. The data indicates that there are interactions among obesity, estrogen, and CRC carcinogenesis. While the exact biologic mechanisms are not clear and warrant further

research, metabolic syndrome, insulin resistance, and systemic inflammation are believed to be mediators. A 2018 study among 85,000 women researchers noted that obesity was independently associated with an increased risk of early-onset CRC (Liu et al.). Thus, promotion of a healthy body weight can have a direct effect on reducing an individual's risk of developing early-onset CRC.

Environmental Factors

Evidence indicates that environmental factors play a significant role in development of colorectal cancer. Well water contains water-borne bacteria, disinfection by-products, and nitrates and is therefore implicated (Schwartz, Klug, & Rundquist, 2019). Bacteria is believed to stimulate CRC carcinogenesis by promoting a microbial imbalance and aberrant gene expression. Water that is treated with chlorinated compounds produces by-products of disinfectants which are known CRC carcinogens. Furthermore, nitrate is a common pollutant of drinking water in regions of agriculture and comes from animal manure and nitrogen containing fertilizers. The nitrates are broken down into compounds that are also known CRC carcinogens. Another environmental factor related to cancer is radon. Radon found in groundwater has been associated with increased rates of stomach and lung cancer, though at this time there is little evidence to find a correlation between radon and CRC (Messier & Serre, 2017).

Common Signs and Symptoms of CRC

Early CRC often has no symptoms, which is one reason why screening is so important (ACS, 2020b). Common CRC symptoms include rectal bleeding, abdominal pain, change in bowel habits, change in shape of the stool, blood in the stool after having a bowel movement, dark or black stools, cramping, pain or discomfort in the lower abdomen, an urge to have a bowel movement when the bowel is empty, constipation or diarrhea that lasts for more than a few days,

decreased appetite, and anemia (ACS, 2020b; Ahnen et al., 2014). The presence of two symptoms listed above doubles an individual's risk of having CRC for all age groups. However, not all patients with CRC will present with colorectal symptoms. In a 2008 study, 86% of 1,025 patients with early-onset CRC were symptomatic (Dozois et al., 2008). Further investigation of the asymptomatic individuals revealed 14% had anemia, 7% had positive fecal occult test, 2% had abdominal masses, and 2% had a palpable mass on digital rectal examination.

Screening Guidelines

Current guidelines from the Centers for Disease Control and Prevention (CDC) and U.S. Preventative Services Task Force (USPSTF) strongly recommends (A grade) screening for CRC to begin at age 50 and continuing until age 75 years (CDC, 2020; D'Andrea et al., 2019). In May 2021, the USPSTF updated their guidelines to include a recommended (B grade) screening for CRC in adults ages 45 to 49 years old. Both an "A grade" and "B grade" recommendation from the USPSTF suggest medical providers "offer or provide this service" and the evidence suggests there is high or moderate certainty the net benefit is moderate to substantial (USPSTF, 2018). The recommendation is also in line with the American Cancer Society, who updated their guidelines in 2017, advising that people with average risk of colorectal cancer begin screening at age 45, rather than age 50. At the time of this publication, the majority of insurance companies are covering the cost of colorectal cancer screening for average risk patients beginning at age 50, though some are transitioning to beginning at age 45. There is concern that making CRC screening recommendations more complex may prove to be an additional barrier to increasing screening rates. Nonetheless, statistics indicate that early-onset CRC does represent 10% of total CRC cases that have not been prevented or detected (Syed et al., 2019).

Types of Screening for CRC

There are multiple tests available for CRC screening. The gold standard for CRC screening is an invasive procedure called a colonoscopy, which allows direct visualization of the colon and rectum and provides an opportunity for the patient to have most polyps and some cancers removed at the same time (CDC, 2021; USPSTF, 2018). This indicates the colonoscopy is a test used for screening, diagnosing, and potentially treating. Additionally, there is minimal risk of having a false positive result.

While the colonoscopy is considered gold standard, "the best screening tool is the one that gets done" and patients should be made aware of all the screening options (Pederson, 2019). There are other options of CRC screening that are less invasive than colonoscopies and similar direct visualization screening tools. These non-invasive alternative forms of screening include stool-based testing and laboratory drawn blood samples.

When considering the different types of CRC screening, noting the specificity and sensitivity of each screening test is important. The sensitivity of a screening test measures how often the test will correctly generate a positive result for people who have the condition that is being screened (UMN, 2021). A test that is highly sensitive will accurately identify almost everyone who has the condition and will not generate many false-negative results. A low sensitivity test will result in more false-negative results, indicating patients think they don't have the disease, when they may have it. A low sensitivity test can results missed diagnosis and increased mortality or morbidity rates (NCI, 2020b). The specificity of a screening test measures how often the test will correctly generate a negative result for people who do not have the condition that is being screened (UMN, 2021). A test that is highly specific will accurately identify almost everyone who does not have the condition and will not generate many false-

positive results. A test that has a lower specificity will have more false-positive results, indicating patients think they have the disease, when they may not. A lower specificity test can result in increased health care costs due to the additional diagnostic and follow up tests needed.

Colonoscopy

The colonoscopy is an invasive procedure that is the best at screening and diagnosing CRC, due to the ability to directly visualize the colon and rectum in entirety (CDC, 2021; USPSTF, 2018). Colonoscopy is also the best option for follow-up of positive results and allows the provider to address and remove the polyps at the same time as the screening. This screening method is the most extensive in terms of preparation, involves the most complications, and takes the greatest amount of time between bowel prep and recovery. Colonoscopy requires less frequent screening once performed and is typically done once every 10 years, due to the slow growing nature of pre-cancerous polyps. Potential side effects include bleeding and perforation of the colon, both of which increase as a person gets older.

Of all the CRC screening methods, colonoscopies have the greatest evidence at reducing incidence rates and mortality from CRC. Colonoscopy is also considered one of the most sensitive tests available for CRC screening (CDC, 2021; Mayo, 2021a). Due to its dual purpose of direct visualization and ability to treat patients by removing pre-cancerous polyps, a colonoscopy is the next step taken after a patient receives a positive result from an alternative form of CRC screening. Furthermore, the American Gastroenterology Association recommends not repeating CRC screening by any method for 10 years after a colonoscopy is negative in average risk individuals (Wilkins & McMechan, 2018).

The colonoscopy is categorized as a direct visualization test (USPSTF, 2018). There are additional direct visualization tests used for CRC screening, including CT colonography and

flexible sigmoidoscopy. These additional tests are less commonly utilized, as they have limitations in screening, including not being able to visualize the colon as thoroughly as a colonoscopy and not being able to remove the polyps when found (USPSTF, 2018; Mayo 2021a; Mayo 2021b).

Stool-based Tests

There are three types of stool-based tests that can be used for CRC screening (CDC, 2021; Mayo Clinic 2020a; USPSTF, 2018). The stool-based tests do not require the time commitment, required prep, or anesthesia like the colonoscopy does. A patient receives the test either from the clinic, or by mail, and can perform the test at home. After obtaining a stool sample, the patient places the sample in the included envelope and mails it to the laboratory. Results are typically available within 2 weeks. The stool-based tests do have a chance of false negatives and false positives. Depending on the results, these tests are repeated every 1-3 years. Any positive result from a stool-based test will need to be followed up with a colonoscopy to diagnose and treat. Sometimes insurance companies will not cover the follow-up colonoscopy if used for screening, because they have already paid for the initial stool-based screening. Stool-based tests should only be used on patients considered "average risk", meaning they do not have a personal or family history of CRC, adenomas, or genetic syndromes, nor do they have current signs or symptoms of CRC (ACS, 2019). Any high risk patients should be encouraged to have a colonoscopy for screening.

Fecal Occult Blood Test

Guaic-based fecal occult blood test (gFOBT) is a high sensitivity stool-based screening test for CRC (ACS, 2019). To obtain the most accurate results, patients are asked to obtain three separate stool specimens. Once a patient collects a sample of their stool, they send their stool

samples to a laboratory, who examine the samples for blood or DNA markers associated with CRC.

Results can be impacted by certain foods and/or medications. Prior to taking the FOBT, patients should be educated that beginning 3 days prior to testing there are certain foods, supplements, and medications that should be avoided to prevent false positives (ACS, 2020b). The FOBT can detect blood from any source, including meat, so this should be avoided during the three day window. Foods or supplements that contain ascorbic acid (Vitamin C) and foods that have perioxidase activity, such as cabbage, carrots, spinach, celery, squash, potatoes, onions, green beans, and leeks, may decrease the tests sensitivity (Bangaru & Agrawal, 2019). Patients should also avoid taking antiplatelets, anticoagulants, and anti-inflammatory drugs, as these medications may facilitate bleeding in the body and may consequently lower the specificity of the FOBT.

An example of a gFOBT brand name is Hemoccult II SENSA. Older generations prior to the Hemoccult II and similar older guaic-based tests should not be used for CRC screening as they are no longer considered accurate (ACS, 2020b). The Hemoccult II SENSA has sensitivity rates ranging from 62%-79% and a specificity of 87%-96%. These tests are performed once a year.

Fecal Immunochemical Tests

Fecal Immunochemical Tests (FIT) look for blood hidden in the stool. They are not affected by food or medication and usually only one sample is needed (ACS, 2019; Mayo Clinic, 2020a). Studies show higher levels of patient adherence to FIT vs FOBT, as there are no dietary or medication restrictions and only 1-2 stool samples are required. Patients who have inflammatory bowel disease, are menstruating, or have active bleeding from hemorrhoids should

not take the FIT, as these conditions can result in false-positives. Examples of the FIT name brands are OC-Light iFOB test, QuickVue iFOB, Insure FIT, and Hemoccult ICT. FITs have sensitivity rates ranging from 65%-97% and a specificity of 74%-97%. These tests are performed once a year.

Fit-DNA

The Fit-DNA, also called a stool DNA test, is a stool test that looks for increased levels of DNA biomarkers (ACS, 2019; CDC 2019). As cells from CRC cancer and adenomas break down, DNA biomarkers are released into the stool. The Fit-DNA has a sensitivity rate of 92.3% and a specificity rate of 89.8%. These tests are performed once every three years. Cologuard is the only stool DNA test currently marketed in the US.

Blood-tests

An additional less invasive option for CRC screening is "liquid biopsy", or blood-based DNA test. In this test, a patient has a sample of blood taken to look for circulating cancer cells or pieces of DNA from tumor cells (NCI, 2020b). A brand name of this test is Epi proColon, a blood test used for the detection of methylated septin 9 (mSEPT9) gene. This test is approved by the U.S. Food and Drug Administration (FDA) for CRC screening for people considered average risk and have declined first-line screening tests (Lin, 2019). Benefits of this test include no patient preparation and potentially more convenient than fecal tests. Additionally, some patients may be more receptive and/or compliant to this method compared to other screening modalities.

The sensitivity of the mSEPT9 test is higher than the FIT sensitivity, and the mSPET9 test specificity is lower than the FIT specificity. One drawback to the mSEPT9 test is the lower specificity rate, indicating a higher rate of false negatives. Another drawback is that this is a screening test, not a diagnostic test, and must be followed up with a colonoscopy if a positive

result occurs. Furthermore, at the time of this publication, the USPSTF does not recommend this as a method for CRC screening and there is no research showing morbidity or mortality reductions or benefits from this test (NCI, 2020b). These tests are performed once a year.

Rural Populations

According to Healthy People 2020, only 58% of rural populations have been screened for CRC, in comparison to 66% of metropolitan areas (2018). The lower screening rates in rural areas are largely believed to be lack of or limited access to providers, limited availability to screening methods or providers, and limited medical resources (Wang et al., 2019). Wang et al's 2019 systematic review identified lower screening rates in rural areas due to financial barriers, embarrassment or discomfort of undergoing the screening procedures, lack of knowledge regarding and lack of perceived need for screening, and lack of health care providers recommendation to be screened. Their study also supported that evidence-based strategies to educate patients and health care providers to share information on all types of CRC screening test options, efficacies, and CRC treatment options can alleviate these barriers.

Primary Care Providers

Nurse practitioners (NPs) in the primary care provider (PCP) role are well suited to meet the needs of CRC education. NPs are trained to emphasize health promotion and disease prevention, helping individuals live longer and healthier lives (Dunphy et al., 2019). This is done by educating patients about their individual risk factors and changes they can make to prevent, or at a minimum delay, the onset of disease and potential sequela of disease. Furthermore, implementing and utilizing evidence-based practice can be an effective tool in encouraging healthy choices (AANP, 2021).

NPs and other PCPs play an important role in assisting patients to identify their risk of CRC, encouraging patients to follow through with CRC screening, and educating them on lifestyle reduction factors (Ghai et al., 2020). A 2016 systematic review revealed patients who reported an awareness of a need for CRC screening and patients with a recommendation to be screened from their PCP had the highest CRC screening participation rates (Honein et al., 2016). Furthermore, patients who had greater numbers of annual wellness visits with their PCPs reported higher CRC screening rates (Ghai et al., 2020).

To be most effective at providing care that reduces mortality and morbidity of CRC, PCPs needs to have an awareness of statistics, knowledge of who is eligible for screening, and understanding of risk factors and signs and symptoms of CRC. Due to the increasing trend of early-onset CRC, it is essential that PCPs feel comfortable in identifying high-risk young individuals for screening and promptly evaluating CRC symptoms (Ahnen et al., 2014). Several resources are available to guide PCPs in assessing risk, knowing when to screen and which screening test to perform. Some of these resources include CRC assessment risk tools (discussed below), free CME educational tools and webinars provided by the ACS, and USPSTF guidelines (ACS, 2021a).

Tools Available to Determine CRC Risk

PCPs have access to tools developed to obtain a cancer-related family history and improve a patient's risk for CRC. The Office of the Surgeon General has created a family history initiative portal to augment the accuracy of an individual's personal and family medical history. The National Cancer Institute (NCI) has created the "Colorectal Cancer Risk Assessment Tool", to determine the patient's risk (NCI, n.d.) Also, the NCCRT has developed a toolkit that provides clinical information, a list of common errors PCPs may make in risk assessment, and screening

recommendations. This toolkit also encourages an office-specific CRC screening policy, reminder system, and communication strategy, as these interventions can improve screening adherence and outcomes (Ahnen et al., 2014).

There are also the Amsterdam Guidelines and Revised Bethesda Guidelines that can help guide in assessing a patient's risk for CRC. Any patient that meets either criteria should have a referral placed to see a genetic counselor. The genetic counselor can then perform a more detailed assessment of familiar risk and provide further genetic testing (Ahnen et al., 2014).

Health Promotion

In addition to being aware of signs and symptoms of CRC for patients of all ages, and recommending appropriate screening interventions, health promotion is also vital to reduce the incidences of CRC. NPs have a fundamental role in health promotion with patients. Advocating for healthy behaviors such as being physically active, maintaining an ideal body weight, correction of Vitamin D deficiencies, limiting a diet high in animal meat and fat, not consuming excessive alcohol, and not smoking can reduce an individual's risk of CRC by at least one-third (Ahen et al., 2014; Siegel et al., 2020). Additionally, PCPs and all health care providers prescribing antibiotics responsibly may also decrease the incidences of CRC by limiting alterations of the glut flora.

Screening Recommendations

PCPs need to keep up to date on the current guidelines for when to begin screening and educate patients on the options available. The ACS offers a free CEU seminar for providers to complete on the various forms of screening tests available (ACS, 2021a). It's important for providers to know that some patients may feel embarrassment or reluctance in getting a colonoscopy yet may be willing to consider an alternative form of CRC screening. Being able to

offer alternative forms can alleviate embarrassment or discomfort for patients. Some rural patients may not have easy access to receive a colonoscopy, so educating patients on stool-based tests that can be mailed to their house and mailed to a laboratory can help address the gaps in CRC screening (Wang et al., 2019).

Providers also need to consider patient insurance coverage when determining an appropriate CRC screening test. The Affordable Care Act (ACA) requires Medicare and private insurance companies to cover the costs of CRC screening tests (ACS, 2021b). Sometimes patients run into coverage issues from their insurance companies when they have an alternative form of CRC screening first, receive a positive result, and have a colonoscopy for follow-up. Coverage concerns occur when insurance companies consider the initial CRC screening test as a "screening" test and the follow up colonoscopy is considered a "diagnostic" test. Consequently, patients are often required to pay the deductible and co-pay (ACS, 2021b). Health coverage concerns can be alleviated by educating patients on the various forms of CRC screening and encouraging patients to check into insurance coverage in the event of a positive result. Encouraging patients to participate in a colonoscopy for their initial screening can also help prevent coverage issues. However, the best screening option is the screening option that the patient is willing to get done. NPs are strategical placed in rural areas to help improve health care cost and access to help facilitate screenings.

CHAPTER 3: METHODS

Overall Project Design

The purpose of this dissertation topic was to increase awareness of colorectal screening options in rural ND. The project outcomes helped determine whether providing an educational booth with informational handouts and PowerPoint for adults ages 18-75 in a rural community in ND increases participants' knowledge and influences intent regarding CRC screening, and to better understand barriers to receiving CRC screening.

This was done through obtaining descriptive and qualitative information from adult participant surveys in the rural ND community of Grafton. The project was designed with evidence from the literature review, the dissertation committee, North Dakota Colorectal Cancer Roundtable (NDCCR) stakeholders, and collaborators at Reach the Heart, a non-profit organization with a goal to reach out to rural and underserved communities. An educational booth with an informational handout and PowerPoint was presented to voluntary participants. Participants were from a convenience sample from adults already attending a community event in a small-town setting in rural North Dakota. Post-survey results after visiting the educational booth were evaluated with descriptive statistics.

Implementation Plan

The implementation design was guided by the Iowa Model. The Health Promotion Model was also used as a framework to help identify potential barriers, guide direction of the interventions, and develop the post-survey. The following steps describe the process.

Steps 1-3: Identify a Trigger, Identify the Problem, Form a Team

The identified trigger for this project was the gap in CRC screening rates in rural areas. This health care discrepancy was determined to be a priority due to the potential reduction in

mortality and morbidity rates of CRC when screening is performed. An additional issue to address was the rising incidence of early-onset CRC in ND. A dissertation committee was formed. Reach the Heart partnership was sought and goals were identified. Input from the committee, stakeholders, and partnership with the outreach program were utilized in the design of the intervention and project implementation. Once implemented, the results were evaluated to determine if a change in practice should take place.

Steps 4-5: Appraise the Evidence

A literature review was conducted to examine evidence which indicates that educational interventions and addressing of barriers are effective means to increase CRC screening rates (Bone et al., 2020; Renault, 2021). Individuals who complete an education model on CRC indicate a higher likelihood of intent to screen. Additionally, addressing barriers can have a positive impact on a person's decision to pursue screening. Researchers also describe that utilizing an outreach program is an effective method to reach the rural populations (Cole et al., 2014; Geng & Gupta, 2013). While educational programs are effective at increasing knowledge and skills regarding an individual's health, when combined with an outreach program, an entire community is empowered to improve their overall health and well-being (Renault, 2021).

Step 6: Design and Pilot the Intervention

The co-investigator developed an educational booth from resources from the ACS, NCCRT, CCA, and NCI. Collaboration with Pastor Cal Thompson, president of Reach the Heart, was initiated to determine potential rural settings to implement. A review of available resources was determined through the help of the dissertation committee members, CCA, and the local public health department in the proposed community. Input from the dissertation committee and stakeholders was utilized in the final implementation plan.

Steps seven through nine included determining if the change is appropriate to implement into practice, integrating the change into practice, and disseminating the results. These steps were performed post-implementation and will be discussed in Chapter 5.

Setting

The project took place in the rural community of Grafton, ND. This site was selected by Pastor Cal to target a smaller rural area to make a local impact, as rural communities often have limited availability of resources (Thompson, 2021). After identifying areas with limited resources, Pastor Cal partners with local churches and health initiatives to meet community needs. One example is through organizing a weekend-long community event that is family friendly and free to attend. Collaborators with health initiative goals who want to target needs in the community are encouraged to collaborate with Pastor Cal. Examples of collaboration include setting up informational booths and providing educational sessions throughout the weekend events. For the implementation of this project, an educational booth with handouts and PowerPoint set on loop was provided during the time of the community meal and live music, when the greatest turnout of adults ages 18-75 was expected to attend.

Grafton, ND. The city of Grafton, ND has a population of 4,284 and is in Walsh County (United States Census Bureau, 2020). Of this population, 75% are considered White, 18% are Hispanic, 4% are Native, 1% Black, 1% Asian, and 1% are a combination of 2 or more races. The median age is 40.5 years old. Approximately 63% of the population is between the ages of 18-74.

There are two health care clinics available in Grafton called Unity Medical Center and Community Health Service Incorporated. These clinics include a combined total of five physicians, one physician assistance (PA), and four NPs serving the area. Fifteen miles away in

Park River, ND, an additional clinic and clinic/hospital area available: the Midgarden Family Clinic and First Care Health Center. Additional health care resources for the Grafton community include Walsh County Public Health in Grafton, ND and a sliding scale clinic called Valley Community Health Center located 41 miles away in Grand Forks, ND.

According to the Walsh County Health District, colonoscopies can be performed at both Unity Medical Center in Grafton and First Care Health Center in Park River. Public health does not distribute any screening tests. There are no community-based CRC screening clinics, other than what is provided by the above, mentioned clinics.

Sample/Sample Size/Recruitment

Adults ages 18-75 years who attended the community dinner were encouraged to participate in the educational booth. The age of 18-75 was selected to encompass the categories of eligible individuals to receive CRC screening based on age, family history, risk factors, and high prevalence of early onset CRC in the state of ND. Inclusion criteria included adults between the ages 18-75 years and able to understand, as well as read and write in English. Exclusion criteria included participants younger than 18 years, older than 75 years, and not able to understand and/or read and/or write in English. The total pool of possible participants in Grafton is 2,698. While considering these numbers, Pastor Cal believed that the total likely pool of individuals is 100, though varies greatly. Participation was voluntary and data were obtained only by participants who signed consent and chose to provide data. No pregnant or vulnerable populations were intentionally sought after, though pregnant and vulnerable populations were not excluded if they met inclusion criteria and volunteered to participate.

Participants were recruited by asking members attending the community dinner to consider participation at the educational booth. Advertising for the partnered event took place

via flyers in local community spaces (grocery stores, town hall, clinics), local church bulletins and social media platforms, and word of mouth through the community and local churches. Advertising also came from an article in the local newspaper, Walsh County Record, describing the free community events. This newspaper does both a printed and an electronic publication. The article included an invitation for those attending the community dinner to stop by and visit "an informational booth on colorectal cancer screening for all adults ages 18-75, with free apple cider and an opportunity to win gift cards."

Prior to implementation, this project was submitted to the Institutional Review Board (IRB) of North Dakota State University (NDSU). This ensured protection to the participants' rights, safety, and welfare during the study. No participant identifiers, such as name, birthday, or address were obtained. Additionally, patients were supplied with informed consent, so they had a better understanding of what their participation involves.

Educational Booth/Handouts/Post-Survey

An educational booth with handouts and PowerPoint set to loop on the co-investigator's personal laptop was developed by the co-investigator utilizing resources from the ACS, NCCRT, and Colon Cancer Alliance (CCA). Permission to use resources was obtained from the CCA (Appendix F). No permission was required from NCCRT or ACS, as these resources are free in the public domain and have been appropriately cited. The NCCRT and CCA have patient handouts available for clinicians to print off and distribute, which were utilized during implementation. A PowerPoint presentation on loop and verbal discussion by the co-investigator was offered at the booth and followed the same information found in the handouts.

At 5 pm, the start of the community dinner, Pastor Cal Thompson welcomed the community members and introduced the co-investigator. The co-investigator was brought up on

stage and gave a brief explanation of the purpose of the educational booth on CRC and encouraged community members to stop by the booth for some free apple cider, a chance to win gift cards, and to learn more about colorectal cancer and how to be screened. As members of the community went through the dinner line, they stood in front of the booth and were able to read a poster titled "Prevent Colon Cancer Throughout Your Life" (Appendix G) which served as a visual interest and a talking point discussion. The educational PowerPoint was also played on loop for community members to view and listen to as they stood in the line. The co-investigator was also able to engage in conversation about CRC with the community members standing in line. As community members finished going through the food line and sat down to eat, the co-investigator walked around and distributed brochures (Appendix H) to each adult individual and verbally encouraged participants to visit the booth. Verbal announcements from volunteers at Reach the Heart were also made encouraging participants to read the brochure and stop by and visit the colorectal cancer booth for some free apple cider, a chance to win gift cards, and to learn more about colorectal cancer and how to be screened. These verbal announcements occurred by the Reach the Heart Organization at 5:30 pm and 6:00 pm. The informational booth was available from 5pm-6:30 pm, the same duration as the community dinner.

A slideshow presentation at the booth was used as an electronic platform to present. The PowerPoint presentation was created by the co-investigator and included videos, figures/diagrams, and lecture. The information presented included CRC statistics, risk factors, lifestyle modifications to reduce risk, common signs and symptoms, types of screening available, and a recommendation to discuss further with their primary care provider. These topics were selected to fulfill the main idea of Objective 1, increase knowledge of CRC and screening options.

As people approached the booth, they were offered a cup of free apple cider. Then, the co-investigator asked interested people if they were between the ages of 18-75 and if they've had an opportunity to review the brochure. If they said "*no*" to the age of 18-75, the co-investigator did not extend an invitation to participate in the study. If participants said "*yes*" to the age range of 18-75 and "*no*" to the brochure, the co-investigator asked if the participant would like a brochure to review. If they answered "*yes*" to both questions, the co-investigator asked participants if they were willing to participate in a study for a chance to win a gift card from Caribou Coffee and this opportunity will take about 7-10 minutes of their time. If they were willing, the co-investigator handed them a consent form (Appendix E) to review, which took one to three minutes to read over. After reviewing the consent, participants were directed to watch a four-minute PowerPoint presentation on a laptop set up at the booth. Four chairs were available for participants to sit on while watching the PowerPoint presentation.

After watching the PowerPoint presentation, the co-investigator was available to answer any participant questions through discussion and then directed them to fill out a hard copy (16 question) post survey (Appendix I) which took about five minutes to complete. The post-survey was developed, with permission, from a previous nurse practitioner dissertation pilot study and modified for this project. Through the post-survey, the co-investigator gathered information of the knowledge the participants, perceptions of barriers, and intent to screen. Once completed, the co-investigator collected the surveys in a folder for data collection purposes under the booth and handed participants a ticket stub to keep, with a matching ticket stub to be placed into the gift card drawing canister. Participants were told that the gift card drawing will be done at 6:30 pm and they must be present to win or to give their ticket stub to someone who will be there at the 6:30 pm to collect for them. Participants could stop participating at any time without penalty.

Prior to implementation, gift cards from a local Grafton coffee shop, Caribou Coffee, were purchased in $5 increments in 10 gift cards for a total of $50. These gift cards were utilized in a drawing as incentives for participants to complete the survey for data collection. Post-surveys needed to be collected by the co-investigator to be eligible for being entered into the gift card drawing. The co-investigator performed the drawing on stage by shaking the can to disburse the tickets, then blindly drawing out 10 tickets, and reading the numbers aloud. Participants needed to show their matching ticket stub to the co-investigator at the booth to be given their gift card.

Demographic data collected included age range, gender, ethnicity, and acknowledgement of insurance. Questions were in the following formats: yes/no questions, multiple choice, qualitative questions, and Likert scales. The post-survey was developed to help evaluate Objectives 2 and 3. These objectives included identifying potential barriers to CRC screening and determining if an educational session and handouts increase intent to be screened.

Timeline

The project was implemented on a single occasion. The implementation date was 09/11/2021 in Grafton, ND.

The timeline for the creation and integration of the project was as follows:

- August 2020-May 2021 – Literature review and synthesis
- May 2021-July 2021 – Proposal development
- August 2021 – Approval of committee
- September 2021 – IRB Approval
- September 2021 – Implementation of project in Grafton, ND
- October-December 2021 – Compile assessment results

- February 2022 – Submit dissertation to committee and defend, share results and recommendations with collaborators
- May 2022 – Present results to NPs enrolled in the DNP program and faculty and NDSU; Submit dissertation to nursing program chair and graduate school

Budget

Funding for this project was dependent on the co-investigator's discretion. All resources and handouts were provided free of cost in digital form, or physical copies could be obtained for the cost of shipping. To enable ease of reading and allow participants to keep for future reference, the handouts was ordered in a color brochure and distributed to each participant. This tax-deductible cost of $25, included 100 brochures and was absorbed by the co-investigator. Additional costs absorbed by the co-investigator included gift cards to Caribou Coffee in Grafton, ND. These gift cards were $5 in amount, quantity ten, for a total of $100. The gift cards were utilized as a monetary incentive for participants to fill out the post survey and were awarded through a gift drawing. Other costs absorbed by the co-investigator included $8 for the raffle tickets (quantity 2,000), $100 in apple cider supplies, and an estimated $50 in gas.

Evaluation/Outcomes/Data Analysis

The objectives were evaluated with the help of a NDSU assigned statistician to determine if any statistical analysis is appropriate. Each objective was evaluated to determine if the practice improvement project met the goals. Relationships between the outcomes and interventions were also examined.

Objective 1

Increase knowledge of CRC and screening options after attending the educational session with informational handouts. Counting the number of brochures distributed was one

way of determining how many individuals in the community were able to review the educational information. The number of completed post-surveys was another method of identifying individuals who completed the education. Evaluating answers to the post-survey questions determined if the individual has already had screening, what his or her awareness is by measuring his or her characteristics and experiences, what perceptions surround education and screening methods, and an indication of intent to get screened for CRC in the future. Question six of the post-survey *"have you ever had screening for colorectal cancer before?",* question seven of the post-survey *"has your Primary Care Provider talked to you about screening for CRC?"* question eight of the post-survey "*did you know that you can complete screening in the privacy of your own home*" and question ten of the post-survey "*circle any or all benefits that CRC offers you*," were utilized in evaluating this objective.

Objective 2

Identify potential barriers to CRC screening in the rural community by the end of the educational session. At the end of the educational session, participants were encouraged to participate in a post-survey and return to the co-investigator. Comparing the data of the survey, including what might prevent a participant from being screened, and the open-ended questions, aided in identifying potential barriers. Question eleven "*circle any or all of the following that might keep you from getting screened*" helped evaluate this objective. Additional information regarding barriers can be gleaned from questions twelve through fourteen "*how likely are you to start/continue CRC screening; please explain why or why not."*

Objective 3

Evaluate if an educational presentation and hand-out session increased intent to be screened by participants by the end of implementation. Question thirteen of the post-survey

asked *"did the information presented today affect your intent to screen. Yes or No."* Evaluating this close ended question, in comparison to the remainder of the survey, helped evaluate if this goal was met.

CHAPTER 4: RESULTS

Data collected included both quantitative and qualitative. The completed number of surveys was 28 and all surveys were able to be included as completed. Tables were utilized to better summarize the data. Descriptive statistics were used to determine whether each objective was met. Table 1 includes responses regarding general demographics collected from the surveys.

Table 1

Survey Results

Question	Answer/Response (N=28)	Mean (%)
Age Range		
18-44	17	60.7
45-49	1	3.6
50-75	10	35.7
Male	12	42.9
Female	16	57.1
Ethnicity		
Caucasian	28	100.0
Hispanic or Latino Black	0	0
African American	0	0
American Indian	0	0
Asia/Pacific Islander	0	0
Other:	0	0
4. In your home, do you drink well water? If yes, is it filtered/treated? *(27 participants answered this question)*		
Yes	16	59.3
No	11	40.7
Yes (filtered/treated)	10	62.5
No (filtered/treated)	4	25.0
Not sure (filtered/treated)	2	12.5
5. Do you have health insurance?		
Yes	25	89.3
No	3	10.7
6. Have you ever had screening for colorectal cancer done? Which test did you complete at that screening?		
Yes	14	50.0
No	14	50.0
Stool testing (at home kits)	1	7.1
Procedure: colonoscopy, sigmoidoscopy or CT scan	13	92.9

Table 1. *Survey Results (continued)*

Question	Answer/Response (N=28)	Mean (%)
7. Has your Primary Care Provider talked to you about screening for CRC?		
Yes	13	46.4
No	15	53.6
8. Did you know that you can complete screening in the privacy of your own home?		
Yes	13	46.4
No	15	53.6
9. Have you, a family member, or a friend ever been diagnosed with CRC?		
Yes	7	25.0
No	21	75.0
10. Circle any or all benefits that CRC screening offers you:		
Prevent colorectal cancer	27	27.0
Detect colorectal cancer	28	28.0
Treat colorectal cancer early	24	24.0
Peace of mind	21	21.0
Not sure	0	0
11. Circle any or all of the following that might keep you from screening for colorectal cancer: *(twenty-five participants answered this question)*		
Costs too much to be screened	6	23.1
I cannot get to a place to be screened	0	0
I am not sure of what screening options there are	1	3.9
I do not want to talk about colorectal screening	0	0
Other: *(see Table 3 for qualitative data)*	19	73.1
12. How likely are you to start colorectal cancer screening?		
Very likely	6	21.4
Likely	5	17.9
Somewhat likely	6	21.4
Not likely at all	2	7.1
Not applicable – I have already started colorectal cancer screening	9	32.1
13. How likely are you to continue colorectal cancer screening?	14	50.0
Very likely	3	10.7
Likely	5	17.9
Somewhat likely	1	3.6
Not likely at all	5	17.9
Not applicable – I have not started colorectal cancer screening		
14. Please describe why or why not (regarding #12-13 above)	*See Table 3*	
15. Do you intend to be screened for colorectal cancer?		
Yes	26	92.9
No	2	7.1
16. Did the information presented today directly influence your intent to screen?		
Yes	18	64.3
No	10	35.7
Please describe why or why not (regarding #15-16 above)	*See Table 4*	

Objective 1

Increase knowledge of CRC and screening options after attending the educational session with informational handouts. Objective One was evaluated by questions seven, eight, and ten of the post-survey. See Table 2 below for a summary of the results of these questions. Questions six and nine listed in Table 1 also provide supportive data for this objective. Additionally, the number of brochures distributed to individuals at the event were 54, indicating the number of individuals provided with an opportunity to increase their knowledge. Of these 54 individuals, 28 participants attended the educational event and completed a post-survey. The total possible pool of adults attending the event is estimated to be 60, though the exact number is unknown.

Table 2

Survey Results Supporting Objective One

Question	Answer/Response (*N*=28)	Mean (%)
7. Has your Primary Care Provider talked to you about screening for CRC?		
Yes	13	46.4
No	15	53.6
8. Did you know that you can complete screening in the privacy of your own home?		
Yes	13	46.4
No	15	53.6
10. Circle any or all benefits that CRC screening offers you:		
Prevent colorectal cancer	27	27.0
Detect colorectal cancer	28	28.0
Treat colorectal cancer early	24	24.0
Peace of mind	21	21.0
Not sure	0	0

Objective 2

Identify potential barriers to CRC screening in the rural community by the end of the educational session. Objective Two was evaluated from the following close-ended and open-ended questions of the post-survey: *#5. "Do you have health insurance"* and *#11. "Circle any or all of the following that might keep you from getting screened.*" Three participants marked "*no*" to having medical insurance. All three of these participants listed cost as a barrier to receiving screening. Fifteen participants indicated a barrier of some form on the post-survey. See Table 1 (questions five and eleven) and Table 3 for review of data supporting this objective. While the co-investigator had individualized time with participants after completion of the post-survey to further discuss any questions or concerns regarding the educational session, no additional verbal feedback was given regarding barriers.

Table 3

Qualitative Data From Survey Results: [What] Might Keep You From Getting Screened [for CRC]?

Theme	**Qualitative Data**
Cost	"Unsure of cost and coverage" "Might be expensive"
Time	"Hard to get time off from work" "Time off from work to prep and recover" "Time and prep"
Embarrassment/Uncomfortable	"Absolutely will not do the prep" "At home test sounds gross" "I had a bad experience last time. It was embarrassing still having diarrhea while being checked in."
Other	"Will do it when my doctor recommends it" "Not old enough yet"
No barriers	"None" or "no barriers" (*10 participants wrote this*)

Objective 3

Evaluate if an educational presentation and hand-out session increased intent to be screened by participants by the end of implementation. Objective Three was measured by the closed-ended and open-ended questions of *#16.* "*Did the information presented today directly influence your intent to screen? Yes or no. Please describe why or why not?"* All twenty-eight participants provided a response of *"yes*" or *"no"* to the presentation affecting their intent to screen. Twenty-three participants gave a written response under *"please describe why or why not?"* Ten individuals marked *"no"* regarding their intent to screen. Eight of these wrote in they had already decided to be screened prior to the presentation, one wrote in *"cost and not at risk"*, and one individual gave no written response. Eighteen participants indicated *"yes"* to the presentation affecting their intent to screen. Four participants indicated health reasons being the reason they choose to get screened. Five participants indicated knowledge of at home screening tests influencing their intent. Six participants indicated increased knowledge as a reason for their decision to get screened. Four individuals marked *"yes"* and did not give a written response under why or why not. Table 4 has qualitative data indicating that increased knowledge positively affected participants decision to be screened.

Table 4

Qualitative Data From Survey Results: Did the Information Presented Today Directly Affect Your Intent to Screen? Why or Why not?

	Theme	Qualitative Data
Yes	For health reasons	"Important for my health" "Taking care of ones health" "Peace of mind" "Prevent cancer"
	At-home screening	"The at-home screening options" "Didn't know about at home screening" "…the option to do it at home is new information and I feel like it makes it a much easier option!" "If have to get screened will not do colonoscopy. Would consider at home screening tests if doctor tells me I have to." "Offered easier ways to detect at home screening"
	Increased knowledge	"I was hesitant but with this info I know it's important to follow up" "Reiterated importance" "Probably should" "I know what age to start screening now" "I didn't know I needed to be screened" "Learning of increased risk"
No	Already decided to be screened	"I was doing it already" "Mostly because of the prompting of my general practitioner forcing me to have it done" "Already see the benefits and am comfortable with the process" "Already done it/will continue"
	Cost	"Cost and not at risk"

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

Summary

The purpose of this dissertation topic was to increase awareness of colorectal cancer screening options in ND. The project aimed to increase awareness of colorectal cancer screening options for adults ages 18-75 in rural ND, to determine whether an educational booth with informational handouts and informational PowerPoint set on loop was an effective means to increase participants' knowledge and influence their intent regarding CRC screening, and to better understand barriers to receiving CRC screening. After completion of the project, all three objectives were met, though to varying degrees. Pertinent findings include participants in Grafton, ND acknowledging increased knowledge of screening methods, identifying barriers to receiving CRC screening, and signifying intent to begin or continue with CRC screening.

After implementation of the project, a review of literature from the years 2021-2022 was conducted to compare results of the project with the most current literature. One notable topic in the literature pertains to the Covid-19 pandemic and a decrease in the rate of CRC screenings (D'Ovidio et al., 2021; Gorin et al., 2021; Patel et al., 2021). This is largely due to clinics temporarily being shut down and/or patients experiencing fear of becoming infected by the Covid-19 virus by entering a public setting. While many clinics have opened back up after a temporary shutdown, unfortunately, some rural areas continue to be closed. Interventions to address the decrease in CRC screening during the pandemic include utilizing at home-screening tests, implementing mailed fecal immunochemical test programs (i.e. Cologuard), utilizing telehealth, increasing the capacity of screening centers, and finding interventions to reduce fear in the public (Mazidimoradi et al., 2021; Nodora et al., 2021). Additionally, current literature from 2021-2022 does support findings listed in Chapter 2, that providing educational

interventions in a community setting and utilizing the Health Promotion Model can increase the rates of CRCS (Leach et al., 2021). More specially, the scoping review by Leach, et al. (2021) indicates that when communities personalize their educational interventions to the needs of their communities, recognize and address barriers in their communities, implement interventional components such as handing out FIT and FOBT tests, and utilize print resources promoting CRCS, all of these interventions individually and collectively can increase CRCS rates.

Discussion

Objective One

The purpose of the first objective was to increase knowledge of CRC and screening options after attending the educational session with informational handouts. This objective was challenging to measure because there was no pre-survey conducted to definitively compare the post-survey data with regarding knowledge increase. However, answers to questions six, seven, and nine from the survey asking about participants' previous knowledge, could support participants' prior knowledge. Therefore, considering the results of these questions as previous knowledge and taking into account the results of question ten post-intervention, listing benefits that CRC screening offers, can possibly contribute to increased knowledge.

This objective was determined "partially met" by evaluating the quantitative data of questions seven, eight, and ten listed in Table 2 and supported by questions six and nine in Table 1, including the qualitative data from Table 4. Regarding question seven, 53% (n=15) indicated their primary care provider had not talked to them about CRC before. For question eight, 53% (n=15) indicated they were unaware they could complete screening in the privacy of their own home. The individuals who marked "*no*" to question seven were not always the same individuals who marked "*no*" to question eight.

Additionally, though there was no pre-survey to compare prior knowledge regarding CRC and screening options prior to the educational intervention, one can only infer based on the results of the post-intervention data from question ten that participants gained knowledge; however, one cannot prove. The post-intervention data from question ten demonstrated 100% of the participants were able to correctly identify that a benefit of CRC screening is to *"detect colorectal cancer."* Regarding additional benefits of receiving CRC, 96% correctly identified *"prevent colorectal cancer"*, 86% correctly identified *"treat colorectal cancer early"*, and 75% identified *"peace of mind"*. Also, Table 4 includes data of participants noting increased knowledge as evidenced by the following comments of: *"Didn't know about at home screening","...the option to do it at home is new information and I feel like it makes it a much easier option!", "I was hesitant but with this info I know it's important to follow up"*, *"I know what age to start screening now", "I didn't know I needed to be screened",* and *"Learning of increased risk."* These findings correlate with current literature which indicates that educational programs can empower their target audience to care for themselves by increasing their knowledge, thus improving their health and well-being (Renault, 2021).

While not clearly defined, there is potential that Objective One was supported by distributing brochures to individuals at the event and by the individuals that attended the educational booth. The number of brochures distributed to individuals at the event were 54, indicating the number of individuals provided with an opportunity to potentially increase their knowledge. Of these 54 individuals, 28 participants attended the educational event and completed a post-survey.

Objective Two

The second objective was to identify potential barriers to CRC screening in the rural community. Fifty-three percent (*n*=15) indicated a barrier of some form. Participants identified many of the same barriers that were noted in the literature review including cost, embarrassment or discomfort of undergoing the screening procedure, concern with time commitment, lack of knowledge, and lack of health care providers recommendation to be screened (Douthit et al., 2015; Jackson et al., 2016; May, 2019). The most frequently cited barrier was cost, cited by participants who had health insurance and those who did not. The cost barrier is consistent with the literature indicating rural locations may have lower insurance rates and lower income rates. Interestingly, from this small sample, men cited time as a barrier more than women. Cost as a barrier, was equally cited by both men and women.

Objective Three

The third objective was to evaluate if the educational handouts and presentation increased intent to be screened by participants. This objective was met by 64% of participants (*n*=18) marking *"yes"* when asked "*did the information presented today affect your intent to screen?"* Of these 18 individuals, 15 specifically cited increased knowledge of benefits or increased knowledge of screening options as their deciding factors. Furthermore, the qualitative data from Table 4 reflected that 64% of participants gained a greater understanding of the importance of getting screened for health reasons and acknowledgment of learning of the variety of screening options. This positive feedback also reinforces the literature, that educational programs can empower their target audience to care for themselves by increasing their knowledge, thus improving their health and well-being (Renault, 2021).

Regarding the remaining 10 participants who indicated *"no"*, the information did not affect their intent to screen, eight of these participants indicated they had already decided to be screened prior to the intervention. Of the 15 participants who identified a barrier to receiving screening, 13 indicated they were still likely to begin or continue receiving CRC screening, and two participants indicated they were not likely to begin CRC screening. This data supports that providing education on CRC screening test options can contribute to possibly alleviating barriers and positively influencing intent to screen. These positive outcomes are consistent with recommendations from current literature that educating patients on all types of CRC screening test options can alleviate barriers to getting screened (Wang et al., 2019). Furthermore, individuals that complete an education module on the types of CRC screening have a higher rate of reporting intention to screen (Cole et al., 2014; Geng & Gupta, 2013).

Additional data gleaned from the results of the survey include 59% (*n*=16) of the participants indicating they drink well water in their home. Of those, 25% stated their well water was not filtered or treated and 13% were unsure if their well water was filtered or not. This information is consistent with the statistics in North Dakota that approximately 60% of the state utilizes well water for private or public use (National Ground Water Association [NGWA], 2019). The use of untreated or unfiltered water was shared during the PowerPoint presentation under "risk factors for CRC." This information was included so that participants were made aware of their increased risk of CRC, especially regarding the prevalence of well water in a rural setting and its correlation to increased risk for CRC.

An additional potential benefit of the educational both was educating the community on the increased risk for early-onset CRC. Sixty-four percent of participants (*n*=18) who stopped by the educational booth were under the age of 50, which is the age range for early onset CRC.

While no further measurable data were collected to determine who was impacted, there were several opportunities for members of the community to become aware of this rising trend in cases of early onset CRC. During the initial announcement of the educational booth and introduction of the purpose of the booth, the co-investigator verbally shared this alarming statistic with all those in attendance and encouraged people of all ages to stop by the booth to learn more. As members of the community stood in line for the food table, they passed by the booth where the PowerPoint Presentation audibly played and shared statistics, including the rise of early onset CRC. Furthermore, the brochure that was handed out to each individual at the event included statistics and information on early onset CRC.

Recommendations

Collaborating with the Reach the Heart organization provided an ideal platform for positively impacting rural communities and encouraging health promoting behaviors. Partnering with trusted community entities for health programs and education implementation is also a way to enhance participation and trust in communities, such as rural areas (Estacio, 2017). Working with this organization also has potential to impact multiple communities in rural ND, as this group often performs events at multiple rural sites throughout the year. Continuation of this partnership, and similar community-based organizations, by utilizing their platform to reach members in a community and implementing educational booths regarding CRC can potentially increase the CRC screening rates and knowledge and awareness of CRC in rural ND communities.

The data collected during this project is in line with the current literature that educational interventions can positively impact members of a community to make health promoting choices (Renault, 2021). Armed with this knowledge, future community events can be hosted by a

plethora of organizations with an interest in increasing CRC awareness and screening rates. Utilizing the free multiple resources on CRC screening available through organizations such as the ACS, NCI, NCCRT, and CCA, educational interventions can be conducted by persons varying in education from a non-medical degree to the advanced practice providers in medicine.

One example of utilizing resources for an educational intervention is the promotion of National Colorectal Cancer Awareness Month, which occurs every year in March. During the month of March, the colorectal cancer community of advocates, patients, survivors, and caregivers rally together to promote awareness of CRC and encourage the community to get screened (CCA, 2022). Organizations and individuals can use the month of March to create small media campaigns by posting flyers and handouts throughout the community in physical buildings and posting on social media platforms. Had time constraints not impacted the implementation of this project, the co-investigator would have utilized March 2022 as an outlet for promoting Colorectal Cancer Awareness in surrounding rural areas.

The results of this project, as well as current literature, strongly reinforce the importance of providers sharing their knowledge, providing education, offering recommendations, addressing of barriers, and offering of multiple screening options to their patients as an effective means to influence intent to screen for CRC (Ahnen et al., 2014; Ghai et al., 2020; Honein et al., 2016; Wang et al., 2019). Advanced practice providers are in a prime position to encourage health promotion and disease prevention, and these conversations should occur with each encounter with their patients (AANP, 2021). Understanding the latest guidelines for CRC screening and prevention, as well as knowing an individual's risk and potential barriers, are crucial to conducting a conversation about CRC. Additionally, building a relationship of trust

with patients can positively influence a patients' intent to be screened at the recommendation of their provider (Renault, 2021).

Dissemination

Collecting information on current knowledge and reasons for getting screened, as well perceived barriers to receiving screening, in a rural ND town can be beneficial to the community. Utilizing this information and distributing to appropriate entities can aide future planning for improved educational opportunities and can help increase CRC screening rates in ND. As such, the findings of this project were presented in an Executive Summary (Appendix B) and shared with the American Cancer Society, CCA, and NDCCRT Liaisons, the Walsh County Public Health, and the Reach the Heart co-founder. Additionally, the co-investigator presented a poster at the 2021 North Dakota Nurse Practitioner Association Pharmacology Conference (peer reviewed) and will present at the NDSU College of Health Professionals Poster conference in May 2022, with the intent of influencing other DNP professionals to pursue similar projects. Also, the co-investigator plans to submit a three-minute doctoral dissertation video that will be submitted to the NDSU's graduate school in summary of the project. Lastly, the co-investigator is considering submitting journal articles to the *Journal of Family Nursing* and the *Clinical Journal of Oncology Nursing*.

Strengths and Limitations

Strengths of this project include the overall design, which contributed to all stated objectives being met to various degrees. The qualitative design allowed for a deeper understanding of barriers and perceptions of participants' intent to be screened, due to the open-ended framing of the questions and individualized attention. Other strengths included an effective partnership with a community-focused program like Reach the Heart, the incentive of

free hot apple cider on a cool rainy day, personal interaction with the participants, and strong recruitment in the community and communication during the event. Yet, the results of this study should be interpreted with caution, as there are several limitations.

Some limitations of the study included phrasing of some questions in the post-survey that may have impacted interpretation of the data. Twenty-five participants responded to question eleven *"circle any or all the following that might keep you from screening for colorectal cancer"*, yet only 15 participants indicated a barrier of some kind, and the remaining participants wrote *"none"*, *"no barriers*", or *"I do get screened"* under *"other (please write)"*. A better phrasing of this question would have been to include the listed barriers, *"other"*, and the addition of *"none or no barriers"*. A second difficulty in interpreting the data were discrepancies when questions asking the same information produced different answers. For example, 14 participants indicated *"yes"* to the question "*Have you ever had screening for colorectal cancer done*", while only nine participants marked intent to begin screening as "*not applicable – I have already started colorectal cancer screening."* Presumably, these numbers should be the same, but participants may have had a single occurrence of a colonoscopy for a certain reason, and not interpreted that as a means of receiving CRC screening. A third challenge in interpreting the data involved measuring the goal of *"increase knowledge of CRC and screening modalities"*, because there was no pre-survey data to compare to the post-survey after participants completed the educational intervention.

Additionally, due to the COVID-19 pandemic, the number of participants attending the community dinner may have been limited, as members of the community may have chosen to abstain from attend a large group gathering. Furthermore, due to the rainy conditions, the dinner and educational booth ended at 6:30 pm, instead of the planned 8:00 pm, which may have

negatively impacted the number of participants. Due to the smaller number of participants (*N*=28), the results cannot be generalized to a larger population. Implementing at multiple rural towns for a broader population pool may have allowed for better generalizations.

Comparison to Similar DNP Projects

At least two other projects have been completed regarding the topic of increasing CRC screening in rural ND in the past three years. One of these published dissertations is titled *Colorectal Cancer Screening: A Collaboration with Public Health and Primary Care to Increase Colorectal Cancer Screening in a Rural North Dakota Community* written by Dr. Laura Bond (2019). Dr. Bond's implementation included partnering with a local primary care clinic and public health center during influenza vaccination clinics. Her first objective was to increase the number of individuals receiving information on CRC and screening options, which was met by distributing brochures to individuals in the clinic. The second objective was to identify barriers of CRC screening, which was met through participants filling out a survey. Her third objective was to positively impact CRC screening rates in ND by distributing FIT screening kits, which was not met as no eligible participants accepted FIT kits during her implementation. Limitations to her project included having two different clinics implement her project, lack of advertising for CRC screening prior to the influenza clinic to recruit participants, encountering concerns from the clinics regarding time constraints in explaining and implementing the project to participants, and utilizing two different methodologies for implementation to address these concerns. Strengths included her survey to identify barriers, utilizing multiple sites for implementation, and implementing during two influenza seasons.

The second published dissertation is titled *Colorectal Cancer: Utilizing Educational Handouts, Endorsement Letters, and Questionnaires to Increase Screening and Identify Barriers*

and Facilitators at a Rural Clinic in Elgin, North Dakota written by Dr. Joshua Hadsell (2020). The project implementation provided CRC screening educational handouts and screening endorsement letters to at risk individuals. Limitations included restrictions of the clinic's electronic health record (EHR) in identifying CRC screening compliance rates and delayed timing of the follow up telephone questionnaire after receiving the handouts and endorsement letter. Strengths of the project included the follow-up phone call "Telephone Questionnaire" to identify barriers and positive feedback and impact of the endorsement letters.

Like these two previous projects, this current project had the strength of a survey that identified barriers to receiving CRC and was consistent with the findings in the literature. In contrast to these two studies, this current project had the strength of recruitment to engage participants, as evidenced by 47% of individuals in the total pool participating in the survey. This high rate of recruitment was likely due to the personal invitation the co-investigator gave participants at the dinner, as well as the advertising done prior to and during the event. Dr. Bond's results identified that when advertising for her project was done via a poster and no verbal discussion, no one filled out the survey or received a FIT screening test. Her only survey results and identification of eligible participants for a FIT screening test occurred when the clinic staff verbally discussed the project to the participants. For Dr. Hadsell's project, he had a limited response to his mail-back questionnaire, until he decided to add on a personalized follow up telephone questionnaire which resulted in a strong response from his total pool of participants. Future projects can consider these comparisons as they design similar projects.

Application to the NP Role

The core curriculum of DNP programs incorporate "Essentials of Doctoral Education for Advanced Practice Nursing" from the American Association of Colleges of Nursing (AACN)

and the "Practice Doctorate Nurse Practitioner Entry-Level Competencies" from the National Organization of Nurse Practitioner Faculties (NONPF) (Chism, 2019). These standards are designed to help the DNP evaluate, integrate, translate, and implement EBP. Utilizing the above standards and competencies, the DNP role equips healthcare providers to engage in conversations with patients and identify barriers, advocate for patients, promote health, prevent disease, influence organizational change, and provide leadership. DNPs are also exceptionally prepared to implement a practice improvement project and evaluate the interventions, which in turn can be utilized to provide further education and improve patient outcomes while using EBP.

This dissertation project reinforces how DNPs are highly qualified to contribute to and practice EBP within the nursing profession. The AACN DNP Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes was utilized during the implementation of this project, demonstrating how developing expertise in a topic area and collaboration with other entities can improve patient care. This project also utilized Essential VIII, which includes assessing the clients' health care needs and implementing therapeutic interventions. The results of this project of utilizing educational handouts regarding CRC risk factors and types of screening can be used by healthcare professionals to promote healthy behaviors and increase CRC screening rates.

Conclusion

Colorectal cancer is the second leading cause of cancer-related death in the United States (ACS, 2020b). Preventative CRC screenings help to reduce mortality through early detection, yet only 65% of the ND population is up to date with their screening (NDCCRT, 2020). The purpose of this project was to increase awareness of CRC and screening options for adults in the rural community of Grafton, ND, determine if educational interventions increased participants'

knowledge and intent to receive CRC screening, and to explore barriers to receiving CRC screening. The results of this dissertation supported that educational interventions helped increase participants' knowledge and positively influenced their intent to receive CRC screening. This project also provided an avenue to explore potential barriers to receiving CRC screening in Grafton, ND. The results and project design of this dissertation can aide future projects to continue to help merge the gap between the screened and unscreened population for CRC, leading to improved health outcomes.

To increase screening rates, barriers must first be addressed, and individuals should be empowered to care for themselves by increasing their knowledge and skills. Partnering with an organization that is equally invested in community-based health promotion is a beneficial way to recognize and address barriers, as well as provide interventions to the community members. The barriers identified in the community of Grafton are similar to the barriers identified in rural communities nationwide. As the literature indicates though, as each community is unique, there are numerous modalities to provide interventions that can increase CRCS and each intervention should be tailored to the individual communities.

DNPs and other practitioners should take into consideration the results of the study project and the literature supporting CRC screening. The DNP role is well suited to help lead screening efforts, on an individual basis with their patients or to the general public at large, by providing education on the prevalence of CRC, the variety of screening methods available, and addressing potential barriers. When DNPs utilize the findings of this project and understand how effectively educational interventions can positively impact an individuals' health related choices, they can help improve health promotion strategies. As such, DNPS can have a lasting impact on reducing CRC morbidity and mortality rates.

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APPENDIX A: IRB APPROVAL

NDSU NORTH DAKOTA STATE UNIVERSITY

09/08/2021

Dr. Heidi Lynn Saarinen
Nursing

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #IRB0003845, "COLORECTAL CANCER: INCREASING AWARENESS OF SCREENING IN A RURAL NORTH DAKOTA COMMUNITY"

NDSU Co-investigator(s) and research team:

- Heidi Lynn Saarinen
- Karissa Gladen

Approval Date: 09/08/2021
Expiration Date: 09/07/2024
Study site(s): The setting will take place in the rural town of Grafton, ND at Buster Schumacher Park. An informational booth will be set up during the community meal, when the greatest turnout of adults ages 18-75 are expected to attend. Research will be conducted during this single interval of time.
Funding Agency:
The above referenced human subjects research project has been determined exempt (category 2,3) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*).

Please also note the following:

- The study must be conducted as described in the approved protocol.
- Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Promptly report adverse events, unanticipated problems involving risks to subjects or others, or protocol deviations related to this project.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.

NDSU has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

RESEARCH INTEGRITY AND COMPLIANCE
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | ndsu.research@ndsu.edu
Shipping Address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

APPENDIX B: EXECUTIVE SUMMARY

Increasing Awareness of Colorectal Cancer Screening

Introduction to Study

Colorectal cancer (CRC) is the second leading cause of cancer deaths in the United States, yet only 67% of the eligible population have received screening (ACS, 2020b). As of 2018, the most recent data available for ND, indicates that 35% of residents are not up to date with CRC screening (NDCCRT, 2020). Preventative CRC screenings help to reduce mortality through early detection, which allows CRC to be found at the pre-cancerous or early stages, when the disease is highly curable. This project focused on increasing awareness of CRC screening via an educational booth with informational handouts and PowerPoint for the community of Grafton, ND, with the purpose of understanding barriers, increasing knowledge, and positively influencing intent to screen for CRC.

Project Design

While there is strong evidence for the success of CRC screening, a gap remains in the number of individuals who are eligible to be screened and those who receive the screening. Numerous barriers can be attributed to this gap (Douthit et al., 2015; Jackson et al, 2016; May, 2019). Previous studies demonstrate that individuals who complete an educational intervention have higher rates of reporting intent to screen (Bone et al., 2020). Additionally, partnering with a trusted and respected organization in the community can positively impact the outcome of the educational program (Cole et al., 2014; Estacio et al, 2017; Geng & Gupta, 2013). Furthermore, addressing barriers to receiving screening can influence an individuals' intent to screen. This project was conducted in collaboration with the Reach the Heart organization to reach members of the community and utilized educational resources from the American Cancer Society, National Cancer Institute, National Colorectal Cancer Roundtable, and Colon Cancer Alliance.

Process

An educational booth was set up in Grafton, ND during an outdoor community dinner organized by Reach the Heart. Advertising for the event took place via flyers in local community spaces, local church bulletins, social media platforms, and an article in the local newspaper. Participants were invited to stop by the booth for free apple cider and to learn more information about CRC, as well as a chance to win a gift card. During the dinner, all adults ages 18-75 were handed a brochure on CRC and invited to stop by the booth. Participants who visited the booth watched an informational PowerPoint set on loop. The information presented included CRC statistics, risk factors, lifestyle modifications to reduce risk, common signs and symptoms, types of screening available, and a recommendation to discuss further with their primary care provider. After reading the brochure and watching the PowerPoint, participants were asked to fill out a post-survey for an opportunity to win a gift card. A gift card drawing was done at the end of the dinner. Responses from the post-survey were collected and analyzed.

Main Findings

- 28 participants stopped by the booth and completed a survey (*N*=28)
- 64% (*n*=18) of participants indicated increased knowledge on CRC and/or screening modalities
- 18 participants indicated the educational intervention positively influenced their intent to be screened
- 53% (*n*=15) of participants identified barriers of some form in receiving CRC screening
    - Of these 15 participants, 13 indicated that due to the educational session, they were still likely to begin or continue CRC screening
- Top 3 barriers: cost, time, embarrassment/uncomfortable

Recommendations for Further Action

- Continue partnership with trusted community entities (i.e. Reach the Heart) for educational health programs, as a way to positively impact rural communities.
- Continue implementing educational interventions, such as educational booths, as they can empower members of a community to make health promoting choices.
- Continue to identify and alleviate barriers that exist in the community to increase CRC screening compliance.
- Utilize free educational resources from organizations such as the ACS, NCI, NCCRT, and CCA for teaching and promoting awareness of CRC:
    - Example: promote National Colorectal Cancer Awareness Month, which occurs every year in March
- Primary health care providers are strongly recommended to share their knowledge, educate patients/general public, provide recommendations, address barriers, and offer multiple screening options to their patients/general public as an effective means to influence intent to screen for CRC.
- Further research with larger samples needs to be done to better understand barriers to receiving CRC screening.

APPENDIX C: PERMISSION TO USE THE IOWA MODEL REVISED: EVIDENCE-BASED PRACTICE TO PROMOTE EXCELLENCE IN HEALTH CARE

From: Kimberly Jordan - University of Iowa Hospitals and Clinics
Sent: Tuesday, August 3, 2021 9:42 PM
To: Gladen, Karissa
Subject: Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

The Iowa Model Revised (2015)

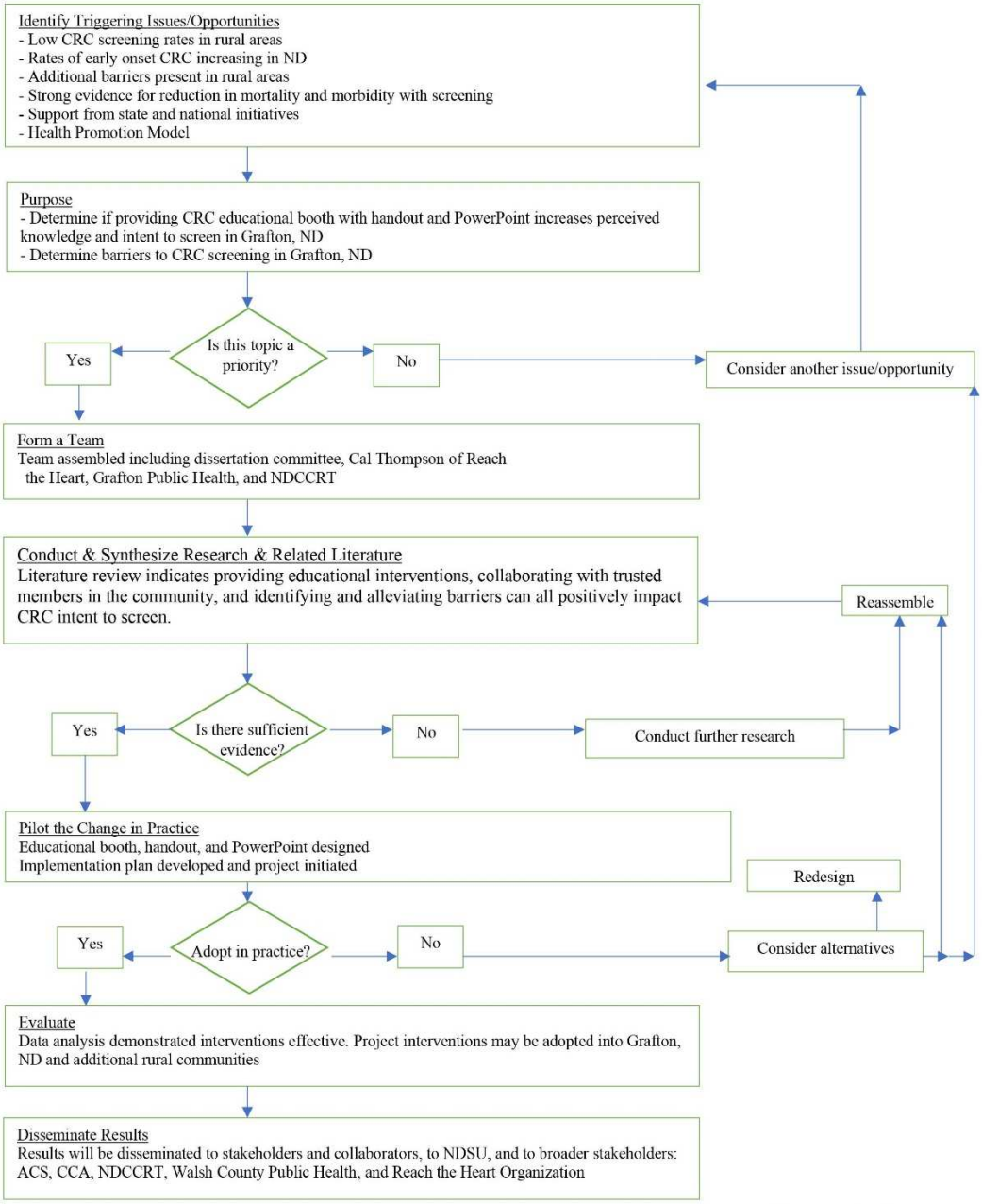
Copyright is retained by University of Iowa Hospitals and Clinics. **Permission is not granted for placing on the internet.**

Reference: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223*

> In written material, please add the following statement:
> *Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098.*

Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

APPENDIX D: THE IOWA MODEL REVISED: EVIDENCE-BASED PRACTICE TO PROMOTE EXCELLENCE IN HEALTH CARE



The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care. Used/Reprinted with permission from the University of Iowa Hospitals and Clinics. Copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at (319)384-9098.

APPENDIX E: INFORMED CONSENT FOR PARTICIPANTS

NDSU **North Dakota State University**
Department of Nursing
Aldevron Tower 540
NDSU Dept. 2670
PO Box 6050
Fargo, ND 58108-6050
701.231.7395

Increasing Awareness of Colorectal Cancer Screening in a Rural North Dakota Community

Dear Grafton Community Members:

My name is Karissa Gladen. I am a graduate student in the Doctorate of Nursing Program at North Dakota State University, and I am conducting a research project to increase colorectal cancer (CRC) awareness and screening throughout the community of Grafton, ND. It is our hope, that with this research, we will learn more about ways to increase knowledge of CRC, influence intent to screen, and understand barriers to receiving CRC screening.

Because you are between the ages of 18-75, you are invited to take part in this research project. Your participation is entirely your choice, and you may change your mind or quit participating at any time, with no penalty to you.

It is not possible to identify all potential risks in research procedures, but we have taken reasonable safeguards to minimize any known risks. These known risks include feeling emotional distress or discomfort.

By taking part in this research, you may benefit by having an increased knowledge and understanding of CRC and the importance of getting screened. Additionally, you may benefit from winning a gift card. However, you may not get any benefit from being in this study.

It should take about 3-5 minutes to complete the questions in the post survey. You may hand in the post-survey at the informational booth. After handing in a completed post-survey, you will receive a ticket for a gift card drawing. Keep this ticket, as all winners will need to show the winning ticket prior to picking up their gift card at the informational booth. The expected probability of winning is 1 in 5 chances.

This study is anonymous. That means that no one, not even members of the research team, will know that the information you give comes from you. All results will be kept solely for the project. **By completing this survey, you give consent to participate in the research for this project.**

If you have any questions about this project, please contact me at

Karissa Gladen, RN CWOCN DNP-Student

605-430-6601

Karissa.Gladen@ndsu.edu

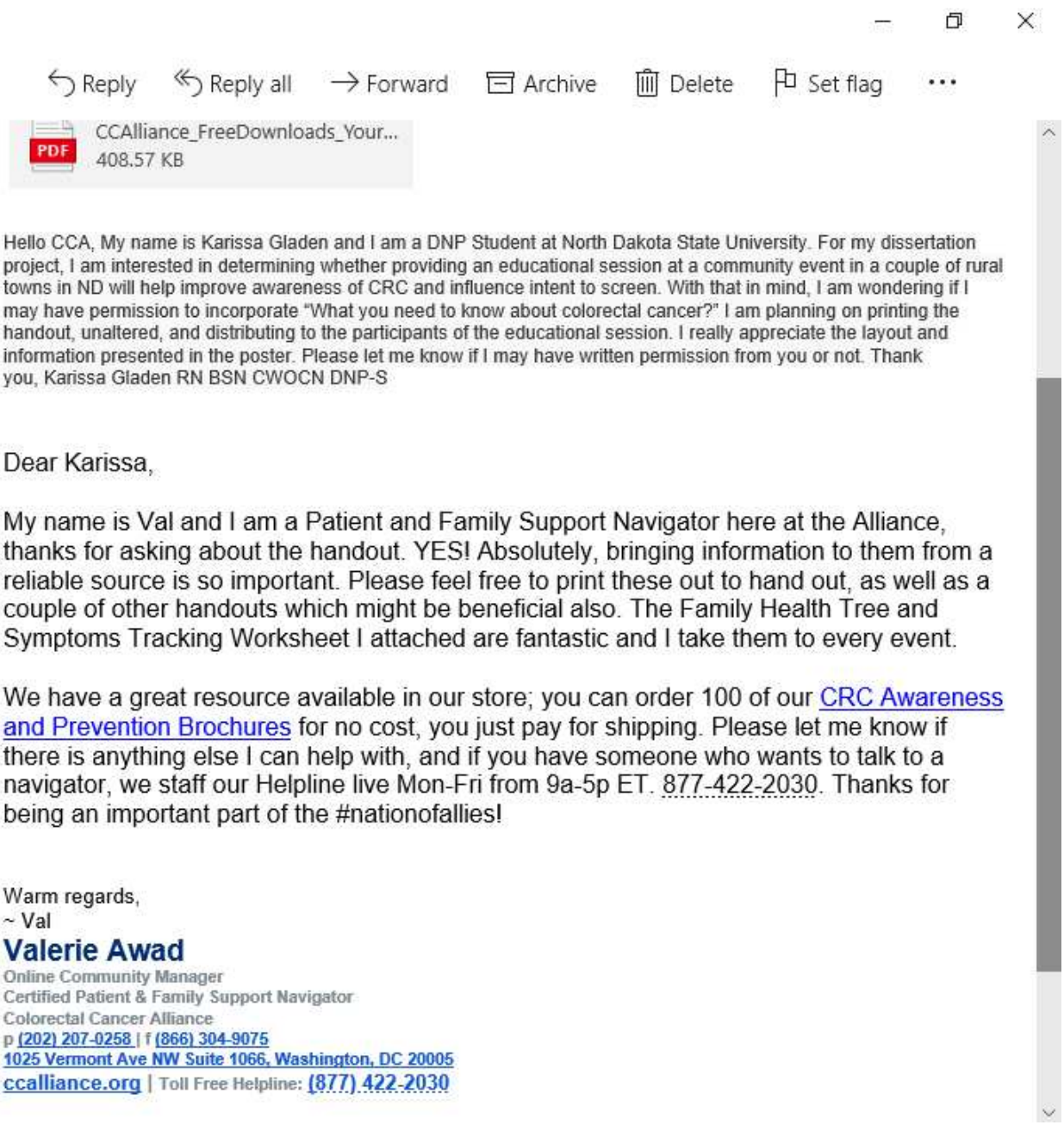
or contact my advisor at Dr. Heidi Saarinen: Heidi.Saarinen@ndsu.edu

You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at 701.231.8995, toll-free at 1-855-800-6717, by email at ndsu.irb@ndsu.edu, or by mail at: NDSU HRPP Office, NDSU Dept. 4000, P.O. Box 6050, Fargo, ND 58108-6050.

Thank you for your taking part in this research. If you wish to receive a copy of the results, please contact either myself, or my advisor Dr. Heidi Saarinen via the contact information listed above.

Karissa Gladen, RN CWOCN DNP-Student

APPENDIX F: PERMISSION TO USE HANDOUTS



Reply Reply all Forward Archive Delete Set flag ...

CCAlliance_FreeDownloads_Your...
408.57 KB

Hello CCA, My name is Karissa Gladen and I am a DNP Student at North Dakota State University. For my dissertation project, I am interested in determining whether providing an educational session at a community event in a couple of rural towns in ND will help improve awareness of CRC and influence intent to screen. With that in mind, I am wondering if I may have permission to incorporate "What you need to know about colorectal cancer?" I am planning on printing the handout, unaltered, and distributing to the participants of the educational session. I really appreciate the layout and information presented in the poster. Please let me know if I may have written permission from you or not. Thank you, Karissa Gladen RN BSN CWOCN DNP-S

Dear Karissa,

My name is Val and I am a Patient and Family Support Navigator here at the Alliance, thanks for asking about the handout. YES! Absolutely, bringing information to them from a reliable source is so important. Please feel free to print these out to hand out, as well as a couple of other handouts which might be beneficial also. The Family Health Tree and Symptoms Tracking Worksheet I attached are fantastic and I take them to every event.

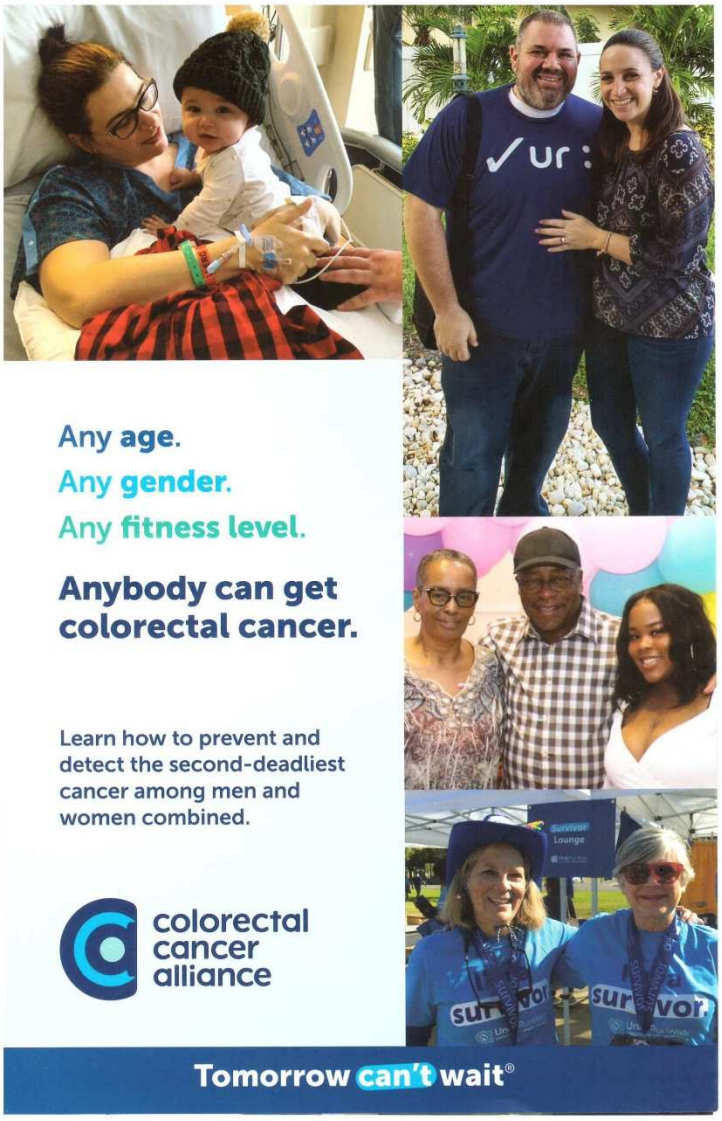
We have a great resource available in our store; you can order 100 of our CRC Awareness and Prevention Brochures for no cost, you just pay for shipping. Please let me know if there is anything else I can help with, and if you have someone who wants to talk to a navigator, we staff our Helpline live Mon-Fri from 9a-5p ET. 877-422-2030. Thanks for being an important part of the #nationofallies!

Warm regards,
~ Val

Valerie Awad
Online Community Manager
Certified Patient & Family Support Navigator
Colorectal Cancer Alliance
p (202) 207-0258 | f (866) 304-9075
1025 Vermont Ave NW Suite 1066, Washington, DC 20005
ccalliance.org | Toll Free Helpline: (877) 422-2030

APPENDIX G: PREVENT COLON CANCER THROUGHOUT YOUR LIFE POSTER

APPENDIX H: EDUCATIONAL HANDOUT



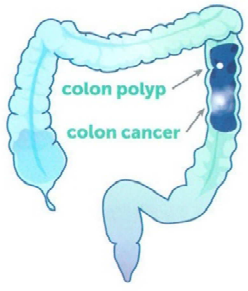
What is colorectal cancer?

Colorectal cancer, or CRC, is a disease of the colon or rectum, which are parts of the digestive system. Unlike most cancers, **colorectal cancer is often preventable** with screening and highly treatable when detected early.

> *My wife noticed my changing bowel habits and insisted that I get screened. I'm young, and I try to live a fairly healthy lifestyle. The last thing I expected to hear was that I had cancer, but screening saved my life.*
>
> **— Jason, 48**

Most cases of colorectal cancer occur in people ages 45 and older, but the disease is **increasingly affecting younger people**. In 2021, an estimated **149,500** Americans will be diagnosed with this disease, and an estimated **52,980** will die.

Colorectal cancer starts as an abnormal tissue growth, which is called a polyp, inside the colon or rectum. With the help of screening tests, doctors can detect polyps, remove them, and prevent them from developing into colorectal cancer.



CRC will affect 1 in 24 people.

How can CRC be prevented?

Screening is the No. 1 way to prevent colorectal cancer or detect it early, when it's most treatable. Colorectal cancer usually develops over a period of 10 to 15 years, often without symptoms. When screening detects CRC early, survival rates can be as high as 90%. It's important for all people at average risk to **get screened starting at age 45 and earlier if you have one or more risk factors**.

Common Screening Methods

Every 10 years

COLONOSCOPY

A colonoscopy is the standard screening method for people at higher risk and can be used for average-risk individuals, too. A doctor uses a thin tube with a camera to see inside your colon and rectum while you're under anesthesia. If found, polyps can be removed during this routine and safe procedure.

Every 3 years

STOOL DNA

At home, people of average risk collect a sample stool and mail it to a lab for analysis. The lab looks for abnormal DNA and blood in the stool, which can indicate cancer. A positive test requires a follow-up colonoscopy.

Every 1 year

FIT (FECAL IMMUNOCHEMICAL TEST)

Just like a stool DNA test, average-risk users take a sample and place it on a card for analysis. Most tests are sent to a lab, and some newer tests can be completed at home. The test alerts for blood that can't be seen. A positive test requires a follow-up colonoscopy.

Risk Factors

- Inflammatory bowel diseases such as Crohn's disease or ulcerative colitis
- A personal or family history of colorectal cancer or colorectal polyps
- A genetic syndrome such as familial adenomatous polyposis (FAP) or hereditary non-polyposis colorectal cancer (Lynch syndrome)
- Black/African Americans and Ashkenazi Jews are at higher risk

Learn more at **ccalliance.org/crcinfo**

Common Symptoms

- Blood in or on stool
- Persistent unusual bowel movements like constipation or diarrhea
- Stomach pain, aches, or cramps that don't go away
- Losing weight for no reason

Ask your doctor which screening test is right for you.
Learn more at **getscreened.org.**

Take steps toward prevention

Live a Healthy Colon Lifestyle

While some unavoidable health issues increase risk, these actions can help prevent colorectal cancer.

- ☑ Eat healthy
- ☑ Don't smoke
- ☑ Maintain a healthy weight
- ☑ Add calcium and vitamin D to your diet
- ☑ Exercise regularly
- ☑ Limit red meat intake
- ☑ Know your family history of disease
- ☑ Limit alcohol consumption

Ask Questions Now

Use these questions to start a conversation about CRC prevention with your doctor. You should also learn about your family's health history.

ASK YOUR DOCTOR

- What is my risk for colorectal cancer?
- When should I start getting screened?
- What test do you recommend based on my risk?
- How often should I get screened?

ASK YOUR FAMILY

- Has anyone in our immediate family had colorectal cancer?
- Have they had polyps removed?
- Do they have Crohn's disease or ulcerative colitis?
- Share answers with your doctor.

Know that You're Never Too Young

In the U.S., approximately **10% of colorectal cancer cases are diagnosed in individuals under age 50, and about half of those are people aged 45 to 49**. Young people with symptoms should talk to a doctor and be appropriately screened. Learn more about young-onset colorectal cancer at **nevertooyoung.org**.

Have Questions?

Call the Colorectal Cancer Alliance Helpline at **(877) 422-2030**, Monday through Friday from 9 a.m. to 5 p.m. EST, to speak with a certified patient and family support navigator.

Learn more at ccalliance.org

> *I'm proud of being my own advocate, knowing that I needed screening and getting it done. I was lucky the cancer was caught early — had I waited, who knows?*
>
> *— Margo, 54*

Connect with the **Colorectal Cancer Alliance** on social media.

APPENDIX I: POST-SURVEY

Colorectal Cancer (CRC) Screening:

Please fill out survey with pen/pencil.

1. Please circle your age range: 18-44 45-49 50-75

   (If age younger than 18 or older than 75, end of survey - Thank you!)

2. Please circle your biologic gender: Male or Female

3. Please circle which ethnicity best describes you:

   Caucasian American Indian

   Hispanic or Latino Black Asian/Pacific Islander

   African American Other: _____

4. In your home, do you drink well water? Yes or No

   If yes, is it filtered/treated? Yes or No or Not Sure

5. Do you have health insurance? Yes or No

6. Have you ever had screening for colorectal cancer done? Yes or No

   If yes, list what age/year you completed screening_____

   Which test did you complete at that screening? (Please circle one option)

   a. Stool testing (at home kits)

   b. Procedure: Colonoscopy, sigmoidoscopy or CT scan

7. Has your Primary Care Provider talked to you about screening for CRC? Yes or No

8. Did you know that you can complete screening in the privacy of your own home? Yes or No

9. Have you, a family member, or a friend ever been diagnosed with CRC? Yes or No

10. Circle any or all benefits that CRC screening offers you.

Prevent colorectal cancer

Detect colorectal cancer

Treat colorectal cancer early

Peace of mind

Not sure

11. Circle any or all the following that might keep you from screening for colorectal cancer:

Costs too much to be screened

I cannot get to a place to be screened

I am not sure of what screening options there are

I do not want to talk about colorectal screening

Other (please write) _____

12. How likely are you to start colorectal cancer screening?

Very Likely

Likely

Somewhat likely

Not likely at all

Not applicable – I have already started colorectal cancer screening

13. How likely are you to continue colorectal cancer screening?

Very Likely

Likely

Somewhat likely

Not likely at all

Not applicable – I have not started colorectal cancer screening

14. Please describe why or why not? (regarding questions #12-13 above)

15. Do you intend to be screened for colorectal cancer? Yes or no

16. Did the information presented today directly influence your intent to screen? Yes or no

Please describe why or why not (regarding question #18 above)