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The Impact of an Evidence-Based Multi-component Intervention on Colorectal Cancer Screening in Primary Care at a Healthcare System

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Abstract

Practice Problem: Colorectal cancer is the second leading cause of cancer death in the United States; many of the deaths are preventable with early detection. Adherence rates for colorectal cancer screening with fecal immunochemical test kits (FIT) was below the national benchmark at this facility.

PICOT: The PICOT question that guided this project was: Among veterans 50 – 75 years old requiring average risk colorectal cancer screening (CRCS) seen in primary care at a veterans affairs healthcare system facility (P), how does the use of a multi-component intervention (I), compared to the usual care (C), affect the number of patients completing CRCS (O) over a period of 12 weeks (T)?

Evidence: Review of high-quality studies suggested a multi-component approach, including increasing provider awareness and increasing patient education and outreach, as the most effective approach to increase colorectal screening compliance.

Intervention: The multi-component intervention included a standardized CRCS nurse navigation process through standard work which included the teach-back method, patient outreach, and provider feedback.

Outcome: There were clinically significant improvements in adherence with returned FIT kits, follow up for abnormal FIT kits, and statistically significant improvements with nursing documentation of patient teaching. The number of patients overdue for CRCS decreased.

Conclusion: The multi-component CRCS screening intervention demonstrated significant improvements in the intervention clinics which is consistent with the body of evidence.

The Impact of an Evidence-Based Multi-component Intervention on Colorectal Cancer Screening in Primary Care at a Healthcare System

"Dying from embarrassment" may be more than a saying when it comes to colorectal cancer. Colorectal cancer (CRC) is the second most common cause of cancer deaths in the United States (American Cancer Society [ACS], 2020; Centers for Disease Control and Prevention [CDC], 2020). However, the five-year survival rate can be as high as 90% when CRC is detected in its early stage (Agency for Healthcare Research and Quality [AHRQ], 2018; ACS, 2020; CDC, 2020). A critical component in early detection is colorectal cancer screening (CRCS) for adults between the ages of 50 and 75 (AHRQ, 2018; ACS, 2020; CDC, 2020). Despite improvements in access to CRCS, other barriers, such as lack of education, fear, and embarrassment (Reynolds et al., 2018), still pose obstacles in reaching higher screening rates. These barriers contribute to premature deaths that could have been prevented by a simple CRCS (Adams et al., 2018; Brouwers et al., 2011b, 2011a; Dolan et al., 2004).

The National Center for Health Promotion and Disease Prevention provides guidance for a comprehensive CRC prevention and screening program (U.S. Department of Veterans Affairs [USDVA], 2020a). At the project site, a Veterans Affairs (VA) healthcare system, the CRCS rate from a 2020 random audit (75.6%) was below the national benchmark of 80% (National Colorectal Cancer Roundtable [NCCRT], 2021; Office of Disease Prevention and Health Promotion [ODPHP], 2020a; U.S. Department of Veterans Affairs [USDVA], 2020c). Mitigating missed opportunities to prevent avoidable deaths by increasing CRCS aligned with the VA's high reliability organization (HRO) journey (AHRQ, 2019; Grabowski & Roberts, 1997).

Significance of the Practice Problem

Estimates of deaths due to CRC are over 50,000 per year in the United States (Siegel et al., 2018, p. 8). Tragically, many of these deaths could have been prevented with early screenings (CDC, 2020; National Committee for Quality Assurance, 2020; Redaelli et al., 2003; Wilkins et al., 2018; Wolf et al., 2018). Because CRC does not produce symptoms until the more advanced stages, screening before symptoms appear is crucial for early detection (Wilkins et al., 2018; Wolf et al., 2018).

In addition to the societal impact of morbidity and untimely deaths caused by CRC, CRC's economic burden is significant (Dieguez et al., 2017; Yabroff et al., 2008, 2011). Yabroff et al. (2011) estimated CRC costs $14.1 billion per year in the United States. Due to its relatively long disease course, CRC has one of the highest economic cancer burdens (Yabroff et al., 2008). Costs include frequent surveillance procedures, surgeries, chemotherapy, radiation therapy, and inpatient comfort care (Redaelli et al., 2003). In addition to healthcare costs, CRC causes an economic burden due to lost productivity by the patient (Bradley et al., 2011; Pearce et al., 2016). Bradley et al. (2011) projected that lost productivity caused by CRC would be $4.2 billion in 2020 (p.5).

Most CRCs begin as slow-growing, pre-cancerous polyps (Tobi, 1999). The identification and treatment of pre-cancerous polyps while the lesions are in a localized stage significantly increase survival chances (ACS, 2020; Siegel et al., 2018). Two methods for CRC screenings include stool-based tests and visual examination (Levin et al., 2008; Wilkins et al., 2018; Wolf et al., 2018). The colonoscopy is the most common visual examination CRCS procedure (Levin et al., 2008; Wilkins et al., 2018; Wolf et al., 2018). An example of a common stool-based test is the fecal immunochemical test or FIT (Levin et al., 2008; Wilkins et al., 2018; Wolf et al., 2018) . Data from 2018 shows that 25% of U.S. adults did not get screened for CRC (CDC, 2021).

Reducing the prevalence, morbidity, and mortality caused by cancer is one of the leading health indicators of Healthy People 2020 and Healthy People 2030 (ODPHP, 2020a, 2020b). The goal of both Healthy People 2020 and 2030 is to improve wellness by prioritizing the prevention of health threats on the U.S. population (ODPHP, 2020a, 2020b). To reduce the health threat of CRC, prevention must address cultural disparities and stigma associated with the disease (Goldman et al., 2009; NCCRT, 2021).

Health Literacy and Colorectal Cancer

A relationship exists between a low health literacy rate and adherence to CRCS recommendations (Arnold et al., 2012; Dolan et al., 2004). The veteran population at this facility may have a higher percentage of low health literacy levels than the general U.S. adult population (Nouri et al., 2019; Rodríguez et al., 2013). This organization's primary mission is to honor its customers by providing "exceptional health care that improves their health and well-being" (USDVA, 2019, "VHA Mission," para. 6). Therefore, healthcare providers working at the facility had professional and organizational obligations to maximize efforts for improving CRCS rates among veterans.

PICOT Question

Exploration of the current state of this organization and available evidence-based literature led to this PICOT question: Among veterans 50 – 75 years old requiring average risk CRCS seen in primary care at a VA healthcare system (P), how does the use of a multi-component intervention to increase CRC screening (I), compared to usual care (C), affect the number of patients completing CRCS (O), in twelve weeks (T)?

The CRCS process at VA facilities was governed by the VA national directive 1015 (USDVA, 2020a). The directive alone, however, was insufficient to ensure the evidence-based

practice was translated into practice. The purpose of this project was to support the intent of the directive by using a multi-component approach for promoting CRCS. The components included a combination of interventions, which were classified into three categories: a) increasing demand, b) increasing access, and c) increasing provider delivery (Mohan et al., 2019). This scholarly project increased demand and improved provider delivery by standardizing care coordination and navigation through the CRCS process.

Evidence-Based Practice Framework and Change Theory

John's Hopkins Nursing Evidence-Based Practice Framework

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Model provided the framework for implementing this project (Dang & Dearholt, 2017). The model was developed for easy practical application in clinical settings by nurses and interdisciplinary teams (Brooks-Staub, 2005). The first step was inquiry into a practice question. Next, a continuous loop of learning and practical application surrounded the core steps of: practice question, evidence, and translation, or PET (Dang & Dearholt, 2017).

For this scholarly project, the evidence-based practice inquiry began with questioning why CRCS rates at this organization were below national benchmarks. This resulted in the development of the PICOT question. The evidence phase involved exploring the available body of literature and scrutinizing findings for quality using the JHNEBP Model for rating evidence (Dang & Dearholt, 2017). The results were synthesized into actionable information. Consideration of the evidence strength was weighed against the risk-benefit. Alignment with the organization's mission was considered to determine whether the practice change moved forward to implementation or was suspended. The final step was to disseminate outcomes and any new lessons learned (Dang & Dearholt, 2017).

ADKAR Change Management Theory

The change management theory that guided this project was ADKAR (Hiatt, 2006). It was a good fit for this project because ADKAR had been endorsed by the VA as its change management theory (USDVA, 2020a). The acronym ADKAR represents the five components that must be met before a successful change is sustained into practice: awareness, desire, knowledge, ability, and reinforcement (Hiatt, 2006). Since each condition builds upon the other, each step had to be accomplished in sequence to avoid adoption failure (Hiatt, 2006).

The first condition was awareness (Hiatt, 2006). Stakeholders were made aware that a change was necessary (Hiatt, 2006; Wong, 2019). Communication was a critical element in this step. The stakeholders were provided with comparison data that showed their specific clinic's performance and the entire facility's performance compared with that of other facilities across the nation.

The next step was creating desire in the stakeholders to engage the change (Hiatt, 2006; Wong, 2019). The desire to improve CRCS rates was built by illustrating the deadly impact on patients of failure to have timely screening. The leadership sought to make the facility the number one healthcare organization in the country. Sharing substandard performance data drove the stakeholders' desire to change.

Gaining knowledge of how to change and applying it to facilitate changes in workflow were critical steps (Hiatt, 2006). Those involved in the change must be informed about how the change will impact their workflow (Hiatt, 2006). Knowledge gaps were addressed by providing information to the primary care staff on the new standard work process, which structured a procedure for CRC care coordination to help patients navigate the CRCS process.

Once the affected individuals possessed relevant knowledge, they had to be able to execute the change (Hiatt, 2006). For example, discussing CRC screening concerns with the patient may have been ineffective if the clinician was unable to move the conversation to a private place. The most significant gap in ability was correctly documenting in the electronic health record (EHR) clinical reminder system as well as using the available reports through the CRC aggregate database.

The final change model step was reinforcement (Hiatt, 2006). Previous estimates reported 70% of organizational changes that were attempted were not sustained (Jones-Schenk, 2019; Leonard & Coltea, 2013; Nohria & Beer, 2000). During the project, graphs and charts of the metrics were provided for the daily huddle board. In the future, creating and using an automated visual management system, such as a digital dashboard, would help maintain ongoing awareness and sustainability (Silver et al., 2016; Ulhassan et al., 2015).

Evidence Search Strategy

The search strategy utilized many databases through the University of St. Augustine for Health Sciences (USAHS) and the facility's online libraries. These included ProQuest, PubMed, and CINAHL. The inclusion criteria were: peer-reviewed, original research articles, in English, that were published between 2010 to present (October 2020). The timeframe was limited to the past ten years to ensure results were current. Keywords for the search guided by the PICOT question were "colorectal cancer screening," "intervention," "study," "compliance," "adherence," and a truncated, wildcard version of the word multi-component (multi$ or multi*). The Boolean operator "OR" was used for the search "compliance OR adherence." Due to the large number of initial ProQuest results (number), an additional search filter was applied: "primary care," and the subject was limited to "colorectal cancer."

Evidence Search Results

The exhaustive search returned CINAHL (52 articles), PubMed (170), and ProQuest (was 2,473, reduced to 192). After removing duplicates, the studies that addressed the PICOT question (n=14) were analyzed with a full-text reading of each. Four additional articles found during a review of reference lists of the 14 included studies were deemed suitable for full text review. The final 18 studies included randomized control trials, quasi-experimental studies, cross-sectional cohort studies, and three systematic reviews. See Figure 1 for the Prisma search strategy.

The evidence strength and quality were appraised using the Johns Hopkins Evidence Rating scheme (Dang & Dearholt, 2017). See Figure 2 for the JH Nursing Evidence-Based Practice Evidence Strength Rating. Evidence rating allowed for scrutiny of the studies, which resulted in the calculation of an overall strength level.

The first component (level of evidence) was determined by the study type. Level I is considered the highest level and includes studies such as randomized-controlled trials. The lowest level (Level V) includes non-research publications such as quality improvement and case reports (Dang & Dearholt, 2017). The quality rating ranges from low to high, with specific criteria for each category based on evidence level (Dang & Dearholt, 2017). For example, for evidence Levels I to III, a randomized-controlled study with adequate sample size, definitive, generalizable results supported by the body of evidence would rank as high quality.

Evidence tables in Appendices A and B provide ratings of the study strengths. Nine individual studies were appraised at Level I, randomized controlled trials (RCT) of high quality, or Grade A (Baker et al., 2014; Coronado et al., 2018; Davis et al., 2017; Fitzgibbon et al., 2016; Green et al., 2013, 2017; Hendren et al., 2014; 2013; Wong et al., 2018). Dodd et al.'s (2019) study was appraised at Level C for concerns with validity due to insufficient sample size. Five

studies were appraised to be Level II, and four were Grade A (Chou et al., 2016; Fortuna et al., 2014; Tu et al., 2014; Yu et al., 2018) and one Grade B (Basch et al., 2015). Three systematic reviews directly relevant to the PICOT question were also included (see Appendix B). For evidence levels, one was appraised as Level I (Dougherty et al., 2018), and the other two were Level II (U.S. Department of Health and Human Services [USDHHS], 2019; Young et al., 2019). All three were graded as high quality.

Themes with Practice Recommendations

A thorough and rigorous review of the existing literature on the use of a multi-component strategy to increase CRCS revealed several themes (see Appendix C).

Patient Outreach

The use of patient outreach through non-tailored reminder letters was demonstrated as effective in numerous studies. These included six randomized control trials (RCTs) of high quality (Baker et al., 2014; Coronado et al., 2018; Green et al., 2013, 2017; Hendren et al., 2014; Myers et al., 2013) two quasi-experimental, high quality studies (Fortuna et al., 2014; Yu et al., 2018) and one level II good quality systematic review, or SR (UDHHS, 2019). Only Myers et al. (2013) compared tailored versus non-tailored reminder letters in a high quality RCT, and the results failed to show any statistically significant difference between the two.

Colorectal cancer screening rates increased with the use of automated voicemails in three high quality RCTs and one SR (Baker et al., 2014; Fortuna et al., 2014; Hendren et al., 2014; USDHHS, 2019; Wong et al., 2018). Results using text messaging were inconsistent.
One high quality RCT demonstrated an increase with text messages (Baker et al., 2014). Two studies, one high quality RCT (Wong et al., 2018), and one high quality quasi-experimental study

(Fortuna et al., 2014) showed no difference in CRCS rates with either automated phone messages or text messages.

Distributing fecal occult blood testing (FOBT) kits by mail or in person was demonstrated to be a successful outreach approach. Seven high and one low-quality RCTs (Baker et al., 2014; Chou et al., 2016; Dodd et al., 2019; Green et al., 2013, 2017; Hendren et al., 2014; Myers et al., 2013), two quasi-experimental, good-quality studies (Chou et al., 2016; Yu et al., 2018) and two SRs of high quality (Dougherty et al., 2018; USDHHS, 2019) showed providing FOBT kits to patients increased CRCS.

Navigators help patients manage medical conditions by guiding care and providing education (National Cancer Institute, n.d.). The use of navigators showed consistently effective results. Five RCTs (four high quality; one low quality), three quasi-experimental studies of good to high quality, and three high quality SRs (one Level I; two Level II) (Baker et al., 2014; Basch et al., 2015; Dodd et al., 2019; Dougherty et al., 2018; Fortuna et al., 2014; Green et al., 2013; Myers et al., 2013; USDHHS, 2019; Wong et al., 2018; Young et al., 2019; Yu et al., 2018) showed increases with CRCS rates. However, there were inconsistencies in the type of staff used for navigators.

Patient Education

Two SRs (one Level I and one Level II, both high quality) demonstrated benefits of with patient education when coupled with other interventions (Dougherty et al., 2018; USDHHS, 2019). The results from a Level II high quality SR by Young et al. (2019) showed that the outcome was inconclusive. The effectiveness varied with the delivery mode of the information. Eleven studies, eight of which were high quality RCTs and one low (Baker et al., 2014; Davis et al., 2017; Dodd et al., 2019; Fitzgibbon et al., 2016; Green et al., 2013, 2017; Hendren et al.,

2014; Myers et al., 2013), three quasi-experimental good to high quality studies (Basch et al., 2015; Fortuna et al., 2014; Tu et al., 2014) were consistent in demonstrating that printed material was effective. Results from the use of videos were inconsistent (Chou et al., 2016; Davis et al., 2017; Fitzgibbon et al., 2016; Tu et al., 2014).

Clinician Interventions

The final theme identified was clinician-directed interventions. One strategy to change provider behavior was educating (academic detailing) physicians and mid-level providers. It showed promising results. Academic detailing (AD) refers to using peer subject matter experts to provide education on a targeted practice issue (AHRQ, 2013). Fitzgibbon et al. (2016), in a high quality RCT, demonstrated that AD was effective. Still, Basch et al. (2015), in their quasi-experimental, good quality study, did not have statistically significant differences with AD. However, there were improved CRCS adherence rates in the intervention group.

The high quality RCT by Fitzgibbon et al. (2016) and the Level II high quality SRs by Young et al. (2019) demonstrated provider feedback on their patient panels performance increased CRCS adherence rates. Two Level II high quality SRs showed EHR pop-up screening reminder alerts were effective when combined with other interventions (USDHHS, 2019; Young et al., 2019).

Practice Recommendations

The overwhelming body of evidence supported the use of a multi-component intervention to address the PICOT question, which focused on increasing CRCS in primary care (PC) clinics. The systematic review by the Community Preventive Services Task Force, or CPSTF (USDHHS, 2019), a group of independent subject matter experts, also served as a clinical practice guideline for this clinical issue. The multi-component intervention aimed at a practice change within the

primary care clinics included a standardized CRCS nurse navigation process and provider feedback.

These elements were selected as the multi-component bundle for several reasons. First, the literature strongly supported these interventions as the most effective and targets all three categories in the CPSTF guideline (see Figure 3). Secondly, the organization's infrastructure allowed for ease of implementation because of the existing national Colorectal Cancer Screening and Surveillance (CRCS/S) database and the primary care RN care managers already in place. Lastly, the interventions were able to be executed with minimal cost impact to the organization.

Setting, Stakeholders, and Systems Change

Project Overview

The intervention was applied at three primary care (PC) Patient Aligned Care Teams (PACT) clinics (Clinics J, K and L) located on the main campus of a high complexity VA healthcare system in California. The PACT team is the VA's version of the medical home model (USDVA, 2020d). This VA is undergoing a lean, cultural transformation and was also pursuing Magnet to support their vision of becoming an HRO.

The number of patients eligible for average risk CRCS during the 12-week period was 3623. The number of eligible patients who were dispensed a FIT kit during the 30-day data collection period was 189. The participant size was adequately powered based on Wong et al.'s (2018) randomized, eight-month, three-arm study comparing CRCS interventions. They calculated 600 participants as the sample size necessary to provide 80% power to detect an 11% increase in the intervention group (Wong et al., 2018). The observation period for this Doctor of Nursing (DNP) project was one month, which was $1/8^{th}$ of Wong et al.'s study duration. Therefore, this project's participant count of 189 was appropriate to determine significance. Since

most female patients within this organization opted to receive their care in the Women's Clinic instead of the PC clinic, most of the patients impacted were male patients ages 50 to 75 (see Table 3).

The need for this project was identified by evaluating data from the VA's quality tracking program (Strategic Analytics for Improvement and Learning Value Model – SAIL). It compiles data from approximately 170 nationwide facilities and includes 25 measures and multiple sub-measures (USDVA, 2020b). This facility's ranking for the CRCS measure was below other comparable facilities and therefore identified as a need. The preceptor, the deputy associate director for patient care services endorsed and confirmed support for the project. She was also part of the executive leadership team. The PC leadership team and the PACT RN Coordinator also supported the project.

Interprofessional Stakeholders

A great deal of interprofessional stakeholder collaboration was needed for this project. Those directly impacted were nursing, medical, and clerical staff in the primary care (PC) clinics. Assistance from medical media, patient education, and public affairs staff was needed to develop and modify patient education materials. The supply chain department manager and the FIT kit vendors were also stakeholders. Leadership stakeholders included the PC physician and nurse chiefs, the directors for nursing (director and deputy for patient care services), and the chief of staff, who had ultimate clinical practice oversight in PC.

Systems Change

The scopes for changes that DNPs impact are categorized into three levels: macro, micro and meso (Moran, 2020; Rubio & Scott, 2011; Trautman et al., 2018). Macro level changes occur within a large-scale population, such as at a national level (Moran, 2020). A more localized group,

such as a city or community, is considered the meso level (Moran, 2020). Micro level changes are those that take place at an organizational level, like those achieved by this scholarly project (Moran, 2020). Although this evidence-based project was scoped at the micro-level to change primary care's CRCS process at the facility level, the plan is to expand to the meso level by partnering with other local and state organizations who provide care to similar populations.

The SWOT (strength, weakness, opportunities, threats) analysis is a method to assess factors that may positively impact or put the project at risk (Stonehouse, 2018). The SWOT analysis for this project showed many strengths, such as RN care managers who were already in place and an existing lean process improvement culture (see Appendix D). The most concerning threat was the impact of the COVID-19 pandemic on project implementation or completion. The project's process metrics were closely monitored to ensure threats or weaknesses were quickly identified and mitigated. See Table 2 for metrics that were monitored.

Implementation Plan with Timeline and Budget

Project Plan

After receiving approval for the project proposal implementation from the University's DNP Evidence-Based Practice Review Council and the facility IRB, the intervention took place over 12-weeks between March and June 2021 at three primary care (PC) clinics (clinics J, K, and L). The full schedule of activities is outlined in Appendix E. As the project manager, the DNP student was critical in implementing the project and following it through sustainment (Burson & Moran, 2020). A skilled project manager is critical because they must strategically plan and anticipate potential barriers along the change management process (Conrad, 2020). Failing to adequately prepare to manage the change process can cause the project to fail (Campbell, 2020). The essential skills of a project manager to produce a successful team collaboration include

effective communication skills, leadership, creativity, ability to inspire others, and change management (Harris, 2015). Coaching and guiding the team to stay motivated and persist amid multiple projects is another crucial function for the project manager (Harris & Ward-Presson, 2015).

The preceptor, faculty, and the nurse scientist served as coaches to guide the project manager through the project. The executive sponsor, who was also the preceptor, was the deputy associate director for patient care services. She provided the necessary executive level support to vet the project's importance and support for utilizing resources for the project. The PC chief physician and the chief nurse helped mitigate change resistance encountered at the PC staff level. Other professionals required for collaboration included the gastroenterology (GI) providers, the data analyst, the supply chain department manager, and the laboratory manager. Collaborating with the GI providers offered insight from their experience as providers receiving consultations for patients referred for colonoscopies from positive CRCS tests. The data analyst was needed to assist with data mining and extraction of performance reports. The supply chain department supplied the FIT kits, and their expertise was necessary to maintain adequate supplies and to determine cost.

Objectives and Timeline

The primary objective was to increase CRCS adherence. The outcome measure was the percent of returned FIT kits within 30 days of distribution. The target was to increase the return rate by at least 10% from the baseline of 16.7%. The intervention included a multi-component strategy. This included a standard work that guided the RN care managers through a systematic process for monitoring CRCS status, navigating the patient successfully through the screening (see Appendix H), and providing feedback to the PACT teams on their performance with CRCS.

Another objective was to increase the number of PC nurses who used the Colorectal Cancer Screening Surveillance (CRCS/S) database, which contained data to facilitate CRC prevention. There was a gap in a standardized approach for CRC prevention. The inconsistencies contributed to the substandard CRCS adherence rates. The standard work provided guidance on using the CRCS/S database, thereby improving the nurses' ability to function more effectively as navigators.

The final objective was to decrease the number of CRCS-positive patients waiting for provider follow up over 30 days by 20%. The mean number of patients waiting at baseline for the three intervention clinics was 16. By utilizing a report in the CRCS/S database that identified patients waiting for follow up, the care managers were able to collaborate with the provider and patient to remove barriers to follow up.

Implementation Framework

The JHEBP model guided the project (Dang & Dearholt, 2017). Any CRC rates below the 80% national benchmark published by the NCCRT (2021) was a significant clinical practice issue. Failing to meet the benchmark meant that patients were needlessly dying from preventable cancer. The translation of evidence into practice included implementing a multi-component CRCS standard work multi-component bundle.

The ADKAR was the change model informing the project (Wong, 2019). Facilitating transformative change was an essential skill in implementing evidence-based practice (Kendall-Gallagher & Breslin, 2013). Encountering resistance to change was common (Campbell, 2020; Hiatt, 2006; Kendall-Gallagher & Breslin, 2013; Wong, 2019). Applying an effective change management strategy mitigated some of the resistance (Campbell, 2020; Hiatt, 2006; Wong, 2019).

Raising awareness and creating the desire to change were accomplished by disseminating and explaining the rationale for each step in the standard work. The knowledge and ability to implement the change was validated by the RN care manager and nurse manager, who audited the application of the new standard work in clinical practice. The reinforcement component of the change model was initiated through random audits of the nursing documentation in the EHR. Feedback about the PC team's performance on the metrics (see Table 2) was shared by displaying the weekly metrics at the daily huddle board. These metrics supported sustainment.

Budget

Expenses for the project above normal operation costs were minimal (see Table 1). The costs included the salary for additional time to provide comprehensive patient teaching and follow up phone calls. The total salary estimated for the duration of the project was $20,631. Details of the other costs such as costs associated with photocopying and supplies are outlined in Table 1.

Results

The Intellectus Statistics (2021) online program was utilized for descriptive and quantitative statistical analyses. Participants were patients enrolled at one of the intervention clinics (Clinic J, K, or L), ages 50 to 75, and eligible for average-risk CRCS. Patients considered high risk, such as those with a history of CRC or under surveillance for suspicious polyps, were excluded. The participants were predominantly male (n = 1672, 96%), 4% female (n = 77), with a mean age of 64.1 (see Table 3).

FIT Kits Returned

The primary outcome included the number of CRCS FIT kits returned by the patient within 30 days. Thirty days of data were compared at baseline and post-intervention. The result of the two proportions z-test did not reach statistical significance based on an alpha value of

0.05, z = -1.02, p = .307, 95% CI = [-0.12, 0.04]. This suggests the difference between FIT kits returned pre and post-intervention were not statistically significant (see Table 4). However, Figure 4 displays the upward trend in the number of FIT kits returned. The upward trend is clinically significant as it shows an improvement in returned FIT kit rates. The early detection of CRC is contingent on a robust FIT test monitoring program. The median turnaround time for patients to turn in their FIT tests is 44.5 days (Haas et al., 2019). Twelve weeks may have been an insufficient duration for demonstrating the full impact of the intervention due to the average lag time for returning FIT kits.

Follow-up for Abnormal FIT Screens

A secondary outcome metric was the number of patients pending follow-up greater than 30 days from the time of positive FIT test results. A two-tailed independent samples t-test was conducted to compare the total numbers of patients pending at baseline (n=49) and post-intervention (n=37). Normality assumption was met through the Shapiro-Wilk test (Razali & Wah, 2011). The result was not statistically significant based on an alpha value of 0.05, t(4) = 0.45, p = .675, (see Figure 5). Reasons the results may have failed to reach statistical significance may have been due to the short duration of the project and the small participant size for this subset. In addition, the "creating desire portion" of the ADKAR change model took much longer than expected. Furthermore, Clinic L's performance appeared to be an outlier caused by one provider's practice (see Figure 6). There was, however, a downward trend in the number of patients pending over 30 days for an abnormal FIT test follow-up, which is clinically significant as this means there was an improvement in patients receiving timely follow-up for abnormal FIT screenings.

Overdue Colorectal Cancer Screening

The proportion of overdue CRCS in the intervention clinics was one of the process metrics. The number of eligible patients overdue compared to all eligible patients was analyzed with the two-tailed independent samples t-test pre and post-intervention. The result was not significant based on an alpha value of 0.05, $t(4) = 0.34$, $p = .754$ (see Figure 7). It is very likely that the duration of this project was insufficient to demonstrate the impact on all eligible patients.

Nursing Documentation

Another process metric was a manual charting documentation audit. The audit of the EHR was done pre and post to monitor compliance with patient teaching about the FIT kit process (see Appendix G). The normality assumption was met using the Central Limit Theorem (CLT) (Pituch & Stevens, 2015). The result of the two proportions *z*-test was significant based on an alpha value of 0.05, $z = -5.62$, $p < .001$, 95% CI = [-0.65, -0.31], (see Table 5). The statistical significance means that compliance with patient education documentation improved post-intervention (see Figure 8). This result is clinically significant because educating patients about the importance of completing the screening is critical in improving FIT kit return rates. In addition, patients need to be informed about their role in health promotion and illness prevention as a means for empowering patients to take charge of their health.

Colorectal Cancer Screening and Surveillance Database Use

The third process metric was the frequency of CRCS/S database use pre and post-intervention collected through an internally created questionnaire (see Appendix F). The face validity for this internally developed tool (see Appendices F and G) was established through consulting six subject-matter experts who deemed the tool valid. The result of the two proportions *z*-test comparing the difference in the database use pre and post was not significant based on an alpha value of 0.05, $z = -0.82$, $p = .414$, 95% CI = [-0.46, 0.19], (see Table 6). The

baseline usage rates may have been falsely elevated due to staff confusion about the term "database" and interpreting it as the clinical reminder used in the EHR. There was, however, an uptrend in the usage of the database post-intervention (see Figure 10). Although not statistically significant, the increased use is clinically significant because consistent usage of the database is important for efficiently identifying the status of CRCS and pending follow-up for each patient. Using the database consistently can ensure patients receive timely management of CRC.

Balancing Metric and Data Security

The balancing metric monitored was the amount of overtime caused by the potential increase in nurse workload from the project. Payroll data was extracted through a centralized database to assess the impact on overtime caused by the intervention. The results showed no increase in overtime as a result of the intervention (see Figure 9).

Data Integrity and Protection of Human Participants

Automatically extracting data reduces the potential for human error (Mathes et al., 2017; Pandey et al., 2020). Therefore, the majority of the data were extracted automatically from the EHR and the centralized data warehouse. The only data manually extracted were the chart audits for nursing documentation and the CRCS/S questionnaire. To mitigate the risk of disclosing personally identifiable information (PII) and protect the patient, PII was coded, and data was stored electronically within the facility's restricted computer network. Access to the network is limited only to those who have a facility-issued microchipped access card and PIN. Electronic files with PII were restricted to the project manager and the preceptor.

Impact

Creating awareness was the first step in the ADKAR change model. The project alerted several significant clinical opportunities. This project was the first step in aligning this specific

department to the organization's HRO journey and the HRO principles of preoccupation with failure and reluctance to simplify. This project highlighted and created awareness about the importance of monitoring routine health maintenance tracking processes.

For sustainment, the PC nurse leaders and champions have taken over as project managers to spread the multi-component approach to CRCSs to other PC locations and specialty clinics. A sustainment toolkit was provided, including process control spreadsheet templates, a video on how to conduct data analysis and CRCS database use, and a cheat sheet for clinicians on where to go for data and additional resources. The plan is to continue refining the standard work, audit the process, and continue tracking outcome metrics.

The project also highlighted significant challenges the clinicians face because of the antiquated EHR system, which may be contributing to alert fatigue. The need for the VA to modernize its EHR is well documented (Torres, 2014; USDVA, 2021). A locally created dashboard to simplify data interpretation will be critical for providing an efficient visual management tool for successfully sustaining positive outcomes.

Limitations of the project included competing priorities with the COVID-19 pandemic. Many of the regularly assigned staff and leaders in PC were reassigned out of PC to support pandemic-related activities, thus limiting their availability for the project. Finally, the project's duration was another limiting factor and a barrier to reaching some targeted goals. For example, the FIT kit return rates and the number of FIT positive patients pending follow-up greater than 30 days may have reached targets with a longer project duration.

Dissemination and Future Plan

The project outcomes were disseminated locally within the organization. The venues included presentations at various meetings including the facility's systems redesign and

improvement team, Magnet ambassadors, PC staff, and the nursing research committee. A virtual session was recorded to allow staff not in attendance to watch at a later time.

In addition, presentations will be done at the facility-wide director's meeting. The director showcases facility projects every Friday morning at the director's meeting. The director's meeting is designed as the communication platform from the director to the chiefs but is open for any staff to attend. The facility's nursing grand rounds and evidence-based practice committee are other forums for future dissemination. The plan is to disseminate the findings to a greater audience outside of the local organization such as the annual nursing research conference, co-sponsored by this facility, its neighboring university's academic affiliate, and the parent organization's national nursing evidence-based poster presentation forum.

Plans for dissemination also include submitting the manuscript for publication to *The Federal Practitioner* journal. *The Federal Practitioner* is an appropriate match for manuscript submission and publishing because this peer-reviewed journal focuses specifically on the veteran population (MDedge, 2020). The Federal Practitioner uses a web-based editorial manager for peer review and is the only scholarly journal that addresses unique issues related to the veteran population and the VA healthcare system. The database used for implementing this project is unique to the VA. The Federal Practitioner readers would have access to this database, making the information generalizable to other veterans. Finally, the project will be submitted to the University of Saint Augustine for Health Sciences Library, Scholarship and Open Access Repository (SOAR) for archiving.

Conclusion

The intent of the project was to increase CRCS in the underserved population treated at this organization. This goal was met by implementing a CRCS multi-component intervention,

including a standard work for PC nursing staff to function more effectively as CRCS navigators and by providing feedback on CRCS performance metrics. The standard work offered a systematic process for the current best-known way for identifying patients who are due for CRCS, those who have not returned their FIT kit, and those awaiting follow-up from a positive FIT test.

The project was limited to three PC clinics in one location. Disseminating this project's results will allow this EBP to spread to other PC clinics and specialty outpatient clinics. Implementing the project at specialty clinics such as the women's and spinal cord injury clinics would be just as important as in PCs. The project can also be implemented at other VA facilities across the nation. The dissemination of this project's results will facilitate reaching the 80% CRCS target established by the NCCRT, thereby saving millions of lives in the United States (2021).

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Table 1

Budget

EXPENSES		**REVENUE**	
Direct			
Salary (RN and LVN)	$20,631		
Supplies – photocopies	$200		
Supplies – FIT Kit	$648		
FIT Kit processing	$817		
FIT Kit mailing	$600		
Statistician Consultation	$100		
Total Expenses	**$22,996**	**Total Revenue**	**0**
Net Balance	- $22,996		

Table 2

Project Measures

	Categories					Time for Data Collection												Statistical Tests		Targets	
Measures	**Outcome**	**Process**	**Balancing**	**Financial**	**Sustainability**	**Baseline**	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Week 9**	**Week 10**	**Week 11**	**Week 12**	**2 Proportions *z*-Test**	**2 Tailed Independent *t*-Test**	**Baseline**	**Goal**
FIT kit returned in intervention clinics Calculated by dividing the total number of patients issued a FIT kit by the number returned within 30 days – data source: CRCS/S	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		65%	≥ 75%
Abnormal FIT follow-up in intervention clinics The mean number of patients who have an abnormal FIT test pending follow up > 30 days – data source: CRCS/S	X				X	X	X	X		X				X				X		X	16	< 12.8
Patients overdue for CRCS in intervention clinics The number of patients who are overdue on their CRCS > 30 days – data source: CRCS/S. Denominator = number of pts due for CRCS within a time period. Numerator = number of patients who completed the CRCS.	X				X	X	X	X		X				X				X		X	35.4%	≤ 25%
EHR nursing documentation audit Random manual audit of EHR nursing documentation of CRCS patient counseling. Denominator = number of audited charts. Numerator = number of nursing documentation reflecting CRCS patient counseling – data source: EHR		X				X	X	X	X	X	X	X	X	X	X	X	X	X	X		28.3%	100%

	Categories					Time for Data Collection												Statistical Tests		Targets	
Measures	**Outcome**	**Process**	**Balancing**	**Financial**	**Sustainability**	**Baseline**	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Week 9**	**Week 10**	**Week 11**	**Week 12**	**2 Proportions *z*-Test**	**2 Tailed Independent *t*-Test**	**Baseline**	**Goal**
Nursing staff CRCS/S use questionnaire Questionnaire for nursing staff regarding usage frequency of CRCS/S database. Comparing frequency of use pre-mid-post intervention. Denominator = RNs/LVNs that respond to survey. Numerator = number of RNs/LVNs that report uses the CRCS/S database at least once per month		**X**				**X**						**X**						**X**	**X**		**57.9%**	**$\geq$ 75%**
Nursing overtime Amount of nursing overtime hours increase after intervention implementation			**X**	**X**		**X**		**X**		**X**		**X**		**X**		**X**		**X**	**X**		**N/A**	$\leq$ 1%

Legend: CRCS – colorectal cancer screening; CRCS/S Colorectal Cancer Screening and Surveillance database

Table 3

Frequency Table for Age Groups and Gender

Age Group	Male	Female
50-54	229 (14%)	19 (25%)
55-59	258 (15%)	21 (27%)
60-64	326 (19%)	18 (23%)
65-69	302 (18%)	11 (14%)
70-75	557 (33%)	8 (10%)
Missing	0 (0%)	0 (0%)

Note. Due to rounding errors, column wise percentages may not equal 100%.

Table 4

FIT Kits Returned Within 30 days. Two Proportions z-Test for the Difference between Pre and Post

Timeframe	Returned Kits	*n*	Proportion	*SD*	*SE*
Pre	36	216	0.17	0.37	0.03
Post	39	189	0.21	0.40	0.03

Note. z = -1.02, p = .307, 95% CI: [-0.12, 0.04]

Table 5

Compliance with Patient Teaching Documentation Pre and Post. Two Proportions z-Test for the Difference between Pre and Post

Timeframe	Pt Teaching - Yes	*n*	Proportion	*SD*	*SE*
Pre	15	53	0.28	0.45	0.06
Post	39	51	0.76	0.42	0.06

Note. z = -5.62, p < .001, 95% CI: [-0.65, -0.31]

Table 6

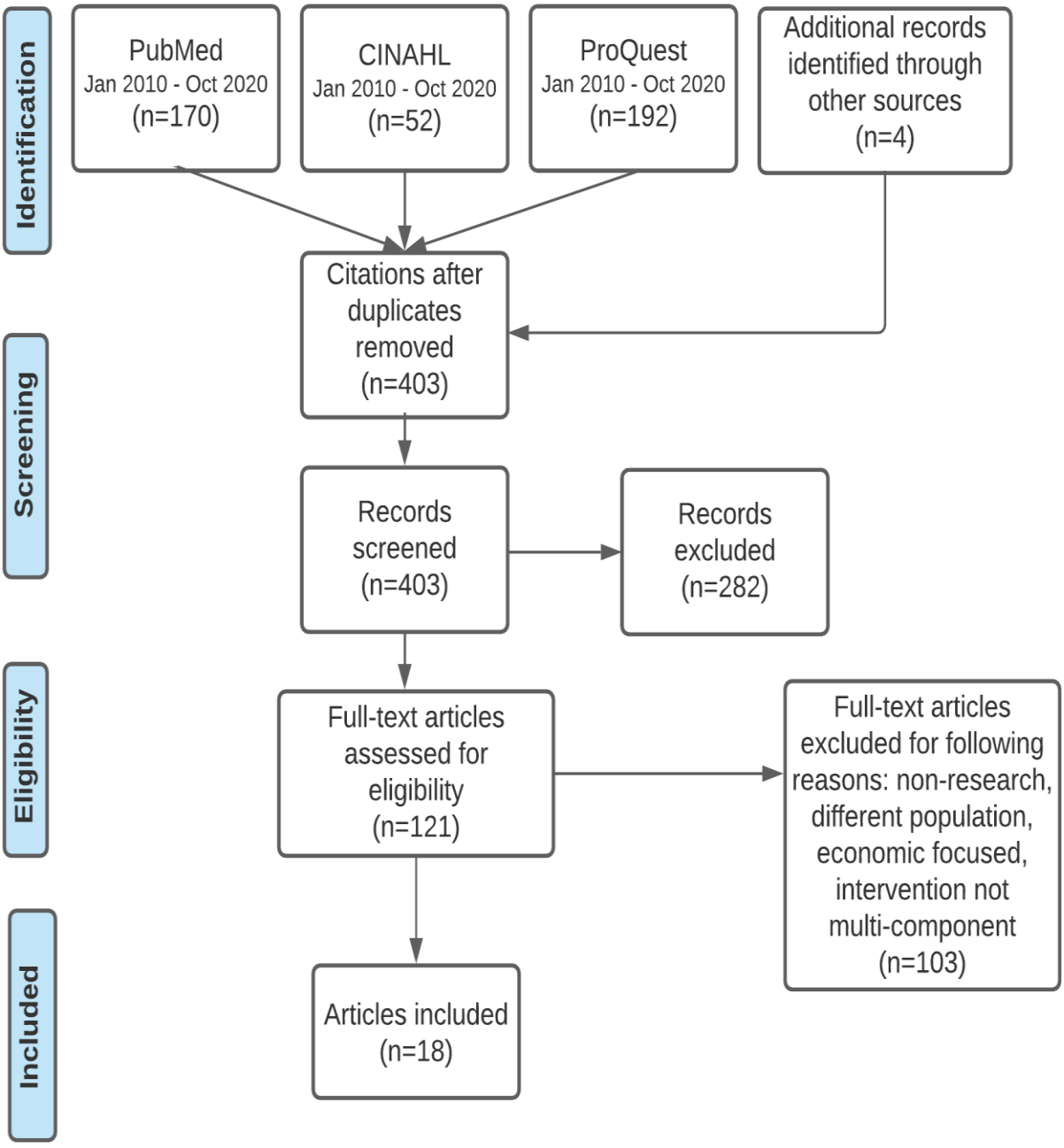
Colorectal Cancer Screening and Surveillance Database Usage Per Month. Two Proportions z-Test for the Difference between Pre and Post

Timeframe	Usage - Yes	*n*	Proportion	*SD*	*SE*
Pre	11	19	0.58	0.49	0.11
Post	10	14	0.71	0.45	0.12

Note. z = -0.82, p = .414, 95% CI: [-0.46, 0.19]

Figure 1

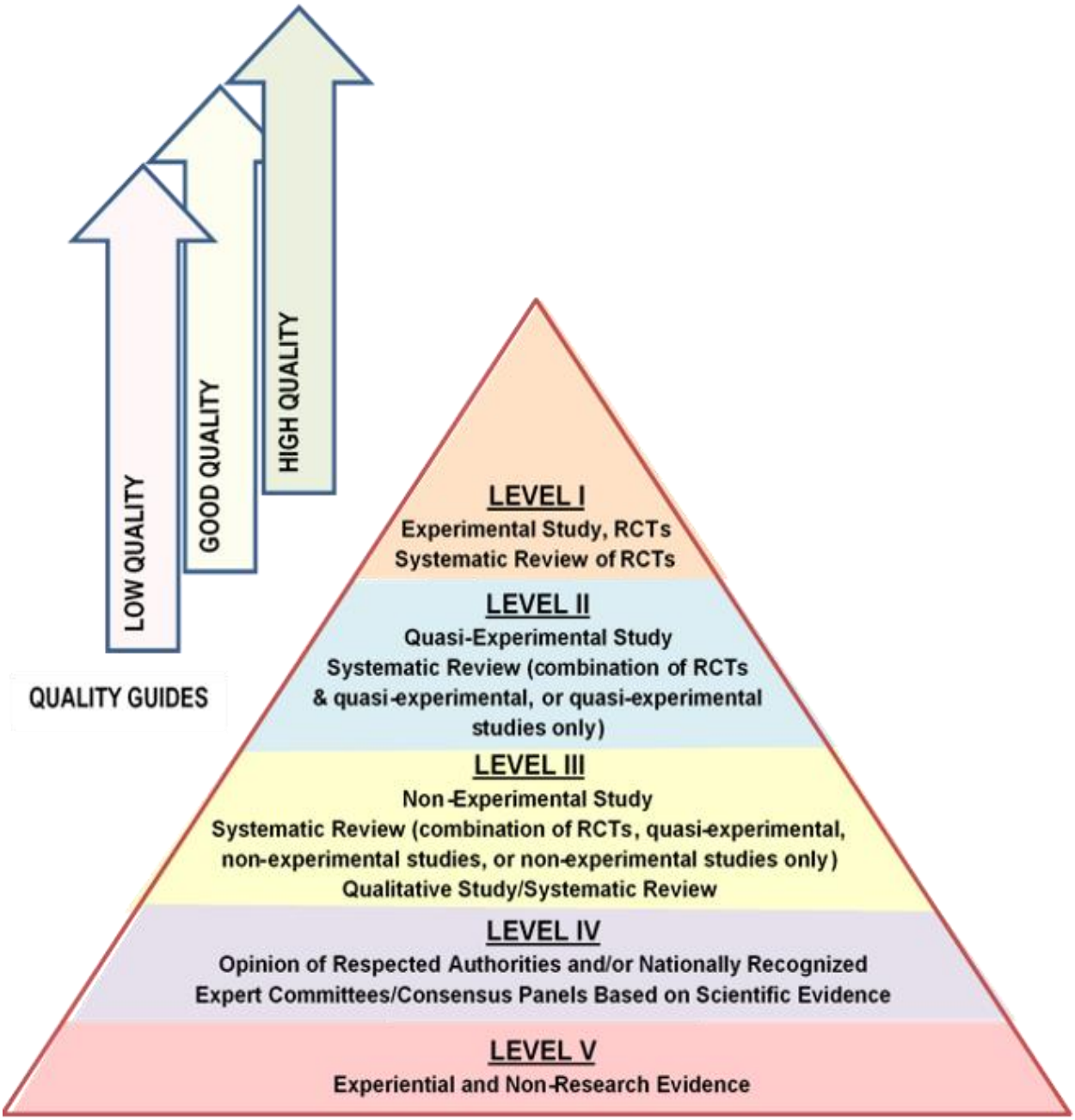
PRISMA Literature Search Strategy Diagram



Note. Adapted from Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLOS Medicine, 6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097 (Moher et al., 2009)

Figure 2

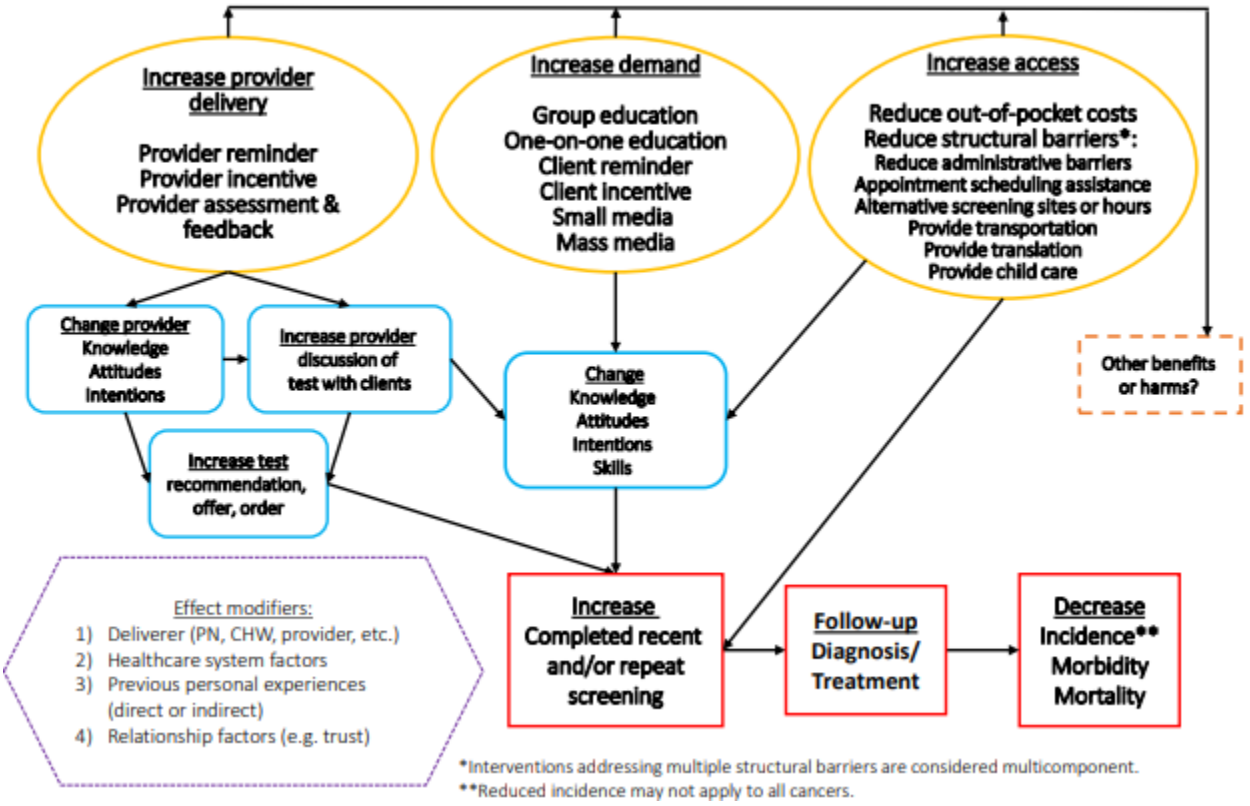
Johns Hopkins Nursing Evidence-Based Practice Evidence Strength Rating



Note. Adapted from: Dang, D., & Dearholt, S. L. (2017). Johns Hopkins nursing evidence-based practice: Model and guidelines (3rd ed.). Sigma Theta Tau International.

Figure 3

Analytic Framework: Multi-component Interventions to Promote Breast, Cervical, and Colorectal Cancer Screening



Note. From: U.S. Department of Health and Human Services. (2020). Cancer screening: Multicomponent interventions—Colorectal cancer. https://www.thecommunityguide.org/findings/cancer-screening-multicomponent-interventions-colorectal-cancer

Figure 4

Percent of FIT Kits Returned Pre and Post Intervention

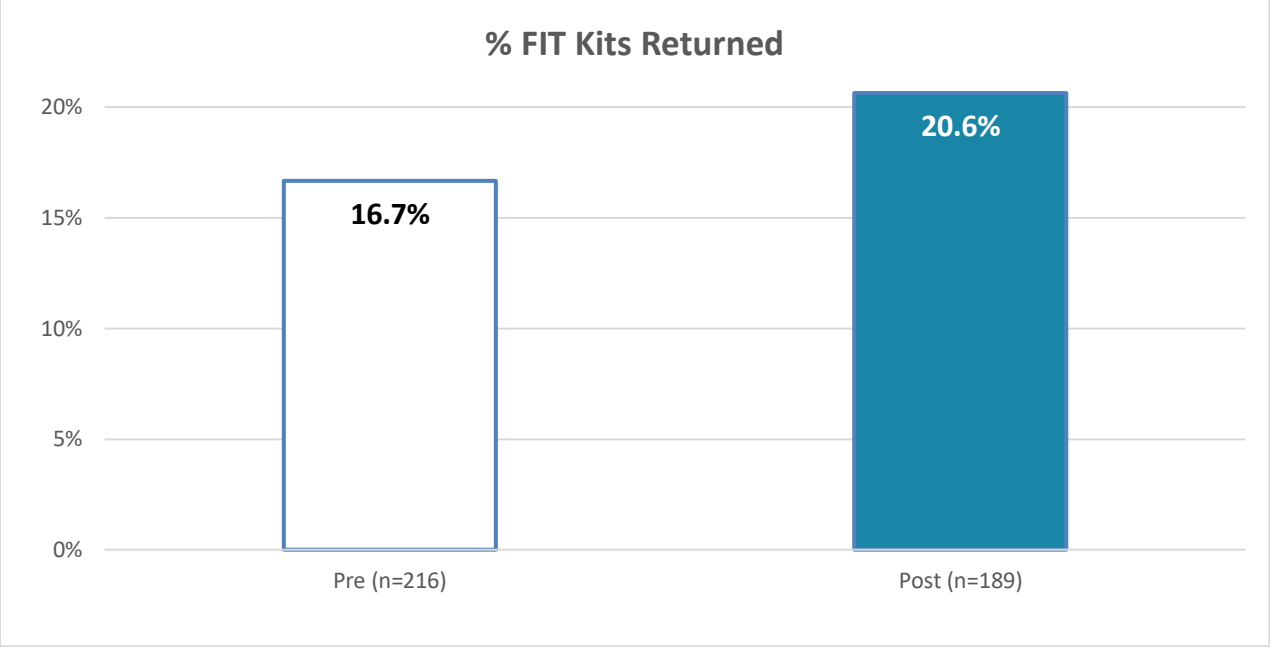


Figure 5

Mean Number of Positive FIT Test Patients Pending Follow Up Greater than 30 days

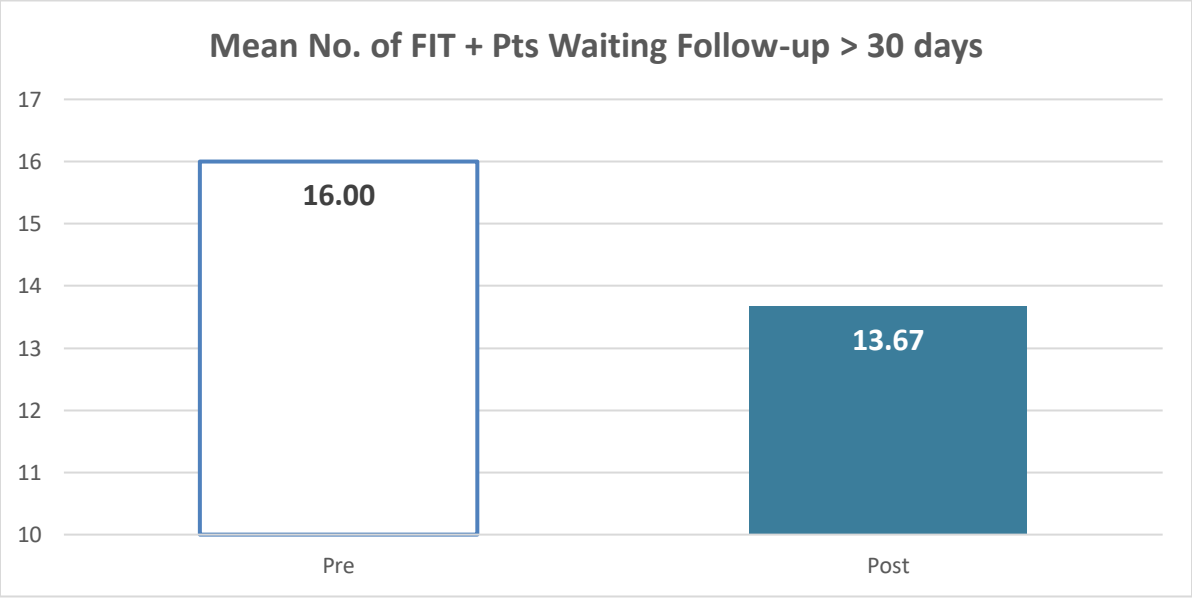


Figure 6

Total Number of FIT Positive Patients Pending Follow Up Greater than 30 days by Each Clinic

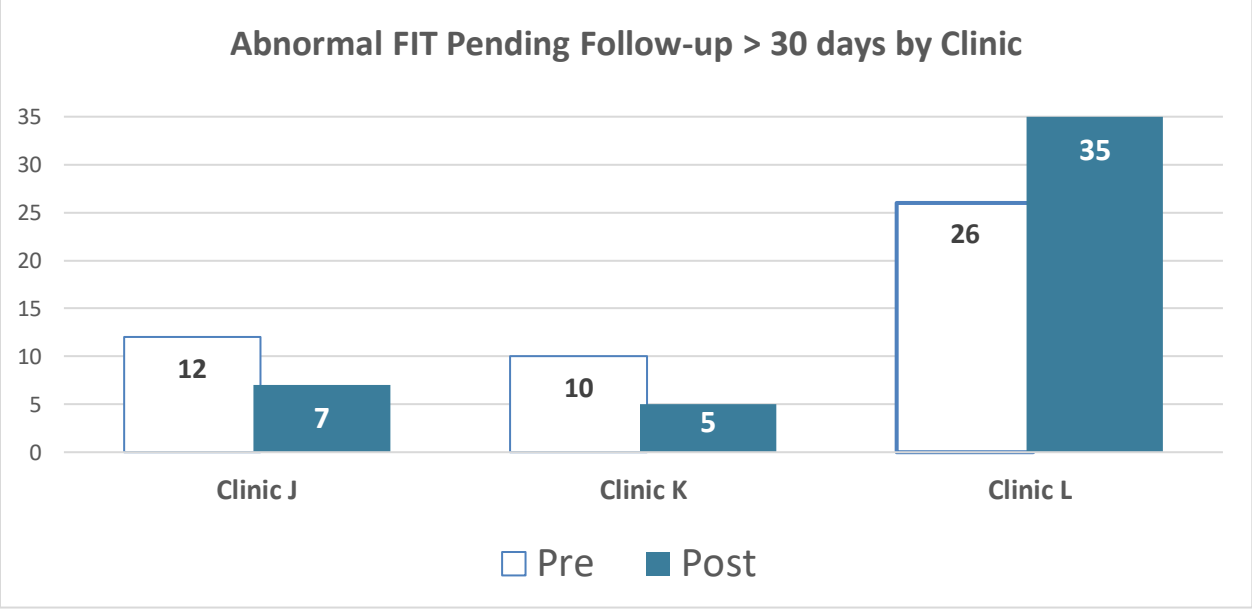


Figure 7

Mean Number of Patients Overdue for a Colorectal Cancer Screening in the Intervention Clinics

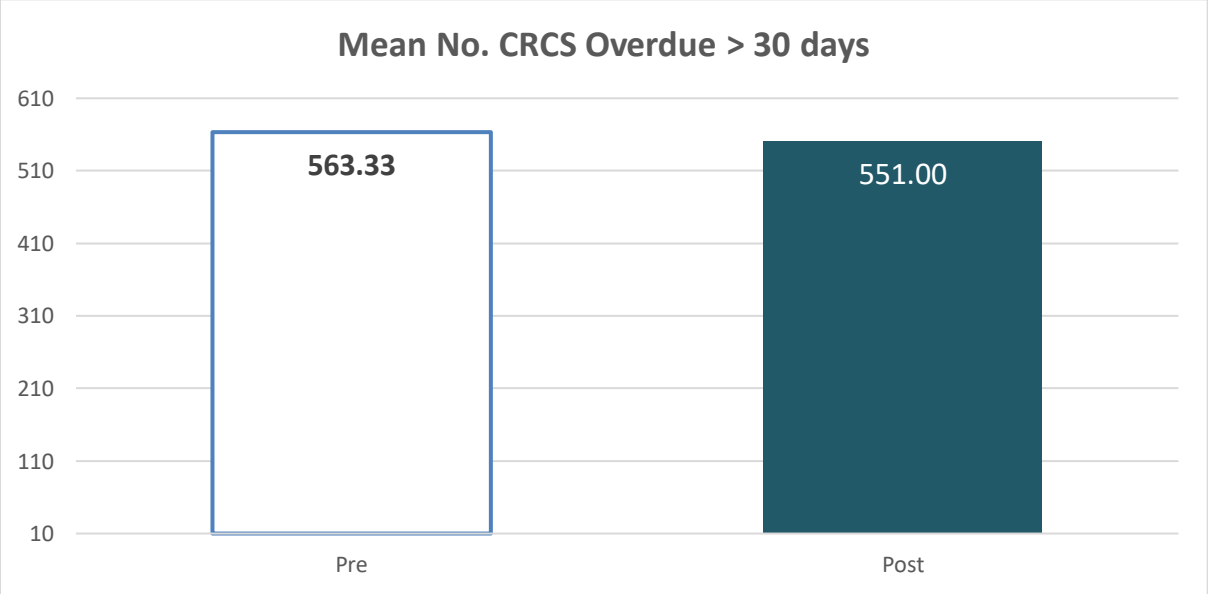


Figure 8

Nursing Documentation Compliance with Documentation of Patient Teaching

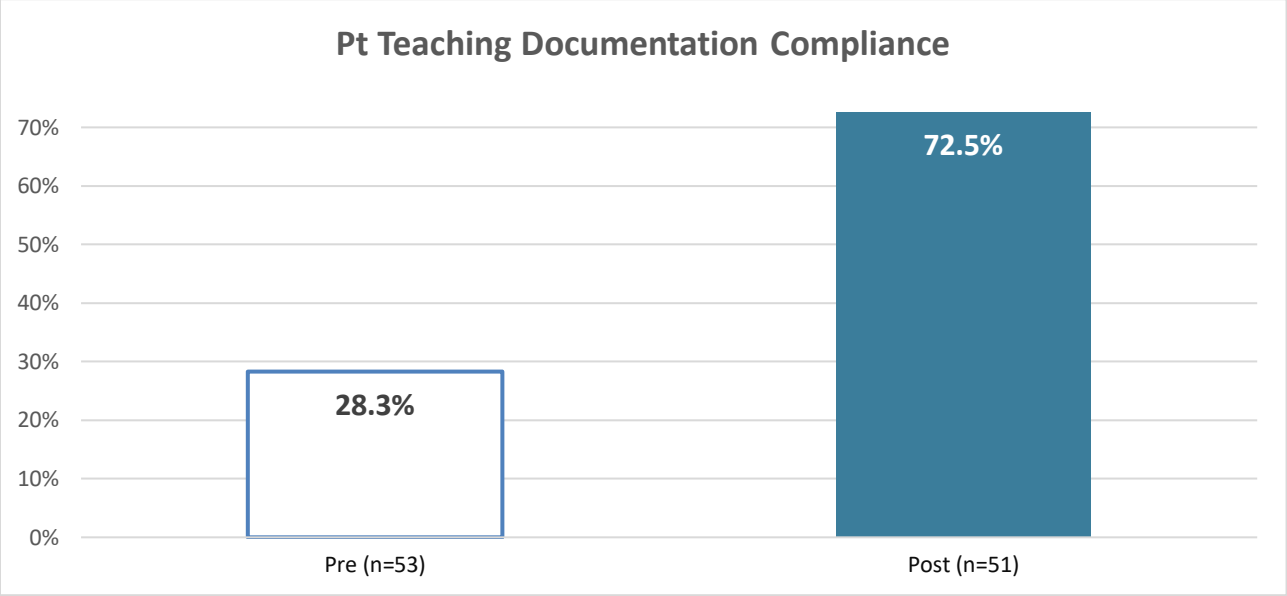


Figure 9

Overtime Nursing Hours

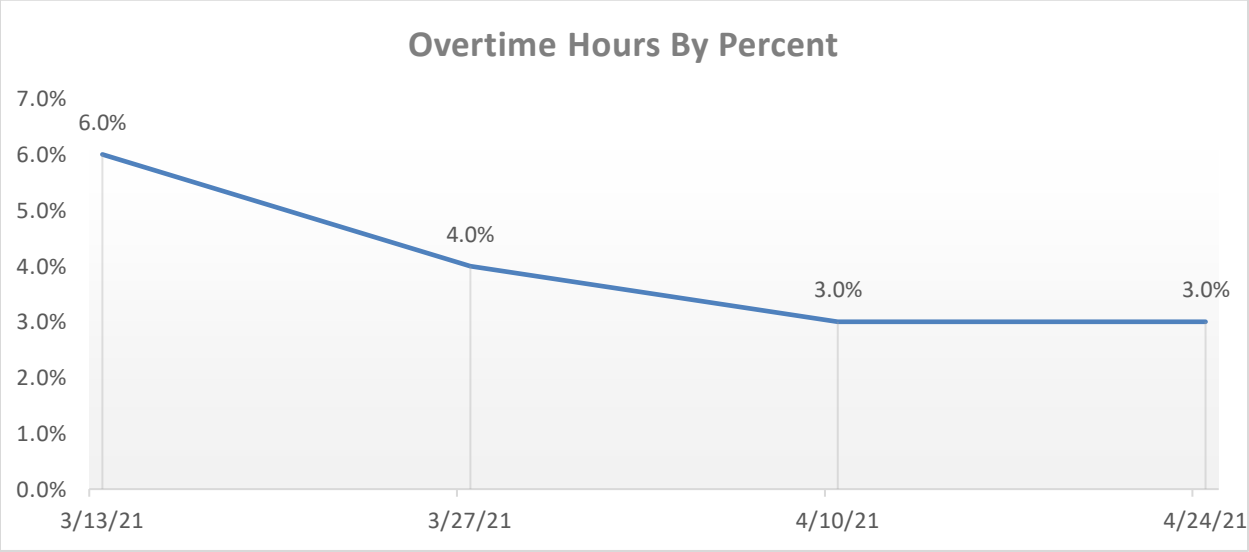
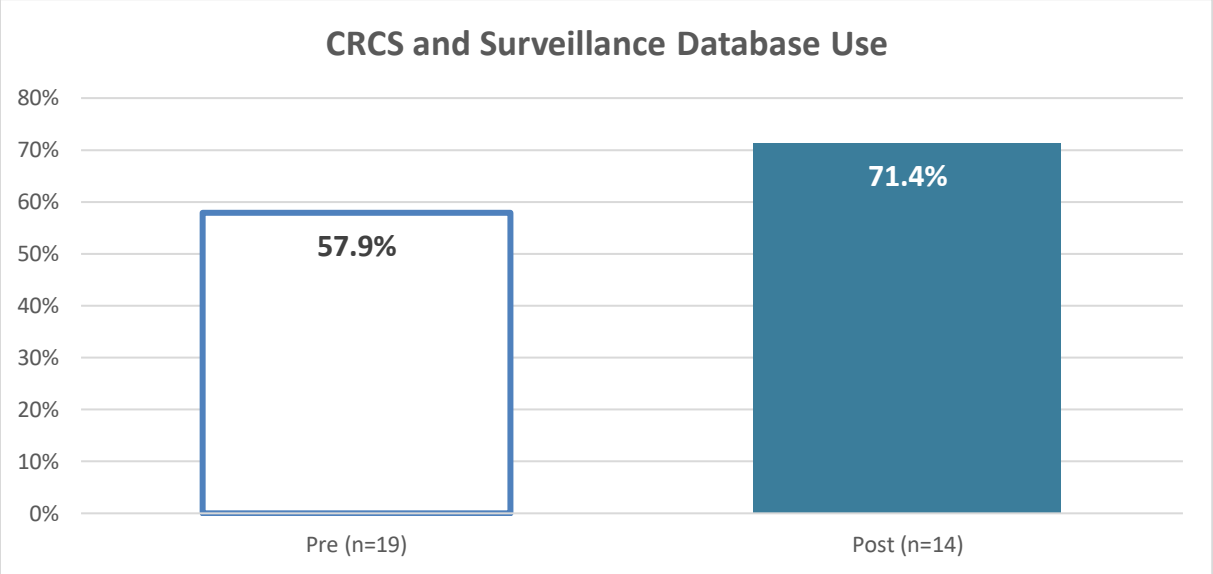


Figure 10

CRCS and Surveillance Database Use by Nursing Staff



Appendix A

Summary of Primary Research Evidence

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Baker, D. W., Brown, T., Buchanan, D. R., Weil, J., Balsley, K., Ranalli, L., Lee, J. Y., Cameron, K. A., Ferreira, M. R., Stephens, Q., Goldman, S. N., Rademaker, A., & Wolf, M. S. (2014). Comparative effectiveness of a multifaceted intervention to improve adherence to annual colorectal cancer screening in community health centers: A randomized clinical trial. JAMA Internal Medicine, 174(8), 1235. https://doi.org/10.1001/jamainternmed.2014.2352	RCT Level I Grade A	Adult patients aged 51 to 75 of community health centers in Chicago Intervention group (n=202) Control group (n=225)	Study: impact of multifaceted intervention on increases FOBT adherence Intervention: Intervention group = usual care and mailed reminder letter, FIT kit with low-literacy instructions, postage-paid return envelope, auto-phone message, and text message when due for screening and 2 weeks later if not done. If still not returned 3 months later, phone call from CRC screening navigator Comparison: Usual care = computerized reminders, standing orders for medical assistants to give patients home FIT and clinician feedback on CRC screening rates	Not stated - approach consistent with health literacy framework. In order to make informed decisions about risks and health promotion and illness prevention, health literacy is an essential component (Woudstra et al., 2019).	Completion of FOBT	Intervention group significantly higher than control (82.2%vs 37.3%; P < .001). Giving FIT cards with additional interventions increases adherence to CRCS in low literacy groups.
Basch, C. E., Zybert, P., Wolf, R. L., Basch, C. H., Ullman, R., Shmukler, C., King, F., Neugut, A. I., & Shea, S. (2015). A randomized trial to compare alternative educational interventions to increase	Randomized Trial (no control) Quasi-experimental Level II	Adults, aged 50-75 union members in New York 3 arms: Arm 1: Patient education materials (PEM) group (n=180)	Study: determine impact of educational interventions on CRCS rates Study dates: 2011 and 2013. 3 arms compared to each other. No control. Arm 1: PEM - mailed printed	Not stated but interventions point to a theoretical foundation in the socioecological model (Gili et al., 2006).	CRCS: colonoscopy, FS and FOBT or FIT	TTE/PCP-AD vs PEM – did not reach statistically significant but trend towards significance (p=0.11). Could be clinically significant even though did not meet statistical significance.

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
colorectal cancer screening in a hard-to-reach urban minority population with health insurance. Journal of Community Health, 40(5), 975–983. https://doi.org/10.1007/s10900-015-0021-5	Grade B	Arm 2: Providers - academic detailing (PCP-AD) (n=185) Arm 3: Telephone tailored education + physician academic detailing (TTE/PCP-AD) (n=199)	education on CRC risk factors, early detection and prevention. Information colonoscopy, prep, other screenings (FOBT, FIT, sigmoidoscopy, barium enema and virtual colonoscopy) Arm 2: PCP-AD - Primary care physicians - academic detailing. Included targeted education intervention about CRC screening with physician's committing to trying one new thing to improve CRC screening practices Arm 3: TTE/PCP-AD – primary care physicians received same academic detailing as arm 2 plus the addition of tailored telephone education to patients			TTE/PCP-AD had higher adherence vs PEM in ages > 60 (27.3 % vs 7.7%; p = .02) No statistical difference between the three groups.
Chou, C.-K., Chen, S. L.-S., Yen, A. M.-F., Chiu, S. Y.-H., Fann, J. C.-Y., Chiu, H.-M., Chuang, S.-L., Chiang, T.-H., Wu, M.-S., Wu, C.-Y., Chia, S.-L., Lee, Y.-C., Chiou, S.-T., & Chen, H.-H. (2016). Outreach and inreach organized service screening programs for colorectal cancer. PloS One, 11(5). https://doi.org/10.1371/journal.pone.0155276	Quasi-experimental Pre-Post cross-sectional design Level II Grade A	Cross-sectional study A total of 3,363,896 subjects, adults aged, 50–69 in Taiwan 2004 to 2009 – Outreach only (n=1,160,895) 2010 to 2013 – added In-reach to Outreach (n=2,203,001)	Study to determine the impact of integrating two national interventions on CRCS and cancer detection Interventions were compared to each other. Outreach program = distribution of FIT kits through the Taiwan districts In-reach program = CRCS awareness campaign via posters or video tapes in hospital or clinic waiting rooms, encouraging CRCS. Physicians and nurses encouraged screenings. When FITs showed positive, confirmatory diagnostic procedures arranged by MDs.	Not stated but the study approach is consistent to the public health model (White et al., 2019)	Number of CRCS and CRC detected	Screenings increased from 21.4% period 1 to 36.9% period 2 (P < 0.01). CRC detection (percent of patients) - period 1 = 0.20%; period 2 CRC 0.34% (P < 0.01) Huge cohort – demonstrates adding layers to interventions increases screenings which result in higher detection of CRC. Limited generalizability due to homogenous population.

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Coronado, G. D., Petrik, A. F., Vollmer, W. M., Taplin, S. H., Keast, E. M., Fields, S., & Green, B. B. (2018). Effectiveness of a mailed colorectal cancer screening outreach program in community health clinics: The STOP CRC cluster randomized clinical trial. JAMA Internal Medicine, 178(9), 1174–1181. https://doi.org/10.1001/jamainternmed.2018.3629	RCT Level I Grade A	Adult patients, aged 50-74, receiving care at a Federally Qualified Health Centers in Oregon and California Clinics randomized to intervention or control Intervention clinics (n=13 clinics). Eligible patients = 21,134 Control – Usual care (n=13 clinics). Eligible patients = 20,059	Study to determine effectiveness of electronic health record-embedded mailed FIT tests with adherence to CRCS Study dates: February, 2014 and August, 2015 Intervention: Three sequential mailings: (1) introductory letter; (2) a FIT kit packet with instructions (3) a reminder letter. Comparison: Usual care = standard processes for CRCS = providing information and ordering tests during routine clinical encounters.	Not stated but the study approach is consistent with the health promotion model where the goal is to prevent illness and promote wellness (Johns et al., 1987**)**	Completion of FIT Secondary = proportion who completed any CRCS (FOBT, FS, colonoscopy)	FIT completion proportions = 3.4 percentage points higher for intervention clinics (13.9%) than usual care clinics (10.4%) (95% CI, 0.1%-6.8%; P = .05). Any CRCS = 3.8 percentage points higher for intervention clinics (18.3%) than for usual care clinics (14.5%) (95% CI, 0.6%-7.0%; P = .02).
Davis, S. N., Christy, S. M., Chavarria, E. A., Abdulla, R., Sutton, S. K., Schmidt, A., Vadaparampil, S. T., Quinn, G. P., Simmons, V. N., Ufondu, C., Ravindra, C., Schultz, I., Roetzheim, R., Shibata, D., Meade, C. D., & Gwede, C. K. (2017). A randomized controlled trial of a multi-component targeted low-literacy educational intervention compared with a non-targeted intervention to boost colorectal cancer	RCT Level 1 Grade A	Adult patients aged 50–75 years, of a Federally Qualified Health Center or a primary care community health clinic in Tampa Bay area Intervention (n=210) Control - Usual care (n=207)	Study aim: determine impact of intervention to usual care and impact of sociodemographic and health-related beliefs on adherence FIT screening Conducted between July 2012 and August 2014– Colorectal Cancer Awareness, Research, Education and Screening (CARES) trial Intervention: Usual care plus targeted low-literacy, photonovella booklet and DVD. Photonovella/DVD = local characters modeled using FIT kit Comparison: Usual care written and verbal FIT kit collection instructions, along with an in-	Authors stated theoretical foundation = Preventive Health Model	Returned FIT kits	FIT completion rate was 81%, 78.1% for intervention vs. 83.5% for control (p=0.17). No significant difference between the groups. Control was slightly higher. Simply providing a DVD may not have much impact.

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
screening with fecal immunochemical test in community clinics. Cancer, 123(8), 1390–1400. https://doi.org/10.1002/cncr.30481			person FIT kit collection demonstration and standard CDC brochure			
Dodd, N., Carey, M., Mansfield, E., Oldmeadow, C., & Evans, T.-J. (2019). Testing the effectiveness of a general practice intervention to improve uptake of colorectal cancer screening: A randomised controlled trial. Australian and New Zealand Journal of Public Health, 43(5), 464–469. https://doi.org/10.1111/1753-6405.12913	RCT Level I Grade C	Adult patients aged, 50-74 of four general practices in New South Wales, Australia Intervention (n=53) Control (n=70)	Study to determine impact on FOBT adherence at six-week follow-up and impact in patient knowledge Study dates: September 2016 to– May 2017 Baseline knowledge assessment about CRC. Assessment tool lacked validity or reliability testing. Intervention: Before the appointment, patients received pre-paid FIT kit with return postage; educational print-out about the importance of CRCS. Information reviewed at MD appointment Comparison: Usual care – patients received printed CRC educational print-out.	Not stated, but the study approach is consistent with the health promotion model where the goal is to prevent illness and promote wellness (Johns et al., 1987)	Primary outcome = self-reported CRCS. Secondary outcome = patient knowledge.	Intervention = significantly higher self-reported CRCS (OR 10.24; 95%, CI2.9–36.6, p=0.0006). No statistically significant differences between the intervention and control on knowledge. (Control OR 1.59 (0.8 to 3.1) p=0.18; Intervention OR 1.58 (0.5 to 4.9) p=0.43) Generalizability limited due to small sample size.
Fitzgibbon, M. L., Ferreira, M. R., Dolan, N. C., Davis, T. C., Rademaker, A. W., Wolf, M. S., Liu, D., Gorby, N., Schmitt, B. P., & Bennett, C. L. (2016). Process evaluation in an intervention designed to improve rates of	RCT Level I Grade A	Male veteran patients, aged 50 years and older of VA primary clinics in Chicago Intervention clinic (n=728 patients) Control clinic – Usual care (n=258 patients)	Study to determine impact of combined intervention on screening recommendations by providers and adherence by patients Patient intervention: CRCS pamphlet; video for educating low-literacy patients and a simplified FOBT instructions. Provider intervention:	The authors identified the Health Belief Model as the framework that provided the foundation for the patient intervention portion of the study. They also identified Deming's Quality Improvement	Primary outcome measures = CRCS (home FOBT, FS, or colon-oscopy)	Providers who attended intervention sessions recommended CRCS at a higher rate during patient visits compared to those who did not attend 64% vs 54% of visits ($p < .01$) Also, the patients of providers who attended intervention sessions

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
colorectal cancer screening in a VA medical center. Health Promotion Practice. https://doi.org/10.1177/1524839907302210		Provider Intervention - Attended some sessions (n=37) Attended no sessions (n=7)	One-hour feedback sessions every 4-6 months with data about screening performance	framework as the guiding framework for the provider intervention portion.		were more likely to be screened (42% versus 29%, $p < .05$) Patient intervention - no difference in the screening adherence between intervention and control
Fortuna, R. J., Idris, A., Winters, P., Humiston, S. G., Scofield, S., Hendren, S., Ford, P., Li, S. X. L., & Fiscella, K. (2014). Get screened: A randomized trial of the incremental benefits of reminders, recall, and outreach on cancer screening. Journal of General Internal Medicine, 29(1), 90–97. https://doi.org/10.1007/s11606-013-2586-y	Randomized Trial (No control) Quasi-experimental Level II Grade A	Adult patients, aged 50–74 years past due for CRC screen and women aged 40–74 years past due for breast cancer (BC) screening receiving care in a safety net clinic in urban New York. 4 arms: Arm 1: Letter (n=157) Arm 2: Letter + Automated Call (n=158) Arm 3: Letter + Automated Call + Paper Visit Prompt (n=156) Arm 4: Letter + Personal Call (n=153)	Study to determine impact of interventions on colorectal and breast cancer screenings. Parallel comparisons of 4 arms. Interventions: Arm 1: Letter – reminder letter for overdue screening. Arm 2: Letter + Automated call – same as arm 1 plus up to 5 automated call reminders Arm 3: Letter + Automated call + Paper Visit Prompt: Same as arm 2 plus addition of education sheet encouraging screening at the time of visit with the physician. Arm 4: Letter + Personal call: Same letter as arm 1 plus a call from a trained outreach worker.	Not stated. The study approach is consistent with a theoretical foundation in the socioecological model (Gili et al., 2006).	Cancer screening = mammo-gram, CRCS (FOBT, FIT, FS, colon-oscopy, DCBE)	Compared to a reminder letter alone, Letter + Personal Call showed a higher adherence rate: BC (17.8% vs. 27.5%; AOR 2.2, 95 % CI 1.2–4.0) and CRCS (12.2% vs. 21.5%; AOR 2.0, 95 % CI 1.1–3.9) Compared to letter alone, a Letter + Autodial + Prompt showed a higher adherence rate improving rates of BC screening (17.8% vs. 28.2%; AOR 2.1, 95 % CI 1.1–3.7) and CRCS (12.2 % vs. 19.6 %; AOR 1.9, 95 % CI 1.0–3.7). Only the Letter + Automated Calls showed worse results than the letter alone. All interventions except the auto phone calls had a

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
						higher impact than a letter alone in increasing screening rates.
Green, B. B., Wang, C.-Y., Anderson, M. L., Chubak, J., Meenan, R. T., Vernon, S. W., & Fuller, S. (2013). An automated intervention with stepped increases in support to increase uptake of colorectal cancer screening: A randomized trial. Annals of Internal Medicine, 158(5 Pt 1), 301–311. https://doi.org/10.7326/0003-4819-158-5-201303050-00002	RCT Level I Grade A	Adult patients, aged 50 to 73 years of primary care clinics in Washington state. 4 arms: Arm 1: Usual Care plus Automated Telephone (UC/AT) (n=1173) Arm 2: Usual Care Plus Automated Interventions Plus Assisted Care (UC/AT/AC) (n=1159) Arm 3: Usual Care Plus Automated Interventions Plus Assisted Interventions Plus Navigated Care (UC/RN) (n=1170) Control: Arm 4: Usual care (UC) (n=1166)	Study aim: determine impact of escalating interventions on CRCS and screening decisions. Interventions: Study took place between August 2008 and November 2009 Arm 1: UC/AT - sent reminder letters informing due for CRCS; educational pamphlet about different screening options. Patients could request alternate screening method or notified that FOBT kits were coming. If no alternates selected patient were mailed FOBT kits with postage-paid return envelope. Arm 2: UC/AT/AC – received everything that UC/AT patients received plus telephone assistance from a medical assistant. Arm 3: UC/RN – received all items as Arm 2 with addition of RN Navigators Comparison: Arm 4: UC – patients received mailings of evidence-based guidelines; patient handouts; and an annual systems-delivered, patient-tailored “birthday letter” with previous completion and due dates for immunizations and screening tests	Not stated. The multiple interventions approach is consistent with a theoretical foundation in the socioecological model (Gili et al., 2006)	Two primary outcomes: receiving any CRCS and being current for CRCS in years 1 and 2	All intervention groups performed better with CRCS in both years 1 and 2 than control. Greater intensity of intervention = direct correlation with adherence UC = 26.3% [95% CI, 23.4% to 29.2%]; UC/AT = 50.8% [CI, 47.3% to 54.4%]; UC/AT/AC = 57.5% [CI, 54.5% to 60.6%]; UC/RN=64.7% [CI, 62.5% to 67.0%] Secondary outcome: Year 2 – The UC/AT/AC and UC/RN groups had higher adherence rate than UC but the UC/AT did not. UC = 26.0% [CI, 22.8% to 29.2%]; UC/AT = 20.7% [CI, 17.4% to 24.0%]; UC/AT/AC = 23.0% [CI, 19.8% to 26.2%]; UC/RN=25.6% [CI, 23.2% to 28.0%]
Green, B. B., Anderson, M. L., Cook, A. J.,	RCT	Adults patients, aged 50 to 73 of primary	Study to determine impact of continued interventions on CRCS up to 5 years	Not stated. The approach of the	Compliance with CRCS	Intervention patients = 31% higher compliance

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Chubak, J., Fuller, S., Meenan, R. T., & Vernon, S. W. (2017). A centralized mailed program with stepped increases of support increases time in compliance with colorectal cancer screening guidelines over 5 years: A randomized trial. Cancer, 123(22), 4472–4480. https://doi.org/10.1002/cncr.30908	Level I Grade A	care clinics in Washington state who participated in an earlier study (Green et al., 2013). Original study arms 2, 3, 4 eligible patients re-randomized No intervention (n=1106) Automated mail (n=1102)	Intervention: Auto-generated CRCS due reminder letters; informational pamphlet about different screening options. Patients could request alternate screening method or notified that FOBT kits were coming. Patients were mailed FOBT kits with simple instructions and postage-paid envelope if no alternatives selected Comparison: usual care – Mailed annual birthday reminders about preventive health screening and tests due (including CRCS); verbal screening reminder at time of visit	interventions point to a theoretical foundation in the socioecological model (Gili et al., 2006).	guidelines over 5 years	over 5 years (incidence rate ratio, 1.31; 95% confidence interval, 1.25-1.37; 47.5% vs 62.1%). Long term study showing mailed interventions remain effective over long term compared to usual care.
Hendren, S., Winters, P., Humiston, S., Idris, A., Li, S. X. L., Ford, P., Specht, R., Marcus, S., Mendoza, M., & Fiscella, K. (2014). Randomized, controlled trial of a multimodal intervention to improve cancer screening rates in a safety-net primary care practice. Journal of General Internal Medicine, 29(1), 41–49. https://doi.org/10.1007/s11606-013-2506-1	RCT Level I Grade A	Adult patients, aged 50–74 years past due for CRC screen and women aged 40–74 years past due for breast cancer (BC) screening receiving care in a safety net clinic in urban New York Intervention (n=185) Control (n=181)	Study to determine impact of intervention on increasing cancer screening among patients in a safety-net primary care practice Study period: April to September 2010 Multi-modal interventions: Letters = mailed personalized letter indicated the patient was overdue for mammogram, CRCS or both. Letter included education and stressed importance of screening; information on free cancer screening; outreach worker contact information. Letter #2 was sent week 12 for any remaining unscreened. FIT kits also mailed if due Phone = Automated telephone reminder calls on weeks 2, 6, 14 and 25 with similar information to letters but brief 25 second message with a phone number to call to	Not stated. The multiple interventions is consistent with the theoretical foundation in the socioecological model (Gili et al., 2006).	Mammo-gram; CRCS completion .	Screening rates were higher in the intervention groups. Mammogram screening rate: intervention group 29.7% vs. control 16.7% group (p=0.034); CRCS rate: intervention group 37.7 % vs. 16.7 % in the control group (p=0.0002). Multimodal interventions were effective in increasing screening adherence.

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
			arrange for screening. Point-of-Care written prompt sheets = Sheet provided to any patients with screenings due. Prompt sheet = a reminder for screening for providers and patients. The back of the sheet provided educational information about CRCS options. Comparison: Usual care (details were not specified in the article)			
Myers, R. E., Bittner-Fagan, H., Daskalakis, C., Sifri, R., Vernon, S. W., Cocroft, J., Dicarlo, M., Katurakes, N., & Andrel, J. (2013). A randomized controlled trial of a tailored navigation and a standard intervention in colorectal cancer screening. Cancer Epidemiology, Biomarkers & Prevention: A Publication of the American Association for Cancer Research, Cosponsored by the American Society of Preventive Oncology, 22(1), 109–117. https://doi.org/10.1158/1055-9965.EPI-12-0701	RCT Level I Grade A	Adult patients ages 50-79 receiving care at primary care clinics in Delaware 3 arms: Arm 1 = Tailored Navigation Intervention (TNI) Group (n=312) Arm 3 = Standard Intervention (SI) Group (n=316) Arm 4 = usual care = Control Group (n=317)	Study to determine impact of interventions on CRCS and screening decisions Study conducted between 2007 and 2011 Interventions: All patients received baseline survey Preventive Health Model Screening Decision Stage (SDS) to identify potential barriers to colorectal cancer screening. SDS tool has been studied as valid and reliable in previous studies (Myers et al., 1994; Vernon et al., 1997). TNI Group intervention = mailings with colonoscopy instructions and/or stool blood tests according to reported test preference, and received a navigation call from a nurse navigator The SI Group intervention = mailings with an informational booklet on CRCS, a personalized letter with phone numbers to a nurse, scheduling colonoscopy or SBT kit request. Reminder letter mailed at 30 days post-randomization.	The authors identified the PHM model as the theoretical foundation for the study.	Primary outcome = CRCS completion Secondary outcome = change in overall SDS between the baseline and the endpoint surveys	Results: CRCS completion: TNI Group: 38% (P=-0.001) SI Group: 33% (P=0.001) Control Group: 12% but no significant difference between the TNI and SI groups Secondary outcome: SDS change from the lower decision stages to the decided-to-do or screened stages (TNI Group: 91%, SI Group: 87%, Control Group: 81%) Conclusions: Both interventions had significant, positive effects on outcomes compared with usual

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
			Comparison: Control group = usual care (not described in article).			
Sequist, T. D., Zaslavsky, A. M., Marshall, R., Fletcher, R. H., & Ayanian, J. Z. (2009). Patient and physician reminders to promote colorectal cancer screening: A randomized controlled trial. Archives of Internal Medicine, 169(4), 364–371. https://doi.org/10.1001/archinternmed.2008.564	RCT Level I Grade A	Adult patients, aged 50 to 80 years of ambulatory health centers in Massachusetts. 4 arms: Arm 1: Patient intervention group (n=10,930) Arm 2: Patient control group (n=10,930) Arm 3: MD intervention group (n=10,912) Arm 4: MD control group (n=10,948)	Study aim: determine impact of personalized mailings to patients and electronic reminders to primary care physicians on colorectal cancer screening Interventions: Study done between April 2006 and July 2007 Arm 1 – Patient intervention –mailing with a cover letter from the chief medical officer with details about their last screening dates; educational pamphlet detailing screening options; an FOBT kit with 3 stool cards, stamped return envelope; dedicated phone number to schedule FS or colonoscopy Arm 2 – Patient control – usual care (details not included in the article) Arm 3 –MD intervention - reminders via the electronic health record as a pop-up alert and also available for reviewing any time. One-click ordering option with choices of screening options. Arm 4 – MD control - Comparison: Control group was educated on the alerts but did not have the alerts turned on.	Not stated by the authors. The approach of the study is consistent with the Precaution Adoption Process. The aim of the study was to explore if providing education and information to patients impact the engagement and decision of health behaviors (Weinstein & Sandman, 1992).	Completion of 1 of FOBT, FS, or colon-oscopy. Secondary study outcome = detection of adenomas	Patient intervention arm = significantly more likely to complete CRCS than control group (44.0% vs 38.1%; P.001) MD intervention arm: no difference in CRCS (41.9% vs 40.2%; P=.47). No difference in detection of adenomas but a trend towards significance in both intervention groups.
Tu, S.-P., Chun, A., Yasui, Y., Kuniyuki, A., Yip, M.-P., Taylor, V., & Bastani, R. (2014).	Quasi-experimental Level II	Vietnamese adult patients; aged 50 to 75 years of community	Study to determine the impact of culturally tailored interventions on colorectal cancer screening	Authors state the study framework = Diffusion of Innovations Theory	Time limited study. Adherence to CRCS	Marginally significant increase in CRCS in intervention clinic (the

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Adaptation of an evidence-based intervention to promote colorectal cancer screening: A quasi-experimental study. Implementation Science: IS, 9, 85. https://doi.org/10.1186/1748-5908-9-85	Pre-Post Design Cross-sectional Non-equivalent control Grade A	health centers in Washington Baseline: Control (n=412) Intervention (n=604) Post-Intervention: Control (n=514) Intervention (n=746)	Study period March, 2009 to February, 2011 Comparison of 2 clinics: control and intervention clinic Intervention: Vietnamese small media (DVD and pamphlet); medical assistants gave small media and education to patients Usual care: CRCS = FOBT ordered by primary care providers then patient given FOBT card by medical assistant to patients with verbal instructions			ratio of the two ORs = 1.42; 95% CI 0.95, 2.15).
Wong, M. C., Ching, J. Y., Huang, J., Wong, J. C., Lam, T. Y., Chan, V. C., Ng, S. K., Hui, Z., Luk, A. K., Wu, J. C., & Chan, F. K. (2018). Effectiveness of reminder strategies on cancer screening adherence: A randomised controlled trial. The British Journal of General Practice: The Journal of the Royal College of General Practitioners, 68(674), e604–e611. https://doi.org/10.3399/bjgp18X698369et al., 2018	RCT Level I Grade A	Adults patients, aged 40 to 70 of primary care clinics in Hong Kong 3 arms: Interventions: Arm 1: Text (n=212) Arm 2: Phone messages (207) Arm 3: Control – no communication (n=210)	Study to determine the impact of interventions on FIT screening compliance Interventions: Text group: One-way text messages to patient's cell phone with reminder about the importance of regular CRCS, and the time and place for of FIT kit pick up Phone group: Call from healthcare professionals with same message as text group except that the screening participants were able to talk with healthcare professionals Comparison: Control group: No communication	The authors identified the PRECEDE-PROCEED Model = theoretical foundation	FIT test submitted	FIT test returned on anniversary date: 86.5% Control 90.4% Text 95.1% Phone (P = 0.010) At 6 months return rate: 94.1%, Phone 90.0%, Text 86.0% Control (P = 0.022) Compared with the control telephone group were significantly more likely return FIT test. (AOR = 2.73, 95% CI = 1.35 to 5.53, P = 0.005) Text only intervention did not have a significant difference compared to the control group

Citation	Design Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
						The interaction with a trained health professional had a higher impact on the adherence rate with CRCS Generalizability to the US may be limited
Yu, C., Skootsky, S., Grossman, M., Garner, O. B., Betlachin, A., Esrailian, E., Hommes, D. W., & May, F. P. (2018). A multi-level fit-based quality improvement initiative to improve colorectal cancer screening in a managed care population. Clinical and Translational Gastroenterology, 9(8), 177. https://doi.org/10.1038/s41424-018-0046-z	Quasi-experimental Level II Pre-Post Grade A	Adult patients, aged 51 to 75 of a large university-affiliated health system in California Sample (n=5093)	Study to determine impact of a multi-modal intervention on CRCS Study dates: June 2015 and October 2014 Interventions: Patient-level = Letter with education about screening options and pre-colonoscopy telephone counseling plus a FIT kit. Reminder letter sent after 4 months if not returned. Physician level = Provided screening test results and work-flow for abnormal results. System-level = establishment of a patient navigator, expedited work-up for abnormal results, and stream-lined colonoscopy scheduling.	Not stated. Study approach is consistent with the socioecological model (Gili et al., 2006)	CRCS adherence	CRCS rate increased from 65.1% prior to intervention and 76.6% after the intervention

Note: Levels and quality of evidence ranked using Johns Hopkins Nursing Evidence-Based Nursing Evidence Level and Quality Guide (Dang & Dearholt, 2017).

Legend: Colorectal Cancer (CRC); Colorectal Cancer Screening (CRCS); Confidence Interval (CI); Double Contrast Barium Enema (DCBE); Fecal Immunochemical Test (FIT); Fecal Occult Blood Test (FOBT); Flexible Sigmoidoscopy (FS); Odds Ratio (OR); Randomized Controlled Trial (RCT); Stool Blood Test (SBT)

Appendix B

Summary of Systematic Reviews (SR)

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/ Recommendation/ Implications
Dougherty, M. K., Brenner, A. T., Crockett, S. D., Gupta, S., Wheeler, S. B., Coker-Schwimmer, M., Cubillos, L., Malo, T., & Reuland, D. S. (2018). Evaluation of interventions intended to increase colorectal cancer screening rates in the United States: A systematic review and meta-analysis. JAMA Internal Medicine, 178(12), 1645–1658. https://doi.org/10.1001/jamainternmed.2018.4637	Level I Grade A	What interventions increase CRCS completion?	Electronic databases: PubMed, CINAHL, Cochrane Library, ClinicalTrials.gov Key words: colorectal cancer and screening.	Inclusion: English, RCTs, published from 1/1/96 to 8/31/17 Original research only, full-length publications. Exclusion: not presenting original data (i.e. cost effectiveness analyses of trials already/separately published)	Data extracted and appraised by > 2 investigators independently Random-effects meta-analysis used to obtain either a pooled risk ratio or risk difference for screening completion for each type of intervention.	73 RCTs FOBT outreach and patient navigation, especially multi-component interventions showed increased CRCS rates in US trials	Useful information to support use of multi-component strategy for CRCS

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/ Recommendation/ Implications
U.S. Department of Health and Human Services. (2020). Cancer screening: Multicomponent interventions—Colorectal cancer. https://www.thecommunityguide.org/findings/cancer-screening-multicomponent-interventions-colorectal-cancer	Level II Grade A	Compared with no intervention which multi-component interventions increased CRCS?	Electronic databases: PubMED, Medline, PsycINFO, Embase, CINAHL, Cochrane, Chronic Disease Prevention, Web of Science	Inclusion: English-language; multicomponent interventions on breast, cervical, or colorectal cancer screening in high-income countries. Search period: January 2004 - November 2013 Exclusion: not specified	Screened independently by two abstractors Data evaluation = stratified analyses	Number of cancer screening studies included: Total 88 -: breast (33), cervical (20), colorectal (56) RCTs 30, quasi-experimental 26 Multi-component interventions increased colorectal cancer screening	Recommendation: Strong evidence to support multi-component interventions to increase CRCS. The interventions were cost-effective. Very useful systematic review which was developed into a practice guideline
Young, B.-R., Gwede, C. K., Thomas, B., Vázquez-Otero, C., Ewing, A., Best, A. L., Aguado Loi, C. X., Martinez-Tyson, D., Schneider, T., Meade, C. D., Baldwin, J. A., & Bryant, C. (2019). A systematic review of U.S.-based colorectal cancer screening uptake intervention systematic reviews: Available evidence and lessons learned for research and practice. Frontiers in Public Health, 7. https://doi.org/10.3	Level II Grade A	What are the EBP interventions for colorectal cancer screening (CRCS), their effect size, and their characteristics?	Electronic databases CINAHL, rTIPS, PubMed, Cochrane Library, PsycINFO, EBSCO, Review of reference section of each systematic review.	Inclusion: Eligible systematic reviews: published in English, only studies conducted in U.S. and/or its territories. Study types: RCTs, quasi-experimental, or single arm intervention design Outcome: CRCS uptake per U.S. Preventive Services Task Force guideline Study date range 1986 to 2013 Exclusion: Non-English; articles that solely	One author abstracted the data, another independently reviewed all data. Arbitrator for disagreements Effect size to measure magnitude of difference	16 systematic reviews totaling 116 unique individual studies contained within the systematic reviews Inconsistent evidence to support: • provider assessment and feedback for any screening other than FOBT • client reminders for any screening other than FOBT • small media on increasing sigmoidoscopy, colonoscopy, or DCBE • client incentives • reducing client out of pocket costs • client group education	Helpful information for focusing interventions on components that had the largest effect size

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/ Recommendation/ Implications
389/fpubh.2019.00145				focused on improving intentions to be screened		Most effective: (a) allowing clients to select a screening modality; option from a colonoscopy, FOBT, or sigmoidoscopy' (b) patient navigators or a patient-referral structures or provider-level intervention through provider assessment and feedback	

Legend: Colorectal Cancer Screening (CRCS); Double Contrast Barium Enema (DCBE); Fecal Occult Blood Test (FOBT)

Appendix C

Study Themes

Theme	Subtheme	Baker et al., 2014	Basch et al., 2015	Chou et al., 2016	Coronado et al., 2018	Davis et al., 2017	Dodd et al., 2019	Fitzgibbon et al., 2016	Fortuna et al., 2014	Green et al., 2013	Green et al., 2017	Hendren et al., 2014	Myers et al., 2013	Sequist et al., 2009	Tu et al., 2014	M. C. Wong et al., 2018	Yu et al., 2018	Dougherty et al., 2018	USDHHS, 2019	Young et al., 2019
	Study Type	R-I-A	Q-II-B	Q-II-A	R-I-A	R-I-A	R-I-C	R-I-A	Q-II-A	R-I-A	R-I-A	R-I-A	R-I-A	R-I-A	Q-II-A	R-I-A	Q-II-A	SR-I-A	SR-II-A	SR-II-A
Patient Outreach	**Letters**	X			X				X	X	X	X	X	X			X		X	
	Auto phone message/text	X							X			X				X			X	
	Navigator	X	X				X		X	X			X			X	X	X	X	X
	FOBT kit	X		X	X		X			X	X	X	X	X			X	X	X	
Patient Education	**Written**	X	X			X	X	X	X	X	X	X	X		X		X	X	X	X
	Video			X		X		X							X				X	
Clinician Directed	**Clinician education**		X					X												
	Clinician feedback							X											X	X
	Clinician reminder													X					X	X

Legend: R – Randomized Controlled Trial; Q – Quasi-Experimental; SR – Systematic Review; I – Level I; II – Level II; A = Grade A; B = Grade B; C = Grade C

Appendix D

SWOT Analysis

STRENGTHS	WEAKNESSES
• Strong lean culture within the organization • Supportive leadership • Engaged staff • Strong Systems Redesign (process improvement) department • Existing VA directive that supports the practice • Daily Management System huddle board for metric tracking • Lead NPs available • Dedicated nurse educator available • PACT (primary care aligned care team) model (medical home model) with an RN care manager in every PACT team • Goal set to have Magnet recognition. Currently in pre-application phase	• Limited flexibility in type of FIT kit used • Lack of a feedback loop from GI practitioners to primary care • Nursing and clerical staff floating in from other areas without having received education • Fears and perceptions about handling stool sample • Number of patients seen face to face may vary with pandemic surge • Potential supply chain issues with FIT kits
OPPORTUNITIES	**THREATS**
• Dashboard for performance feedback available but not used • Collaborating with other like facilities who are performing well on this metric • Facility currently has a quarterly process improvement fair for staff to showcase improvement in outcomes • Pandemic – COVID-19 may improve patient visits using telehealth	• Pandemic – COVID-19 causing instability in patient confidence to venture out • Multiple projects coinciding that impact primary care • Potential leadership changes may cause change in support • Change of guideline to start CRCS screening at age 45

Appendix E

Project Schedule

Course/Week	NUR7802								NUR7803							
Activity	*Week 1*	*Week 3*	*Week 5*	*Week 7*	*Week 9*	*Week 11*	*Week 13*	*Week 15*	*Week 1*	*Week 3*	*Week 5*	*Week 7*	*Week 9*	*Week 11*	*Week 13*	*Week 15*
Meeting with leadership and lead RN Care Manager to discuss project status																
Obtain EPRC approval from university																
Obtain IRB approval from facility																
Official kick-off meeting with stakeholders (PC staff, nurse scientist, data analyst, supply chain rep, leadership, PC NSG)																
Collect baseline data measures (Table 2)																
Lead Care Manager to review new standard work with nursing staff																
Meet with statistician																
Collect data and enter into statistical program																
Analyze data																
Update huddle boards with status of metrics																
Hand-off project to PC lead care manager for sustainment																
Write analysis and conclusion on proposal																
Dissemination of findings																

Legend: PC – primary care; CRCS/S Colorectal Cancer Screening and Surveillance database; PC NSG – primary care nursing shared governance committee

Appendix F

Demographic and Colorectal Cancer Screening & Surveillance Database Use Data Collection

Date_____ Dept _____

To assist in data analysis and interpretation, please provide the following information. All information will be held strictly confidential.

1. Circle the number beside your age range (1) 18-30 (2) 31-40 (3) 41-50 (4) 51-64 (5) 65 +

2. What is your gender? (1) Female (2) Male

3. Circle the number beside your highest level of education: (1) LVN (2) AA/ADN (3) Diploma (4) BSN (5) Master's Degree (6) DNP/PhD (7) MD/DO (8) Other_____

4. Circle the number of years of experience you have in your profession: (1) 6mo - 1 yr (2) 1 - 3 yrs (3) 3-5yrs (4) 5-10 yrs (5) 10 + yrs

5. Circle the number of years of primary care experience you have: (1) 6mo - 1 yr (2) 1 - 3 yrs (3) 3-5yrs (4) 5-10 yrs (5) 10 + yrs

6. How important do you think it is to talk to your patients about colorectal cancer? (check one)
   - [ ] 0 – not important
   - [ ] 1 – somewhat important
   - [ ] 2 – important
   - [ ] 4 – extremely important

7. What is your level of comfort with discussing colorectal cancer with your patients? (check one)
   - [ ] 0 – not comfortable at all
   - [ ] 1 – somewhat comfortable
   - [ ] 2 – comfortable
   - [ ] 4 – extremely comfortable

8. How many days in the past week have you used the Colorectal Cancer Screening & Surveillance database?

   Circle the number 0 1 2 3 4 5

Appendix G

Nursing Documentation Chart Audit

Date & Time of Visit	Clinic Name	Initials of Nurse Who Saw the Patient	Type of CRCS Due (F= FIT; C=colonoscopy; O=other (specify)	Documentation in EHR about CRCS patient counseling? (Y=yes; N=no)	Auditor Initials	Date of Audit
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		
			[ ] F [ ] C Other (specify): _____	[ ] Y [ ] N		

Appendix H

Standard Work for CRCS in Primary Care

Standard Work: Colorectal Cancer Screening (CRCS) in Primary Care					
Last updated:	11/7/20	**Owner:**	Primary Care Chief MD and Chief Nurse	**Performed by:**	Primary Care Staff
Version:	1	**Revised by:**	Ahnnya Slaughter	**Trigger:**	Patient EHR indicates due for CRCS
				Work in Process:	1
Standard Work Applicability:	When patients have an appointment in primary care			**Takt Time:**	30 days

Step	Performed by	Cycle Time	Major Step	Details	Why this step is important
1	Licensed Vocational Nurse (LVN)	2-3 mins	LVN reviews type of CRCS due	• Patients vary with the type of CRCS depending on history. Some may get a FIT kit. Others may need other options (colonoscopy, CT colonoscopy)	• Ensures the appropriate screening tool is provided to the patient.
2	LVN	5 mins	Discusses general colorectal cancer prevention with patient	• LVN provides patient teaching to address frequent myths and barriers that prevent colorectal cancer screening. If the patient is refusing, go to step 3. If patient is a candidate for FIT test, go to step 5. If the patient is a colonoscopy candidate, to step 6. • Use the attached Nursing FIT Kit Screening Script to guide the conversation	• Providing accurate information and addressing barriers increases the likelihood that the patient will adhere to CRCS
3	LVN	1 min	Refer to RN care manager if patient had concerns or refusing screening	• Patient refusing the screening needs further assessment to be done by the RN care manager	• Additional assessments may be necessary if the patient is refusing preventative health services
4	RN	2-3 mins	Discusses concerns with patient	• A higher-level assessment by the RN may be needed to address barriers to CRCS	• Ensures barriers have been appropriately

Step	Performed by	Cycle Time	Major Step	Details	Why this step is important
				• If patient agrees, go to step 5. If patient does not agree, go to step 6	addressed and that the patient understands the risks of their decision
5	RN/LVN	5 min	Provide FIT kit for FIT-eligible patients per clinical reminder	• Provide FIT kit instructions including caution about FIT kit expiration date and process for returning • Verify understanding by using the Teach-Back method	• Patient teaching ensures likelihood that the process is done correctly • Teach-Back method verifies the patient understood the instructions • Teach-Back method verifies the patient understood the instructions
6	RN/LVN	5 min	Provide colonoscopy instructions for patients who will be scheduled for a colonoscopy for CRCS	• For colonoscopies, provide instruction on the importance of adequate prep • Verify understanding by using the Teach-Back method • Document teaching	• Patient teaching ensures likelihood that the process is done correctly • Teach-Back method verifies the patient understood the instructions
7	RN	2-3 mins	Document in EHR	• Document patient's decision in the EHR	• Ensures information is available in the EHR for all clinicians involved in the care • Documentation is critical from a

Step	Performed by	Cycle Time	Major Step	Details	Why this step is important
					medical-legal perspective
8	Provider	1 min	Order appropriate procedure if other than FIT test (i.e. colonoscopy, CT colonoscopy)	• Other CRCS needs an order entered by a provider	• To set the expectation of the huddle
9	Provider	1 min	Reinforce instructions	• Reinforce instructions provided by nursing staff	• Hearing the same information from multiple clinicians reinforces the importance of the screening
10	RN Care Manager	2 mins	Review patient panel on Colorectal Cancer Screening Surveillance (CRCS/S) tool on a weekly basis	• Screen for any patients who have FIT tests not returned > 30 days – go to step 11 • Screen for any patients who were referred for colonoscopy but no appointment – go to step 12	• Ensures the CRCS is completed
11	RN Care Manager	5 mins	Call patients who have FIT tests not returned > 30 days	• Call patients to remind them to return the FIT kit • Use the attached Nursing FIT Kit Screening Script to guide the conversation • Discuss any concerns or barriers • Go to step 13	• Ensures the CRCS is completed • Provides an opportunity for any barriers to be addressed
12	RN Care Manager	15 mins	For patients referred but who do not have a colonoscopy appointment within	• Review chart. Identify and coordinate appointment for the colonoscopy • Go to step 13	• Ensures CRCS is completed in a timely manner

Step	Performed by	Cycle Time	Major Step	Details	Why this step is important
			30 days, review chart and take appropriate action		
13	RN	2-3 mins	Document in EHR	• Document conversations and/or call attempts in the EHR	• Ensures information is available in the EHR for all clinicians involved in the care • Documentation is critical from a medical-legal perspective
14	RN Care Manager	5 mins	Repeat process from step 10 at 60 days and 90 days for any patients with incomplete CRS	• Continue to track until CRCS is completed • Take appropriate action to coordinate care • If not able to resolve at own level, escalate to lead RN care manager for guidance	• Discuss how these metrics align with the department and facility's strategic direction
15	RN Care Manager	2 mins	After 90 days, escalate case to lead RN Care Manager	• After 90 days, escalate case to lead RN care manager	• Ensures complex patients are referred to a more experienced clinician
*	Additional Resources	N/A	Resources for patients	• Patient Health Library – Colorectal Cancer https://www.veteranshealthlibrary.va.gov/RelatedItems/142,87081_VA • Lots of resources for patients: https://vaww.prevention.va.gov/docs/Colorectal_Cancer_Resource_Document.pdf (must be within healthcare system network to access) • VIP – Integrated Education Program (link accessible within healthcare system)	• Provide patient with resources consistent with preferred learning style

Attachment to Standard Work

NURSING FIT KIT SCREENING SCRIPT

General FIT Kit Explanation

A FIT kit contains a screening test to determine whether you have small amounts of blood in your stool. This test can be done at home using a kit that has a small sampling bottle inside. At home, you collect a small amount of stool on a little stick inside the sampling bottle, put the stick back inside the sampling bottle and then send the envelope back to us or drop it off at the lab. You do NOT touch your stool with your hands.

- Did you know that colon cancer is the 2nd leading cause of death in the US?
- More than half of the patients who died because of colon cancer could have been saved by early detection.
- Anyone can get colon cancer. The risk increases as you get older.
- The majority of cases occur in persons over age 50.
- Many people with colon cancer do not have any symptoms at all. You should get tested even if you feel healthy.
- Colon cancer can be prevented and even treated successfully when found in the early stages.
- Having a FIT test can PREVENT cancer before it starts; that's why it is so important – it could save your life!

FIT Kit Unreturned – Phone Follow-Up

Good Morning/Afternoon. May I speak with _____?
(Note: Due to HIPAA regulations, the conversation should not proceed unless speaking directly with the patient.)
My name is _____ and I am calling from_____.
You recently received a FIT kit stool blood test for colon cancer screening. We are calling because we noticed it's been quite some time since you received the kit and our records indicate it hasn't been returned yet.

1. "Have you had the chance to complete and mail or bring your kit to our lab?" If the answer is YES, get the approximate date to ensure that the test will be valid, and get the approximate date of receipt.
Thank the patient and let them know how they can receive their results.

If the answer is NO, ask the following question.

Mr./Ms. _____, do you have any questions or concerns that I can help you address?
(Document reason; possible reasons are listed below.)
– Confused about diet or drug restrictions
– Test is difficult and disgusting
– Haven't had the time
– Received other colorectal cancer testing
– Concern it is not effective way of screening/would have preferred colonoscopy*
– Health insurance --Feeling healthy/have no symptoms

2. Emphasize the benefits of screening.
"Colon cancer can affect anyone – men and women alike – and your risk increases with age. It is one of the most common cancers in the U.S. There are often no symptoms of early stage colon cancer, but it can be detected early or even prevented through screening. That's why it's so important for you to return your test. The American Cancer Society recommends stool testing as one of many options, as an effective way to screen for colon cancer, and we know it can save lives. Many people appreciate that it is an easy test they can do at home. [Explain how to return test].

3. Do you have any other questions?

4. When do you think you can complete the test?
Document when patient commits to completing the test

Note: Adapted from: Evidence-Based Cancer Control Programs. (2014, August 26). *Healthy colon, healthy life: Telephone counseling script*. https://ebccp.cancercontrol.cancer.gov and U.S. Department of Veterans Affairs. (2020e, November 13). *Are you FIT?* https://www.prevention.va.gov