Increasing Colorectal Cancer Screening Using a Quality Improvement Approach in a Nurse-Managed Primary Care Clinic

Diane Hountz, Jennifer Coddington, Karen J. Foli, Janet Thorlton

Introduction
Colorectal cancer (CRC) is the third most common type of cancer in men and women in the United States and is the second leading cause of cancer-related deaths in the United States.\(^1\) In 2016, more than 134,000 new cases of CRC will be diagnosed with more than 49,000 of these resulting in a patient death.\(^2\) Individuals with Stage 1 CRC have a 92% 5-year survival rate when detected and treated; however, only 39% of these individuals are diagnosed at Stage 1.\(^2\) With early detection through screening procedures, CRC can be prevented or treated sooner with increased potential for positive patient outcomes.

Colorectal cancer screening modalities are widely available throughout the United States and can detect early-stage cancer and adenomatous polyps.\(^3\) For average risk individuals, the U.S. Preventive Services Task Force recommends CRC screening to begin at age 50 and continue until age 75 years, and to begin at age 40 for those adults with a high risk for CRC.\(^4\) National benchmarks recommend that at least 70% of all adults aged 50 to 75 be screened for CRC.\(^5\)

Recommendations are for CRC screening to be accomplished by either colonoscopy or fecal immunochemical tests (FITs).\(^3,4\) Colonoscopy is the gold standard in CRC screening and can be performed every 10 years if the screening is negative. It is an invasive procedure that allows for direct visualization of the colon, and the physician is able to remove polyps if discovered during the procedure. The FIT is a noninvasive test that relies on the individual to collect a stool sample to send in to the laboratory and is recommended annually if negative. If the FIT is positive, a colonoscopy is recommended to identify and remove any adenomatous polyps.\(^3,6\)

Abstract: According to the American Cancer Society, 1 in 23 Americans will be diagnosed with colorectal cancer (CRC) in their lifetime. Screening for CRC is an effective, yet underused preventive approach. This is especially true in rural areas, where only 35% of patients were found to be up to date on their screenings in 2014. Increasing CRC screening can produce positive patient outcomes by early recognition and removal of precancerous polyps. The purpose of this project was to use quality improvement (QI) interventions to increase CRC screening rates at a nurse-managed clinic in rural Indiana. Using Deming’s Plan-Do-Study-Act QI model, multiple interventions were implemented which resulted in a 37% increase in the number of screenings ordered on eligible patients and an overall increase of 28% in the completion of the screenings. This project contributes to healthcare quality knowledge by also suggesting that the fundamental principles of encouraging staff feedback to gain buy-in, improving processes informed by patient data, and valuing frequent performance feedback to staff, strengthened this QI project and ensured adoption and sustainability of these results.

Purpose
Although screening rates have increased overall in recent years, the rates for patients seen at Federally Qualified Health Clinics (FQHCs) remain around 35% (Figure 1).\(^7\) The purpose of this project was to use a quality improvement (QI) approach to increase CRC screening rates in a rural FQHC nurse-managed health clinic (NMHC). The goals of this project were to

- Review the current CRC screening process used at the NMHC.

Keywords: colorectal cancer screening, preventive care, quality improvement, nurse-managed health clinics, nurse led
• Develop interventions based on results.
• Implement QI interventions to improve the process.
• Evaluate the progress of the interventions implemented.
• Sustain process changes.

**Background**

In the United States, office-based primary care medicine is the foundation of the healthcare system. Nurse-managed health clinics are one of the venues that provide primary healthcare in medically underserved rural and urban areas. Nurse-managed health clinics are clinics operated by nurses and use nurse practitioners (NPs) as primary care providers. These clinics face challenges to provide high-quality, patient-centered care with limited financial resources while trying to continuously improve preventive screening rates through QI initiatives, (e.g., CRC screening). Currently there are more than 250 NMHCs operating throughout the United States with 2.5 million patient visits per year. Many NMHCs operate in geographic areas with health professional shortages and provide care to low-income and minority individuals, where the primary sources of payment are Medicaid, Medicare, private, and federal grants.

**Review of Literature**

**Barriers.** Low rates of CRC screening are a complex problem involving patients, providers, and healthcare systems. Barriers reported for underserved or low-income patients include lack of knowledge on importance of screenings, language barriers, fear of the screening procedure, suffering as a result of the procedures, lack of insurance coverage, and low literacy levels. Additional barriers, specific to colonoscopies, reported were the lack of time, scheduling issues, bowel preparation time and discomfort, and lack of transportation. Fecal immunochemical test–specific barriers included being too busy, problems keeping track of cards, and not remembering to mail cards back.

Healthcare system barriers include the inability to provide colonoscopies for patients with a positive FIT due to lack of insurance, lack of time during patient visit, lack of transportation, lack of insurance coverage, and lack of an electronic health record (EHR) tracking system. A lack of physician/provider recommendation for CRC screening was a common healthcare system barrier in FQHCs, resulting in low screening rates.

**Interventions to Increase Screening Rates.** Numerous approaches to increase CRC screening rates have demonstrated...
small increases. Menon et al\textsuperscript{16} used tailored telephone education and observed a 23\% increase in colonoscopy and FIT rates among patients. Tailored navigations through a CRC screening booklet and materials, matched patient preferences for screening, increased screening rates by 6.5\% over nontailored interventions.\textsuperscript{17} Client reminder postcards yielded a 16\% increase in CRC screenings.\textsuperscript{18} Lasser et al\textsuperscript{19} found patient navigators increased the CRC screening rates at clinics by 13.6\%. Hendren et al\textsuperscript{20} used a multifaceted approach through letters, automated phone calls, and mailed FIT kits, netting a 21\% increase in screening rates. Provider recommendation was found to increase screening rates in one study by 34\%.\textsuperscript{14}

**Methods**

Increasing quality of care outcomes in settings involves a problem-solving and iterative approach. The Deming Plan-Do-Study-Act (PDSA) Framework, when applied to systems problems, is shown to improve morale, organizational effectiveness, and efficiency, whereas reducing costs.\textsuperscript{21} Throughout this process, the PDSA model emphasized staff input as an integral process for ensuring buy-in and success of any QI project.\textsuperscript{22} Therefore, this model was selected as a guiding framework for this project.

**Setting**

The setting used for this QI project is a NMHC that provides primary care to patients in medically underserved, rural areas of Indiana. A QI committee serves to assess, implement, and monitor all QI initiatives. In 2015, clinic NPs saw more than 3,212 patients, with more than 8,500 patient encounters. About 50\% of patients seen are at 100\% or above the poverty level. This NMHC received full recognition in 2014 as a Level Two Patient-Centered Medical Home provider. To ensure financial viability, ongoing reporting and improvement of quality of care measures had been in place for the past 15 years. One of these measures was CRC screenings. A summary of the PDSA methods used to address each of the five main goals of the project are summarized in Table 1.

**Institutional Review Board Approval**

Our University’s Institutional Review Board approved this study in April 2015 (IRB study number 1504015943).

**Results**

**Goal 1: Review the Current CRC Screening Process**

A comprehensive assessment of the current CRC screening process was completed. Input was given by all staff involved in the process (i.e., NPs, nurses, medical assistants, administration, QI committee). The QI committee previously established a CRC screening rate goal of 70\% for patients aged 51–74. The NMHC is required by Health Resources and Services Administration to monitor, improve, and report different quality initiatives through Uniform Data Sets (UDS) measures. The UDS measurement for CRC screening is from age 51 to 74, so was decided to keep this consistent with monitoring and reporting for these requirements. During May–July 2015, a retrospective review of 200 medical records was conducted for this population. All patients between ages of 51 and 74 who were seen and treated for a medical condition by a NP at the NMHC were included. Patients who were less than 51 years or greater than 74 years and those patients who were not seen or treated by a NP were excluded from the record review.

Data points were then entered into the Research Electronic Data Capture (REDCap) database. Of the 200 charts reviewed, 76 (38\%) had either screenings ordered by the provider or were up to date with screenings (see Table 2 for CRC screening definitions). In addition, 60 of the 200 charts (30\%) had their screenings ordered by the provider and completed by the patient or were up to date with their screenings. Of those charts with no
Table 1. **Quality Improvement Methods Overview**

<table>
<thead>
<tr>
<th>Goal</th>
<th>PDSA framework</th>
<th>Timeframe</th>
<th>Project tasks</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Develop process flow map</td>
</tr>
<tr>
<td></td>
<td>Plan</td>
<td></td>
<td>Retrospective chart review of 200 charts</td>
</tr>
<tr>
<td></td>
<td>Plan</td>
<td></td>
<td>Obtained organizational goal from NMHC QI committee.</td>
</tr>
<tr>
<td></td>
<td>Plan</td>
<td></td>
<td>Reviewed pertinent literature and current practice guidelines.</td>
</tr>
<tr>
<td></td>
<td>Plan</td>
<td>August–September 2015</td>
<td>Informal interviews of NPs and registered nurse staff at NMHC.</td>
</tr>
<tr>
<td></td>
<td>Plan</td>
<td></td>
<td>Analyzed preintervention data with identification of problems.</td>
</tr>
<tr>
<td>2. Develop QI interventions.</td>
<td>Plan</td>
<td>August–September 2015</td>
<td>Used problems from predata, staff interviews, review of literature, and clinical guidelines to shape intervention development.</td>
</tr>
<tr>
<td>3. Implement QI interventions to improve the process.</td>
<td>Do</td>
<td>October 2015</td>
<td>Educated staff at staff meeting on predata and proposed interventions.</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td></td>
<td>Obtained staff feedback on proposed interventions and modified interventions.</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>Oct 2015–February 2016</td>
<td>Performed weekly chart audits and sent findings to individual providers for feedback.</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td></td>
<td>Compiled data and sent to providers and posted at NMHC.</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td></td>
<td>Answered questions and educated staff on new processes.</td>
</tr>
<tr>
<td>4. Evaluate the interventions implemented.</td>
<td>Study</td>
<td>Feb 2016–March 2016</td>
<td>Performed biweekly chart audit and sent findings to individual providers.</td>
</tr>
<tr>
<td></td>
<td>Study</td>
<td></td>
<td>Retrospective review of 200 charts 2 months postimplementation</td>
</tr>
<tr>
<td></td>
<td>Study</td>
<td></td>
<td>Completed pre and postdata comparison and analysis.</td>
</tr>
<tr>
<td>5. Sustain process changes.</td>
<td>Act</td>
<td>April–May 2016</td>
<td>Continue to provide education to staff as needed.</td>
</tr>
<tr>
<td></td>
<td>Act</td>
<td></td>
<td>Post data by provider monthly at NMHC.</td>
</tr>
<tr>
<td></td>
<td>Act</td>
<td></td>
<td>Establish process owners.</td>
</tr>
</tbody>
</table>

CRC = colorectal cancer; NMHC = nurse-managed health clinic; NP = nurse practitioner; PDSA = Plan-Do-Study-Act; QI = quality improvement.
Data were analyzed to illuminate problems with existing processes and guide semistructured staff interviews with the researcher. These interviews revealed process strengths and weaknesses, along with proposed interventions for overcoming the problems with the screening process (Table 3).

### Goal 2: Develop Interventions Based on Findings

Six interventions were developed using an iterative, multifaceted approach,

### Table 2. Colorectal Cancer Screening Process Definitions

<table>
<thead>
<tr>
<th>Colorectal cancer screening process term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening ordered</td>
<td>Colonoscopy or FIT was ordered by the NP.</td>
</tr>
<tr>
<td>Screening up to date</td>
<td>Patient had colonoscopy within past 10 years or FIT within past 1 year</td>
</tr>
<tr>
<td>Screening completed</td>
<td>Patient completed screening procedure (colonoscopy or FIT)</td>
</tr>
</tbody>
</table>

FIT = fecal immunochemical test; NP = nurse practitioner.

### Table 3. Problems Identified and Quality Improvement Interventions Completed

<table>
<thead>
<tr>
<th>Problem</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Lack of defined CRC screening protocol</td>
<td>Protocol/algorith for CRC screening posted at nursing stations and given to all providers.</td>
</tr>
<tr>
<td>2) Inefficient process for ordering FIT</td>
<td>Simplified FIT ordering process in EHR to allow NPs to order FIT at same time as other laboratories and support staff to split orders to print requisitions to be sent home with patient.</td>
</tr>
<tr>
<td>3) Low numbers of ordering CRC screenings on those who are eligible</td>
<td>Clinical decision support tools (pop-up reminders in EHR) to NPs on patients who are eligible but not up to date on screenings.</td>
</tr>
<tr>
<td>4) Lack of follow-up for outstanding FIT that were ordered</td>
<td>Outstanding FITs will be queried monthly and letters sent to all patients with outstanding FIT.</td>
</tr>
<tr>
<td>5) Lack of patient education information regarding CRC screening options</td>
<td>Educational brochure on colonoscopy and FIT explanations, preparations for tests, and frequency of tests placed in patient rooms.</td>
</tr>
<tr>
<td>6) Inadequate documentation of patient refusals of CRC screening tests</td>
<td>Utilization of comments box in EHR within screening window of colonoscopy and FIT</td>
</tr>
</tbody>
</table>

CRC = colorectal cancer; EHR = electronic health record; FIT = fecal immunochemical test; NP = nurse practitioner.
considering stakeholder input, current practice guidelines, and pertinent literature.

**Goal 3: Implement QI Interventions to Improve the Process**

We began by educating the clinic staff in a meeting. An overview of the problem, project goals, and proposed interventions were presented. Interventions were modified based on staff feedback through informal discussions and email correspondence. To improve overall CRC screening rates, ongoing communication with the NMHC staff during the first few weeks of the implementation was critical to support successful interventions.

Data were compiled and provided to all NPs after weekly chart audits; NPs were given the number of patients eligible for CRC screening along with the actual number of screenings ordered. Data were also organized by NP name and posted on the clinic QI board weekly. Specific feedback was also given through individual flags in the EHR, which were sent to NPs requesting clarification of documentation.

Two weeks postimplementation, FIT follow-up letters were sent to all patients with uncompleted FITs. Letters were written in English and Spanish, and included in the EHR for tracking purposes. Monthly follow-up letters continued to be mailed to all patients with uncompleted FITs.

**Goal 4: Evaluate the Progress of the Interventions Implemented**

A retrospective review of 200 new charts began in March 2016. To ensure consistency in pre and postintervention data analysis of these two patient groups, identical data points were collected in the postintervention chart review (Table 4).

Postintervention results showed 150 charts of 200 (75%) had CRC screenings ordered by the NP or were up to date. We compared the proportions of CRC screening for the two independent samples by calculating $z$ scores to test our hypothesis. The $z$ statistic was determined to be $-7.4635$ ($p$ value <.0001), which correlates with significant improvement from pre to postdata equating to a 74% increase in screenings ordered, and

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Preintervention (02/2015), n = 200</th>
<th>Postintervention (01/2016), n = 200</th>
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</thead>
<tbody>
<tr>
<td>Age group, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51–59</td>
<td>120 (60)</td>
<td>116 (58)</td>
</tr>
<tr>
<td>60–69</td>
<td>75 (38)</td>
<td>73 (37)</td>
</tr>
<tr>
<td>70–75</td>
<td>5 (2)</td>
<td>11 (5)</td>
</tr>
<tr>
<td>Sex, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>116 (58)</td>
<td>137 (68)</td>
</tr>
<tr>
<td>Male</td>
<td>84 (42)</td>
<td>63 (32)</td>
</tr>
<tr>
<td>Race/ethnicity, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>176 (88)</td>
<td>192 (96)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>20 (10)</td>
<td>7 (4)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Health insurance coverage type, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>59 (29.5)</td>
<td>86 (43)</td>
</tr>
<tr>
<td>Self-pay</td>
<td>53 (26.5)</td>
<td>27 (14)</td>
</tr>
<tr>
<td>Medicare</td>
<td>45 (22.5)</td>
<td>55 (28)</td>
</tr>
<tr>
<td>Private insurance</td>
<td>43 (21.5)</td>
<td>32 (16)</td>
</tr>
</tbody>
</table>
a 56% increase in screenings completed (Figure 2).

Of the 200 charts, 116 (58%) had CRC screenings ordered and completed or were up to date. By almost doubling this measure, the NMCH is closer to their goal of 70%. The z statistic was determined to be $-5.64$ ($p$ value <.0001), which also correlates with significant improvement from pre to postdata (Table 5). Post-intervention also revealed that 12 (24%) charts had a patient refusal documented compared with 4% in predata results. Seventy-eight letters were mailed one time to patients who had not completed their FIT. The mean rate of return was 42% for the FITs.

One month postimplementation, increases in the overall numbers for CRC screening were seen at the NMHC. Because of this increase, provider feedback was decreased to biweekly and included overall screening rates and NP documentation of patient refusals. Overall screening rates continued to be posted biweekly by provider on the QI bulletin board and were reported monthly at the QI meeting.

Because interventions were implemented, the impact on the overall screening completions has been positive. Since October 2015, 19 patients have had either a positive FIT or colonoscopies. Of these, 11 patients had polyps removed, thus preventing the potential growth of these polyps into CRC.

Confounding factors could have also contributed to this increase in ordering and completion of screening. In 2015, the clinic hired a QI Coordinator to drive QI initiatives and also an additional patient navigator to patient enrollment for insurance through the Affordable Care Act.

**Goal 5: Sustain Process Changes**

Monthly feedback was given to individual providers and continues to be posted at the NMHC. Pre and postintervention data were presented to the QI committee, where ideas were discussed for ongoing sustainability. First, the committee wanted to educate the staff on project outcomes to encourage staff to help with sustainability. Next, it was determined to continue to post the monthly data on the number of CRC screenings ordered by provider at the NMHC. The QI committee also determined the positive value of the FIT follow-up letter and will continue this intervention.

**Limitations**

There are several limitations to this project. The Affordable Care Act was
changing the payer system structure in the United States, especially for the underserved population, during the project implementation. Those patients who had suboptimal or no health insurance were now able to afford preventive screenings. This influx of patients with health insurance could have influenced the results. This project was completed at one NMHC in a rural, underserved setting and, therefore, generalizability of the results may vary across geographic areas.

Discussion

The six goals outlined in this project were achieved and assisted in the improvement of CRC screening rates in this NMHC. Based on the positive results, the QI interventions that were developed and implemented had a significant impact not only on the numbers of CRC screenings ordered on patients but also on the numbers of patients who completed their CRC screenings.

Four main themes emerged that influenced the increase in the CRC screening rates. The first theme, using multiple interventions, summarizes the implementation of this QI project. Healthcare QI processes are multidimensional and complex. Assessing these processes brings about identification of multiple problems that require various interventions to positively bring about change. In this project, six different QI interventions were implemented concurrently to target the six problems identified. This multifaceted approach to

<table>
<thead>
<tr>
<th></th>
<th>Predata (n = 200), n (%)</th>
<th>Postdata (n = 200), n (%)</th>
<th>% Change (increase)</th>
<th>Z statistic</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal cancer screening up to date or ordered</td>
<td>76 (38)</td>
<td>150 (75)</td>
<td>74</td>
<td>-7.4635</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Colorectal cancer screening completed</td>
<td>60 (30)</td>
<td>116 (58)</td>
<td>56</td>
<td>-5.64</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

increase screening rates was also previously noted in the literature. Using an approach with multiple interventions helped to improve CRC screening rates in primary care settings by 13–23%.16,20

The utilization of staff input, theme two, helped to guide the project development and will strengthen sustainment. According to The Deming Institute,23 utilization of staff input is crucial to the success of QI initiatives. Staff input was used from the inception to the end of this project. The NMHC staff were presented with the initial data and asked for their recommendations on how to improve the findings. Staff had many ideas for improvement and were then motivated to be a part of the solution. With this initial buy-in, additional feedback throughout the process was given freely, with minimal prompting, as providers were excited to see how their ideas positively affected CRC screening rates.

Within this feedback, NPs repeatedly discussed the difficulty remembering the numerous preventive screenings they needed to address with patients. Reminder systems, theme three, were incorporated into workflow to trigger NPs to order the CRC screenings. These findings verify that a lack of provider reminders is a barrier in ordering CRC screenings in the literature.11,15 For this project, pop-up reminders in the EHR were initiated to serve as reminders for the NPs.

Strategic reminders applied to the patients who needed CRC screenings and the providers. Low-income patients often
have competing health priorities and financial challenges that contribute to their complicated lives. Within this project, a process was developed and implemented to provide patients with reminders to complete their CRC screenings. Reminder letters, which were sent to patients through postal mail 2–4 weeks after their visit to those who had not completed their FITs, were effective. Reminder systems, whether for NPs or for patients, are useful tools to provide and receive quality healthcare.

Theme four, the value of performance feedback, is an often underused and underestimated method for producing positive results in QI. The Deming PDSA model emphasizes the importance of data-driven continuous improvement that focuses on the needs of the staff and providing current performance feedback. Healthcare personnel want to see the result of their nursing interventions to grasp whether these strategies were impactful, from both micro and macrosystem perspectives. After the implementation of the QI interventions, performance feedback was given to the individual NPs on a weekly basis through emails. These weekly numbers were also posted on the QI bulletin board for entire NMHC staff to view. This visualization created peer pressure to improve individual performances, and therefore, have an impact on the organization’s overall goal.

**Conclusion**

Colorectal cancer is one of the most common cancers with high patient morbidity and mortality; the disease also provides a significant financial burden to the patient and healthcare system. However, positive outcomes can result for patients afflicted with CRC through the early detection and diagnosis through screening methods (i.e., colonoscopy and FIT). Through the Deming PDSA QI model, an assessment was completed and multiple interventions were developed and implemented that successfully increased CRC screening rates at a NMHC. These interventions incorporated the QI principles of using multiple interventions, using staff input to develop and sustain lasting change, implementing staff and patient reminders, and using data-driven information to provide performance feedback to staff. This project demonstrates that applying QI principles to the challenge of increasing CRC screening rates at a NMHC can result in positive patient and healthcare organization outcomes.

**Implications for Practice**

Using these QI interventions has had a substantial impact on the quality of care for patients in this NMHC at minimal organizational cost. This project used existing EHR technology to provide patient and staff reminders and to establish an easier workflow for ordering and following up of the FIT. In addition, a minimal time commitment was necessary to provide valuable performance feedback, which will be sustained through the QI committee.

The economic impact on the patients was also significant. The overall increase in the number of patients screened for CRC will ultimately lead to a decreased need for CRC treatment. Through CRC screening, polyps are discovered and removed at an earlier stage. Because these polyps were identified early, they are less likely to progress into more complicated CRC treatment regimens, thus decreasing the burden of cost to patients and third party payers.

Primary care providers and leaders in healthcare may find this project’s design and findings useful and easily transferred to primary care organizations. The overall impact of this project resulted in the prevention of CRC in 11 patients; thus, decreasing the morbidity and mortality of this underserved patient population. These QI interventions could also be applied to additional preventive screening practices in primary care clinics. Adoption of reminders for NPs or patients could be easily transferred to screenings such as mammograms for the detection of breast cancer or cervical cancer screenings.
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The authors declare no conflicts of interest.

Continuing Education (CE) Objectives and Questions: Increasing Colorectal Cancer Screening Utilizing a Quality Improvement Approach in a Nurse-Managed Primary Care Clinic

Learning Objectives
After reading this article and taking this test, the learner should be able to:

1. Define the importance of colorectal cancer screening and the modalities used.
2. Describe the goals of this project to increase the CRC screening rates in a rural FQHC NMHC.
3. Describe the 4 major themes that were determined to influence CRC screening rates.

Questions
1. Approximately how many people in the United States will be diagnosed with colorectal cancer in their lifetime?
   a. 1 in 15
   b. 1 in 23
   c. 1 in 54
   d. 1 in 100

2. What quality improvement conceptual framework was utilized for this project?
   a. Define, Measure, Analyze, Improve, Control (DMAIC)
   b. Plan, Do, Study, Act (PDSA)
   c. Model for Improvement (MFI)
   d. Continuous Quality Improvement (CQI)

3. What is the recommended screening modality for colorectal cancer?
   a. Fecal Immunochemical Tests (FIT)
   b. Colonoscopy
   c. CT Abdomen
   d. Either Fecal Immunochemical Tests (FIT) or Colonoscopy

4. Nurse-managed health clinics utilize which healthcare professional as primary care providers?
   a. Physicians
b. Physician Assistants (PA)  
c. Nurse Practitioners (NP)  
d. Registered Nurses (RN)

5. All of the following were goals of this Quality Improvement project except:  
a. Convince patients to receive colorectal cancer screenings  
b. Review the current colorectal cancer screening process utilized at this nurse-managed health clinic  
c. Develop and implement quality improvement interventions based upon results  
d. Sustain process changes

6. In order to increase the completion of Fecal Immunochemical Tests (FIT), which of the following interventions was implemented?  
a. Tailored telephone education by patient navigators  
b. Follow-up phone calls by RNs  
c. Follow-up letters mailed  
d. Counseling by RNs during discharge from primary care visit

7. Low numbers of screening for colorectal cancer for those who were eligible was identified as one of the problems during this project. What intervention was developed in order to help with this problem?  
a. Clinical decision support tool in Electronic Health Record (EHR)  
b. Educational brochure on colorectal cancer screens given to patients  
c. Revised colorectal cancer screening protocol  
d. Simplification of the ordering process for screenings

8. As a result of the interventions, what percentage increase in the number of eligible patients being screened for colorectal cancer was seen in the nurse-managed health clinic?  
a. 11%  
b. 25%  
c. 37%  
d. 53%

9. This project’s positive results indicate that utilizing staff input throughout the entire quality improvement process was important. At what point during the project was staff input utilized?  
a. Initially during a staff meeting, prior to implementation  
b. During implementation and for 1 month after implementation  
c. During the sustainability phase of the project  
d. Prior to implementation and during implementation

10. All of the following were themes identified from this project except:  
a. Patient and family centered care  
b. The value of data-driven performance feedback  
c. Utilizing multiple interventions simultaneously  
d. Importance of reminder systems to providers and patients