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Improving Colonoscopy Preparation Quality: A Quality Improvement Project

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Abstract

Background

High-quality bowel preparations are essential for colonoscopies. Helping patients enhance prep quality can help increase the early detection of colorectal cancer, improving patient outcomes. A quality improvement (QI) project was introduced to increase the bowel prep quality at a Veterans Health Administration ambulatory surgery center.

Methods

Bowel prep quality descriptors were collected from a chart audit collected for the year 2021 to establish a baseline. In addition, the patients were queried regarding their perceptions on how easy the instructions were to follow.

Interventions

New prep instructions were created with feedback from the clinic gastroenterology registered nurses. The new instructions were then implemented to see whether there was an impact on the patient's perception of the ease of the instructions and the bowel prep quality rating by the gastroenterologist. Post-intervention data were collected after the implementation of the new instructions.

Results

The prep quality rated by the gastroenterologist improved from 72.8% to 77.7% rated as good, remained relatively unchanged for the fair quality rating, and improved from 4.4% to 0% rated as poor. For the Likert scale that patients were surveyed with pre-and post-intervention, with 1 being very easy and 5 being very hard, the mean answer went from 1.99 pre-intervention ($SD=1.17$, range 1-5) to 2.06 post-intervention ($SD=1.18$, range=1-5).

Conclusion

Overall, implementation of the new instructions did impact the prep quality, however not the patient's perception regarding the ease of the instructions. There are many suggested next steps for the facility to take to continue with this quality improvement project including a longer intervention phase to collect more data, and continue getting feedback on how to improve the instructions from patients.

Keywords: *Quality improvement, bowel preparation, patient education*

Introduction

Problem Description

Patient adherence to the plan of care is essential for many healthcare procedures. There are multiple reasons why a patient may not adhere to directions, including health literacy factors, ease of instructions, the timing of the education, comprehension, and more. However, adhering to satisfactory completion of pre-procedure preparation (prep) instructions is essential for colonoscopies. Visualization of the entire colon without obstruction is essential for diagnostic accuracy. Bernstein et al. (2019) state that poor preparation can lead to increased duration and repetition of the colonoscopy, which can worsen health care outcomes and increase costs. One intervention to prevent poor preparation is by educating patients about best preparation practices with clear and engaging information. In addition, Bernstein et al (2019) referenced several recent systematic reviews that found that patient education interventions improve the quality of bowel preparation and reduce anxiety about the procedure.

According to the Colorectal Cancer Alliance (2022), colorectal cancer is the third most diagnosed cancer in men and women combined in the U.S. Also, colorectal cancer is the second leading cause of cancer-related death in men and women combined in the U.S. Therefore, early detection through screening is essential. Early detection and screening strategies are performed through colonoscopies. A small scope with a camera is advanced through the colon from the anus to the cecum to identify and biopsy any polyps, which can lead to a cancerous growth (Colorectal Cancer Alliance 2022). High-quality colonoscopy preps are vital to the procedure. Poor and fair bowel preps can lead to repeated colonoscopies, poor patient experience, increased costs, and prolonged hospitalization (Russell et al., 2021). In addition, poor and fair preps can delay patient diagnosis or cause a missed diagnosis. It can also cause a delay in essential

treatment (Russell et al., 2021). Therefore, enhancing prep quality can help increase the early detection of colorectal cancer, improving patient outcomes. A local same-day surgery center performs several hundred colonoscopies per year. Of these, only 72.8% were rated as of good quality necessary for adequate visualization. It was the perception of the staff that sub-optimal pre-colonoscopy preparation was an important factor. Patient confusion regarding adherence with the plan of care may be connected to the instructional handout sent prior to the scheduled procedure. Good prep quality is important to the accuracy of colonoscopies and optimizing patient care. Overall, the problem identified is sub-optimal pre-colonoscopy prep which may be due to the educational handout with instructions on how to complete the prep.

In 2021, there were over 500 colonoscopies performed in the Same Day Surgery (SDS) Unit in the northeast region. There are a few different colonoscopy preps that the provider will send to the patients depending on the patient and their past medical history. However, the most common at the VAMC is the split-dose MiraLAX and Dulcolax combined prep. Achieving a good prep is imperative to the accuracy of the colonoscopy procedure. Therefore, the question is, in patients receiving a colonoscopy in the SDS, how do improved prep instructions that add large simple font and pictures compared with the old prep instructions affect prep quality over five weeks.

Available Knowledge

For this literature review, Cochrane Library and PubMed were the databases searched for the keywords *Education* and *Colonoscopy Prep Quality*. To reflect recent best practices and research, the search was limited to relevant studies since 2018. Because this SDS only performs colonoscopies on adult patients, the pediatric population was excluded from this review of the literature. Therefore, the pediatric population was excluded. In addition, the requirements

included full text and English articles that were accessible online. The results were first refined to remove duplicates and then to remove articles that were not relevant to the inclusion criteria. This released articles irrelevant to the study regarding the differences in preps prescribed to the patient and articles that used interactive videos and smartphones for prep education.

In the first study by Russell et al. (2021), the aim was to decrease the number of incomplete inpatient colonoscopies because of poor bowel preparations and improve the patient preparation experience through easy-to-use and straightforward interventions. The model for improvement and Donabedian conceptual evaluation framework was used to guide this retrospective study. Russell et al. (2021) developed three different improvement opportunities: “bowl prep ordering, nursing education, and patient education” (p. 547). The patient education included a placemat designed with instructions for the prep. The placemat had visual aids with simple phrases for what to do each day. Data were collected retrospectively through chart audits and based on a 5-point Likert scale to determine the feasibility and satisfaction of each intervention. There were 99 colonoscopies included before the intervention and 47 post-intervention. Pre-intervention, the most common reason for a repeat colonoscopy was poor prep (44%), and post-intervention, 80% of patients were provided with the placemat, which decreased poor prep quality from 44% to 27.7%, which was statistically significant ($P=0.038$) (Russell et al., 2021). The study’s strengths included the extensive pre-project information gathered and the large number of staff that participated, including a team of physicians, nursing staff, managers, and QI specialists, who gave various perspectives. In addition, the educational placemat was easy to implement and low cost. The limitations include an absence of a bowel prep rating in some of the reports (28.7%), and the nurses were not given any education about the placemat or how to use it (Russell et al., 2021). This study demonstrated that developing easy-to-use and

straightforward patient-centered interventions can effectively improve colonoscopy preparation for hospitalized patients.

In a systematic review and meta-analysis, Gkolfakis et al. (2019) aimed to evaluate the efficacy of different interventions to improve patients' colonoscopy prep quality. The authors reviewed the literature to find interventions that studied thought to enhance prep quality. They searched MEDLINE, Cochrane Library, and Google Scholar Databases. The initial search had 119 results, which decreased to 75 after removing the duplicates. Overall, 17 studies included 2,733 patients, and of the studies, 11/17 took place in North and South America, with 4 in Europe and 2 in Asia (Gkolfakis et al., 2019). The studies were prospective, retrospective, and monocentric. They used multiple ways to evaluate bowel prep, including the Ottawa Bowel Preparation Scale (OBPS), Boston Bowel Preparation Scale (BBPS), Aronchick Scale, the Chilton Scale, and various rating scales (Gkolfakis et al., 2019). The educational interventions included an educational booklet on the prep instructions, extra counseling with a provider, and written instructions provided to the patient. Another study focused on the reinforcement of nursing knowledge to enhance patient education with booklets, PowerPoint presentations, and lectures to educate the patient.

Focusing on the effects of an educational booklet, 67% of the participants achieved an adequate prep quality before the intervention (Gkolfakis et al., 2019). After the intervention, an adequate prep was achieved in 77% of the patients who received the education and only 50% in those who did not (Gkolfakis et al. 2019). The strengths of this systematic review and meta-analysis include the comprehensive search strategy and the intensive literature articles reviewed. The limitations include the heterogeneity encountered, which leads to a careful interpretation of the results. This consists of small samples, retrospective studies, single location studies, and

observational studies. The authors state that, as a result, they did perform a sensitivity analysis, but bias cannot be excluded (Gkolfakis et al., 2019). The overall takeaway from this study is that educational booklets provided to the patients can reduce the rate of inadequate bowel preps.

A randomized controlled trial by Andrealli et al. (2018) evaluated whether pre colonoscopy counseling and a dedicated leaflet increased the split-dose colonoscopy prep intake resulting in inadequate bowel prep qualities. This is an investigator-blinded randomized controlled study performed in an endoscopy center in Italy. The target population for this study included 50–60-year-old patients who would have a colonoscopy in the outpatient setting whose colonoscopies were scheduled at 10 am or earlier. (Andrealli et al., 2018). The study excluded patients who had already had a colonoscopy in the last five years, patients with adenomas, inflammatory bowel disease, inpatients, patients with severe comorbidity, and those unable to give informed written consent (Andrealli et al. 2018). They designed an educational leaflet with instructions regarding the bowel prep, detailed in simple terms, with pictures and subtitles (Andrealli et al., 2018).

In addition to education on the performance of the prep itself, the importance of a good bowel prep was emphasized. When scheduling the patient, those who consented to the study and were eligible were randomized 1:1 by a computer sequence to receive the leaflet or the leaflet plus oral instructions (Andrealli et al., 2018). The provider filled out a form reporting the bowel prep quality using the Boston Bowel Preparation Scale (BBPS) at the end of the procedure. The scale ranges from an unprepared colon as 0 to a perfectly clean colon as 9. Adequate cleansing was defined for this study as BBPS greater than or equal to a score of 2 in each colon segment (ascending, transverse, descending) (Andrealli et al., 2018).

There were 302 patients considered eligible for this study. However, 16 patients dropped out, four did not show up to their appointment, seven canceled, and 5 rescheduled the meeting, resulting in 286 patients. According to the authors, each group included 143 patients that were well balanced in terms of gender, age, and ethnicity (Andrealli et al., 2018). The strengths of this study include that it is a blind randomized controlled trial. The limitations have that the analysis was performed in a single place and did not account for colonoscopies scheduled past 10 am. The results showed that procedures with adequate bowel cleansing were 95.6% in the educational leaflet control group only and 95.1% in the leaflet plus oral instructions ($p=0.77$) (Andrealli et al., 2018). Therefore, the authors' overall conclusion is that this trial showed that the educational booklet guaranteed a high patient uptake and an excellent bowel cleansing which was not statistically significant compared to the leaflet plus oral instructions. Overall, an educational leaflet is a cost-effective and straightforward way to implement a strategy to increase the number of good bowel preps. Also, the results did not change with the addition of the nurses educating the patient, therefore reinforcing the importance of an educational handout.

Donovan et al. (2021) conducted a cross-sectional study to determine the compliance and adequacy of the bowel prep quality. Donovan et al. (2021) state that the split-dose bowel prep is the most effective to ensure high-quality colonoscopies; however, understanding these directions is quite tricky as they require multiple steps over multiple days. In addition, many socioeconomic factors affect patient adherence, including education level, health literacy, medication burden, and more (Donovan et al., 2021). Understanding the instructions is important for adherence to the plan of care, therefore the quality of the patient education is essential. The overall study aims to improve outcomes regardless of the patient education level. Informed consent was obtained for 60 patients, then written instructions were given to each patient, and adherence was self-

reported before the procedure. The provider reported the bowel prep adequacy as either adequate or inadequate. For this study, the college graduates and those with some college education were grouped.

Out of all the patients, 52% received high school education, 38% received some college education, and 10% were college graduates (Donovan et al., 2021). Higher education levels were significantly associated with more adequate preps ($p=0.018$) (Donovan et al. 2021). However, the authors noted that the mean rank scores were lower than expected in both groups, indicating a need for improved patient instructions. The limitations of this study include the small sample size and the single-center population. Overall, education level does play a role in understanding the instructions. Creating instructions that are easy to follow using simple words and visual aids should help increase the patient adherence with the bowel prep.

In a randomized controlled trial by Chen et al. (2021), the objective was to investigate virtual reality (VR) videos for patient education pre colonoscopy could increase bowel prep quality. This study is a prospective, single-blinded, single-center clinical trial that followed the Consolidated Standards of Reporting Trials (CONSORT) reporting guideline. The study setting was an outpatient facility where 346 patients met the inclusion criteria of being between the ages of 18-75 who were scheduled for a colonoscopy for screening or diagnostic purposes and had not previously had a colonoscopy. Patients who had a history of bowel surgery, severe comorbidities, severe constipation, pregnancy, irritable bowel disease diagnosis, or blind were excluded (Chen et al., 2021). Patients were randomized into two groups: conventional education and conventional education plus VR video group. An endoscopist who was not performing the procedures randomized the patients 1:1 to the groups. The conventional education included a well-trained physician who gave an in-person education session and written instructions. The

intervention group was the same with the addition of a required 6-minute video that provided four parts of the education, including bowel prep instructions, a to-do list before the procedure, a brief introduction to a colonoscopy, and a post colonoscopy to-do list (Chen et al., 2021).

The bowel prep quality was measured by the Boston Bowel Preparation Scale (BBPS), which was evaluated by the endoscopist. This scale ranges from 0-9, where 0 indicates an extremely unsatisfactory prep and 9 indicates a complete bowel prep. One hundred seventy-three patients were assigned to each group with baseline characteristics comparable between the two groups. The results showed that the BBPS score was significantly lower in the control group compared with the video group ($p=.002$) (Chen et al., 2021). The rate of adequate bowel preparation was higher in the video group than in the control group. However, this was not statistically significant (Chen et al., 2021). In addition, this study concluded that using the VR videos enhanced patients' compliance and experience, which improved bowel prep. The limitations include that the economic and educational status was above the mean level compared to the general population, and it was performed in a single location, which limits generalizability. Overall, the authors concluded that using the VR videos for patient education may help improve bowel prep quality.

Evidence Synthesis

Overall, the evidence suggests that better educational tools decrease the number of inadequate bowel preps, resulting in more accurate results for the patient, which supports the question; in patients receiving a colonoscopy at the SDS unit, how do improved prep instructions that add large simple font and pictures compared with the old prep instructions affect prep quality over five weeks. The strengths of this literature review include the level of evidence that was gathered, which had level 1 evidence (systematic review and meta-analysis) and level 2

evidence (randomized controlled trial). Also included are level 3 evidence (cross-sectional study) and level 4 evidence (retrospective study). This review had some limitations, including the limited number of recent studies (since 2018) on patient education based on handouts, pamphlets, visual aids, and video instructions. A handful of studies used web-based instructions and even a smartphone app to increase education on how to cleanse the bowel before a colonoscopy. Last, there were many confounding variables to navigate throughout each study, such as the inclusion of different bowel preps, nurse education, verbal education, and handouts. However, each study did emphasize the importance of education before the colonoscopy bowel prep using readily accessible, easy-to-understand pamphlets, handouts, and a video.

Project Implications

For this project, the literature shows statistically significant evidence regarding creating a visual aid that is accessible and able to be understood by anyone regardless of their educational level. In addition, according to the U.S Census Bureau (2019), 27% of SDS population hold a high school diploma or GED, 23.0% have some college education, 12.5% have an associate degree, and 34% hold a bachelor's degree or higher. Therefore, the goal was to create a visual instructional handout to be distributed to the SDS patients with a reading ability assessment at the 6th-grade level. The literature suggests that easy-to-use and straightforward interventions can effectively improve colonoscopy preparation. In addition, these interventions are easy to implement and cost-effective. Overall, the goal is to create a pamphlet/leaflet similar to those previously mentioned that includes images, significant simple words, and step-by-step instructions. Another idea in consideration is to implement a checklist for each day, so the patient knows exactly what they need to do. In addition, there is evidence that using a video may also help to improve bowel prep. Overall, the evidence suggests that an educational tool easily

understood at any education level, with images and simple instructions, along with a video of the instructions, may help increase the number of *good* rated prep qualities, which are essential for accurate patient colon cancer screening.

Rationale

The plan-do-study-act (PDSA) model for improvement was used for this study. This improvement model is used to test a change, first by planning it, then trying it, observing the difference, and finally acting on the results (IHI.org 2022). This framework was used during each phase of the study. In the planning stage, data was collected on prep quality in 2021 and categorized by frequency and percentage to represent good, fair, and poor-rated preps. In addition, the patients were surveyed on a Likert Scale regarding how easy they perceived the prep instructions to follow. Data were collected to determine the baseline and planning the implementation of the new colonoscopy prep instructions was done in this phase. For the *do* phase, the new prep instructions were distributed to the patients. These new instructions included larger, bolder font with visuals. The instructions were sent to the patient via mail and uploaded to their patient portal along with the video. This was implemented by June 1st, 2022. Next is the study phase, when data was collected for post-intervention measures from June 1st to June 30th, 2022. Finally, after gathering all the data and comparing pre-intervention with post-intervention, recommendations were made based on the results from the data.

Specific Aim

The global aim is to increase patient adherence to the colonoscopy preparation instructions, increasing prep quality. This will be accomplished by creating a better educational handout before the procedure so there is no miscommunication or confusion on what to do. The prep quality is noted by the surgeon during the procedure. Prep quality is rated as good, fair, or

poor. For the year 2021, there were 371 colonoscopies. However, prep quality data was only gathered for 236 patients. Therefore, current metrics on the data collected include 72.8% good, 22.8% fair, and 4.4% poor prep qualities (internally collected data). In addition, patients are given a one-question survey with a Likert Scale on how easy the prep instructions were to follow. Therefore, the specific aim is to increase the percent of good-rated prep qualities from 72.8% to 90.0% and increase the patients' perception of ease related to the prep instructions. The expected outcomes include improving patient adherence to the colonoscopy prep, which are likely to increase the percentage of good prep qualities and increase the patients' perception of ease related to the prep instructions.

Methods

Context

The patient population at the SDS unit includes male and female patients 18 and older. Colonoscopy procedures are routine for screening starting at age 45. Based on observation, most patients who have this procedure at the SDS are older, white men. According to the U.S Census Bureau (2019), 6.1% this population use Medicaid, and 51.7% receive Medicare for benefits (U.S Census Bureau 2019). Therefore, it is fair to assume many patients have Medicare for health insurance. Colonoscopies can be an expensive procedure. The total cost can vary depending on the facility, provider, and anesthesia care; however, the average cost of a colonoscopy in New Hampshire is \$4,354 without accounting for insurance (nhhealthcost.gov 2022). Medicare covers the price of a screening colonoscopy every ten years. However, how much the patient will pay out of pocket depends on their specific type of insurance, but this cost can add up to 20% of the provider's services and facility costs (Medicare.gov 2022).

Bernstein et al. (2019) state that poor preparation can lead to increased duration and repetition of the colonoscopy, which can cause worse health care outcomes and increased costs. If a patient has a fair or poor prep, the provider has a few options. First, he can abort the procedure and document it as incomplete, then have the patient come in another day. This is a waste of resources in terms of staff, equipment, and anesthesia since the patient is under sedation before the provider can assess the adequacy of the colonoscopy prep and its impact on visualization. The second option can try to complete the colonoscopy despite limited visualization, impacting provider confidence in a full assessment. Suppose he is not confident that he didn't miss any potential polyps? In that case, he may recommend the patient have another procedure to confirm, therefore, wasting resources and adding the cost of an additional procedure.

The instructions are printed out and mailed to the patient as well as uploaded to the patient portal. The changes will include a new handout printed in color sent via mail and video uploaded along with the instructions in the patient portal. The cost of this implementation consists of paper, colored ink, and stamps. Paper and colored ink cost around twenty cents per page (Errera 2019). The goal is to keep the instructions to two pages max, which costs forty cents per patient. A stamp costs fifty-eight cents totaling less than a dollar per patient to implement the new instructions (USPS 2022). Overall, the goal is to improve educational handouts and increase the number of good-rated preps, resulting in a decreased risk of another colonoscopy, more anesthesia, and better polyp detection outcomes. There would be less of a waste of resources for the facility, saving the patient and facility potentially thousands of dollars.

Intervention

Close to 400 gastroenterology (GI) procedures are performed annually, including colonoscopies and esophagogastroduodenoscopies (EGDs) performed by the GI provider. The surgical staff includes seven full-time pre-and post-operative registered nurses, two operating room (OR) registered nurses, two surgical technologists, one GI technologist, one anesthesia technologist, and one registered nurse scheduler. In addition, there are three full-time anesthesia providers and one part-time. There is also two gastroenterology (GI) clinic registered nurses whose primary role is to send the patients the instructions, ensure they have everything they need before their procedure, and help the provider run the clinic. Therefore, the key stakeholders include the GI registered nurses (RN), the pre/post-operation nurses giving the patients the survey, the OR nurses, and the GI provider who rates the prep quality.

There are three different preps that this VAMC prescribes. The most common is the MiraLAX/Dulcolax Split prep. In addition, they prescribe GoLytely (Colyte) and MoviPrep. The current instructions they use are written in small grey font. They are also written in sentences without bullet points or visual aids. They also do not use bolded or larger font to emphasize important notes of the instructions. The GI provider determines which prep to prescribe to the patient before the GI RN sends it. If a patient has a history of being constipated, they will also be prescribed magnesium citrate to go along with the prep. A key factor to patient-centered care is patient education and shared knowledge. Ensuring these instructions are easily comprehensible and sharing any insights or helpful tools for the prep is imperative in ensuring the patient is confident in their ability to do the prep.

After gaining feedback from the GI RN, the new instructions were formatted like southern VAMC instructions with the addition of pictures. The Southern VAMC prep

instructions only consist of one page; however, the instructions may require two pages with the addition of visual aids. The instructions will include a significant, bold title, *Colonoscopy Prep Instructions*, so the patients know exactly what they are. In addition, the instructions will be divided into sections on what to do one week before the procedure, the day before the procedure, and the day of the procedure. There will also be sections for what to do if you have diabetes, take blood-thinning medications, antiplatelet medications, and Aspirin or NSAIDs. Last, there will be a section on transportation and contact information. In addition to spacing these out with bolded headers and larger font, visual aids were implemented to ensure clear and engaging instructions. The new instructions were created for each prep type. The goal was for the GI RN to be able to upload the updated handout into the patient's portal and an instructional video and then print the instructions to send to the patient's home.

Study of the Intervention

The project baseline quantitative data was collected from a data spreadsheet compiled by the GI RN and the results of the patient survey. The provider rates the quality of the prep at the time of the procedure, and it is documented by the GI RN. At the end of the procedure, he states the prep quality, and the nurse documents it. There is an excel sheet that the GI doctor created that posted the prep quality for each patient from January 2021 to December 2021. Data were measured using the excel sheet to calculate the percentage of good preps divided by the total number of colonoscopies in 2021. This calculation was done for the fair and poor preps too. There was also a survey created to hand to patients' pre-procedure. It has one question; *how easy was it to follow prep instructions* on a Likert scale of 1-5. One is the easiest, and five is the most difficult. Therefore, there is both categorical and continuous data collection. Both sets of data were compared from baseline to post-implementation. There is also a space for any additional

comments. Qualitative data is collected through the survey if the patient adds any additional comments.

Measures

According to the 2021 data, 72.8% of preps are rated as good. The goal is to increase this number to 90% to decrease wasted resources for the facility, reduce the total cost to the patient, and decrease the risk of missed polyps. The GI provider rates the quality of the prep at his discretion. A good prep indicates that he could reach the cecum with no issues and visualize the whole colon clearly, and he is confident he did not miss any polyps. A fair prep means there is residual stool in the GI tract, but he may be able to suction some of it for proper visualization and assessment. A poor prep indicates that he could not get an accurate diagnosis due to excessive stool to visualize the colon.

The tool chosen to rate the ease of the instructions is the Likert Scale using 1-5 variables. The ease of the instructions determines whether the patient could complete the prep without assistance from another source. A number 1 indicates very easy, where the patient could follow the instructions with no guidance. A 2 shows the instructions were easy, but the patient had to read it over a couple of times to clarify. A 3 indicates the instructions were somewhat easy, meaning the patient followed the directions but may have needed to use an outside resource such as *Google* to clarify. A 4 is difficult and indicates the patient is required to use an external source and call the GI RN for clarification. Last, 5 means they were very difficult to follow and that patients could not complete the prep. Patient statements are also collected. For example, if a patient explains why they rated the instructions a certain way, that explanation is recorded. Psychometric testing was not conducted for the post-procedure instrument.

Analysis

Data were collected from baseline as well as post-implementation. Categorical and continuous quantitative data were collected. The prep quality of good-fair-poor-represent categorical data and descriptive statistical analysis with frequency and percentage was noted. The Likert scale data are the continuous data where the mean, and standard deviation (SD), and range was computed for descriptive statistical analysis. Last, qualitative data collected through patient interviews were analyzed through thematic analysis. Prep quality data was compared from baseline, collected over the year 2021, compared to post-implementation, which was collected from May 30th to June 17th, 2022. Patient interviews were organized for thematic analysis

Ethical Considerations

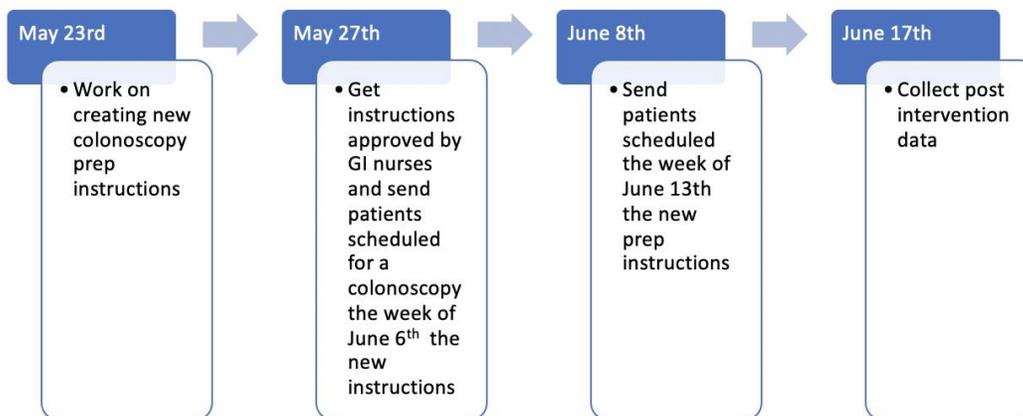
This quality improvement project was conducted ethically. No patient identifiers were collected in the data. Patient Health Information (PHI) is protected throughout the project as the only data collected from the chart will be the prep quality rating. Permission was granted for the chart audits to collect data by the unit manager at the VAMC. In addition, patients were not coerced to answer the survey questions. Verbal consent was obtained before collecting any responses to the survey questions, and the patients were instructed that they can decline to respond at any time. There are no conflicts of interest. Last, this proposal was reviewed by the UNH Department of Nursing Quality Committee and determined to meet the criteria for a quality improvement project with is exempt from IRB review.

Results

Results

Initial Steps and Evolution

The timeline for the implementation phase of this quality improvement project can be seen in Diagram 1. This phase started on May 23rd, 2022 when the new colonoscopy handouts were created with the help of the GI nurse staff and other resources that contained various colonoscopy instructions. Two instructions were made: a one-page handout that had bullet points of the instructions each day in addition to a double-sided handout with a prep calendar on one side with helpful tips on the backside. Both ideas were brought to the GI nursing staff on Friday, May 27th, 2022, for approval and the next steps. It was reported that the current instructions get mailed to patients anywhere from 2-4 weeks in advance, and therefore, it was realized that the patients would be getting two sets of handouts during the implementation. In addition, the GI nurses were not too comfortable with only the new handouts being sent out. Therefore, it was decided to send the patient the one-page instructions and the double-sided prep calendar on top of the original clinic instructions they were already sent. As a result, the patients received two sets of colonoscopy prep instructions. Patients scheduled for a colonoscopy the week of June 6th and June 13th, 2022 were sent the new instructions and a cover letter explaining why they received two letters with different sets of instructions. The latest data were collected for those two weeks to compare to pre-intervention data. The post-intervention data were collected and calculated on June 17th, 2022.

Figure 1*Intervention Timeline****Outcomes***

The prep quality rated by the gastroenterologist improved from 72.8% to 77.7% rated as good, remained unchanged 22.8% to 22.3% rated as fair, and noticeably improved from 4.4% to 0% rated as poor (Table 1). For the Likert scale that patients were surveyed with pre-and post-intervention, with 1 being very easy and 5 being very hard, the mean answer went from 1.99 pre-intervention ($SD=1.17$, range 1-5) to 2.06 post-intervention ($SD=1.18$, range=1-5) (Diagram 2). Patient statements were captured by the PACU nurses when they administered the Likert scale. Pre-intervention statements include patients wanting a larger front and inconsistent directions with what the GI clinic sent versus what was on the medication bottle. In addition, patients requested the directions to be in order. This facility sends the patients the prep medications, so another trend was that patients weren't getting the prep medications sent to them. Post-procedure, this trend continued in addition to a patient stating they were *I was confused about why I got two sets of instructions* and requesting clarification on what times to take the medications.

Table 1:*Likert Scale Survey Responses*

<u>Variable</u>	<u>M</u>	<u>SD</u>	<u>R</u>
Pre-Intervention	1.99	1.17	1-5
Post Intervention	2.06	1.18	1-5

Table 2:*Prep Quality Rating*

<u>Variable</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>
Pre-Intervention	72.8%	22.8%	4.4%
Post-Intervention	77.8%	22.3%	0.0%

Contextual Elements

Some contextual elements that interacted with the intervention include the GI clinic instructions that were already sent to the patients scheduled. The clinic nurses try to send their instructions 2-4 weeks in advance to ensure the patients have enough time to get the instructions and prep medications with room for error. Therefore, when the new instructions were sent, the patients had already received instructions. It is hard to interpret data to determine if the new instructions impacted the results. In addition, the nurse manager noted that many patients get lots of mail from the facility, which may decrease the chance of the patients opening the new instructions. One patient indicated on the survey that he did not feel he had enough time to read the new instructions.

Unintended Consequences and Missing Data

There is a lot of missing data for post-intervention. Chart audits were planned to gather the post-intervention data on June 17th; however, the facility had discontinued the student's access to the system. The nurse manager who oversees the students also happened to be on leave and was unavailable for the next couple of weeks. In addition, with the microsystem being so short-staffed, it would not have been possible to ask another team member to help with the chart audits. Luckily, a backup was put into place just in case something happened, and there was no approval to do the chart audits or any other unforeseen circumstance. A sheet of paper was put in the Endoscopy suite with a table for the nurse to write the date and prep quality rated by the gastroenterologist. Again, due to the staffing shortage and the facility pulling nurses from other departments to help, along with training new OR staff, only one nurse was dedicated to filling out the sheet. There are typically twenty to thirty colonoscopies per week, however, this resulted in fourteen prep quality rating post-intervention.

Discussion

Summary

Key Findings

The global aim of this project was to increase patient adherence to the colonoscopy preparation instructions, increasing prep quality. The specific aim was to increase the percent of good-rated prep qualities from 72.8% to 90.0% and increase the patient's perception of ease related to the prep instructions. To achieve this goal, new instructions were created to help the patients understand how to prep better by using larger words, pictures, and a prep calendar. The prep quality rated good by the surgeon increased from 72.8% to 77.7%, from 22.8% to 22.3% rated fair, and 4.4% to 0% rated as poor. While the specific aim of 90% rated as good was not

obtained, a key finding of decreasing the preps rated as poor from 4.4% to 0% is extremely important and a positive outcome. Poor-rated preps increase the patient's risk of missing a polyp and for a repeat colonoscopy within the year. The patient survey that was given pre-intervention and post-intervention regarding the patient's perception regarding how easy or difficult the instructions were showed only minimal improvement with a change in mean scores from 1.99 to 2.06. This pre-intervention survey mean was 1.99, compared to the post-intervention, which was 2.06. The pre-intervention surveys were collected over the year 2021, and the post-intervention data were collected over two weeks. According to the patient statements, a theme for persistent confusion was noted, which is another key finding. In addition, patients wanted something simple, easy to follow, and large font, with pictures, which was achieved. Last, patients were confused as to why they got two sets of instructions and one patient even wrote they did not have enough time to go over the new instructions. To add, not all patient issues were addressed in this quality improvement project. The most critical takeaway from this quality improvement project is finding out why the patients were confused. From a healthcare perspective, it is easy to guess; however, having concrete evidence of what the patients are looking for is essential for patient satisfaction.

Strengths

The strengths of this study include the stakeholders and support from the facility. There were no issues encountered when doing this QI project. Also, there is only one gastroenterologist, so there is no discrepancy in the prep quality rating, ensuring data integrity. All patients were given the same survey with room to describe their perception of the prep instructions. Adding visuals, bigger font, and limiting the number of pages the patients receive were what the patients wanted to make the instructions easier to read. The most critical takeaway

from this quality improvement project is finding out why the patients were confused. From a healthcare perspective, it is easy to guess; however, having concrete evidence of what the patients are looking for is essential for patient satisfaction.

Interpretation

The goal was for the new instructions to increase the prep quality using better education. Not only did the prep quality rated as good increase after the intervention, but the number of poor preps decreased from 4.4% to 0%. A poor prep would mean the patient would have to repeat the colonoscopy because the colon visibility is poor. According to Russell et al. (2021), poor and fair preps can delay patient diagnosis or cause a missed diagnosis, and it can also cause a delay in essential treatment. Prep quality is essential so the gastroenterologist can view the colon for potential polyps or other issues such as colitis, diverticulosis, and hemorrhoids that may cause the patient to have negative symptoms. A good prep is essential to these procedures, and the intervention positively improved the outcome.

Better educational handouts, including more visuals, simple phrases, and a prep calendar, can help clarify patient instructions and create a simple to-do list for patients to follow. This then helped increase patient adherence to the instructions. Gkolfakis et al., 2019 studied how education affected prep quality. This study concluded that education could reduce the number of inadequate preps. Therefore, education is essential to patient adherence and empowering patients with knowledge and confidence to follow the prep instructions.

The results of this QI project align with the results of other publications. Other publications in the *Available Knowledge* section of this paper previously noted support that education with visuals, simple phrases, a checklist, or an education session with a nurse could all help improve patient adherence to the instructions and increase the quality of the patient's prep.

Andrelli et al. (2019) performed a randomized controlled trial that concluded trial showed that the educational booklet guaranteed a high patient uptake and an excellent bowel cleansing. Overall, the evidence suggests that better educational tools decrease the number of inadequate bowel preps. To reiterate, the results of this quality improvement project are the prep quality rated by the gastroenterologist went from 72.8% to 77.7% rated as good, 22.8% to 22.3% rated fair, and 4.4% to 0% rated as poor, which aligns with the evidence, specifically decreasing the number of inadequate bowel preps. Overall, patient education quality is essential in colon prep quality.

The impact of proper colonoscopy preparation on patients decreases their risk for a repeat colonoscopy. Depending on the facility, this may be repeated the next day up to the following year. High-quality colonoscopy preps are vital to the procedure. Poor and fair bowel preps can lead to repeated colonoscopies, poor patient experience, increased costs, and prolonged hospitalization (Russell et al., 2021). This is more money that a patient must spend on an additional procedure, which can be costly depending on insurance when the average recall is every ten years. For the facility, a good prep helps to decrease wasted resources and gives the provider more availability to see new patients. Therefore, increasing the number of good preps and reducing the number of poor preps benefits the patient, provider, and facility. Improving the patient's ease regarding the instructions is to benefit the patient. Having clear, concise instructions can help decrease patient anxiety regarding the procedure. That then reduces the number of patients who call the office with questions or concerns, freeing up the time of the providers and nurses to assist other patients. Overall, the impact on education and prep quality benefits patients, providers, and facilities.

The outcomes align with what was expected. The focus While the initial focus was on improving the percentage of good-rated preps, it is also important to recognize that the number of poorly rated preps decreased from 4.4% to 0.0%., which was expected and a positive outcome. The Likert scale survey mean did not change from pre- to post-intervention. Given all the information, better prep handouts are beneficial to prep quality. Overall, this facility has the opportunity to decrease wasted resources on repeat procedures and improve patient outcomes by spending a fraction of the cost on improved handouts. Both parties benefit from this quality improvement of bowel prep instructions.

Limitations

This project has several limitations. First, pre-intervention data were collected over 2021 for prep quality with over two hundred data points. The survey questions pre-intervention also spanned one month, which gave more results. Due to the given time frame, the post-intervention data collection only lasted two weeks. There was two weeks' worth of results on the perceived ease of use regarding instructions. However, the chart audits to determine the provider's rating of the colonoscopy prep quality was limited to less than two weeks. On the planned date for data collection through chart audits, it was noted that the student's access to the computer system was discontinued as it was believed that the contractual relationship with the organization had ended. Fortunately, a backup chart audit system was initiated in the event that electronic medical record (EMR) access was discontinued. This included a printed Microsoft excel sheet where the nurse could write the date and prep quality for each case. Given the staffing shortage, only one nurse was willing to record results. This resulted in only fourteen data points for prep quality. When access was restored, there wasn't time to complete another chart audit because of schedule

conflicts. Overall, there was limited post-intervention data compared to pre-intervention, which may not show the whole picture of the results.

Another limitation is that the new instructions were sent out one to two weeks before the patient's procedure. The patients had already been sent the original instructions from the facility. Therefore, they received two sets of prep instructions, and it is unknown whether the patients used the original, new, or both. One patient wrote on their survey that they did not have enough time to read the new instructions, so they referred to the original instructions. Proactively collecting data in case, the EMR access was shut off were the efforts made to adjust for limitations. Overall, it is hard to determine whether the patients received the new instructions and read them through or just used the original GI clinic instructions and whether the intervention correlates directly to the results. The pre-intervention data was collected over 2021, and the post-intervention data were collected over two weeks. This represents a significant difference in sample size, both participants, and the number of procedures for evaluation.

Conclusions

Usefulness of This Work

To reiterate the key findings, the poor-rated preps is extremely important and a positive outcome. Poor-rated preps increase the patient's risk of missing a polyp and for a repeat colonoscopy within the year. Overall, this quality improvement project was completed with few limitations in the process. Although the data may be skewed due to few data points post-intervention, another nurse or employee at the facility can take this project and continue with it. There is a multitude of useful data that came from this project. The most telling information may have come from the patient's statements explaining why they thought the instructions were confusing or what may help make them better.

Future Implications

The facility has the opportunity to use these patient statements to explore other ways to make the colonoscopy prep instructions easier for their patients. One example would be clarifying that the patients need to follow the instructions given to them, rather than the instructions on the bottle. The suggested next steps include re-doing the intervention phase of giving out instructions and collecting the post-intervention data for more data points. This would give a better idea of whether the new instructions definitively made a difference. In addition, this would give more insight into how to revise the instructions from future patient statements and make the process even better.

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