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Intervention to Improve Screening Mammograms in Clinical Practice:

A Quality Improvement Initiative

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Abstract

Breast cancer remains a challenging health issue in the United States, representing the second leading cause of cancer deaths for women. The key approach to tackle this issue is the early detection of breast cancer through annual mammography screening in asymptomatic women. This quality improvement project sought to improve the proportion of breast cancer screening documentation in a private obstetrics and gynecology practice that serves primarily Black women. In addition, the project is thought to improve the current utilization of office mammogram services and its mammogram completion rate. Comprehensive interventions implemented included establishing clear guidelines, staff education, using paper checklists and Electronic Health Records (EHR) tools, enhancing the scheduling workflow process, and providing phone call reminders to patients before mammogram appointments. The project site's EHR and the CMS breast cancer screening report from the electronic clinical quality measure were used to collect data. The interventions were assessed by analyzing data extracted before and after the project. Data indicated that the proportion of eligible patients up-to-date with mammograms or receiving recommendations for breast cancer screening went from 50% pre-implementation to 76% post-implementation (chi-square 97.72, $p < .001$). There was a 16 percent increase in the CMS breast cancer screening quality measures. The mammogram department saw a 12 percent increase in mammogram performance, and the rate of patient adherence to appointments increased by 19 percent ($z = 2.89$, $p = .003$). Project results indicate that an evidence-based, comprehensive process enhances the cancer screening process and improves patient appointment adherence. Recommendations include sustaining the project and improving breast cancer screening referrals and tracking in the EHR.

Keywords: breast cancer, mammogram, screening,

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Introduction

Breast cancer (BC) is a significant challenge for women as it is the most prevalent cancer among women and the second cause of cancer-related death (Centers for Disease Control and Prevention [CDC], 2021). Early detection is critical in the fight against breast cancer, with mammography screening playing a central role (American Cancer Society [ACS], 2022a). The importance of breast cancer screening cannot be overstated; it plays a pivotal role in early detection, diagnosis, and effective therapeutic interventions.

However, despite the well-established efficacy of mammograms, a concerning gap in compliance among women persists. The situation is further compounded by the fact that African-American women experience a disproportionately high breast cancer mortality rate, even though their incidence rate is lower than the national average (Giaquinto et al., 2022). This disparity underscores the urgent need to improve screening adherence within this demographic.

In response to this pressing issue, a comprehensive, evidence-based quality improvement initiative was launched within a private Obstetrics and Gynecology (OBGYN) practice that primarily serves Black women. The objective was to meet compliance targets and a holistic commitment to elevate women's well-being. Through a multifaceted approach encompassing clear guidelines, staff education, process streamlining, and active patient engagement, this project aimed to bridge the gap in breast cancer screening compliance, ensuring that all eligible women received the care they deserved.

Problem Description

Breast cancer is considered a serious public health issue that has a widespread impact on individuals and families. According to the CDC, BC affects about 13% of women in their lifetime in the United States (US), meaning that one in eight women develop breast cancer

(CDC, 2021). Breast cancer is the second most common cancer among women in the US, behind skin cancer, and the second leading cause of cancer-related death, following lung cancer (CDC, 2021). Although there has been a significant 43% reduction in breast cancer mortality since 1989, alarming disparities persist. Black women face a 40% higher death rate than other racial/ethnic groups in the US (Giaquinto et al., 2022). This disparity is even higher among Black women under 50, with a mortality rate of twice as high (Giaquinto et al., 2022).

Additionally, Black women in the US have the lowest five-year relative survival rates across all racial/ethnic groups, except for stage I, for every molecular subtype and disease stage (Giaquinto et al., 2022). It is concerning that Black women also have the highest odds of being diagnosed with Triple-Negative Breast Cancer (TNBC) compared to other ethnicities (Du, 2022). TNBC is a particularly aggressive form of breast cancer that lacks estrogen, progesterone, and HER2 receptors, making it challenging to treat effectively (Du, 2022).

The high incidence of BC calls for increased awareness and action to prevent, diagnose, and treat the disease. Routine BC screening mammography is critical to successful treatment and survival. Breast cancer imaging detects cancer earlier, before women experience noticeable symptoms, and allows earlier patient treatment. According to the ACS, regular screening mammography is considered the gold standard for early detection, which reduces the mortality risk from BC by 40% (ACS, 2022a). If detected at its early and localized stage, the five-year relative survival rate is 99% (ACS, 2022a).

Despite the benefits of screening mammograms, many patients still do not receive timely and proper screenings due to various barriers and inefficiencies. In reality, 30 % of women do not routinely use evidence-based screening mammography (CDC, 2021). Multiple contributing factors have been considered, including inadequate patient reminders and education about

mammogram screenings, exacerbated by inefficient processes and time-consuming scheduling. These factors result in missed appointments, cancelations, and delays in screening mammograms, which increase the risk of late diagnosis and poor outcomes for women with BC. (Rivera-Franco & Leon-Rodriguez, 2018). They also result in potential revenue loss and underutilization of costly mammography units (Marbough et al., 2020).

One of the primary obstacles to adherence to BC screening is a lack of physician recommendations (Abdullah et al., 2022). Research has shown that patients receiving recommendations for screening mammograms from their healthcare providers are more likely to adhere to such recommendations and follow screening guidelines (Flores et al., 2019; Orji et al., 2020). However, healthcare providers face several barriers to addressing cancer screening, including limited time, understaffing, and dealing with patients with multiple comorbidities (Triplette et al., 2018). These challenges may prevent providers from presenting patients with adequate information, providing counseling, and referring eligible patients for screening mammograms.

Another contributing factor that hinders BC screening compliance is conflicting recommendations from different professional and governmental organizations, which could confuse women and healthcare providers, causing a significant barrier to BC screening adherence (Ro et al., 2022). For instance, the National Comprehensive Cancer Network (NCCN) recommends yearly mammograms for women aged 40 with an average risk of breast cancer to continue as long as they are in good health (NCCN, 2023). In comparison, the US Preventive Services Task Force (USPSTF) suggests that women between the ages of 40 and 74 years get their mammogram screening every two years (USPSTF, 2023). Moreover, the ACS provides guidelines stating that women between 40 and 44 should begin with yearly mammograms (ACS,

2022a). Women aged 45 to 54 should get a mammogram yearly, and those aged 55 and older should switch to every other year (ACS, 2022a). These variations in national screening recommendations make it difficult for healthcare providers to decide on mammogram screening schedules (Houston et al., 2022; Nachtigal et al., 2020).

Electronic Health Records (EHR) systems could pose challenges for healthcare providers. Some EHR systems might not have user-friendly interfaces or built-in alerts to remind healthcare providers when a patient's mammogram is due (De Anna et al., 2020). A systematic review found that although EHR has advanced features that could improve patient care, healthcare providers still face challenges, including concerns about the system's functionality, limited resources, and lack of support and training when using EHR systems (Rahal et al., 2021). Thus, it is essential to adopt efficient and cost-effective methods that could help ensure healthcare professionals receive timely notifications.

Improving the mammogram screening rate is a critical objective for healthcare institutions. However, the obstacles preventing women from completing mammogram screenings are numerous and complex. Healthcare organizations must develop and implement practical approaches tailored to their unique challenges and opportunities (McArthur et al., 2021).

Improving mammogram screening rates involves identifying and attempting to overcome the significant factors that prevent patients from completing the screening process.

Available Knowledge

A screening mammogram is a low-dose x-ray of the breasts to screen the breasts for signs of breast cancer (CDC, 2020). Screening mammograms can detect cancer at an early and highly curable stage in asymptomatic women. Professional and governmental organizations and task forces give guidelines on preventive measures based on the most current evidence. The

recommendations and guidelines of the American College of Obstetricians and Gynecologists (ACOG) indicate that healthcare providers should educate women at each visit on breast cancer screening and encourage them to practice breast self-awareness; following the recommendation increases the proportion of women receiving their screening mammograms (ACOG, 2017). Recently, the USPSTF released a new draft proposal urging all women at average risk to get their screening mammogram every two years starting at age 40 instead of 50 (USPSTF, 2023). The new proposal addresses inequities in care and outcomes for minorities, particularly Black women, and could save 19% more lives (Caffrey, 2023; USPSTF, 2023). Breast cancer mortality rates among Black women in the US are the highest, at 27.6 per 100,000. This rate is 40% higher than that of White women (19.7 per 100,000) and more than double that of Asian Pacific Islander women (11.7 per 100,000) (Giaquinto et al., 2022).

Evidence suggests that various methods, such as checklists, patient reminders, and education, could significantly improve patients' adherence to BC screening. For example, Cox et al. (2020) conducted a nurse practitioner-led quality improvement initiative that used a paper checklist given to patients at registration, significantly increasing screening mammography orders from 12% to 69.6%. Additionally, this intervention encouraged healthcare providers to order mammograms and motivated patients to attend their BC screening appointments.

Other studies have shown promising results using mobile technology with text messages and phone call reminders (Jain et al., 2019). In one intervention, telephone reminders and letters sent to patients and a discussion of breast cancer screening status between a patient and provider significantly increased the compliance rate from 64.7% to 76.6% (Jain et al., 2019). A quasi-experimental design study with random assignment found that contacting women by phone improved mammogram rates from 34.3 % to 44.7 % compared with postcard invitations (Lin et

al., 2020). In a semi-experimental study by Aydin et al. (2022), repeated telephone reminder-based training improved participation in breast cancer screening behaviors.

Furthermore, in a randomized control study, personalized text messages sent to women aged 50 and over increased mammogram uptake at an urban safety net hospital (Nanda et al., 2022). The intervention group had an uptake rate of 10% compared to the control group's 2%. Similarly, an interventional study found that the telephone intervention effectively promoted mammogram adherence among women who had previously missed appointments (Ressler, 2022).

In addition to the abovementioned interventions, other approaches, such as EHR and patient portals, have successfully improved mammogram screening rates. The EHR has the potential to significantly improve breast cancer screening rates through the integration of screening reminders and decision-support alerts. These features work by automatically flagging patients due for breast cancer screening, allowing healthcare providers to review the status and prompt patients to order mammograms during patient visits (Clay, 2020). Moreover, patient portals could serve as an additional communication channel to remind patients of their upcoming mammogram appointments, provide essential information on screening guidelines, and offer online scheduling, thus improving patient engagement, increasing adherence to mammogram screening recommendations, and improving health outcomes.

A comprehensive and interdisciplinary approach tailored to the facility and patients' needs could increase BC screening rates and lead to positive outcomes. Voudrie and Dhillon (2020) described a quality improvement project aiming to increase BC screening rates in a rural primary care clinic in Illinois, involving implementing a comprehensive approach, including provider education, patient reminders, and outreach activities. The results showed that the

intervention increased the percentage of eligible women who received mammograms from 51% to 68% in six months (Voudrie & Dhillon, 2020). Patient reminders help ensure that patients return for their BC screening appointments. Similarly, Abou Leila et al. (2021) reported that implementing a multifaceted intervention, including education and reminders for healthcare providers and staff, increased screening mammogram rates from 38% to 64% in a primary care clinic. A recent systematic review showed that multi-component interventions, compared to a single intervention, were more effective in increasing the use of mammography (Nduka et al., 2023).

Implementing BC screening strategies not only increases mammogram uptake but also increases breast cancer survival from early detection. A meta-analysis that analyzed 27 valid studies from different countries' programs and trials found that encouraging patients to participate in BC screening programs decreased BC mortality by 22% (Dibden et al., 2020). These studies highlight the feasibility and effectiveness of quality improvement projects to improve screening mammogram processes and outcomes in different healthcare settings. Implementing multiple strategies enhances provider knowledge and adherence to BC screening guidelines and optimizes the identification and ordering of screening mammograms for eligible patients at the point of care (POC).

Rationale

Lewin's change theory was used as the theoretical foundation for this project and offered a strategic approach for healthcare facilities seeking to optimize their operational workflow and increase breast cancer screening practice. Lewin's comprehensive model suggests that change occurs in three stages: unfreezing, changing, and refreezing (Burnes, 2020). The change involves unlearning previous knowledge and replacing it with new knowledge. Moreover, change is

influenced by three factors: equilibrium, driving, and restraining forces (Burnes, 2020). The theory also describes the driving forces that push in the direction of change and the restraining forces that hinder change (Burnes, 2020).

The first stage is the preparation phase, where the facilities should recognize the need for change. At this stage, the project site's management team and healthcare providers identified an opportunity to improve the screening mammography rate. During the first stage, the issues were evaluated by examining the status quo and identifying barriers to change (Barto, 2019). Success in the preparation phase is facilitated when the driving force increases and the restraining force decreases. After the initial stage of recognizing and accepting the need for change, the focus shifts to the transition phase. During this crucial period, the project site's staff receive the necessary support to embrace and internalize the innovative approach, along with the newly introduced guidelines and workflow. This phase emphasizes the active learning and adaptation process, which is essential for a smooth and effective implementation of the new system. Finally, the last stage, the refreezing stage, aims to adopt and maintain new routines. By applying Lewin's change theory, healthcare facilities could foster a culture of continuous quality improvement that supports increased breast cancer screening practices and improves patient outcomes.

This Quality Improvement (QI) project also employed the Plan-Do-Study-Act Cycle (PDSA) alongside guidance from Lewin's theory to drive improvement. One of the critical improvement principles involves utilizing an iterative process for testing change. Rather than implementing predetermined plans based on assumptions and predictions, the PDSA approach involves embracing a theory of change that emphasizes a continuous cycle of learning and adaptation (McNicholas et al., 2019). This approach involves planning and implementing small

changes within their specific context and studying and comparing the results to the expected outcomes. Project strategies were adjusted based on insights gained at the project site by applying the PDSA cycle. The iterative approach of the PDSA generates valuable evidence regarding effective practices and allows for the refinement of changes until the desired improvement goal is achieved (McNicholas et al., 2019).

Specific Aims

This QI project was carried out to integrate routine breast screenings into standards of care in an OBGYN practice to improve the screening process significantly. Over two months, the specific aims of this project were as follows:

- Increase the proportion of BC screening documentation in the EHR and increase the CMS breast cancer screening quality measures by 10%.
- Improve the current utilization of office mammogram services and patients and the mammogram completion rate by 10%.

Methods

Context

The project site is in a privately owned outpatient OBGYN practice in an Atlanta suburban area established in 2015. The facility provides full-range outpatient gynecology and obstetrics care in a warm, family-centered environment for women throughout all life stages. The services include prenatal care, gynecology exams, contraception counseling and management, menopause management, infertility evaluation and treatment, and cancer screening. The facility operates six days a week from 9 a.m. to 3 p.m., allowing patients to be seen at convenient times without taking time off. The practice accepts most commercial insurances and Medicare. The clinical team consists of one physician and two nurse practitioners (NPs), with each provider

seeing approximately fifteen patients per day. On average, the practice sees 170 patients weekly, including 90 patients aged 40 or older. Most are established patients. Approximately 70% of the patients are Black women from diverse socioeconomic backgrounds. This is significant as the evidence suggests that women of black ethnicity with breast cancer experience higher morbidity and mortality than other women (Giaquinto et al., 2022). In addition, the practice has a fully accredited breast imaging section conveniently located within the location for patients to receive their digital screening mammogram without seeking a referral. The imaging center has one mammography unit, offering a conventional digital mammogram (DM). It is staffed by a mammography technician and a mammography coordinator who work part-time, two days a week. The mammography services are offered two days a week. The practitioners follow the NCCN guidelines and recommend yearly BC screening for women starting at age 40.

An assessment of the local project site revealed that the percentage of up-to-date mammography screening was 50% per chart audit, which was lower than the state of Georgia average of 67% (ACS, 2022b). Only five mammograms were performed daily in the mammography department, with a utilization capacity of ten daily mammograms. Additionally, the percentage of mammogram appointments kept was only 74%.

The providers at the practice are knowledgeable individuals who currently conduct cancer screenings for women who meet the criteria. However, the providers face challenges identifying and reaching out to women due for a screening mammogram and ensuring the women receive prompt and efficient screening, potentially leading to delayed BC diagnosis. Providers and management expressed concern about the issue and were open to exploring solutions that could help ensure that all patients were up-to-date with screening mammograms.

At the project site, the current approach involves healthcare providers discussing mammogram screenings, mainly during patients' annual exams. However, providers often miss discussing mammograms during follow-up visits due to limited time. This oversight occurs as providers are busy addressing urgent matters, and mammogram recommendations sometimes take a back seat. Additionally, no EHR reminder system is in place to prompt providers when screening mammograms are due or overdue. Consequently, some patients miss the opportunity to complete regular evidence-based BC screenings.

Additionally, despite the breast imaging section being part of the OBGYN practice and healthcare professionals' awareness about BC screening guidelines, no structured or consistent routine mammogram process was present before this project was initiated. The lack of consistency could lead to delayed diagnosis and poor patient health outcomes.

Interventions

This QI project's approach involved five steps: (1) establishment of clear guidelines for providers; (2) creation of scheduling workflow; (3) creation of an instruction sheet for patients; (4) identification of patients due or overdue for a screening mammogram; (5) initiation of phone call reminders to patients before screening mammograms.

1. The first intervention involved creating a simplified clinical screening protocol for mammogram screening, an essential tool for healthcare providers (Appendix A). It provided guidance and support to help providers determine which patients were most suitable candidates for a screening mammogram and those who needed a referral for a diagnostic mammogram. The protocol helped providers optimize their practice by considering the patient's history, risk factors, and other clinical considerations. It also provided a framework for the medical decision-making process, helping to ensure that

patient care was safe and effective. Furthermore, a standardized protocol could help providers feel more confident in their care decisions.

2. The second step consisted of creating a scheduling workflow process (Appendix B) to improve resource utilization, patient satisfaction, provider efficiency, and overall office performance. To facilitate the process and improve mammogram scheduling, it was imperative to streamline the scheduling process for the unit clerks by creating a simplified algorithm to assist them with different scheduling processes, including same-day scheduling. In creating a flowchart, unit clerks could be provided with visual guidance on appropriately scheduling appointments. This eliminated any confusion that could arise from trying to remember verbal instructions or deciphering complicated rules and regulations related to when mammograms should be scheduled. Furthermore, with such a flowchart, unit clerks could provide patients with more accurate appointment times while saving valuable time and resources.
3. The patients scheduled for a mammogram would receive an instruction sheet (Appendix C) that included important instructions and details regarding the procedure. The document clarified the procedure, such as the process and what to anticipate. It also outlined the necessary preparation steps to ensure a seamless and effective exam.
4. The subsequent intervention included identifying patients who required a mammogram, using a paper checklist (Appendix D), and reviewing the EHR to flag the patients requiring a mammogram before seeing their healthcare provider. Once the paper questionnaire was completed, the clinical providers reviewed the questionnaire and previous mammograms from EHR with the patient during the consultation. The questionnaire was used to remind the patient upon arrival at the clinic of the importance

of BC screening and for the provider to discuss the mammogram status with the patient. However, the questionnaire was not a substitute for the EHR, which contained information on the patient's mammogram history. The provider would still have to review the EHR for any prior mammogram done in the office. The provider documented the results manually in the EHR system when the mammogram was performed in a different facility. Any patient due or overdue for a mammogram received an order for a screening mammogram. Patients were also offered a same-day mammogram if a slot was available.

5. Finally, the patients scheduling their mammogram in the office received a phone call reminder and a system-generated text message two days before the appointment. Phone call reminders were a valuable tool to enhance appointment attendance by providing a helpful prompt for patients and offering them the flexibility to reschedule or cancel if needed. Furthermore, the phone call reminders provided a convenient platform for addressing patient inquiries or concerns.

The target population of this QI project was based on the NCCN guidelines: women 40 years or older who were at average risk of developing breast cancer. Patients ineligible for the screening included those under age 40, pregnant patients, and patients with a personal history of breast cancer or abnormal breast findings. The provider protocol clearly outlined the criteria for inclusion and exclusion (Appendix A).

Before implementing the project, the project leader conducted one-on-one meetings with staff to thoroughly review the implementation process and its sequence. Particular emphasis was placed on clearly understanding the new clinical guidelines and scheduling workflow to mitigate the potential for misinterpretation. During meetings, staff members were encouraged to offer feedback and seek clarification.

Study of the Intervention

Throughout the project's two-month implementation period, a Microsoft Excel spreadsheet was maintained to track and generate reports on the following:

- The proportion of BC screening compliance was defined as the visits in which women aged 40 and older were up-to-date with their mammograms or received recommendations from their providers when a mammogram was due.
- The CMS breast cancer screening report from the electronic clinical quality measures (eCQM).
- The number of completed mammograms in the mammogram department.
- The mammogram completion rate.

The results were compared to results from the baseline (pre-implementation phase). It was essential to use The PDSA method to hold weekly meetings with the staff to discuss the compliance report and staff needs and address any workflow concerns.

Measures

To measure the documentation of BC screening, a retrospective chart audit was conducted for the two-month pre-implementation period (April and May 2023) using data from the EHR. The audit entailed thoroughly examining documentation confirming recent mammograms. This critical information could be gathered from multiple sections within the patient's chart, including providers' notes, radiology results, patient questionnaires, or records obtained from external sources. The CMS eQMs measures rely heavily on accurate and complete documentation to calculate quality measures effectively as it captures the required clinical data to support the CMS breast cancer measures specifications. Inadequate documentation could lead to underreporting and misrepresentation of the quality of care provided

by the healthcare organization. The same retroactive chart audit was performed after a two-month implementation period (June and July 2023) to measure the effectiveness of the implementation.

The report for eCQMs was easy to access in the "Quality" section of Athenahealth at the project site. The interface was user-friendly and made it simple to retrieve eCQM information. The data were collected three times: before starting the QI project, one month into the project, and at the end of the project, which lasted for two months.

The day before the mammograms, the schedule dashboard was reviewed to collect the number of scheduled mammograms. This data was essential to determining the proportion of completed mammograms. The mammography department maintained a manual list of patients who had completed their mammograms. These two data sets were compared, enabling the calculation of attendance and appointment show rates.

Analysis

Weekly quantitative analyses were conducted using Microsoft Excel histograms and run charts to visually assess changes in mammogram screening rates among eligible women at the project site. These charts provided insights into the data trend and the effectiveness of the intervention. Excel was also used to calculate the Pearson Chi-Square test of independence for statistical significance of categorical data (Institute for Healthcare Improvement, 2023). The calculation of compliance percentages entailed comparing the number of charts demonstrating up-to-date documentation of breast cancer screening (denominator) among all eligible patients. The pre-implementation outcomes were compared to those following the intervention to make meaningful comparisons.

The project also examined the proportion of scheduled and completed mammograms. Differences in percentage from pre- to post-intervention were compared using z test of proportion calculation. This method allowed to assess the significance of differences in percentages related to scheduled and completed mammograms.

Statistical significance was defined as a p-value less than 0 .05 percentage difference. These analytical tools were employed to determine whether the observed changes represented improvements from current practices and to gain valuable insights into data trends (Institute for Healthcare Improvement, 2023).

Ethical Considerations

This QI project was dedicated to improving the quality of care provided for women eligible for screening mammograms by improving the knowledge and adherence of healthcare providers to evidence-based guidelines and modifying the clinic workflow process to facilitate referral and completion of mammograms. Throughout the project, a solid commitment to ethical principles governed all research involving human subjects, ensuring the rigorous protection of the participants' confidentiality in compliance with the Health Information Privacy and Accountability Act (HIPAA). The project leader completed the confidentiality agreement form to safeguard patients' personal information. Additionally, the project leader signed the confidentiality agreement form to comply with the protection of patients' personal information (Appendix E). The project leader signed the HIPAA form in order to comply with the protection of patients' personal information. The service was offered inclusively to all patients meeting the screening mammogram criteria regardless of ethnicity or income. During the implementation period, no control group was involved or had a conflict of interest. Data retrieved from the EHR were collected with the partnership of the office manager and received approval from the

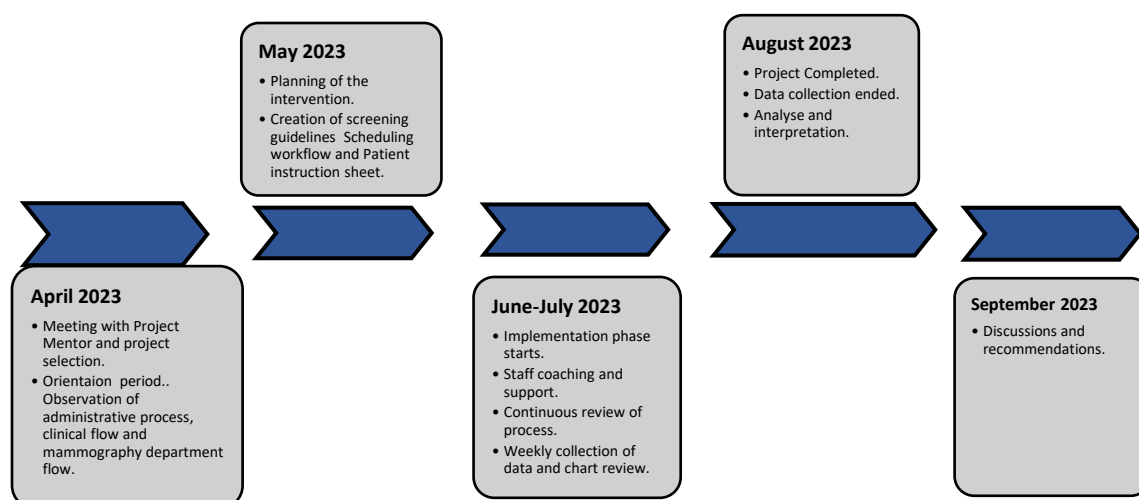
organization once the stakeholders endorsed the project. All data gathered for this project was deidentified, preserving the confidentiality of patient information. This collaborative and systematic approach ensured the integrity and privacy of the information gathered.

Results

The project's timeline is illustrated in Figure 1. The intervention aimed to enhance breast cancer screening and took place over two months, specifically in June and July 2023. The timeline is as follows:

Figure 1.

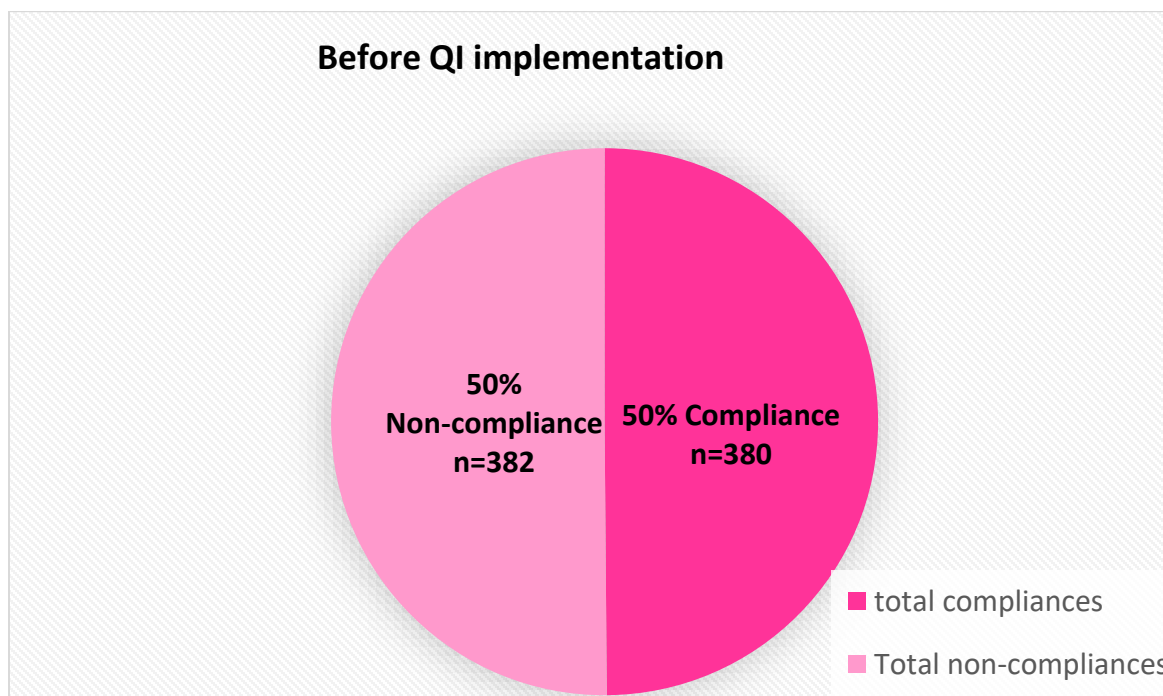
Project Timeline



To obtain breast cancer screening compliance, during the pre-implementation phase, the project leader audited all charts ($n = 762$) of qualifying patients aged 40 and older up to date with their screening mammogram or having a recent order placed (mammogram completed or recommended). Out of the 762 charts reviewed, 380 had documentation of screening mammograms (Appendix F). The percentage of compliance was 50% (see Figure 2).

Figure 2.

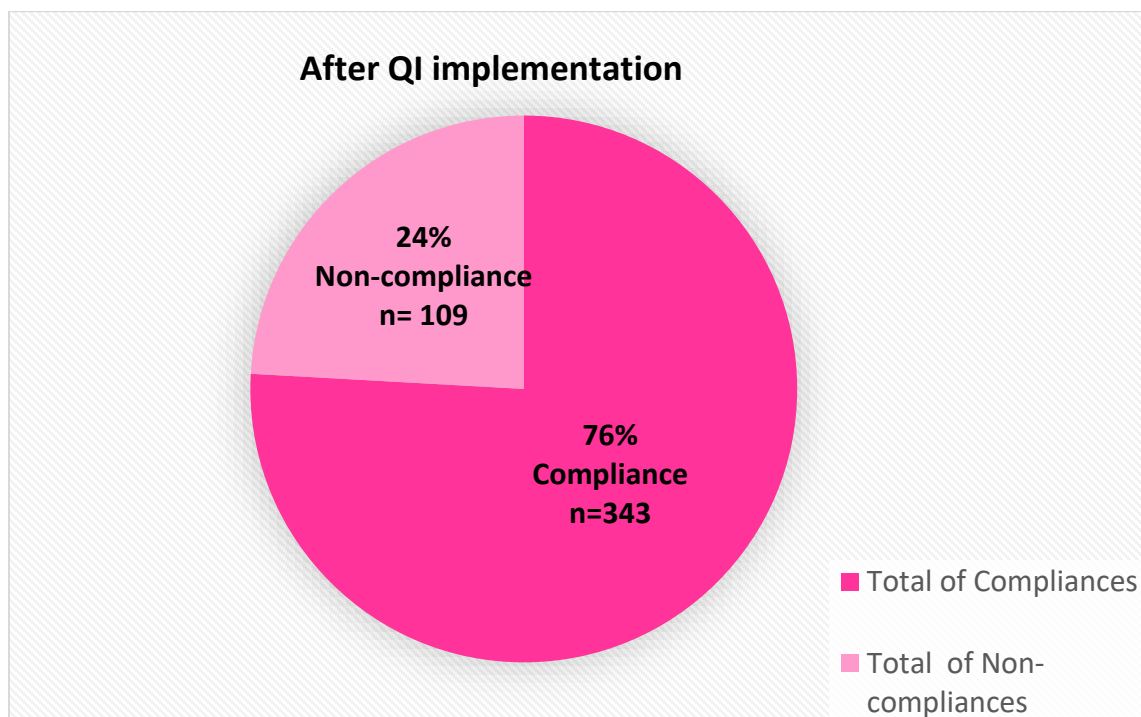
Pre-Implementation Proportion of Chart Compliance with Screening Mammogram



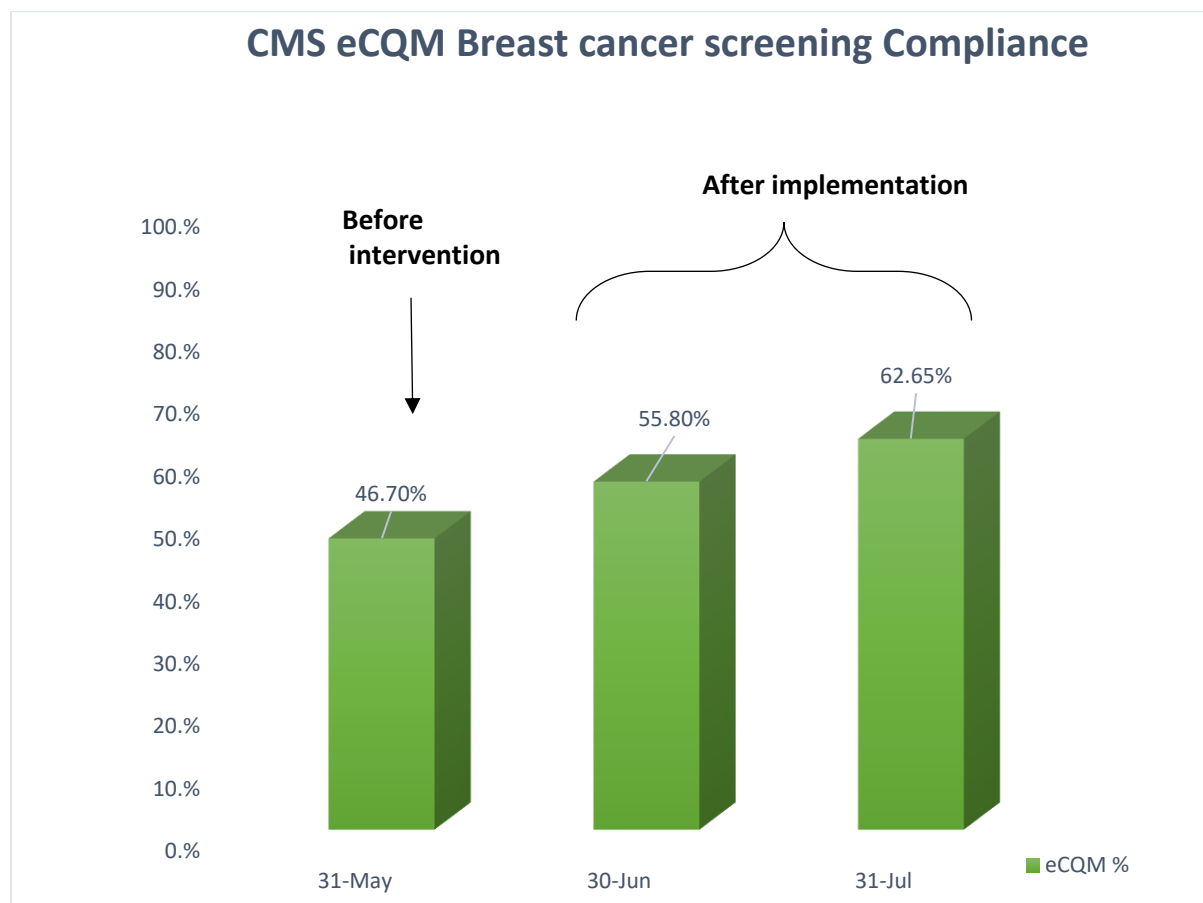
After the implementation phase, the project leader conducted a post-implementation audit on all charts ($n = 452$) of women who met the inclusion criteria. Out of the 452 charts reviewed, 343 contained documentation of screening mammograms (see Figure 3). The proportion of eligible patients who either were up-to-date with their screening mammograms or had received recommendations for breast cancer screening significantly increased from 50 to 76 percent (chi-square 79.72, $p < .001$).

Figure 3.

Post-Implementation Proportion of Chart Compliance with a Screening Mammogram.



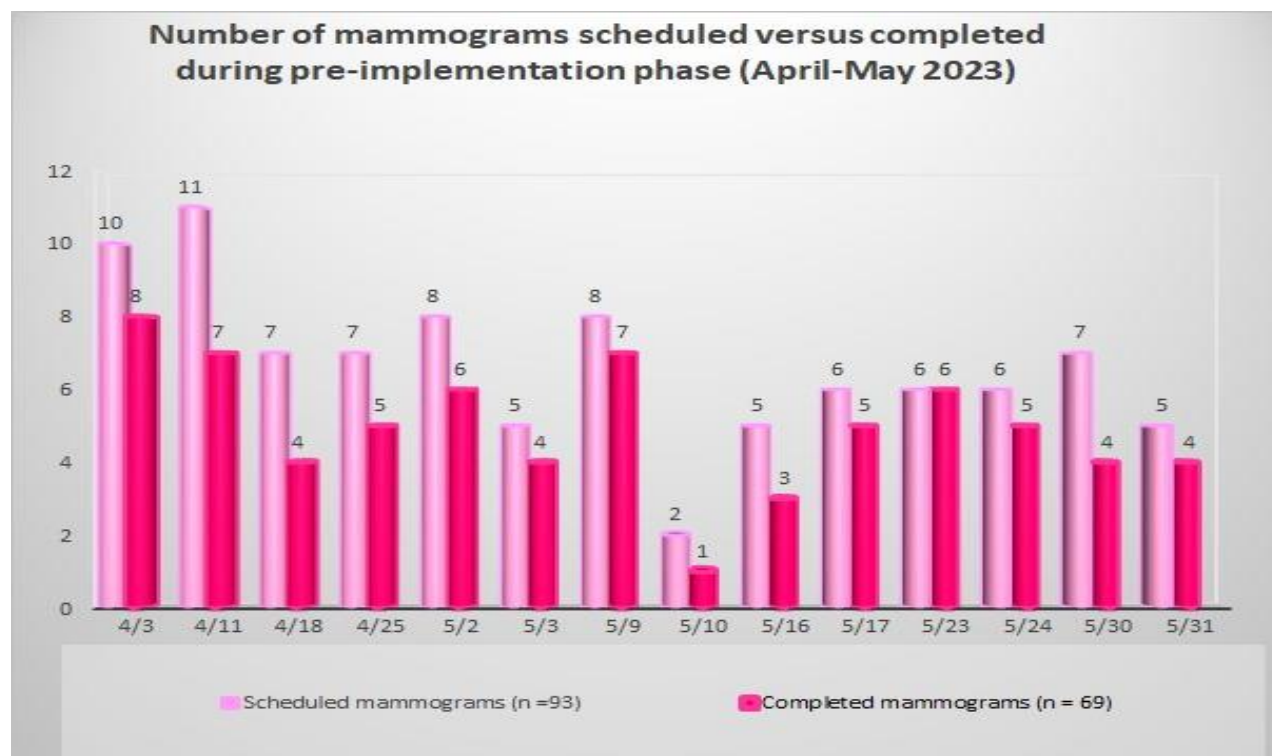
The CMS breast cancer eCQM before the implementation showed 46.7% compliance. The results were conveniently available through the Athenahealth EHR system, with the CMS eCQM measures found under the "Quality" section. By May 31, 2023 (pre-implementation), the eCQM was 46.7%. By June 30, 2023, the compliance rate increased to 55.9%. At the project's conclusion, it reached 62.65% (see Figure 4).

Figure 4.*eCQM Compliance Rates*

To evaluate mammogram department utilization during pre-implementation, the primary investigator collected data on all scheduled mammogram appointments and all completed mammograms weekly (see Appendix G). Figure 5 represents the report of scheduled versus completed mammograms. Of 6.6 mammograms scheduled, 4.9 were performed in the pre-implementation phase.

Figure 5.

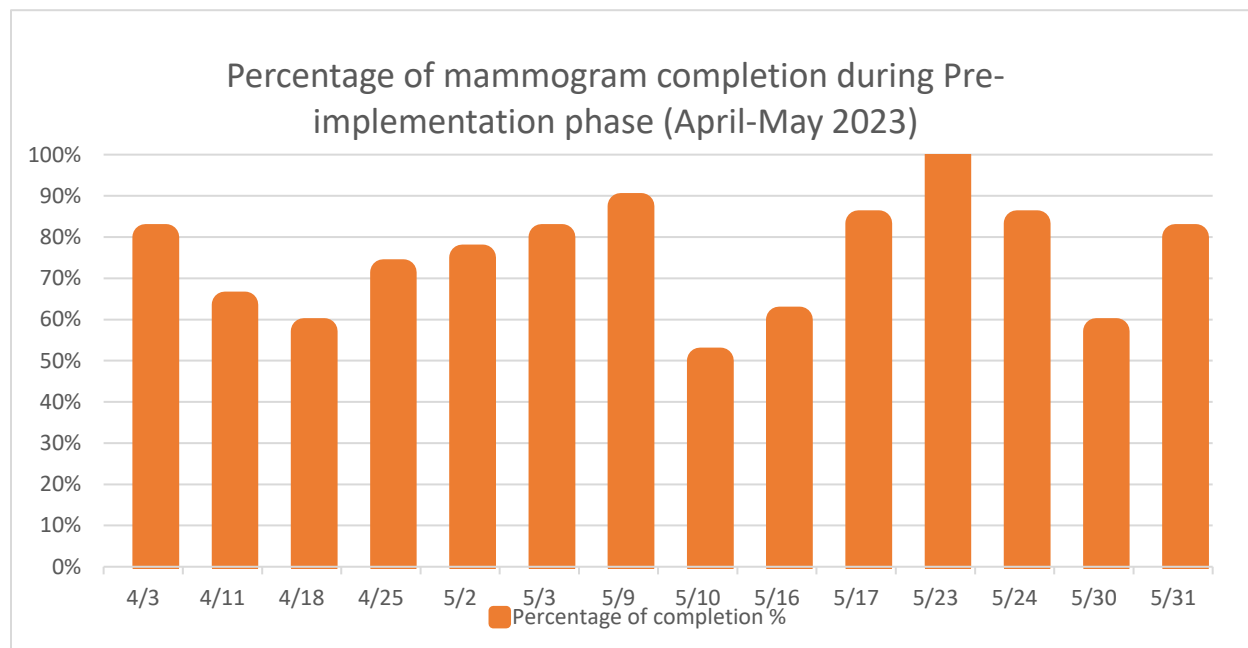
Number of Mammograms Scheduled Versus Completed During the Pre-Implementation Phase



The average mammogram completion rate was defined as the total number of mammograms performed during that period ($n = 69$) divided by the total number of mammograms scheduled ($n = 93$) multiplied by 100. The result obtained was 74% of completed mammograms. Figure 6 shows the weekly mammogram completion rate.

Figure 6.

Percentage of Mammogram Completion During the Pre-Implementation Phase

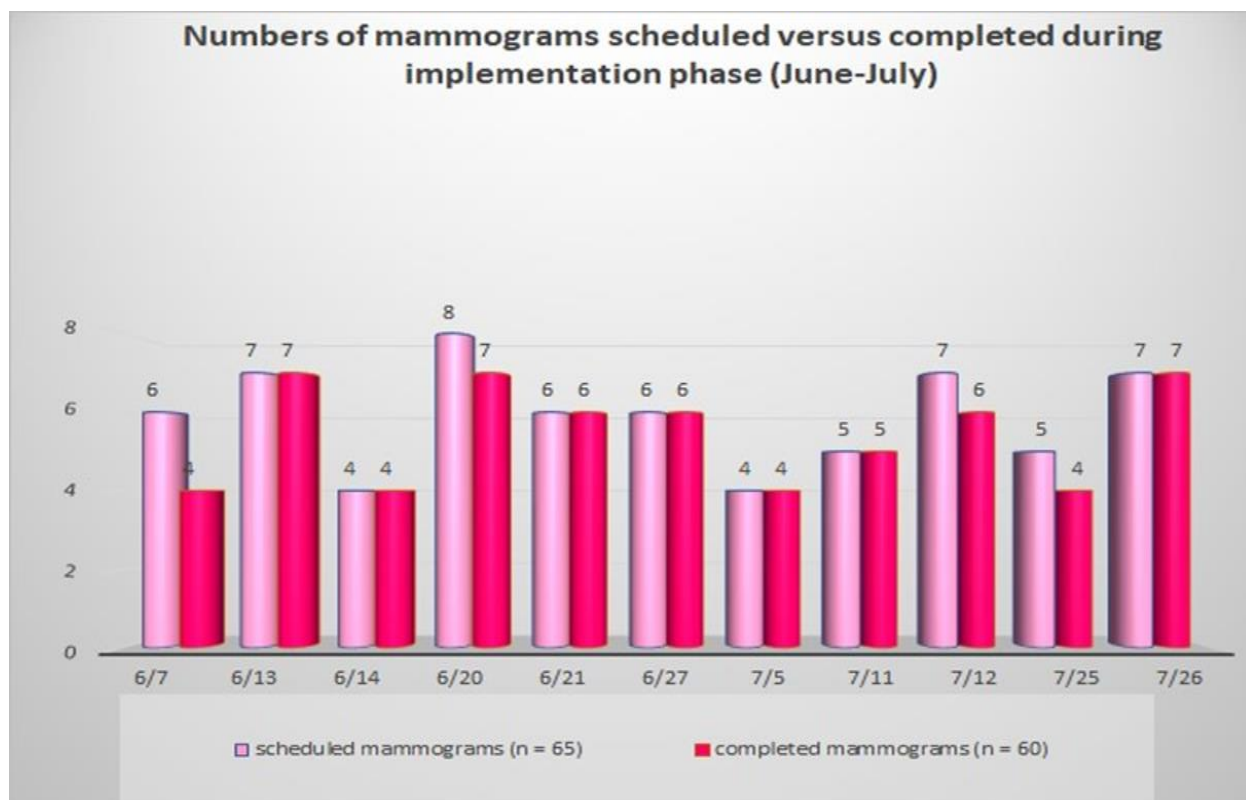


The post-implementation results were analyzed similarly to the pre-implementation phase to obtain the number of daily completed mammograms and calculate the completion rate. The collection of all scheduled mammogram appointments and all completed mammograms was performed weekly (Appendix H).

The graph below (see Figure 7) provides a visual aspect of the weekly report of scheduled mammograms versus completed. Out of the 5.9 mammograms scheduled, 5.5 were performed in the post-intervention phase.

Figure 7.

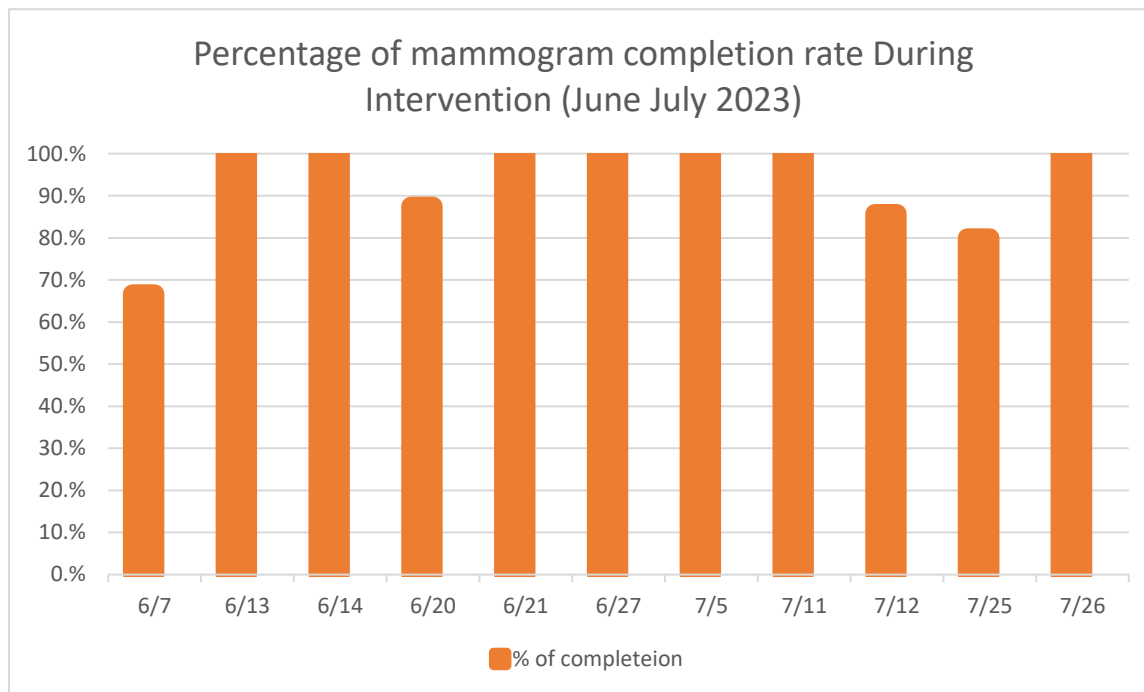
Number of Mammograms Scheduled Versus Completed During the Implementation Phase.



The average mammogram completion rate was defined as the total number of mammograms performed during that period ($n = 60$) divided by the total number of mammograms scheduled ($n = 65$) multiplied by 100. The result obtained was 92 % of completed mammograms ($z = 2.89, p = .003$). Figure 8 shows the weekly mammogram completion rate.

Figure 8.

Percentage of Mammogram Completion During the pre-Implementation Phase

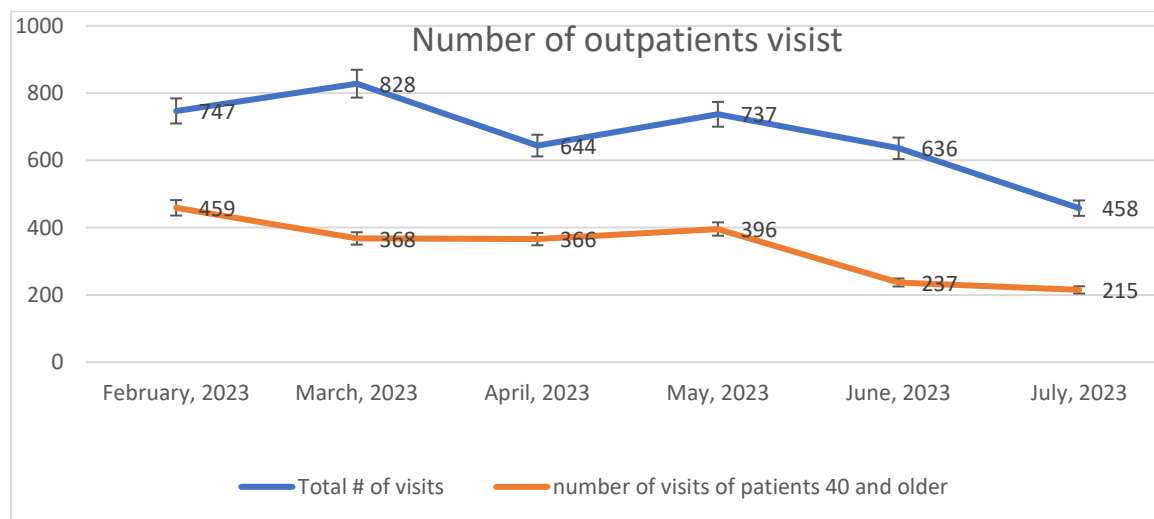


In terms of utilization of the office mammogram services, compared to the pre-implementation phase, there was a slight improvement in the number of mammograms completed in June and July (implementation phase), with 4.9 to 5.5 mammograms completed daily.

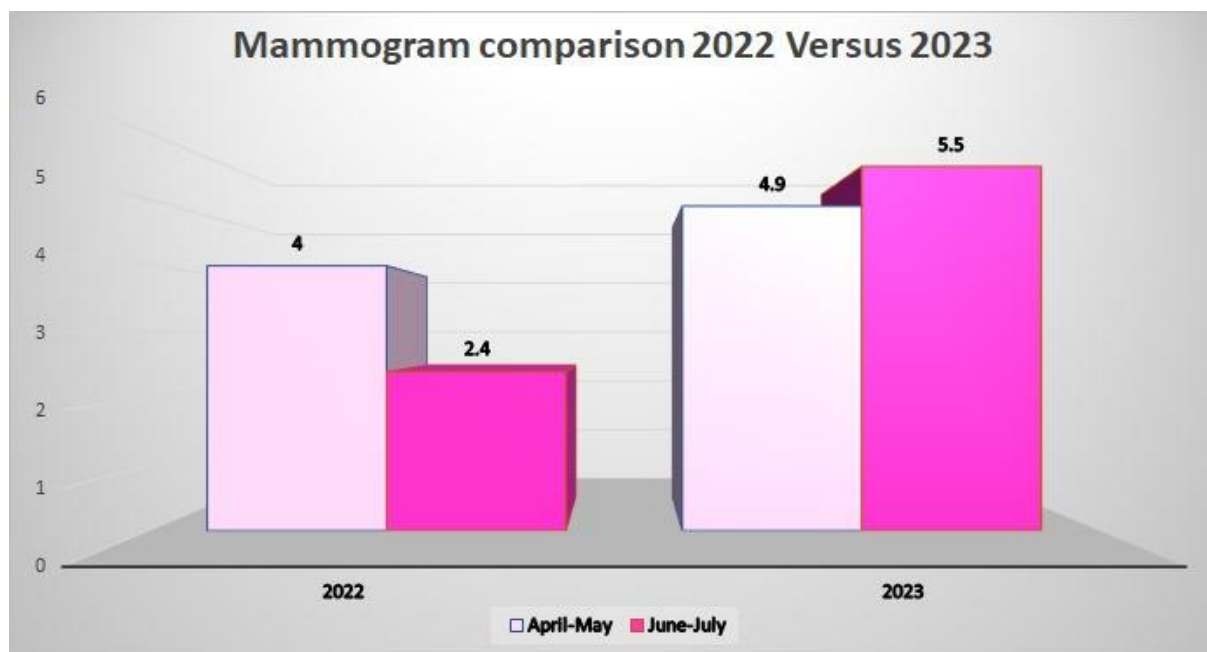
In the implementation phase, the number of scheduled mammograms (65) was notably lower than in the pre-implementation phase (93). This decrease could be attributed to a reduced patient turnout during the summer break, leading to a smaller proportion of patients aged 40 years and older (see Figure 9).

Figure 9.

Total Number of Visits Versus the Number of Visits of Patients 40 and Older



The project leader thought to explore further the effects of the implementation and compared the average completed mammogram during the same period in the previous year (2022). The findings are illustrated in Figure 10. This implementation resulted in an increase from 4.9 to 5.5 mammograms completed daily (12% increase). In contrast, the previous year saw a decline from four to 2.4 daily mammogram completions (40% decrease).

Figure 10.*Mammogram Comparison 2022 versus 2023*

Overall, the project demonstrated that this pragmatic intervention, which aimed to increase compliance with BC screening mammograms, was effective. The documentation of screening mammograms and the CMS Breast cancer screening quality measures increased. While there was a slight improvement in mammogram performance in the mammography department, the results still showed a marked improvement over the previous year.

Discussion

Summary

This QI project sought to integrate routine BC screening into the standard of care within a medical practice, mainly focusing on an outpatient OBGYN practice with an imaging center offering mammogram services. The primary goal of this project was to improve the quality of the screening process, which was dedicated to addressing critical issues such as inadequate

documentation, compliance with CMS BC screening quality measures, and inefficiencies in the scheduling procedures within the mammogram department at the project site. The project's remarkable strength was in its comprehensive and multifaceted approach to tackling the challenges and improving processes at the project site. The project sought to increase the rate of up-to-date screening mammograms for women aged 40 and above and significantly emphasized improving compliance with CMS quality measures.

Furthermore, the project took a holistic view by addressing scheduling issues and mitigating no-shows. A notable advantage of this project was its utilization of the convenience factor associated with on-site mammogram scheduling within an OBGYN practice. Taking advantage of this strategic advantage could motivate more women to engage in screening, potentially leading to earlier detection of breast cancer.

Additionally, the project's targeted efforts to streamline scheduling processes and reduce no-show rates could significantly boost the efficiency of the mammogram department. Optimizing the utilization of resources within the practice was expected to benefit both patients and the medical practice, aligning with an overarching aim to improve breast cancer screening and patient care.

Interpretation

This project aimed to identify strategies that could help enhance BC screening compliance rates and increase adherence to standards. Additionally, the project sought to boost the efficacy of the mammogram scheduling process at the project site to increase mammography performance and reduce patient no-shows. Following the intervention, the percentage of chart documentation compliance with BC screening guidelines and CMS performance improved. Furthermore, the strategic scheduling measures designed for the mammography department

increased the patient show rate. The findings were aligned with previous research showing the superior efficacy of multi-component interventions over single interventions in the context of improving mammography screening rates (Nduka et al., 2023)

The ramifications of this project extend beyond its immediate scope, bearing significant implications for both patients and the clinical practice. Indeed, this project suggests that a multidisciplinary approach could improve patient outcomes. Regular screening mammography not only increases the chance of early detection but significantly enhances the chance of successful treatment, reducing mortality (ACS, 2022a). Streamlining the scheduling process to reduce the no-shows positively affected the mammogram department, improved convenience for the patient, optimized resource allocation, and, by extension, benefited the practice. The clear guidelines and a streamlined scheduling workflow eliminated potential sources of confusion and enabled a seamless execution of respective duties for the site's clinical staff.

Limitations

The project results should be interpreted with several limitations in mind. Limitations became evident during the implementation phase of the project. First, the practice faced an unforeseen setback when one of the NPs resigned, which impacted the team's overall capacity and workflow. In addition, the implementation phase coincided with the summer season, leading to staff members taking their scheduled summer leave and lower patient inflow. Unfortunately, fewer patients were seen during the implementation phase compared to the pre-implementation phase.

The second significant limitation revolved around women who had their screening mammograms outside the office or the Athenahealth network, posing a considerable challenge for data management and quality assurance processes. Specifically, if a patient's mammogram

was conducted outside the Athenahealth network, the results were not visible in the project site's EHR system. Consequently, the mammogram was categorized as "not completed," thereby not contributing to eCQM metrics. Office staff had to allocate additional time and effort to obtain the screening mammogram reports from external sources to address this limitation, causing potential delays and administrative complexities.

Furthermore, the EHR system in the clinical setting posed a significant challenge to the providers, as it lacked built-in alerts to remind the providers when a mammogram was due. As a result, the providers had to search for patient results within the system manually. Moreover, any mammogram performed outside facilities within the network was also difficult to retrieve as they were all consolidated within a single section. The providers had to comb a potentially long list of records, adding a burden on the providers, requiring them to invest extra time and effort, and increasing the risk of oversight or missed mammogram screenings, undermining the effectiveness of BC screening.

In the mammography department, services were limited as the DM service was available only two days a week, limiting patient appointment availability. In addition, the project site's conventional DM limited options and impacted the number of patients seen. Patients increasingly prefer a digital breast tomosynthesis (DBT), also known as the 3D option, for their screening mammogram as it finds more BC and has lower false positive rates than conventional DM, particularly for patients with dense breast tissue (Conant et al., 2023).

Patients' health literacy might influence their decisions to have a mammogram. Ensuring that patients are well-informed and comfortable with the procedure is crucial. The recommendation to use a BC champion who believes in the significance of BC screening and

would be used as a resource person, similar to the role of the project leader in this project, could increase a patient's compliance and the sustainability of a similar project.

By addressing these potential limitations and developing proactive strategies to mitigate their impact, healthcare organizations could enhance the overall effectiveness of their screening mammogram programs and ensure better patient outcomes.

Conclusion

The success of this project's intervention highlights the need to ensure patients receive their annual screening mammograms and emphasizes the importance of reducing missed appointments. The project also underscores the value of utilizing a multidisciplinary team approach to deliver excellent patient care. Every patient interaction within the office should be an opportunity to safeguard patient health. Reminders in the EHR and patient questionnaires upon admission could prompt providers to discuss and document mammogram screenings. The role of the mammography coordinator and medical assistant in updating medical records and sending patient reminders was instrumental in this QI project. It is recommended that the medical assistant could enhance efficiency by initiating advance orders, which providers could sign or delete before patients are discharged. This procedure saves time and serves as a valuable reminder for providers. Medical assistants are trained to review patient charts, prescreen, and assess patient questionnaires before meeting with providers. However, competing responsibilities might limit their long-term commitment to the project's sustainability.

The recommendation is to promote services through social media platforms to increase mammography department utilization at the project site. This approach can effectively expand outreach beyond existing patients, attracting a wider audience and encouraging more individuals to benefit from the available services.

Finally, while this QI project specifically targeted BC screening, it could be adapted and expanded to promote other cancer screenings, such as cervical or colon cancer. The key is to customize and tailor similar approaches to the specific characteristics of other cancer screenings while maintaining the focus on quality improvement and evidence-based practice.

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Appendix A: Providers Reference Guide for Scheduling Screening Mammograms

Breast Cancer Screening Guidelines

Effective Date:06/06/2023

Purpose

Breast cancer screening aims to detect early signs of the disease in healthy, asymptomatic women to prevent adverse outcomes. Early detection and treatment can improve survival and reduce the need for aggressive treatments (ACOG, 2022).

Breast Cancer screening methods

- **Breast self-exam (BSE):**

American Cancer Society no longer recommends BSE as an effective screening method (ACS, 2022a).

- **Breast self-awareness:**

American College of Obstetricians and Gynecologists (ACOG) indicates that healthcare providers should educate women on breast cancer screening

at each visit and encourage them to practice breast self-awareness (ACOG, 2017).

Unlike BSE, breast self-awareness does not involve routine or systematic breast self-examination to detect breast cancer. Women need to be aware of how their breasts look and feel the normal appearance and notify their health care provider of any breast changes such as pain, a mass, new onset of nipple discharge, or redness.

- **Clinical Breast examination (by healthcare providers):**
 - Every 1 to 3 years for women from 25 to 39
 - Annually for women 40 and older.

 - **Screening mammograms (SM) in the office**
 - Average risk patients:
 - Thirty-nine years and under SM not recommended.
 - 40 and older, and asymptomatic: Annual screening mammogram
 - Women with Prior BIRAD1 and BIRAD2
 - Patients complaining of generalized breast pain need evaluation first and may proceed with SM.
 - Patients with nipple discharge must be evaluated first and
-

referred if necessary.

- Previous breast biopsies with benign findings.
- Patients with breast implants: need to mention breast implants in the order.

- **Patients needing referral to outside facility:**

- Patients at high risk: Personal history of breast cancer.
- Women with family breast cancer may need a screening before 40.
- Prior mammogram with BIRAD 0, 3, 4, 5, and 6 (see table below)
- Women with persistent, localized focal pain: evaluate and refer to DM if necessary.

BI-RADS category	meaning	Schedule
0	Needs additional imaging or prior mammogram for comparison	NO
0	Category 0 but had follow-up and is cleared	YES
1	Negative	YES
2	Benign finding	YES

3	Probably benign findings but need follow-ups	NO
4	Suspicious abnormality needs a biopsy	NO
5	Suggestive of malignancy	NO
6	Known biopsy with proven malignancy	NO

Appendix B: Scheduling Workflow Process

Scheduling a Screening Mammogram

Patients present at the clinic for any visits (Annual, Follow-up, or as a new patient)

- Every **return** patient fills out a questionnaire on arrival, including a question regarding the last mammogram and breast condition.
- **Annual exams**: receive a breast exam and are offered a screening mammogram.
- **New patients**: Similar to the annual exam, they receive a questionnaire and are asked about questionnaire asks about mammogram screening.
- Once the visit is completed with their providers, the patients needing a mammogram can have the option of the same mammogram or schedule one for another day, depending on the situation (see algorithm).

A same-day mammogram only for baseline or scheduling at their convenience

- Only **baseline mammograms**,
- with **no prior mammogram**,
- no signs or symptoms.
- The patient should be clear financially.
- The mammographer is available and agrees to see the patient.
- **Baseline mammograms** who cannot be seen on the same day may be given the next available appointment.
- Give patients the patient instructions sheet.

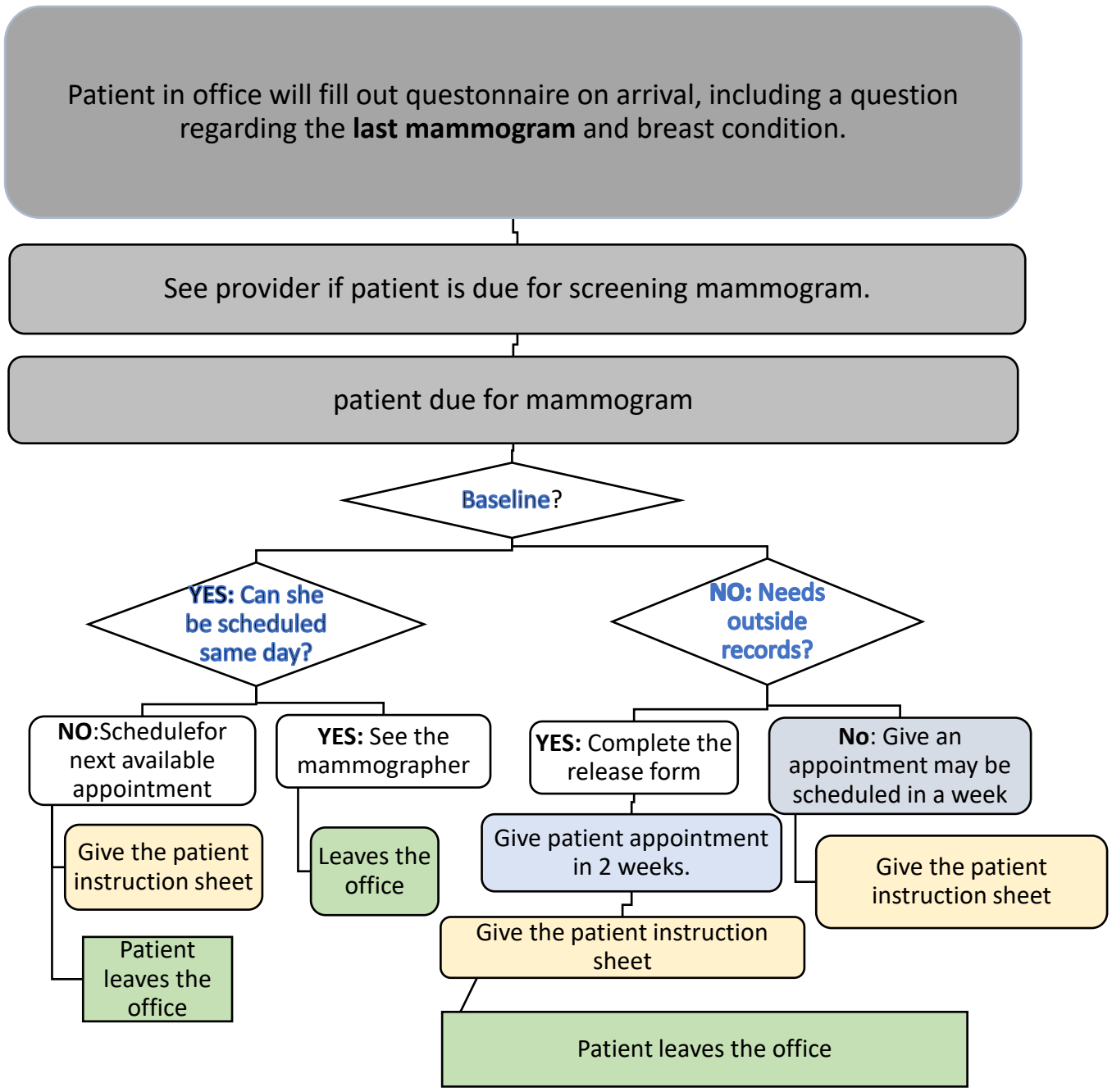
If a patient with a prior mammogram done in our office:

- Schedule **in a week** to allow retrieval of the CD and review the records.
- Give the patient the instruction sheet.

Patient with mammogram from an outside facility.

- She needs to fill out **the release form**. Inform the patient that the previous records are needed for comparison.
- Schedule in 2 weeks
- Let the patient know we need to review outside records to confirm.
- The patient will leave the office with the instruction sheet.
- Text message reminders are sent automatically through the system at least 48 hours before the appointment date.

Same-Day Scheduling Algorithm



Phone Call Scheduling

Every 40 and older patient calling to schedule **appointments** should be asked when her last mammogram was and **if she needs one**.

If the patient agrees to schedule a mammogram:

Before scheduling a patient, we need to ask the following:

- When was the last mammogram? It should be 12 months apart (1 year apart).
- The patient is informed that it is a screening mammogram for patients with no symptoms.
- Ask the patients the three questions:
 1. Do you have any **personal history of breast cancer**?
 2. Do you have any current breast problems, such as **lumps or pain**, or a history of abnormal mammograms?
 3. **Bloody discharge from the nipples?**

If Yes to any of the 3 questions, do not schedule and offer to see the provider first for clearance.

No: We can schedule her, but let her know that If pain or a lump is felt before the exam, a patient must call and ask to see a provider for evaluation.

- Do you have breast implants? The mammographer needs more time and takes more images. Please plan to stay an extra 20 minutes.
 - Schedule her with an appointment code (BIPM).

- If the patient still has her periods, inform her that the best time to have a mammogram is the week after her period because her breasts may be less sensitive. That will help with discomfort and obtain clear images. Avoid the week right before the period, as her breasts may be swollen and sensitive.
- If baseline no previous mammogram:
 - Schedule for the next available and send the patient the instruction sheet.
- Did the patient have a mammogram performed in the office?
 - **Yes**, schedule her in a week to allow time to retrieve and review the C/D records.
 - **No**: Schedule the appointment in 2 weeks to allow time to review the outside records. **Inform the patient that the previous records are needed for comparison. Email the release form as soon as possible.**

Appendix C: Patient Instructions for a Screening Mammogram



The following instructions can help you have a more seamless exam experience and get the most accurate results possible:

A screening mammogram is an X-ray picture of each breast. The screening mammogram is a tool to check for breast cancer in women with no reason to suspect breast cancer.

If you experience any recent problems or changes with your breast (pain or tenderness, nipple changes, lumps, or other breast issues), a personal history of breast cancer, previous biopsies, or abnormal mammogram, you must consult a healthcare provider first. Please call the office and schedule an appointment to see a provider first.

To help with discomfort and obtain clear images, schedule your mammography when your breasts are not expected to be sensitive or swollen. You might plan your mammogram the week after your period because your breasts might be less sensitive.

Avoid the week just before your period.

If you have had breast screening tests in the past in a different center:

You can email them as soon as possible. This includes tests like biopsies, MRIs, ultrasounds, and mammograms.

- You can also fill out the release form and send it by email as soon as possible to allow time for the clinic to obtain your records from the previous office.
- Your new radiologist needs to have access to your previous scans so they can see any changes.

On exam day:

- Deodorant: avoid antiperspirants, powders, creams, lotions, and perfumes in or under the breasts or arms. Some of them have chemicals that can appear as white spots or calcifications on X-rays.
- For the mammography, you must take off your top and bra. You might want to dress in two pieces.
- Once the radiologist reads the images, you can access your results on your Athena portal and will receive a letter with your results.

Appendix D: Patient Questionnaire

Return Patient to Practice Questionnaire - Gynecology

Last Menstrual Period _____

Do cycles come monthly? Yes No If not, how often? _____ Cycles last _____ # days

Have you been pregnant since your last visit? Yes No

Current birth control: None, Condoms, Withdrawal, Birth Control Pills, IUD, Nuvaring, Nexplanon, Tubal sterilization, Vasectomy, Female Partner, Other: _____

Current Medications: _____

Which medications need refills? _____

Are you interested in testing for Sexually Transmitted Infections today? (STDs/STIs) Yes or No

Have you ever had an abnormal pap test? Yes No When? _____

What was follow-up? Repeat testing, colposcopy (with biopsy), LEEP/conization procedure, cryotherapy

Have you recently been treated for a Sexually Transmitted Disease (STD)? Yes No When? _____

If yes, circle/fill in: HPV, Genital warts, Chlamydia, Gonorrhea, Herpes, HIV, Syphilis, Hepatitis C

Have you had gynecologic surgery since your last visit? Yes No

Please list surgery: _____

Have you ever received the Gardasil Vaccine (to prevent HPV and cervical cancer)? Yes or No _____ # doses

Review of Systems: Circle if you are currently having any of the following problems?

Skipping periods, heavy vaginal bleeding, bleeding in between your periods, bleeding after menopause, bleeding after intercourse, anemia, abnormal vaginal discharge, vaginal odor, recurrent vaginal infections, external genital itching, external genital lump/lesion, pelvic pain, painful periods, painful intercourse, pelvic mass, difficulty getting pregnant, urinary frequency, urinary leakage, pain with urination, recurrent urinary tract infections, blood in your urine, pelvic pressure, pelvic bulge or prolapse, bothersome menopause symptoms, significant hot flashes, vaginal dryness, breast pain, breast mass, nipple discharge, chronic constipation, chronic diarrhea, persistent nausea or vomiting, blood in your stools, depressed mood, increased anxiety, irritability, unexplained weight changes, fever or chills.

Last Pap _____ Mammogram _____ Bone Density _____ Colonoscopy _____

Appendix E: Confidentiality Agreement

EMPLOYEE CONFIDENTIALITY AGREEMENT

This ~~employee~~ ^{student} confidentiality agreement is made between
 employee Saida Khamooshi (herein referred to as the "Employee")
 and [REDACTED] as the
 "Employer").

** substitute "student" for "employee" for entire document*


The Employee agrees to the terms of this agreement:

1. The Employee acknowledges that, in the course of employment by the Employer, the Employee has, and may in the future, come into the possession of certain confidential information belonging to the Employer including but not limited to trade secrets, patient personal health information that may include: names, address, phone numbers, email address, family members information, insurance information, occupations and/or celebrity status, supplier lists and prices, practice pricing and managed care contractual data, schedules, business methods, business/office processes, or marketing plans.
2. The Employee hereby covenants and agrees that he or she will at no time, during or after the term of employment, use for his or her own benefit or the benefit of others, or disclose or divulge to others, any such confidential information.
3. Upon termination of employment, the Employee will return to the Employer, retaining no copies, all documents relating to the Employers business including, but not limited to, reports, manuals, drawings, diagrams, blueprints, correspondence, customer lists, computer programs, cell phones, laptops and computers and all other materials and all copies of such materials, obtained by the Employee during employment.
4. Violation of this agreement by the Employee will entitle the Employer to an injunction to prevent such competition or disclosure and will entitle the Employer to other legal remedies to the fullest extent that the law allows for such infractions, including attorney's fees and costs.
5. This agreement shall be governed by the laws of U.S. Dept. of HHS HIPAA Compliance Laws.




- 6. If any part of this agreement is deemed invalid, illegal, or unenforceable, the remaining parts shall not be affected and shall remain in full force and effect.
- 7. This agreement shall be binding upon the parties, and upon their heirs, executors, personal representatives, administrators, and assignees. No person shall have a right or cause to cause of action arising out of or resulting from this agreement except those who are parties to it and their successors in interest.
- 8. This agreement, including any attached exhibits and addenda, constitutes the entire agreement of the parties. No representation or promises have been made except those that are set out in this agreement. This agreement may not be modified except in writing signed by all the parties concerned.

Student
Employee Name: (Print) Saida Khamooshi WTHN P-13c

Saida Khamooshi
 (Signature) 

04/04/2023
 (Date)

Employer Manager Witness Name (Print) 


 (Signature)

4/3/23
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Main Office : 

Appendix F: Screening Mammogram Compliance Before and After Intervention

	Pre-Implementation	Post-Implementation
Total number of Qualifying Compliances	762	452
Non-Compliances	380	343
Compliance Rate (%) = ((Compliances / total) X 100)	382	109
Compliance Rate (%) = ((Compliances / total) X 100)	$(380 / 762) \times 100 = 50$	$(343 / 452) \times 100 = 76$
Race, n (%)		
• Black	495 (65)	267 (59)
• White	114 (25)	144 (31)
• Hispanic	69 (9)	33 (7)
• Other	1 (less than 1%)	8 (2)

Table 1. Raw (Observed) Values.

	Number_of_Compliance	Number_of_Noncompliance	Total_in_Each_Implementation_Period
Before_Implementation	380	382	762
After_Implementation	343	109	452
Total_in_Each_Compliance_Group	723	491	1214

Table 2. Proportions (Raw Values Relativized by the Number of Observations in Each Implementation Period)

	Number_of_Compliance	Number_of_Noncompliance
Before_Implementation	0.499	0.501
After_Implementation	0.759	0.241

Table 3. Expected Values.

	Number_of_Compliance	Number_of_Noncompliance	Total_in_Each_Implementation_Period
Before_Implementation	453.811	308.189	762
After_Implementation	269.189	182.811	452
Total_in_Each_Compliance_Group	723	491	1214

Table 4. Observed Minus Expected Squared Differences.

	Number_of_Compliance	Number_of_Noncompliance
Before_Implementation	12.005	17.678
After_Implementation	20.239	29.802

Table 5. Calculating the Chi-Squared Test Statistic.

Chi-Squared_Test_Statistic	Degrees_of_Freedom	p_Value
79.724	1	4.30706E-19

Appendix G: Scheduled and Completed Mammogram During Pre-Implantation Phase

Pre-implementation Period	Number of Scheduled mammograms	Number of completed mammograms.	Percentage of mammogram completion %
3-Apr	10	8	80
11-Apr	11	7	63.6
18-Apr	7	4	57.1
4/25/23	7	5	71.4
2-May	8	6	75
3-May	5	4	80
5/9/23	8	7	87.5
10-May	2	1	50
5/16/23	5	3	60
5/17/23	6	5	83.3
5/23/23	6	6	100
5/24/23	6	5	83.3
5/30/23	7	4	57.1
5/31/23	5	4	80
Total	93	69	74
Daily Average	6.6	4.9	74

Appendix H: Scheduled and Completed Mammograms During Implantation Phase

Implementation phase	Scheduled mammograms	Completed mammograms	Percentage of mammogram completion %
6/7/23	6	4	66.7
6/13/23	7	7	100
6/14/23	4	4	100
6/20/23	8	7	87.5
6/21/23	6	6	100
6/27/23	6	6	100
7/5/23	4	4	100
7/11/23	5	5	100
7/12/23	7	6	85.7
7/25/23	5	4	80
7/26/23	7	7	100
Total	65	60	92.3
Daily Average	5.9	5.5	93

Phase	Observations	Successes	Phat
Implementation	65	60	0.923076923
Pre-implementation	93	69	0.741935484
Alpha	Pooled Phat	z value	p-value
0.05	0.816455696	2.894347393	0.003799475

Are the results statistically significant?

TRUE