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**Pneumococcal Vaccination in Adult Patients with Chronic Obstructive Pulmonary
Disease**

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in partial fulfillment of the requirements for the degree

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Advisory Committee

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Abstract

Problem: Patients with Chronic Obstructive Pulmonary Disease (COPD) are at risk for exacerbations due to pneumonia which could lead to unwanted outcomes. Despite the existence of evidence regarding phone call reminder usage as a communication strategy about vaccinations as an effective preventive measure that can minimize the likelihood of contracting pneumonia. In a primary care facility in Kentucky, phone call reminders are not being used to promote vaccinations.

Method: This quality improvement (QI) pilot project used a descriptive, comparative, and retrospective design with the aim to increase the pneumococcal vaccination rate by 10% over 3 months by implementing a phone call reminder protocol. A convenience sample of COPD patients aged 65 years and older with follow-up appointments within three months (March-June 2023), who had not received a pneumococcal vaccination was part of the phone call reminder implementation. The IOWA Model of Evidence-Based Practice guided this project. Data was collected using Excel and SPSS for descriptive analysis.

Results: In the pre implementation phase (November 2022-January 2023) there were ($N=17$) patients with ($n=9$; 52.9%) vaccinated who didn't have a phone call reminder. In the post implementation phase (March-June 2023) there were ($N=21$; 100%) patients vaccinated who had a phone call reminder. This resulted in a 47.1% increase in vaccination rates, exceeding the initial 10% target increase. The results indicated phone call reminders could improve pneumococcal vaccination rates among adult COPD patients.

Implication for Practice: Phone call reminders as a communication strategy to promote vaccinations among adult COPD patients could be beneficial and be used to increase other vaccination rates.

Pneumococcal Vaccination in Adult Patients with Chronic Obstructive Pulmonary Disease

The pneumococcal vaccination is recommended for all adults aged 65 or older, particularly for people with lung diseases like Chronic Obstructive Pulmonary Disease (COPD), due to streptococcus pneumoniae-associated infections resulting in morbidity and mortality in the older adult population age 65 or older (Center for Disease Control and Prevention [CDC], 2022). COPD is a chronic illness that is marked by a dysfunction of the airways or alveoli following exposure to hazardous fumes or particulates leading to continual airflow obstruction or respiratory symptoms (Ignatova et al., 2021). Periodic exacerbations can lower the quality of life in COPD patients due to pneumonia and could lead to unwanted outcomes, including mortality, and morbidity (CDC, 2022; Ignatova et al., 2021). Based on the CDC's (2022) data on the prevalence of COPD, the decrease in the number of patients has remained unchanged. The prevalence of the disease is significantly higher in women than in men, but notably mortality in men is higher. COPD is the fourth leading cause of mortality in the United States (CDC, 2022; Wise, 2022). According to CDC (2022) pneumococcal immunization is effective in preventing invasive infections with COPD patients and reducing the severity in vaccinated adults.

A comparative study conducted by Ignatova et al. (2021) explored the use of pneumococcal and influenza vaccination in preventing the development of pneumonia in adult COPD patients. This study revealed that pneumococcal vaccination was effective in the prevention of pneumonia and exacerbation of COPD. Additionally, noted were how vaccines have not increased to an optimal level despite the evidence indicating

vaccinations are an effective preventive measure that can minimize the exacerbations of COPD and lower the likelihood of contracting pneumonia.

Walters et al. (2017) study was a systematic review that highlighted the effectiveness of the pneumococcal vaccine in reducing the likelihood of pneumonia infections in adult COPD patients. Moreover, Fekete et al. (2020) revealed that the uptake of pneumococcal vaccine among adult COPD patients had a meager 10 percent increase despite the evidence of the significant protective effect of the vaccine. In addition, this study found that adult COPD patients who received the pneumococcal vaccination had a reduced number of hospitalizations due to exacerbations of COPD. Thus, immunization in older adults is a vital component of preventive healthcare to avert infectious illnesses like flu and pneumococcal illness (e.g., pneumonia, otitis, sinusitis), reducing illness and mortality, and decreasing complications and hospitalizations (Bach et al., 2019).

The purpose of the project was to increase the pneumococcal vaccination rates among adult COPD patients 65 years or older with the implementation of phone call reminders by 10%. After a literature review and a needs assessment, a PICOT question to guide the project was formulated as follows: Among adult COPD patients 65 years or older, what is the impact of phone call reminders compared to no phone call reminders on the total number of recorded vaccinations over three months? The primary outcome measure was pneumococcal vaccinations recorded with phone call reminders.

Review of the Literature

To determine the viability of the proposed evidence-based project, it was essential to search relevant literature indicating that the adoption of the phone call reminder would be effective in increasing the adoption of pneumococcal vaccination among adult COPD

patients. The databases that were used are CINAHL, PsycINFO, Medline, Web of Science, IMMER, Embase, and Cochrane. Also, other open-access databases and websites were accessed through the Library of the University of Missouri St Louis (UMSL), the Center for Disease Control and Prevention (CDC), The Cochrane Library, National Institute for Health and Care Excellence (NICE), Campbell Library of Systematic Reviews, ICA Health Communication (a Johns Hopkins University database), OpenGrey, Copac National, Academic, and Specialist Library Catalogue, GAVI Alliance (Global Alliance for Vaccination and Immunization). The main keywords that were used to complete the search and the identified databases were “pneumococcal vaccination,” “vaccination”, “COPD”, “phone call reminder,” “benefits,” and “adult COPD patients”. To ensure that the study findings were current, the sources were limited to those published from January 2017 to November 2022. Only studies published in English that had the specified keywords in their title and abstract sections were included in the study. Notably, the search included all forms of peer-reviewed studies not limited to clinical trials, meta-analyses, descriptive studies, and systematic reviews, among others. No editorials, conference abstracts, or commentaries were included. Likewise, articles with irrelevant topics, without abstracts, and minus a clear target population were excluded.

Following the compilation of the results from all the major databases, 57 sources relevant to the current study were identified. Of these, 11 studies were included in the project proposal. Based on the guidelines provided by the Agency for Healthcare Research and Quality (AHRQ), the identified pieces of literature were two meta-analyses and two systematic reviews, four randomized control trials, and three qualitative and quantitative studies.

Cafiero-Fonseca et al. (2017) identified 5,857 papers published between January 2010 and April 2016 on pneumococcal vaccination in adults. The studies reported that the uptake of pneumococcal vaccination resulted in health gains for the patient as well as contributed to significant savings in healthcare costs. Notably, some of the studies went further and captured the additional benefits of pneumococcal vaccination such as the increased levels of productivity. Notably, the review may be limited due to several limitations of some studies included in the review such as the inclusion of only abstracts in some of the studies.

Walters et al. (2017) conducted a systematic review to determine the effectiveness of pneumococcal vaccines in the prevention of pneumonia in adult COPD patients. The researchers searched for all the studies published on the effectiveness of the pneumococcal vaccine up to November 2016 and retrieved 12 studies with 2,171 participants. Walters et al. (2017) found that the vaccinated adult COPD patients had minimized the likelihood of developing pneumonia in the community reducing the likelihood of exacerbation of COPD in patients at statistically significant levels. Nonetheless, the findings did not find significant differences in the effect of vaccination on hospital admissions or reduction in mortality among the controls and the intervention groups.

In examining the effectiveness of involving patients in the decision-making process on pneumococcal vaccine uptake Kuehne et al. (2020) found in the eight studies, that the exchange of information with patients using interventions such as phone call reminders enhanced pneumococcal vaccine uptake compared to the control group. Likewise, Trethewey et al. (2019) conducted a scoping review to determine the

effectiveness of phone call reminders in enhancing pneumococcal vaccination rates among adults. The findings suggested that patient-focused approaches such as the use of phone call reminders can improve the uptake of pneumococcal vaccination among adults. Similarly, Jacobson Vann et al. (2018) conducted a systematic review to examine the effectiveness of various interventions intended to increase vaccination uptake including phone call reminders. The researchers found that the use of phone call reminders could improve the uptake of vaccinations among adults using moderate certainty evidence from 15 studies.

Ho et al. (2019) conducted a cluster randomized controlled trial measuring the effectiveness of point-of-care informational interventions on the uptake of pneumococcal vaccination. The study was conducted in 22 private clinics in Singapore with 4378 patients included in the study and covered all patients above 65 years. The rate of pneumococcal vaccine uptake among the participants was 5.7 percent during the intervention period, which was higher than the 3.7 percent rate reported during the control period.

Stolpe and Choudhry (2019) conducted a study to examine the effectiveness of automated telephone reminders on the uptake of pneumococcal vaccines among adults visiting a community pharmacy. The researchers identified 21,791 patients with vaccine gaps using the data from the pharmacies and randomly assigned them to either a group that received telephone reminders for pneumococcal vaccines based on the patient records or a group that received usual care. The two groups were tracked between March 2016 and January 2017. The researchers did not observe marked differences in vaccine uptake between the two groups. However, it is important to note that the effectiveness of

the application of phone call reminders in the study could have been compromised by technical challenges in the implementation, the minimal connection with the patients, the absence of follow-up, and patients' ignorance of the importance of pneumococcal vaccinations.

In a similar study, Klassing et al. (2018) conducted a randomized control trial to examine the effectiveness of a pharmacist-initiated intervention on vaccine uptake among adult COPD patients. The study included 210 patients from three community pharmacies who were randomized to a control group with one group receiving letters as a reminder, or a group that received phone call reminders. Notably, the results showed that a higher number of participants had vaccine uptake following a phone call reminder than the control group or those who received mailed letters.

Fathima et al. (2021) conducted a pilot study to examine the effectiveness of the pharmacy care model for adult COPD patients that included the use of phone call reminders over a period of six months. Forty pharmacies were recruited for the pilot study, with nine of them recruiting 27 adult COPD patients into the program. The program reported 119 referrals to general practitioners for pneumococcal vaccination among other services. However, the generalizability of the study findings to the general population remains unclear.

In a review of intervention, Bach et al. (2019) provided an expert opinion on the common barrier to vaccination uptake among adult COPD patients. Following their examination of the literature, Bach et al. (2019) noted that phone call reminders were one of the potential interventions that were shown to be highly effective in increasing immunization rates in populations. Furthermore, Andreoni et al. (2021) recommended the

clinical use of phone call reminders as one of the potential interventions that could be effectively used to improve the levels of vaccination uptake among the adult population including COPD patients. The recommendation is based on the advice from the major Global Institution Organizations and also reviews the comorbidities that are associated with diseases such as COPD and the potential benefits of vaccinations.

Froes et al. (2017) posit that pneumococcal vaccines are beneficial for adult COPD patients. The review of studies on vaccine efficacy showed that the combination of influenza and pneumococcal vaccines can be effectively used to reduce infection and the exacerbation of COPD. Understandably the vaccines are effective in older adults, especially if the pneumococcal vaccine is taken during the early cause of COPD diagnosis.

There was sufficient evidence from the literature review to indicate that the uptake of the pneumococcal vaccine among adult COPD patients has benefits (Rochi & Blasi, 2017; Walters et al., 2017; Cafiero-Fonseca et al., 2017)). To this end, Rochi and Blasi (2017) reported that combining the pneumococcal vaccine with the influenza vaccine decreases the exacerbation of COPD and lowers the likelihood of pneumonia infections in adult COPD patients. Cafiero-Fonseca et al. (2017) communicated that the use of pneumococcal vaccination lowers healthcare cost and improves the health status of adult COPD patients, with Walters et al. (2017) reporting that the use of pneumococcal vaccine minimizes the likelihood of a patient experiencing community-acquired pneumonia and the exacerbations of COPD in patients. Evidently, there is sufficient evidence to support the effectiveness of the pneumococcal vaccine in adult COPD patients.

Furthermore, there is sufficient evidence that the use of phone call reminders was an effective intervention for increasing pneumococcal vaccinations among adult COPD patients (Kuehne et al., 2020; Ho et al., 2019). All the studies noted that healthcare organizations that used phone call reminders reported increased uptake of pneumococcal vaccines among adult COPD patients. However, Stolpe and Choudhry (2019) found that the use of phone reminders did not result in significant differences in the uptake of the pneumococcal vaccine among patients recruited from the pharmacy. The differing results could be explained by the limitations of the study. Studies by Fathima et al. (2021) and Klassing et al. (2018) reported positive results in a pharmacy setting.

The research project was guided by the Iowa Model of Evidence-Based Practice (EBP) to Promote Quality Care which was developed with threefold goals of enhancing patient care, facilitating nursing practice, and lowering healthcare costs (Collaborative et al., 2017). The model was appropriate for monitoring and analyzing the structure, process, and outcome data in terms of environment, staff, cost, and patients. Once the trigger was identified, the next step was determining the extent to which the problem was a priority for the site before proceeding to collect the research that would inform the proposed practice change. To this end, the IOWA Model of EBP guided the implementation of this project, which was identified as a priority and provided the facility an opportunity to explore the low number of adult COPD patients who had not received the pneumococcal vaccine despite its proven efficacies.

Method Plan

Design

This quality improvement (QI) pilot project used evidence-based interventions to increase the vaccination rate in adults 65 years or older with COPD. Through the retrospective, descriptive, comparative method, the project evaluated the vaccination rate with the implementation of phone-call reminders.

Setting

This pilot project took place in the primary care located in Kentucky whose mission is to implement a wellness-based model and provide evidence-based, individualized care to patients. There are 3 primary care providers, 1 Registered Nurse (RN), and 3 Medical Assistants (MA) working in this facility. The healthcare providers include a physician working a 10-hour week and other two nurse practitioners working full-time. This primary care has approximately 300 patients as well as some walk-ins daily. The patients are of all ages including adults, more than 70%. The setting has different facilities including vaccination facilities for children and adults. The MAs use phone call reminders to remind patients of their appointments the day before the appointment.

Sample

This pilot project used a convenience sample of adult COPD patients who are 65 years and older who had not received pneumococcal vaccination, had follow-up appointments, and had access to a telephone. Adult COPD patients less than 65 years of age who didn't have follow-up appointments, had received pneumococcal vaccination and who didn't have access to a telephone were excluded. A unique numeric identifier

was created and applied to each primary care provider for identification purposes. A master list of coded identifiers and patient names was stored in a password-protected file on the primary investigator's clinic-provided laptop.

Approvals

Formal, written approval was sought and obtained from the Primary Care. The project protocol was evaluated and determined not to be human-subject research. The approval for this project was sought from the graduate student committee and the Institutional Review Board (IRB) before implementation.

Data Collection/Analysis

The data collection tool was used to collect patients' information, such as age, gender, sex, ethnicity, and patient getting vaccinated with or without phone-call reminders. MA's collected the data which was verified by the primary researcher and transferred into an Excel and analyzed with descriptive statistics using SPSS.

Procedures

The facility determined there was a need to address the lack of vaccinations in individuals who are 65 years or older with COPD. Meetings were held biweekly with RNs, MAs, Administrators, and Providers to synthesize the body of evidence from the literature and to develop a phone call reminder protocol. The project started with obtaining approval from the graduate student committee, the IRB, and the primary care organization's president. After the approval process, individual meetings with the administration of the facility and key stakeholders were held monthly. Adult COPD patients were identified utilizing a retrospective chart review of patients with electronic medical records. To identify patients with COPD, a query report was completed. Once

the patients were identified, a chart review was done to see if they were previously vaccinated with pneumococcal vaccination. If the patients had not been vaccinated and were age 65 or older, had an appointment within three months they were given a phone call reminder for pneumococcal vaccination. All the COPD patients who were 65 years or older who met the inclusion criteria participated in this QI pilot project. The MAs and the RNs were educated about the telephone reminder and script. The MAs made the phone calls one day before appointments using the approved phone call reminder script. The MAs collected the data that was on the data collection tool. Patients' information, such as age, gender, sex, ethnicity, and patient getting vaccination with or without phone-call reminders was collected. The QI project used convenience sampling to identify the research participants. Each patient had a unique identifier to guarantee anonymity. Rights and dignity were respected during the implementation of this QI pilot project. After the data collection, data was transferred into Excel and analyzed in SPSS by the graduate student. Data analysis was done via descriptive methods. The results from the project were shared with the committee members and the facility.

Results

Data was collected from ($N=21$) COPD patients who were 65 or older who were seen at the Primary Care during the phase of post implementation (March-June 2023). In addition, medical records were accessed to determine the number of participants who were previously vaccinated (November 2022-January 2023) before the implementation of the quality intervention. Data revealed that ($N=17$) patients were seen in the pre-implementation phase with ($n=9$; 52.9%) participants who were vaccinated.

In the pre implementation phase, there were ($N=17$) patients, 64.7 % ($n=11$) were female while 35.3 % ($n=6$) of them were male (see APPENDIX C: Table 2). There were ($n=2$; 11.8%) African Americans, ($n=2$; 11.8%) Whites, ($n=12$; 70.6%) Asians, and ($n=1$; 5.8%) Hispanic (APPENDIX C: Table 3). The ages of the participants ranged from 65 years to 80+ years. The mean age of the participants was 71.8 years with a standard deviation (SD) of 4.03. Most of the participants ($n=10$; 58.8%) fell in the age range of 70-74 (see APPENDIX C: Table 1).

In the post implementation phase, there were ($N=21$) patients, ($n=13$; 61.9%) were female while ($n=8$; 38.1%) of them were male (see APPENDIX C: Table 2). There were ($n=2$; 9.5%) African Americans, ($n=3$; 14.3%) Whites, ($n=15$; 71.4%) Asians, and ($n=1$; 4.8%) Hispanic (APPENDIX C: Table 3). The age of the participants ranged from 65 years to 80+ years. The mean age of the participants was 71 years with a standard deviation (SD) of 3.6. Most of the participants ($n=10$; 47.6%) fell in the age range of 70-74 (APPENDIX C: Table 1).

The pre implementation and post implementation data for vaccinations is presented in Figure 4. Prior to the implementation of the phone call reminder, the total number of COPD patients who were 65 years or older that were vaccinated was ($n=9$; 52.9%) out of ($N=17$), and ($n=8$; 47.1%) were not vaccinated (see APPENDIX C: Figure 4).

In the post implementation phase ($N=21$; 100%) COPD patients 65 years or older were seen in Primary Care with all of them having received the vaccination following the phone call reminder. The implementation of the phone call reminder increased the vaccination uptake by 47.1%.

Discussion

The findings of this study highlight the positive impact of phone call reminders on pneumococcal vaccination rates among adult COPD patients 65 years or older. The vaccination rate increased by 47.1% after the intervention, exceeding the initial goal of a 10% increase. The results suggest that phone call reminders can effectively motivate and encourage COPD patients to receive the pneumococcal vaccination. The increase in the vaccination rates is in line with the literature that posits the effectiveness of phone call reminders can have a significant impact on the level of vaccination uptake (Ho et al., 2019; Klassing et al., 2018; Kuehne et al., 2020; Janjua et al., 2021; Tretheway et al., 2019).

The sizeable increase in vaccination rates following phone call reminders could have been attributed to various factors. The phone call reminder was personalized, creating a sense of urgency and emphasizing the importance of vaccination. By providing timely reminders, the intervention helped overcome potential barriers, such as forgetfulness or lack of awareness, that may have hindered vaccination uptake. The attribution was explored by Janjua et al. (2021) who found that reminders were highly effective in reminding patients about the need for vaccination. Among the participants in the study, the researcher noted that the use of telephone communication enhanced the quality of care as it elicited a sense of urgency among the patients. Thus, the improvement in the vaccination uptake following the phone call reminders can be attributed to the sense of urgency that the patient felt following the phone call reminders.

The high percentage of patients who received vaccination following a phone call reminder demonstrates the effectiveness of this communication strategy. Phone calls

allow for direct and interactive communication, enabling healthcare providers to address any concerns or misconceptions the patients may have had. This personalized approach likely instilled confidence in patients, reassuring them about the safety and benefits of the pneumococcal vaccine.

Notably, the QI interventions had several strengths. Firstly, the study was conducted in a real-world healthcare setting, which enhances the external validity and applicability of the findings. By implementing the intervention within the context of routine clinical practice, the study reflected the practicality and feasibility of using phone call reminders to increase vaccination rates in COPD patients. Secondly, the study utilized quantitative data to measure the vaccination rates among adult COPD patients before and after the implementation of the phone call reminders. By using numerical data, the study provided concrete evidence of the intervention's effectiveness in increasing vaccination uptake.

While this QI pilot project achieved a noteworthy increase in vaccination rates, it is essential to acknowledge a few limitations. The project was conducted within a specific timeframe, which may not capture long-term sustainability. Monitoring the vaccination rates beyond the project period would be valuable to assess the persistence of the intervention's effect. Additionally, the project was limited to a single healthcare setting. Introducing the phone call reminders as an evidence-based intervention to validate the effectiveness of phone call reminders on a broader scale should be explored in different contexts and populations. Additionally, the social worker was not part of team to identify or assist in the phone calling but is an integral part of case management team who can be an important resource to increase vaccination.

Recommendation

The phone-call reminder script should be continued to be used by the facility to see the long-term benefits and decrease hospitalization due to COPD exacerbations. Since phone call reminder was effective in increasing the pneumococcal vaccination rate, it can be used for other vaccinations like Influenza and RSV. According to CDC (2022), everyone 6 months and older should get a flu vaccine every season and adults 60 years and older may receive a single dose of RSV vaccine. Vaccinations are particularly important for people who are at higher risk of serious complications from COPD, influenza, and RSV. Social workers are an integral part of the case management team in a primary care setting, and they know the socio-demographics of the patients. Thus, the social workers can be used to provide important resources about vaccinations to the patients during the phone call reminder.

Conclusion

The implementation of the phone call reminders did meaningfully improve pneumococcal vaccination rates among adult COPD patients. The phone call reminders were practical and feasible and provided documentation of the effectiveness. Phone call reminders can promote vaccinations and reduce the burden of vaccine-preventable diseases among vulnerable populations. The intervention results exceeded the set target of a 10 % increase in vaccine immunizations. The personalized nature of phone call reminders, combined with effective follow-up actions, may have contributed to the success of the intervention. These findings highlighted the importance of implementing targeted communication strategies to promote vaccinations and reduce the burden of preventable diseases among vulnerable populations. Future QI projects should focus on

evaluating the long-term sustainability of such interventions and expanding their application to diverse healthcare settings, ensuring equitable access to preventive care for COPD patients of all ages.

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APPENDIX A

Pneumococcal Vaccine Intervention Worksheet

Appt Date	Patient Code Number	Date of Birth	Gender	Race/Ethnicity	Provider Initial	Received a phone Call Reminder Yes/No	Received vaccination Yes/No

Instruction for filling out the worksheet.

1. After the phone call reminders are done prior to the next day by MAs, MAs will fill this form.
2. A code number created with first and last initials and date of birth will be assigned to ensure anonymity of collected data.
3. Each column should be filled with the required information.
4. MA’s will put ✓ for the intervention triggering vaccination acceptance. If the patient is getting vaccination without a phone call reminder, put ✓ on it and also fill the last column by writing vaccinations by referral or walk-in.
5. After the completion of the workday, the worksheet will be kept in secured area by MAs and primary researcher will tally the worksheet information.
6. The participants’ names and other identifying information should not be used for dissemination.

APPENDIX B

VACCINE PHONECALL REMINDER SCRIPT

Please read through the entire document carefully before you contact the patient. This will provide you clear understanding on how to carry the conversation during the phone call reminder. Thank You!

CONVERSATION TIPS

- When starting the conversation, make sure to be courteous by introducing yourself and the organization.
- Make sure you are speaking with the person whom you are calling.
- When speaking with the person, acknowledge the conversation by repeating back what you hear so they know you are listening.

PHONECALL SCRIPT

Caller: Say Hi

State your first and last name, title. Name of the organization
Request to speak to patient by first and last name.

Client: on phone

Caller: Re-introduce self by stating your first and last name, title. Name of the organization

How are you doing today?

Client: Response

Caller: Provide acknowledgement to the response by client

I am calling you to remind you about your appointment (date/time) with us for getting pneumococcal vaccination.

Client: Response

Caller: Provide acknowledgement to the response by client

Thank you so much for your time. Have a nice day.

Sample Script

Hi,

I am (**First name/Last name**) MA working in Primary Care. May I please speak to **First name/Last name** (e.g., John Doe)? How are you doing today? I am calling you to remind you about your appointment (**date/time**) with us for getting your pneumococcal vaccination. Thank you so much for your time. Have a nice day.

APPENDIX C: Results

Table 1. Demographic Characteristics by Age Group

Category	Pre implementation (Nov 2022- Jan 2023)			Post implementation (March-June 2023)		
Age (N=38)	(n=17)	% (100)	Mean (SD)	(n=21)	% (100)	Mean (SD)
65-69	4	23.5	71.8(4.03)	8	38.1	71(3.6)
70-74	10	58.8		10	47.6	
75-79	2	11.8		3	14.3	
80+	1	5.9		0	00.0	

Table 2. Demographic Characteristics by Gender

Category	Pre implementation (Nov 2022-Jan 2023)		Post implementation (March-June 2023)	
Gender	(n=17)	% (100)	(n=21)	% (100)
Female	11	64.7	13	61.9
Male	6	35.3	8	38.1

Figure 1. Age Group

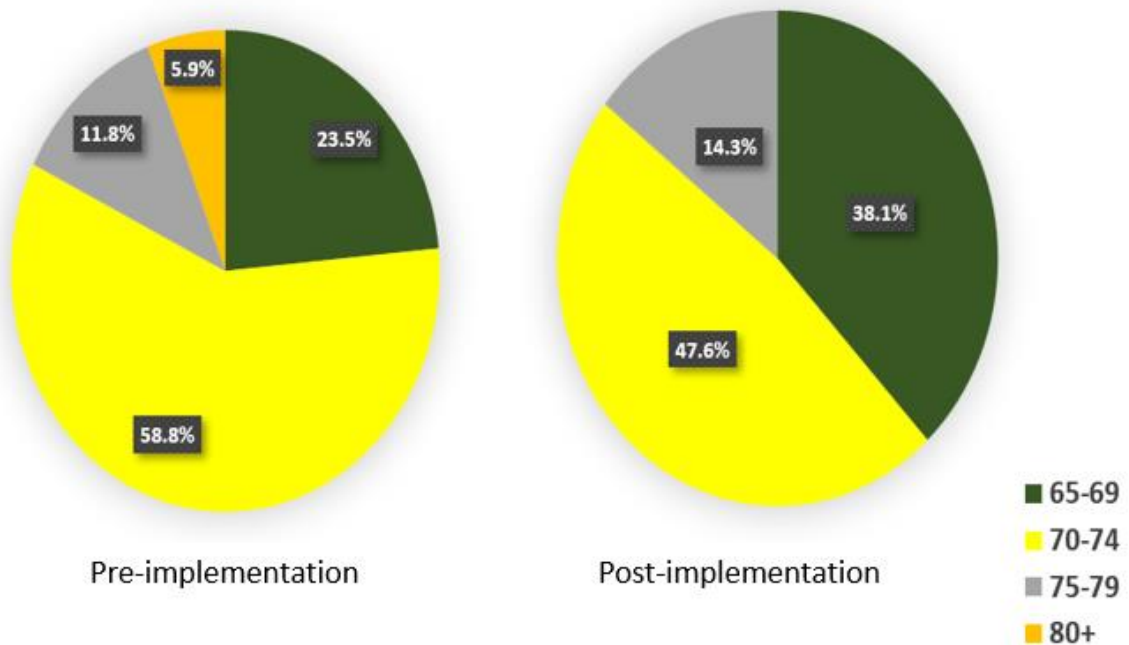


Figure 2. Gender

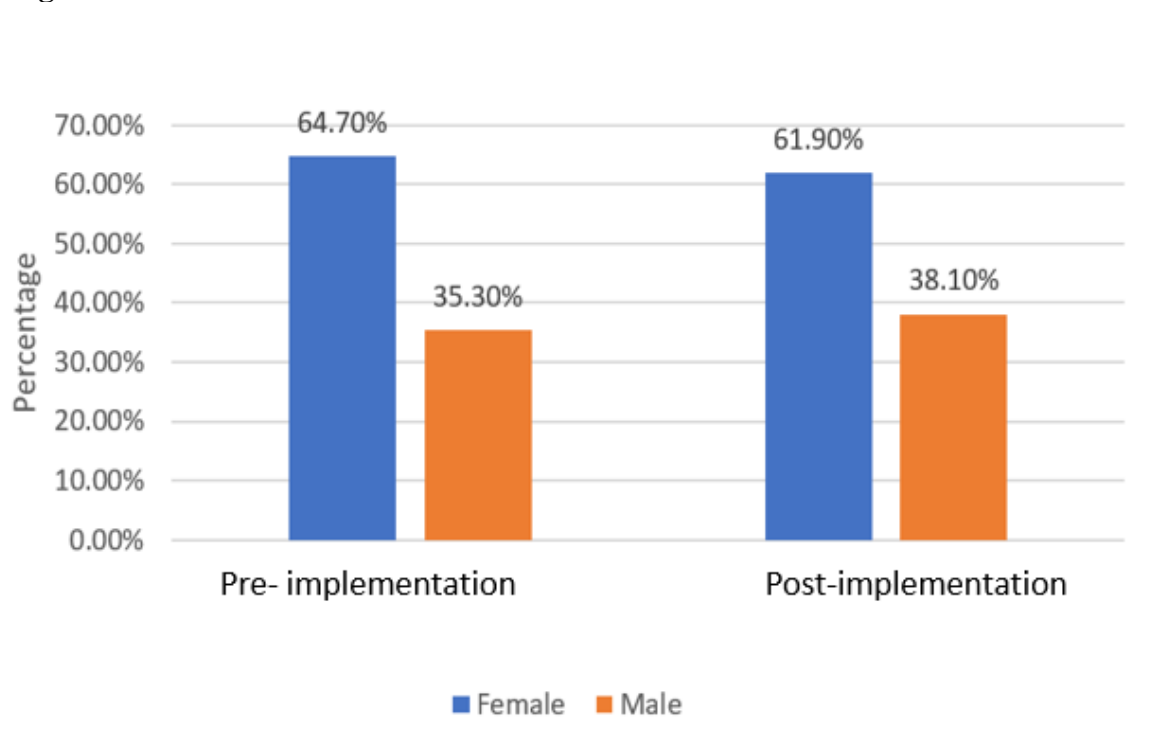


Table 3. Demographic Characteristics by Race/Ethnicity

Category	Pre implementation (Nov 22-Jan 23)		Post implementation (March-June 23)	
Race/Ethnicity	(N=17)	% (100)	(N=21)	% (100)
Asian	12	70.6	15	71.4
White	2	11.8	3	14.3
African American	2	11.8	2	9.5
Hispanic	1	5.8	1	4.8

Figure 3. Race/Ethnicity

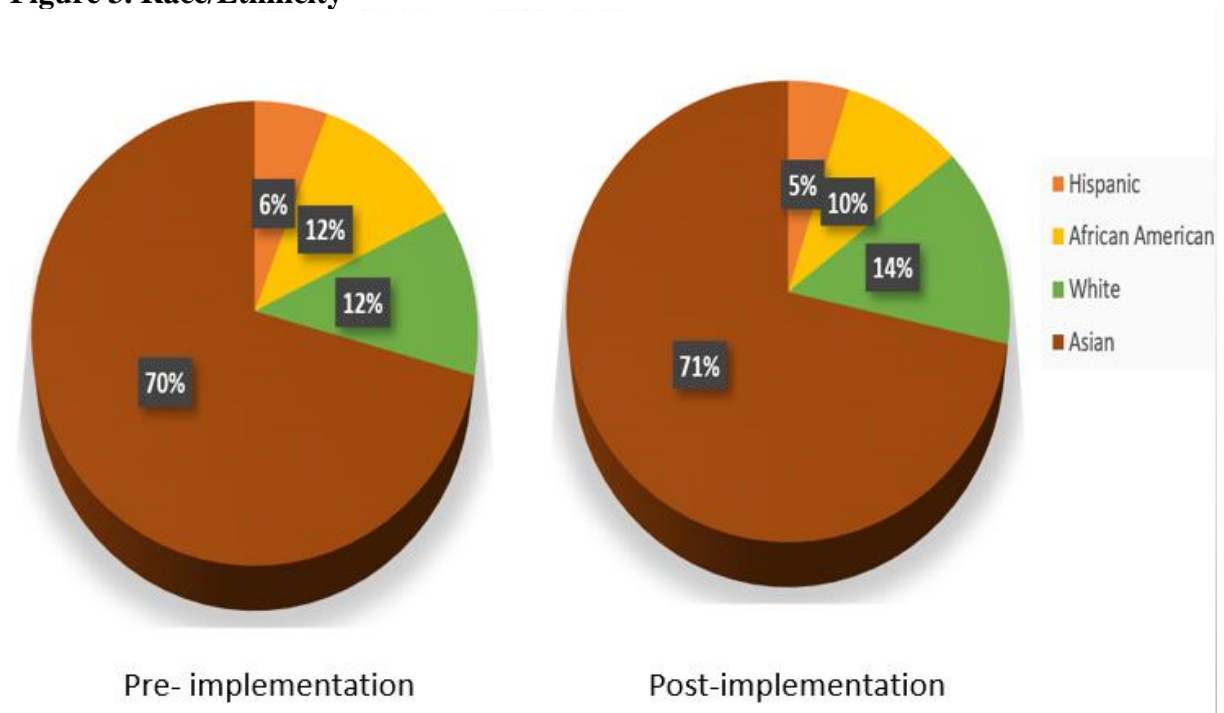


Figure 4. Vaccination

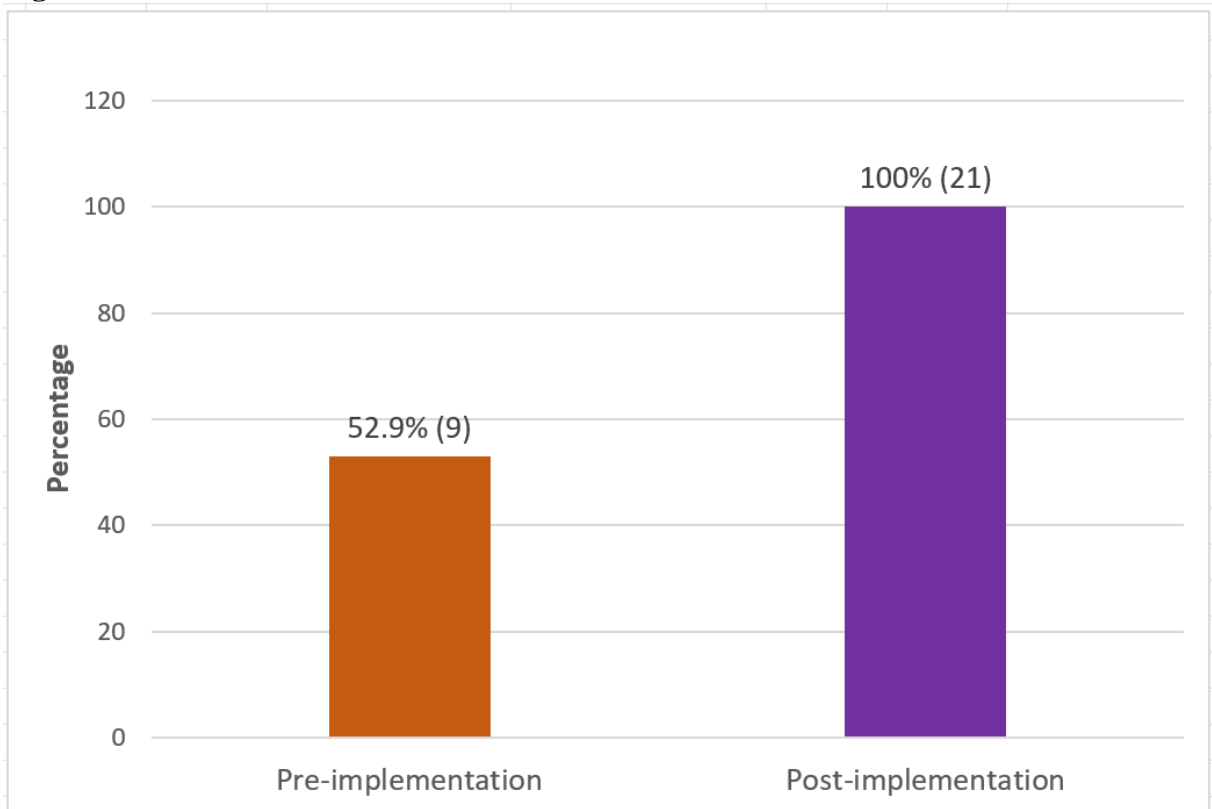


Figure 5. Vaccination by Age

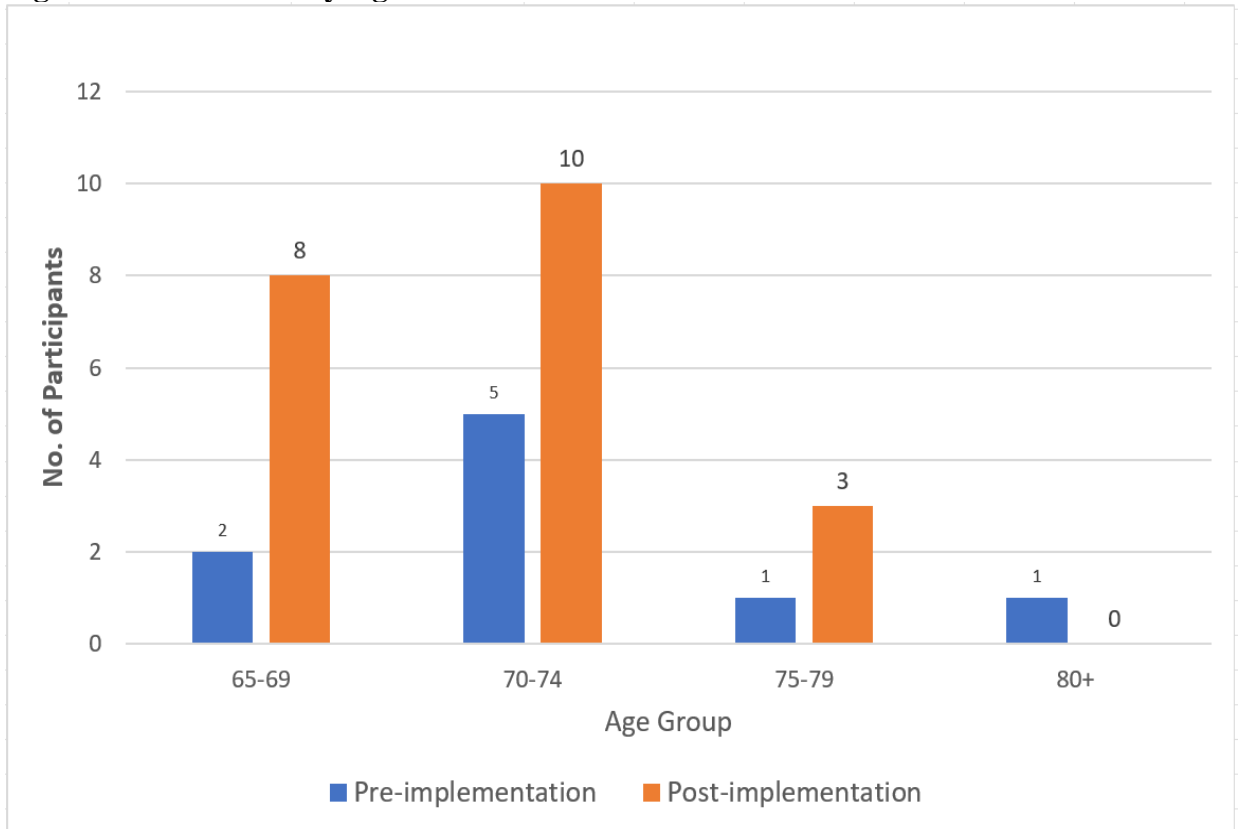


Figure 6. Vaccination by Race/Ethnicity and Gender

