

INCREASING PNEUMOCOCCAL VACCINATION IN ADULTS 65 YEARS AND
OLDER IN PRIMARY CARE

by

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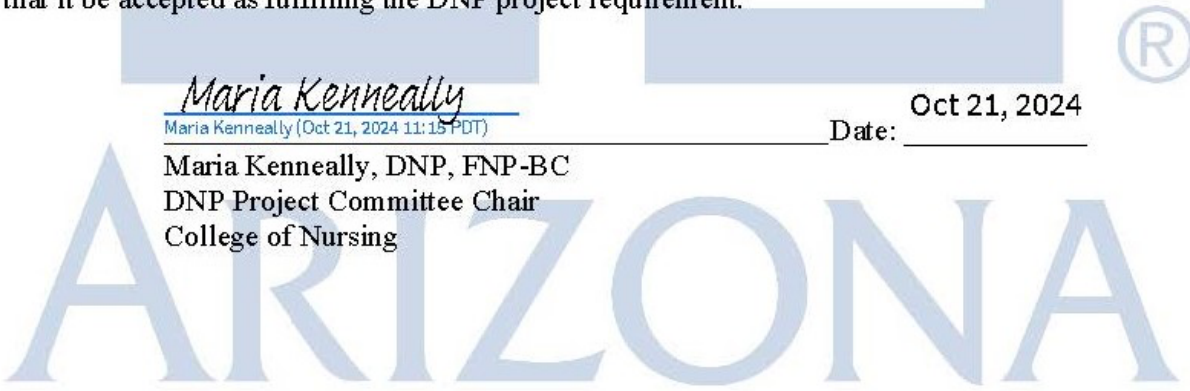


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ABSTRACT

Purpose. This quality improvement project (QIP) focused on improving provider knowledge of pneumococcal vaccine benefits, up-to-date guidelines, and enhancing clinic workflow for immunization processes through an asynchronous educational intervention.

Background. The most effective primary prevention method for this disease includes vaccination. Throughout the United States, pneumococcal rates for adults 65 and older remain below the national goal of 90% (American Lung Association, 2023).

Methods. One method for improving pneumonia vaccination rates is increasing provider knowledge and recommendation of the vaccine to patients to aid in overcoming vaccine hesitancy. Provider baseline knowledge was obtained on pneumococcal vaccinations, recommended immunization schedules, and their current practices through an online knowledge questionnaire. An asynchronous PowerPoint presentation focused on the Advisory Committee on Immunization Practices (ACIP) recommended pneumococcal vaccine schedule. Additionally, utilizing clinic support staff (MAs) could enhance the uptake of pneumonia and other recommended vaccines per age group. Providers were then given a post-test over the information from the presentation.

Results. Five of seven providers or 71% participated in the QIP. Data analysis supports increased provider knowledge regarding pneumococcal vaccination in adults 65 and older. Comprehension of knowledge increased by 60%.

Conclusions. Asynchronous provider education regarding pneumococcal vaccine for adults age 65+ increased knowledge and practice intent for discussing patient vaccination

recommendations. Additionally, providers will improve the utilization of clinical support staff in vaccination recommendations and administration.

INTRODUCTION

Pneumonia is an infection that inflames air sacs or alveoli in either one or both lungs (American Lung Association, 2023). This infection can be caused by bacteria, viruses, or fungi however, the most common cause is the bacterium, *Streptococcus pneumoniae* (American Lung Association, 2023). Pneumonia can cause the lung tissue to swell and cause fluid or pus in the lungs leading to cough, fever, chills, and difficulty breathing. Community-acquired pneumonia (CAP) is the most prevalent type of pneumonia that occurs outside the hospital or other healthcare facilities (Mayo Clinic, 2020). The most effective primary prevention method for this disease includes vaccination. However, due to various factors, pneumococcal rates for adults aged 65 and older remain below the national goal (American Lung Association, 2023). One potential method for improving pneumonia vaccination rates is increasing provider knowledge and recommendation of the vaccine to patients to aid in overcoming vaccine hesitancy.

This disease can range from mild to life-threatening and the two most at-risk age groups include children two years and younger and adults 65 years and older (Mayo Clinic, 2020). Older adults have a greater susceptibility to pneumonia and are at a higher risk of developing complications and dying from this infection than younger populations. Pneumonia occurs in 649 to 847 adults per 100,000 population. It is responsible for roughly 1.6 million hospitalizations per year, putting adults aged 65 and older at a ten times greater incidence rate than those under 65 years (Shoar & Musher, 2020). This disease's presentation, etiology, clinical course, and outcomes often differ from those among younger adults. Pneumonia tends to be of rapid progression in the elderly, predisposing them to severe disease. Certain factors such as a weakened or suppressed immune system, comorbidities, diminished cough reflex, or overall poor

functional status all contribute to an increased incidence and prevalence among older adults (Osman et al., 2021). The more underlying comorbidities, the more fragile the patient and the higher the likelihood of requiring intensive care unit (ICU) admission. Those admitted to the ICU endure increased mortality rates, reaching up to 55.9% (Osman et al., 2021).

There is also an increased infection risk among older adults by multidrug-resistant organisms which results in the inability to treat with common antibiotics and increases susceptibility to more severe outcomes (Osman et al., 2021). Viral illnesses such as influenza, COVID-19, and respiratory syncytial virus (RSV) enhance bacterial adherence and colonization, leading to secondary infection and pneumonia (Oliva & Terrier, 2021). In addition to the importance of pneumococcal vaccination is the significance of staying up to date on influenza, COVID-19, and RSV immunizations due to the risk of developing secondary infection as viral-bacterial co-infections are often associated with the severity of these respiratory diseases (Oliva & Terrier, 2021).

Pneumococcal vaccination is a crucial preventative health measure that significantly reduces the disease burden among those vaccinated and the total population (Rodgers et al., 2021). The risk for pneumococcal disease starts to increase at age 50, however, vaccination is only recommended in those 65 years and older and for adults aged 19 to 64 years with risk factors for pneumococcal disease (predisposing chronic medical conditions such as asthma, diabetes, heart failure, liver or kidney disease, increased risk of meningitis, or immunocompromised) (CDC, 2023b).

Background Knowledge and Significance

Pneumonia is an infection that inflames air sacs or alveoli in either one or both lungs (American Lung Association, 2023). This infection can be caused by bacteria, viruses, or fungi however, the most common cause is the bacterium, *Streptococcus pneumoniae* (American Lung Association, 2023). Pneumonia can cause the lung tissue to swell and cause fluid or pus in the lungs leading to cough, fever, chills, and difficulty breathing. Community-acquired pneumonia (CAP) is the most prevalent type of pneumonia that occurs outside the hospital or other healthcare facilities (Mayo Clinic, 2020). The most effective primary prevention method for this disease includes vaccination. However, due to various factors, pneumococcal rates for adults aged 65 and older remain below the national goal (American Lung Association, 2023). One potential method for improving pneumonia vaccination rates is increasing provider knowledge and recommendation of the vaccine to patients to aid in overcoming vaccine hesitancy.

This disease can range from mild to life-threatening and the two most at-risk age groups include children two years and younger and adults 65 years and older (Mayo Clinic, 2020). Older adults have a greater susceptibility to pneumonia and are at a higher risk of developing complications and dying from this infection than younger populations. Pneumonia occurs in 649 to 847 adults per 100,000 population. It is responsible for roughly 1.6 million hospitalizations per year, putting adults aged 65 and older at a ten times greater incidence rate than those under 65 years (Shoar & Musher, 2020). This disease's presentation, etiology, clinical course, and outcomes often differ from those among younger adults. Pneumonia tends to be of rapid progression in the elderly, predisposing them to severe disease. Certain factors such as a weakened or suppressed immune system, comorbidities, diminished cough reflex, or overall poor

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Prevalence

Although rates have slightly improved over the last ten years, national pneumococcal vaccination rates continue to remain below the Healthy People 2020 goal of achieving a 90% vaccination rate for adults ages 65 and older (Mckeirnan et al., 2021). The most recent national statistics from 2019 report that 63.2% of Medicare beneficiaries aged 65 and older had claims for any pneumococcal vaccination: 46.2% for pneumococcal polysaccharide vaccine (PPSV23), 49.3% for pneumococcal conjugate vaccine (PCV13), and 32.3% for both PCV13 and PPSV23 (CDC, 2021). However, more recent statistics from the U.S. National Health Interview Survey from 2021 reported a 65.8% coverage rate with one or more doses of the pneumococcal vaccine among adults aged 65 and older (CDC, 2023e).

Despite being an older objective, the significance lies in the fact this goal remains unmet. This will ultimately affect the ability to meet the Healthy People 2030 objective to reduce the rate of hospital admissions for pneumonia among older adults (Healthy People 2030, n.d.). This objective was based on the most recent data from 2016 which indicated there were 713.9 hospitalizations for pneumonia per 100,000 adults (Healthy People 2030, n.d.). The goal is to decrease that number to 642.5 hospitalizations per 100,000 adults, which would signify a ten percent decrease in total hospitalizations (Healthy People 2030, n.d.).

Many factors contribute to increasing these immunization rates, including increasing provider knowledge and comfortability in assessing each patient's vaccination status at each medical visit (Kempe et al., 2021). The National Vaccine Advisory Committee (NVAC) provides standards for Adult Immunization Practice for all healthcare professionals to ensure that their adult patients are fully immunized and have maximum protection against serious diseases

(CDC, 2016). The standards include assessing the immunization status of all patients in every clinical encounter, sharing a strong recommendation for vaccines that patients need, administering necessary vaccines or referring to a provider who can immunize, and documenting administered or received vaccines by your patients (CDC, 2016). These standards help prevent missed opportunities for vaccination and ensure timely vaccine catch-up if necessary. Overall, increased efforts to continuously educate and update providers about evolving pneumococcal immunization recommendations would be essential and beneficial to provider practices for implementing these recommendations and increasing vaccine uptake amongst patients.

Available Vaccines

The first pneumococcal vaccine was approved in the United States (US) in 1977 and has continuously evolved since then to be highly effective in preventing hospitalization, infection, and death among older populations (Kirubarajan et al., 2023). Pneumococcal vaccines are active immunizing agents that work by stimulating the production of antibodies that help to fight off infection (Mayo Clinic, 2024). They specifically work against the bacteria *S. pneumoniae*, which has more than 100 distinct serotypes (CDC, 2023c). There are two formulations of these vaccines, polysaccharide vaccine (PPSV23) and conjugate vaccine (PCV13, PCV15, or PCV20). The two new PCVs (PCV15 and PCV20) were recently introduced in 2021 and are differentiated by the number of serotypes they protect against. They protect against more strains of the bacteria that cause pneumococcal pneumonia than the previously used PCV13 (CDC, 2023c). The PPSV has been approved since 1983 and offers protection against 23 strains of the *S. pneumoniae* bacterium that account for approximately nine out of ten cases of pneumococcal disease, including invasive pneumococcal disease (IPD) and CAP (Kirubarajan et al., 2023).

Current Recommendations

The Advisory Committee on Immunization Practices (ACIP) is a committee within the Centers for Disease Control and Prevention (CDC) that provides advice and guidance on controlling vaccine-preventable diseases in the US. The ACIP recommends that all adults aged 65 and older receive at least one dose of the pneumococcal vaccination (CDC, 2023c). However, for complete vaccination, additional recommendations include routine administration of the PCV20 alone or the PCV15 in combination with PPSV23 for all adults aged 65 or older who have reported never receiving a PCV or if vaccination history is unknown (CDC, 2023c). To protect against broader serotypes, PCV15 is recommended in series with PPSV23 (CDC, 2023b). However, for those who have previously completed the series by receiving PCV15 at any age and PPSV23 at 65 or older, shared clinical decision-making should occur to determine if PCV20 should be given. If it is decided to continue with the administration of PCV20, it should be five years or more after the last dose was given (CDC, 2023c). A full overview of these guidelines based on vaccine history is presented in Table 1.

Table 1

ACIP and CDC Pneumococcal Vaccination Recommendations

When to Vaccinate	Pneumococcal Vaccination History	Vaccines to Administer
Adults aged adults 65 and older	No or unknown vaccination history	PCV20, or PCV15 followed by PPSV23 \geq 1 year
	PPSV23 only (at any age)	PCV20 or PCV15 \geq 1 year
	PCV13 only (at any age)	PCV20 or PPSV23 \geq 1 year
	PCV13 (at any age) & PPSV23 at <65 years	PCV20 or PPSV23 \geq 5 years
	Complete series: PCV13 at any age & PPSV23 at \geq 65 years	PCV20 \geq 5 years

Source: Adapted from NCQA, 2022 & CDC, 2023e

Financial Impact

Pneumonia is persistently in the top ten leading causes of death in the US and contributes to a significant economic burden in the US (Lippert et al., 2022). Overall, influenza and pneumonia cost the US \$34.7 billion in outpatient visits, hospitalizations, and mortality each year for adults older than 65 (Lippert et al., 2022). On average, 40% of CAP episodes among older adults will result in a hospitalization lasting roughly 5.6 days, incurring medical costs of \$18,000 per inpatient case (Brown et al., 2018). The economic burden in the Medicare fee-for-service population is estimated to be over \$13 million annually and is expected to continue growing with the aging population (Brown et al., 2018).

Risk Factors

Several physiological changes as well as the presence of multiple comorbidities, increase the incidence and severity of CAP. Changes in lung physiology because of aging include decreased elastic recoil, increased air trapping, decreased chest wall compliance, and reduced respiratory muscle strength (Cho & Stout-Delgado, 2020). In addition, the aging population experiences reduced mucociliary clearance, diminished cough reflex, and a limited immune system due to decreased cell-mediated and humoral immunity (Cho & Stout-Delgado, 2020). All these factors contribute to increased baseline work of breathing and less reserve to cope with bacterial infections.

Specific risk factors are known to increase the incidence and mortality rates of this disease. The presence of comorbidities increases the risk of more severe disease and death due to CAP by two to fourfold (Chebib et al., 2021). These risk factors tend to be significantly associated with the older population and include chronic obstructive pulmonary disease (COPD),

asthma, diabetes, congestive heart failure (CHF), immunosuppression, cancer, and smoking (Brown et al., 2018). It is expected that the number of Americans aged 65 and older is projected to increase by 47% from 2022 to 2050, thus increasing the significance of the burden of CAP in the years to come (PRB, 2024).

Challenges to Vaccination

There is a lot of hesitation around vaccines which commonly stem from a lack of health literacy among the general population. Providers need to regularly improve and increase discussions regarding vaccine effectiveness, safety, benefits, and consequences with their patients. Continuous education regarding disease processes, risk factors, and associated immunizations will aid in improving patients' knowledge and understanding, ultimately improving patient-involved care. The most significant reasons patients choose not to receive the pneumococcal vaccine include a lack of trust in the effectiveness and safety and an overall lack of knowledge regarding the vaccine or disease (Huang et al., 2022). The National Foundation for Infectious Diseases (NFID) highlights key barriers to vaccinations for adults diagnosed with chronic conditions. Those include competing priorities during patient visits due to limited time, lack of responsibility for patient education, challenges surrounding determining vaccination status, and the complexity and changing of recommendations (McKeirnan et al., 2021). Other barriers include no recommendation from a healthcare provider, low perceived infection risk, and no perceived benefit from vaccination (McKeirnan et al., 2021). Nicholls et al. (2021) present similar data, that the strongest predictor of pneumococcal immunization uptake in older adults aged 65 and greater was just being offered the vaccine by a healthcare provider.

Primary care providers (PCP) play a critical role in the vaccination status of adults. Primary care providers will often provide the first and most reliable source of information for patients when it comes to deciding whether to get vaccinated (Leung et al., 2019). Patient confidence can be strengthened by improving health literacy to better influence decision-making and health recommendations from trusted medical professionals. There is an increased need to provide credible and comprehensive educational interventions to support healthcare providers in effective communication with vaccine-hesitant patients (Lip et al., 2023). Vaccine decision-making is complex and hindered by many factors including healthcare access or lack thereof, and individual knowledge. Providers can improve vaccine uptake by facilitating access to accurate information about vaccines online and strengthening provider-patient communication skills (Leung et al., 2019). Evidence supports that specific vaccine communication training through educational interventions is essential to increase vaccine communication skills among healthcare providers (Michel & Goldberg, 2021). Enhancing vaccination knowledge and awareness regarding current recommendations among providers can fill knowledge gaps and build on interpersonal communication skills to facilitate a trusting relationship with patients.

Quality Measures

The Healthcare Effectiveness Data and Information Set (HEDIS) measures are a set of standardized performance measures developed by the National Committee for Quality Assurance (NCQA) to measure, report, and compare quality across health plans (NCQA, 2024). It is a tool utilized by over 90% of healthcare plans in the US to measure performance on important dimensions of care and service including care for older adults (Macleod et al., 2018).

HEDIS measures are composed of two types of data: billing and clinical (Reifsnyder, 2023). Billing data comes from claims submitted by the billing department which are usually first entered by the providers at the time of the medical encounter. These include international classification of diseases (ICD-10) codes, current procedural terminology (CPT) codes, and healthcare common coding procedure system (HCPCS) codes. There is also clinical data which can be either structured or variable, depending on the EHR.

Documentation is one of the most important factors in meeting HEDIS quality measures. For example, ensuring that all diagnoses codes are ICD-10 compliant, as any claims with ICD-9 or other codes are not counted towards current HEDIS quality standards (Reifsnyder, 2023). Also, it is important to ensure that all healthcare services are properly documented in the EHR, as any errors could lead to major obstacles in meeting the quality standards (Reifsnyder, 2023). Properly addressing HEDIS in healthcare is an active collaborative effort between billing, quality improvement, and medical providers. Ensuring processes are established for patients receiving timely health management can aid in addressing any gaps in care. HEDIS scores are an important tool for organizations seeking to achieve higher clinical experience and better patient health outcomes.

The HEDIS measure, Adult Immunization Status (AIS-E), assesses the percentage of adults who are up to date on recommended routine vaccinations, with separate indications for influenza, tetanus, diphtheria, pertussis, zoster, and pneumococcal vaccinations (NCQA, 2024).

The AIS-E is specified for Medicaid members 18-64 years of age and Medicare members 65 years and older who report receiving one or more pneumococcal vaccinations (NCQA, 2024). The measure is specified for the HEDIS Electronic Clinical Data Systems (ECDS) reporting

standard and is responsible for capturing receipt of vaccinations using data from electronic sources including administrative claims, immunization registries, and electronic health records (EHR). The AIS-E HEDIS measure is based on the ACIP which released new pneumococcal vaccination guidelines in 2022 to take effect in 2023 (NCQA, 2022). The new guidelines include the two new conjugate vaccines: the 20-valent (PCV20) and 15-valent (PCV15). Both include additional serotypes and provide better coverage against pneumococcal disease when compared to the existing 13-valent conjugate (PCV13) and polysaccharide (PPSV23) vaccines (NCQA, 2022). An overview of the recommendations that this measure is based on is provided in Table 1.

Local Problem

The most recent statistics regarding the prevalence of pneumonia in Washington state are from 2021 and report a death rate of 5.9 per 100,000 total population, accounting for nearly 500 deaths (CDC, 2022). Other statistics regarding pneumonia vaccination come from 2019 and are presented in Table 2 from the CDC (2021). Based on the total number of enrolled beneficiaries in Washington state, 62.5% have been vaccinated with any pneumococcal vaccine, and only 33.0% have a complete vaccination status with both recommended vaccine types (CDC, 2021). Table 2 provides a snapshot of Washington's vaccination rates among Medicare beneficiaries compared to other states. Comparing Washington to ten other representative states, Washington ranks third lowest in the number of claims for any pneumococcal vaccination.

Table 2

The Proportion of Medicare Beneficiaries Aged ≥ 65 Years Old with Claims Submitted for Pneumococcal Vaccination Regardless of Prior Vaccination, by State, United States, December 2019

State	Total enrolled beneficiaries	≥ 1 dose PPSV23† (%)	≥ 1 dose PCV13§ (%)	Both PPSV23 & PCV13¶ (%)	Any pneumococcal** (%)
South Carolina	361,830	47.2	53.5	34.2	66.6
South Dakota	63,713	46.8	51.1	35.5	62.4
Tennessee	363,035	47.1	50.9	33.1	64.8
Texas	1,032,225	45.7	44.7	29.1	61.3
Utah	116,019	47.6	54.7	34.2	68.1
Vermont	59,321	42.1	53.8	31.7	64.2
Virginia	576,978	50.2	56.1	37.6	68.8
Washington	387,774	44.6	50.9	33.0	62.5
West Virginia	104,310	41.0	41.6	26.0	56.6
Wisconsin	334,250	56.8	64.8	47.6	74.0

Source: CDC, 2021

A family practice clinic in southeastern Washington serves a diverse population ranging from five days old to pregnancy to the end of life. Much of the patient population falls in the age range of 40-64 years old, representing 37% of the clinic population. The rest of the patient population comprises 29% of adults 65 years and older, 22% 21-39 years, and 12% 20 years and younger. Through direct observation of patient care, it was noticed that immunization status is rarely discussed, especially among those aged 65 and older. When immunizations are discussed, there is typically minimal documentation to support it. Documentation is only recorded if a vaccine is given in the clinic, prior immunization history is not recorded within patient charts or

usually inquired about unless the patient expresses interest first. Despite the lack of discussions on immunization throughout the clinic, vaccines are stored onsite and readily available for administration when deemed necessary.

The clinic does not clearly define immunization standard operating procedures (SOPs). The responsibility of interviewing, discussing, and ordering necessary vaccines relies solely on the provider. Once the provider and patient agree upon an immunization, the medical assistant (MA) will queue up the vaccine and administer based on the provider's orders. Current SOPs require minimal involvement from the MAs, contributing to increased provider burden. Each APRN within the clinic represents their own entity with their individualized SOPs.

The EHR system utilized at this family practice clinic is Athena One. This EHR system allows for running reports to determine the number of active patients aged 65 and older as well as vaccination history based on billing codes, however, it does not run reports specifically for HEDIS quality measures. Therefore, it is unknown whether this clinic meets the HEDIS measure for AIS-E among Medicare beneficiaries.

Alerts for past-due preventative screenings and immunizations populate under the quality measures tab in Athena One, notifying clinical staff when immunizations and screenings are due. However, this feature in the EHR is not consistently utilized or updated unless documented and coded appropriately within the patient chart. This indicates a significant practice gap and barrier to running accurate reports within the practice. Current practices and SOPs indicate that NVAC standards are not being met and process improvement is indicated.

Intended Improvement

Project Purpose

As the first step to improve pneumonia vaccine uptake for primary care patients over age 65, this project aims to reduce barriers by achieving 1. increased provider knowledge on pneumococcal vaccine benefits and updated guidelines, and 2. demonstrated intent to improve clinic workflow for immunization processes.

Project Question

Will this family practice clinic in southeastern Washington improve immunization SOPs and practice intent for offering patients 65 years and older pneumonia vaccines after an asynchronous presentation has been given to providers regarding the importance of pneumococcal vaccine in adults 65 years and older?

Project Objectives

The objectives of this project are as follows:

1. Provide an asynchronous educational PowerPoint presentation delivered via recorded Zoom in voiceover format for providers about the importance of recommending pneumococcal vaccination, the updated ACIP pneumococcal vaccination recommendations, and the role of clinicians in educating patients about pneumonia and the associated vaccines (Zhang et al., 2023).
2. Evaluate the effectiveness of the intervention by having clinic providers complete a pre- and post-educational questionnaire regarding their understanding of the presentation.

3. Improve workflows to increase clinical support staff's (MAs) roles in the immunization processes during patient encounters by educating providers via an educational PowerPoint presentation on the significant beneficial impact it can have on improving vaccine uptake among patients.

Theoretical Framework

Health Belief Model

The Health Belief Model (HBM) was used as the framework for this project. The HBM was developed in the 1950s by social psychologists to explain why medical screening programs offered by the U.S. Public Health Service were unsuccessful (Skinner et al., 2015). The HBM has been one of the most widely used conceptual frameworks over the decades to explain the change in health-related behaviors and as a guiding framework to inform interventions to change health behavior (Skinner et al., 2015). The underlying concept of the HBM is that behavior is determined by personal beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Skinner et al., 2015). The HBM contains several components that predict whether people will take action to prevent, detect, or control illness conditions. These constructs include perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, and self-efficacy (Skinner et al., 2015). The model applies to behaviors with the potential to reduce the risk of developing a disease and the effects of an existing disease.

Perceived Susceptibility

The first concept of the HBM is perceived susceptibility, which is one's belief about the possibility of getting a disease or condition. The greater the perceived risk, the greater the likelihood of engaging in behaviors to decrease the risk (Skinner et al., 2015). The opposite is

also true, unhealthy behaviors tend to result when people believe they are not at risk or have a low risk of susceptibility (Hayden, 2019). For the pneumococcal vaccine, this correlates to proper education about the increased risks of morbidity and mortality associated with this disease among the older population. It is essential to educate older adults that they are at increased risk of complications due to the physiologic changes associated with aging as well as the higher likelihood of having comorbidities.

Perceived Severity

The next concept is perceived severity. This concept speaks to one's belief of the seriousness or severity of contracting an illness or condition or of leaving it untreated (Skinner et al., 2015). This includes physical consequences such as death, disability, and pain and social consequences such as having the ability to work, maintaining relationships with others, or feeling stigmatized (Skinner et al., 2015). The perception of severity is often based on medical information or knowledge. It can also come from beliefs about the difficulty a disease would create or the effect it could have on one's life (Hayden, 2019). Education on the importance of pneumococcal immunization should focus on the most common complications such as respiratory failure and bacteremia ultimately leading to multiple organ failure and potentially even death (Mayo Clinic, 2020).

Perceived Barriers

In addition to perceived benefits, the HBM includes perceived barriers to change. These barriers can be defined as obstacles that may prevent one from taking action (Skinner et al., 2015). Obstacles may include perceived negative consequences such as inconvenience, cost, or fear of a screening procedure (Skinner et al., 2015). For barriers to be overcome and a new

behavior to be adopted, a person needs to believe the benefits of the new behavior outweigh the consequences of continuing the old behavior. It is important to educate patients that all health insurance plans are required to cover certain vaccines without charging a copayment or coinsurance when provided by an in-network provider (CDC, 2023a). Medicare will cover the pneumococcal vaccine as a single dose or a two-dose series once in a patient's lifetime (CDC, 2023a). If a patient is uninsured, Washington State provides recommended vaccines at no cost through the Washington State Adult Vaccine Program (AVP). It is a federally funded program that services adults 19 years of age and older who are uninsured or underinsured. Another barrier includes an overall lack of education about the disease and vaccine. Despite the high incidence and prevalence of the disease, knowledge regarding the safety and efficacy of the pneumococcal vaccine needs to be increased to help combat these high rates. However, improved education through this quality improvement (QI) project can help overcome this barrier.

Perceived Benefits

The following concept is the perceived benefits of taking action. These include positive perceptions or advantages a person might have regarding the value or usefulness of a new behavior in decreasing the risk of developing a disease (Skinner et al., 2015). Perceived benefits play a vital role in adopting secondary prevention behaviors, such as screenings or vaccinations (Hayden, 2019). Education to improve pneumococcal immunizations should focus on the benefits for an individual's health. Benefits include protecting against 20 types of pneumococcal bacteria that contribute to developing pneumonia and disease processes like meningitis and sepsis (Hayden, 2019). Pneumococcal vaccination has also been shown to significantly reduce hospitalization rates, and associated morbidity and mortality (Osman et al., 2021).

Cues to Action

The next concept is cues to action which includes events, people, or things that motivate others to change their behavior (Hayden, 2019). Cues can be internal or external and include an illness of a family member, social media reports, advice from friends or family, reminder postcards from healthcare providers, or health warning labels on a product (Hayden, 2019). Cues to action operate mainly through perceived susceptibility and severity. This QI project must include cues such as provider recommendations and visual handouts with the appropriate health literacy levels for patients to educate them on pneumococcal disease and the importance of immunization.

Self-Efficacy

The final concept is self-efficacy which involves the belief that one can perform the recommended health behavior (Skinner et al., 2015). This includes an individual's self-confidence to decide and accomplish it. It is essential to provide patients with the proper education and guidance in receiving the pneumococcal vaccination, focusing on its safety and effectiveness. Among the older population, it is essential to highlight all the benefits of immunization including the prevention of severe disease and potentially hefty medical bills that would come with acquiring the disease and associated complications.

HBM in the Literature

The HBM model is one of the most widely known and used models for understanding health behaviors among people. Many studies have utilized the HBM to aid in understanding vaccine hesitancy, mostly among influenza and COVID-19. Education and HBM-based interventions effectively promote vaccination and decrease vaccine hesitancy (Limbu et al.,

2022). The model incorporates commonly used motivational interviewing techniques such as guiding patient conversations and understanding patient motivations (Gutierrez & Wolf, 2022). Each of the six concepts targets specific beliefs that have proven to influence patients into not obtaining recommended vaccinations (Gutierrez & Wolf, 2022). Further insight and knowledge into these behaviors can help providers break down and overcome the barriers that hinder national vaccination rates.

Limitations

Although the HBM is extensively used and justified as a quality framework for influencing health-related behaviors in preventative care, it does pose some limitations. The model remains more descriptive than explanatory and fails to pose a strategy for changing health-related actions. One limitation is that it assumes everyone has access to equal amounts of information on illness or disease (Jones et al., 2015). This concept was identified as a major contributor to suboptimal vaccination rates. This could be due to a lack of access to healthcare in general or just a lack of access to reliable and comprehensible information. Another limitation is it does not account for environmental or economic factors that may prohibit or promote the recommended action (Jones et al., 2015). These can include a lack of transportation to healthcare access including the pharmacy for vaccination. It could also include a lack of insurance, potentially leaving patients to pay for vaccines out of pocket leading to increased vaccine hesitancy.

Literature Synthesis

Literature Search Description

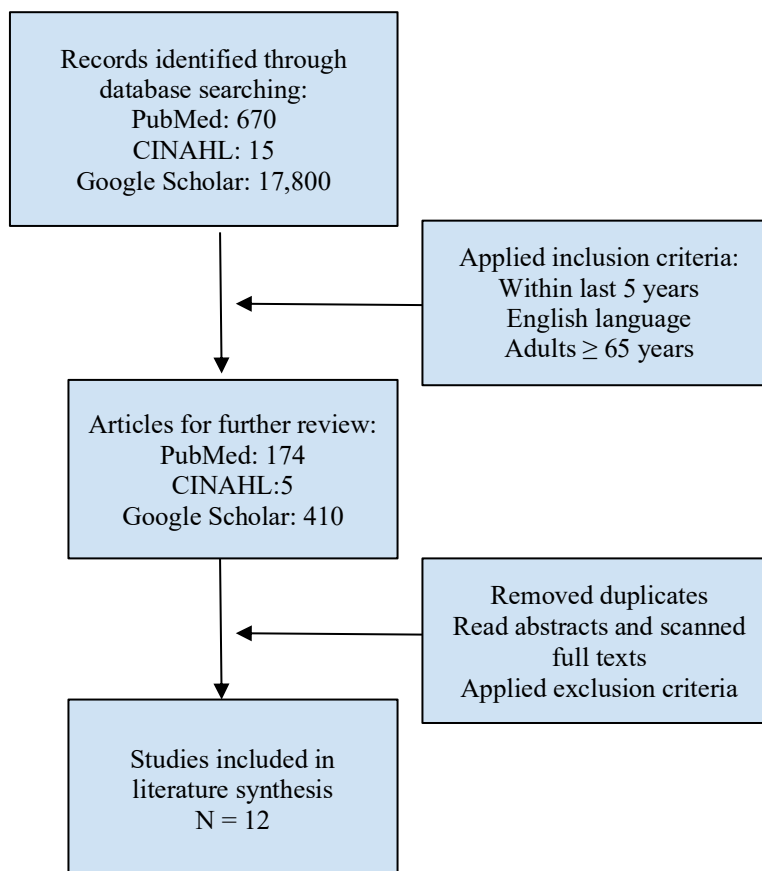
An extensive literature search was performed to explore the incidence, prevalence, and current practice recommendations for pneumococcal vaccinations among adults aged 65 and older. These searches were conducted using Google Scholar, PubMed, and Cumulative Index of Nursing and Allied Health Literature (CINAHL) databases accessed via the Arizona Health Sciences Library. Specific filters included articles from the last five years, English language, human subjects 65 years and older, and full text. The articles were then reviewed for exclusion criteria if they had a narrow focus, took place outside the US, were in an inpatient setting rather than a clinic, and did not include older adults.

PubMed and CINAHL were utilized throughout the introduction and background sections to identify the framework surrounding pneumococcal disease in older populations. Specifically, the incidence and prevalence of pneumonia among older populations, the burden on the healthcare system, as well as the morbidity and mortality rates. These databases were also used to identify risk factors linked to increased incidence rates of developing pneumonia and the common complications that are often associated. Search terms included “incidence and prevalence,” “community-acquired pneumonia,” “65 years and older,” “risk factors,” and “morbidity and mortality.”

Google Scholar was used to explore the different types of challenges that are often associated with getting individuals vaccinated as well as the role that the provider plays in this. Search phrases included “challenges to vaccination,” “vaccination hesitancy,” “barriers to pneumococcal vaccination,” and “improving pneumococcal vaccination rates.” This search

provided articles analyzing common patient concerns and barriers relating to suboptimal vaccination rates. Google Scholar was also utilized to discover interventions to improve vaccination rates among older adults including provider education interventions and utilizing clinic support staff. These searches consisted of various combinations of phrases including “improving provider education to improve immunizations,” “provider educational interventions,” “asynchronous education,” “role of medical assistants in immunization,” and “using support staff to improve vaccination rates.”

After applying exclusion criteria, removing duplicate studies, and reading through articles, twelve articles were included in the literature synthesis. See Appendix F for a detailed literature review of the articles and Figure 1 for the flow diagram of the literature search.

Figure 1*Flow Diagram of Literature Search***Comprehensive Appraisal of Evidence**

Despite the clear need for research regarding the improvement of pneumococcal vaccination across all age groups, minimal studies have researched the implementation of interventions specifically among adults aged 65 and older. A common theme was acknowledged across three systematic reviews and two quasi-experimental studies that endorsed the effectiveness of implementing educational interventions and communication training among providers to aid in vaccine uptake. The qualitative systematic review by Leung et al. (2019), discusses the important association of provider-specific interventions in improving provider

knowledge and vaccine uptake. Interventions included a presentation with educational content such as practice-specific fact sheets, websites, and decision aids for vaccination. Leung et al. (2019) showed that a 30-minute structured presentation can improve provider knowledge both subjectively and objectively. Similarly, Zhang et al. (2023) concluded that asynchronous online modules effectively improve the confidence, knowledge, and self-reported behavior of adult primary care providers in recommending HPV vaccination. Due to the important role that healthcare providers play in vaccine uptake, this quasi-experimental study suggests that online asynchronous educational interventions can be a powerful tool to encourage increased utilization and delivery of vaccines (Zhang et al., 2023).

Subsequently, a systematic review by Michel and Goldberg (2021) focused on enhancing vaccine empowerment through specific vaccine communication training among providers. Michel and Goldberg (2021) conclude that vaccine empowerment depends heavily on patient-provider communication which is contingent upon providers' vaccine knowledge and communication skills allowing an enhanced trust in vaccine efficacy and safety. Lip et al. (2023) also discuss educational interventions focusing primarily on knowledge sharing and communication training to address vaccine hesitancy effectively. Findings from this systematic review suggest that knowledge and communication-focused interventions positively impact providers' self-perceived confidence and an increased likelihood of addressing vaccine-hesitant individuals (Lip et al., 2023). Lip et al. (2023) identify a gap in teaching communication strategies and practical skills among healthcare provider trainees. It was demonstrated that vaccination-related curriculum content across medicine, nursing, and pharmacy training was highly variable, with a median of 12 to 23 hours, where only 21% of participants felt they

received adequate vaccination teaching during training (Lip et al., 2023). Therefore, encouraging providers to participate in vaccination discussions actively starts with providing training in practical skills and communication strategies to enhance preparedness. Alqifari et al. (2023) recognize that the current CDC recommendations for the two pneumococcal vaccines can be complex and confusing for providers and support staff, contributing to the possibility of administering the wrong product to patients. Specified recommendations and target-specific population groups are increasing the complexity of the vaccine. Findings from Alqifari et al. (2023) quasi-experimental study reflect the need for further training on proper vaccine use for nursing staff and providers to facilitate correct administration based on current ACIP recommendations and improve overall knowledge to educate patients adequately.

A second theme includes barriers and perceptions of pneumococcal vaccinations incorporating concerns about vaccine efficacy, poor understanding of the vaccine and disease, competing priorities during patient visits, lack of patient education, challenges in determining vaccination status, missed opportunities, and the complexity surrounding current recommendations (Huang et al., 2022; McKeirnan et al., 2021; Nicholls et al., 2021). Specific factors associated with vaccination hesitancy among older adults may vary by vaccine. Nicholls et al. (2021) found factors that contribute to the pneumococcal vaccine uptake include demographics, co-morbidity, functional status, quality of life, social support, and lifestyle factors. Increasing vaccine uptake may benefit from educating the public about specific vaccines and the disease symptoms, severity, and risks (Huang et al., 2022; McKeirnan et al., 2021; Nicholls et al., 2021). Interventions focusing on increasing awareness and knowledge via primary care found reliable increases in rates of older adults' influenza and pneumococcal

vaccine uptake (Nicholls et al., 2021). In addition, there are obvious education gaps regarding vaccination schedules among providers and a common misunderstanding about who assumes primary responsibility for vaccination (McKiernan et al., 2021). Knowledge must be accompanied by comprehensive discussion and personalized recommendations. Another varying factor includes provider practices on the frequency of vaccine discussions. Healthcare providers are still not routinely screening and recommending standard vaccines to all eligible patients or reviewing and recommending immunizations at each clinical visit (Fernandes et al., 2023). Immunization discussions with patients range from every visit to only once a year at annual wellness exams. Each clinical encounter is an opportunity to discuss and evaluate immunization status with patients and not doing so results in a missed opportunity. Immunizing patients at each clinical visit reduces missed opportunities for vaccination, particularly among patients who do not routinely attend well-medical visits (Fernandes et al., 2023). McKeirnan et al. (2021) found that in over 1000 vaccine-eligible adults, three-quarters of those unvaccinated for the pneumococcal disease believed that their physician either did not think they should be vaccinated, or they did not know their provider's position on the vaccine. Greater awareness and targeted education around vaccine benefits are necessary to increase vaccination acceptance and decrease missed opportunities. Furthermore, collaborative efforts concentrating on health promotion strategies encouraging the pneumococcal vaccine among the aging population are recommended.

A third theme includes utilizing clinic support staff (MAs) to improve patient vaccine acceptance (Hunter et al., 2020; Persell et al., 2020; Thaker et al., 2023). Hunter et al. (2020) acknowledge that assessing vaccination status requires physicians, nurses, and medical assistants

to spend significant time reviewing the medical record, state registry, personal notes, and sometimes even calling pharmacies to compile vaccination histories for adults. Rather than relying solely on the providers to assess vaccination status, training nurses and medical assistants, and supporting them in working to the full extent of their licensing, can result in improved rates of preventative services including immunizations (Hunter et al., 2020; Persell et al., 2020; Thaker et al., 2023). Providers can help increase vaccination rates by writing standing orders and advocating for nurses and medical assistants to receive training and protected time for assessing and documenting vaccination histories and administration (Hunter et al., 2020). Similarly, a cross-sectional analysis conducted by Persell et al. (2020) identifies that implementing changes or new workflows involving the vaccination process, particularly supporting the independence of nonphysician staff, has led to increased vaccination. Interventions include clinical decision support changes to facilitate documentation, changes to the rooming workflow for medical assistants to promote vaccination, prepare orders, document care done elsewhere, and record patient refusals (Persell et al., 2020). In public health facilities, nurses and medical assistants regularly interact with patients, putting them in the perfect position to help bridge the gap and serve as promoters of immunization (Thaker et al., 2023). Nurses and medical assistants play a significant role in vaccine delivery services specifically by educating patients on vaccines and alleviating concerns, and vaccine hesitancy. They are well-positioned to facilitate coordination efforts within their scope of practice (Thaker et al., 2023). Training support staff in evidence-based techniques to provide strong vaccine recommendations has been identified as a promising initiative to accelerate immunization (Thaker et al., 2023). Utilizing

clinical support staff and maximizing the full extent of their licensure can aid providers and help alleviate the burden of maintaining patient immunization status.

Strengths of Evidence

The literature provides substantial evidence regarding the incidence and prevalence of pneumonia infection among the aging population as well as the continued economic burden this disease continues to have on the US. The CDC recognizes immunizations' important role in protecting against preventable diseases, especially among those deemed most vulnerable. Current pneumococcal vaccine recommendations are readily available on the CDC website as a resource for healthcare providers to guide and improve the health of their patients (CDC, 2023b).

Provider-specific educational interventions, such as presentations and communication skills training, to improve provider knowledge and quality recommendations have proven to be a powerful tool in increasing vaccine uptake, and therefore, should be utilized more frequently (Leung et al., 2019; Lip et al., 2023; Zhang et al., 2023). Subsequently, revising immunization SOPs to include clinical support staff (MAs) to enhance workflows has also proven beneficial and highly efficient in improving patient vaccination rates (Hunter et al., 2020; Thaker et al., 2023; Persell et al., 2020).

Weaknesses, Gaps, and Limitations

The literature review is limited as there are minimal clinical research studies with current statistics surrounding pneumococcal vaccinations among adults 65 years and older in Washington State. Some of the most recent literature was from more than five years ago with data dating back to 2017, and the most recent statistics on vaccination rates are from 2019. Most research was directed at national rates and averages rather than being more state-specific.

Limited literature was found on up-to-date studies regarding the pneumococcal vaccine specifically. Despite the knowledge that immunization rates remain lower than national goals, minimal resources and tools are being utilized in practice to aid providers in fighting this battle. More research and education regarding the available strategies to improve vaccination efforts for pneumonia specifically are indicated.

METHODS

Project Design

Provider education about pneumococcal vaccination and the updated recommendations is essential to improving immunization among adults aged 65 and older (Leung et al., 2019; Michel & Goldberg, 2021; Lip et al., 2023; Alqifari et al., 2023). This project focuses on implementing an intervention to improve clinician knowledge regarding pneumococcal vaccination and the benefits of utilizing clinic support staff (MAs) to aid in vaccination SOPs. This QI project first assessed the baseline knowledge of providers currently employed at the family practice clinic about pneumococcal vaccinations, current feelings toward promoting vaccination, and their current practices through an online knowledge questionnaire. The second aspect of the study includes an asynchronous PowerPoint presentation focusing on the importance of recommending the pneumococcal vaccine, the ACIP's recommended pneumococcal vaccine schedule, and the role of the whole healthcare patient team (MAs) in educating their patients about pneumonia and the vaccine. The final component of the study includes a post-education knowledge questionnaire assessing an improvement in providers' confidence in recommending pneumonia vaccination and the likelihood of adopting new SOPs based on the education components provided within the presentation.

Model for Implementation

A tool used to guide this QI project is the Model for Improvement (MFI), a framework to guide and accelerate the successful execution of proposed changes in practice. There are two main components to the framework. These include three fundamental questions followed by the Plan-Do-Study-Act (PDSA) cycle which tests and adapts changes to ensure success in the implemented intervention (IHI, n.d.). The three questions are 1) what is trying to be accomplished? 2) how will it be known if the change is an improvement? and 3) what changes can be made to ensure improvement results (IHI, n.d.). For this QI project, the overarching goal is to facilitate pneumococcal vaccination among adults ages 65 years and older to decrease pneumonia rates and associated complications and improve SOPs for immunizations within the family practice clinic.

Plan-Do-Study-Act (PDSA)

The second concept of the MFI framework includes the Plan-Do-Study-Act (PDSA) cycle. The cycle aids in identifying needs for improvement in current practice, developing specific goals, creating an intervention, and then determining how the intervention will be reviewed for effectiveness (IHI, n.d.). The PDSA is a cyclical testing model that guides testing change and analyzes whether the change resulted in improvement (IHI, n.d.). The cycle continues over and over until the best evidence-based practice results. The PDSA cycle guided this QI initiative through developing the asynchronous educational PowerPoint presentation and patient handout. It allowed for multiple evaluations and refinements to ensure that the project objectives were met.

Plan

The first step of the PDSA cycle is planning, which includes creating a plan for change and project development (IHI, n.d.). During this phase, the project investigator (PI) met with the primary care clinic to determine the need for the QI project and identified an improved intervention and education on pneumococcal vaccination. Based on the clinic's needs and provided feedback, it was determined that this would be best done through an asynchronous PowerPoint presentation, a provider workflow handout on pneumonia vaccine recommendations for adults 65 years and older as a convenient reference, and a pre-and post-intervention knowledge questionnaire. Once the aspects of the project were determined, a request for approval was sent to the clinic's Executive Director to authorize the implementation of the project within the facility. Evidence-based online resources were utilized to prepare the presentation and create an outline of the information that would be presented. Baseline knowledge assessed through a questionnaire was documented for post-intervention comparison. Before implementing the project, the proposal was defended before this PI's DNP project committee, and approval from the University of Arizona Institutional Review Board (IRB) was obtained.

Do

The second step of the PDSA cycle includes implementing the QI project and collecting data (IHI, n.d.). During this phase, this PI implemented the intervention and completed the data collection. Provider staff were verbally recruited with the opportunity to participate in the QI project. After verbal consent to participate was obtained, an email was sent to the providers, which included the disclosure statement, a link to both the pre/post questionnaires and

PowerPoint presentation, and a PDF of the provider handout. Any challenges or obstacles during this phase were noted and addressed as they arose during implementation.

Study

The next step involves interpreting and evaluating the collected data and determining if the intended project objectives and outcomes are effectively met (IHI, n.d.). Descriptive statistics were analyzed as counts and percentages based on pre/post questionnaires used in assessing providers' knowledge before and after viewing an asynchronous educational presentation. The project was considered successful if there was a noticeable improvement in the providers' knowledge and practice intent to improve pneumococcal vaccination recommendations and SOPs. A summary was constructed to explain the findings and outline what was learned. Feedback from the providers was received to adjust the educational presentation to meet the needs of the family practice clinic.

Act

In the final phase, the plan is either adopted, adapted, or abandoned based on the evaluation of the data (IHI, n.d.). This step included making changes where necessary and re-testing the intervention through the cycle, accepting it fully without changes, or deserting the change completely and starting fresh with a new idea. Project success and implementation were determined based on whether there was a noticeable improvement in the providers' overall knowledge and practice intent to improve pneumococcal vaccination recommendations and an increased likelihood of adjusting SOPs to incorporate MAs in the vaccination process. Adjustments were made to the presentation based on the received feedback and then provided back to the clinic providers.

Setting and Stakeholders

The family practice clinic is a federally qualified health center (FQHC) located in an urban, middle socioeconomic area that serves many patients aged 40 years and older, representing 66% of their patient population. Authorization for implementation at the clinic was approved by the Director of Operations (Appendix A). Key stakeholders for this QI project include the clinic providers and the Director of Operations. There are currently seven advanced practice registered nurses (APRNs) employed at the family practice clinic who serve as the primary stakeholders, given that they will be receiving the educational material. Healthcare providers are integral in the screening of vaccination status among patients. A recommendation directly from a provider remains a strong influence and is one of the most important factors in determining whether a patient will decide to get vaccinated (CDC, 2019). Considering each APRN is self-employed and responsible for individual SOPs, this project focused on educating providers on standardizing current SOPs to include MAs in the immunization process. Changes and revisions were adapted to the project based on provider feedback. Support and approval from the Director of Operations was integral to the successful implementation of the proposed project and ensuring an adequate stock of pneumonia vaccines on-site and available for administration.

Planning the Intervention

For this QI project, it was determined that the clinic needs improved provider recommendations for the pneumococcal vaccine, and transparent information for patients, based on updated ACIP recommendations. Consequently, an educational PowerPoint presentation was developed to reinforce evidence-based guidelines. The presentation was asynchronous and included a voiceover format, lasting 16 minutes, to best meet the variable scheduling needs of

the site and time constraints of the clinic providers. The information in the educational presentation included an overview of pneumonia, pneumococcal vaccination rationale, practice guidance for educating patients, current ACIP pneumococcal immunization recommendations, provider workflow handout for clinic use, benefits to utilizing MAs in immunization SOPs, insurance coverage, and appropriate billing codes to use during these encounters. The provider handout is supplied by the CDC and incorporates a user-friendly table to help facilitate the workflow of pneumococcal vaccine timing for adults. It breaks down complicated vaccine guidelines based on previous immunization status and allows quick reference during patient encounters.

The educational PowerPoint was preceded by a questionnaire presented by Qualtrics to document baseline knowledge and current confidence levels of pneumococcal vaccination amongst providers at the family practice clinic. The questionnaire included questions to determine providers' knowledge based on ACIP recommendations for pneumococcal vaccination among adults 65 years and older and current practices regarding vaccine recommendations. The questionnaire was estimated to take less than five minutes. A post-education questionnaire was then completed after the educational PowerPoint was reviewed to determine if the intervention improved knowledge and confidence in the ACIP pneumococcal vaccine guidelines and practice intent and the likelihood of implementing or adjusting immunization SOPs to include clinic support staff (MAs).

This QI project was implemented in July of 2024 following the IRB review. The DNP project committee reviewed the asynchronous presentation, pre- and post-questionnaire, and patient handout before implementation. In addition, site approval was obtained before

implementation (Appendix A). The asynchronous presentation (Appendix D), pre-and post-educational review questionnaires (Appendix C), and a PDF of the provider workflow handout (Appendix D) were delivered through an email invitation (Appendix B) and sent to the Director of Operations who then forwarded it to the rest of the consented clinic providers. This email provided an overview of the project, a consent disclosure (Appendix B), and a link to the educational materials and questionnaires (Appendix C & D). Providers were given one week to view the educational materials and complete the pre- and post-knowledge check questionnaires.

Participants and Recruitment

The clinic providers at the family practice clinic consist of seven APRNs. All were initially recruited verbally and invited to participate, the target was 57% (or four participants). Those who gave a verbal agreement were recruited through an email invitation sent from this PI to the Director of Operations which was then forwarded to the agreeable clinic providers. The email included a disclosure outline of the project's purpose, what to expect, benefits and risks to participation, and that participation was completely voluntary. Attachments in the email included a Qualtrics link to the pre- and post-education questionnaires, a link to the educational presentation, and a PDF of the provider workflow handout.

Consent and Ethical Considerations

Key nursing ethical principles were maintained throughout this QI project including autonomy, beneficence, and justice (Varkey, 2021). These ethical considerations are an important fundamental guidance within the nursing profession and this QI project. The most crucial aspect of autonomy is informed consent. Autonomy was assured to participants by being fully transparent about the potential risks and benefits of participating in this QI project, allowing

participants to make an informed decision before consenting to project engagement (Varkey, 2021). Participants were also assured participation was completely voluntary and withdrawal at any time was acceptable without consequence. Beneficence was met by ensuring that each aspect of the project was made in the best interest of the participants (Varkey, 2021). Specifically, beneficence protects and defends the rights of others, prevents harm, and works to benefit patients and promote welfare (Varkey, 2021). Participants were made aware that there are no psychological or physiological risks to participation in this project and the only benefit includes knowledge enhancement. Lastly, justice was maintained as each participant was treated fairly, equitably, and appropriately throughout the duration of the QI project (Varkey, 2021). All participants were recruited and treated equitably, with no preferential treatment offered to any single participant.

Before implementing this QI project, IRB through the University of Arizona deemed this QI project as not human research (Appendix A). The Director of Operations at the family practice clinic also approved the project before the implementation (Appendix A). Participation was completely voluntary, and no incentives were offered. Anonymity and confidentiality were assured to participants as no identifying data was obtained. The participants were allowed to stop at any time during the asynchronous presentation or pre/post-questionnaire without any consequences. The benefits of participating include increased knowledge and intent to implement the provided information to increase their patient's likelihood of getting the pneumococcal vaccine. Data gathered from the pre- and post-educational questionnaires were de-identified before data analysis to ensure the confidentiality of participants.

Data Collection

There were two questionnaires utilized to capture pre- and post-intervention knowledge. The pre-intervention questionnaire assessed the providers' baseline understanding of the pneumococcal vaccination, current recommendations and practices, and current confidence level in providing these recommendations to patients. The questionnaire consisted of ten questions, including one demographic question, five questions that assess provider perceptions and current practices on vaccination, and four knowledge questions. A post-intervention questionnaire was also administered to assess comprehension of the educational presentation and its contents. It evaluated for increased baseline knowledge regarding pneumococcal vaccination recommendations for adults 65 and older, practice intent, confidence levels, and the likelihood of revising SOPs to incorporate MAs in the immunization processes. The questionnaire consisted of nine questions, including four questions that assess for increased comfortability and confidence in the pneumonia vaccine and schedule, one question evaluating the likelihood of incorporating clinical support staff (MAs) into the immunization process, and the same four knowledge questions administered in the pre-questionnaire to assess for enhanced comprehension. A link to both questionnaires through Qualtrics was sent to the participants in the recruitment email (Appendix B). It was estimated that each questionnaire would take less than five minutes. It was disclosed in the recruitment email that participation in completing the questionnaires will be the participants' consent to this QI project. The retrieved data did not include any identifiers.

Data Analysis

The data collection from the pre- and post-questionnaires was analyzed using quantitative, descriptive statistics to evaluate knowledge, confidence, and intent to apply the

learned information to practice. Microsoft Excel 365 was used for data management and analysis on a secured computer and will be retained for six years following the conclusion of this QI project. Data analysis including descriptive statistics in the form of counts and percentages were calculated via Qualtrics and Microsoft Excel 365. The data is presented in table and graph formats for comparison. The Likert scale responses were measured as ordinal data by being assigned on a scale of “1” to “5” to determine overall percentage improvement. Responses “extremely uncomfortable,” “extremely unconfident,” “extremely unlikely,” “not at all aware,” and “strongly disagree,” were assigned as a “1,” and “extremely comfortable,” “extremely confident,” “extremely likely,” “extremely aware,” and “strongly agree” as a “5.”

RESULTS

Outcomes

The educational video and knowledge questionnaires opened on July 22, 2024, and closed on July 28, 2024. The disclosure email with participant materials was sent to all seven of the APRNs however, only five providers completed the full project. Of the responding participants, 40% (N=2) had one to three years of experience in their current role, 20% (N=1) had four to six years of experience, and the last 40% (N=2) reported ten or more years of experience. The targeted completion rate was achieved with a 71% response rate (or five out of seven providers). This data is presented as counts and percentages in Table 3 below.

Table 3*Provider Demographics*

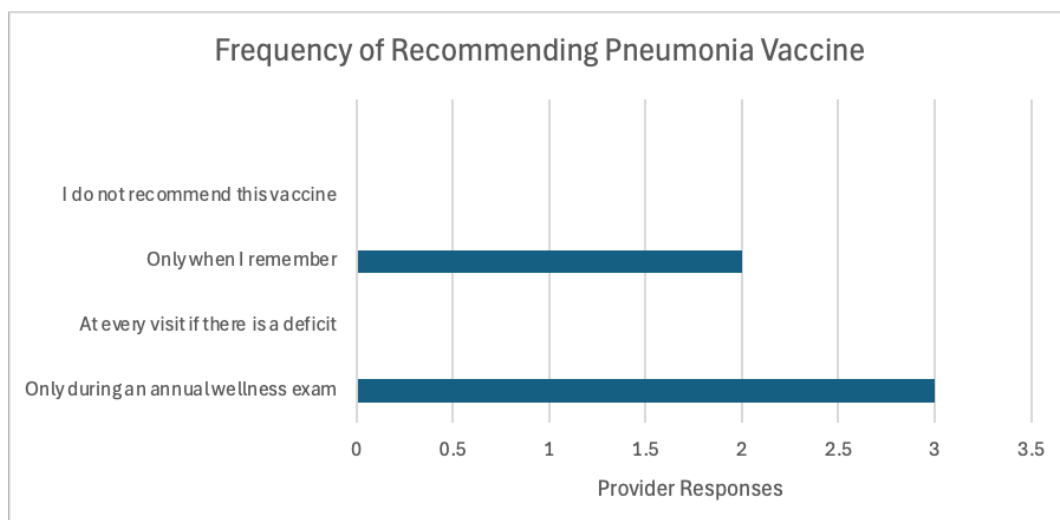
Provider Years of Experience:	N	Percentage
0-3 years	2	40%
4-6 years	1	20%
7-9 years	0	0%
≥ 10 years	2	40%

Pre-Educational Knowledge Questionnaire Responses**Provider Perceptions and Current Practices on Pneumococcal Vaccination**

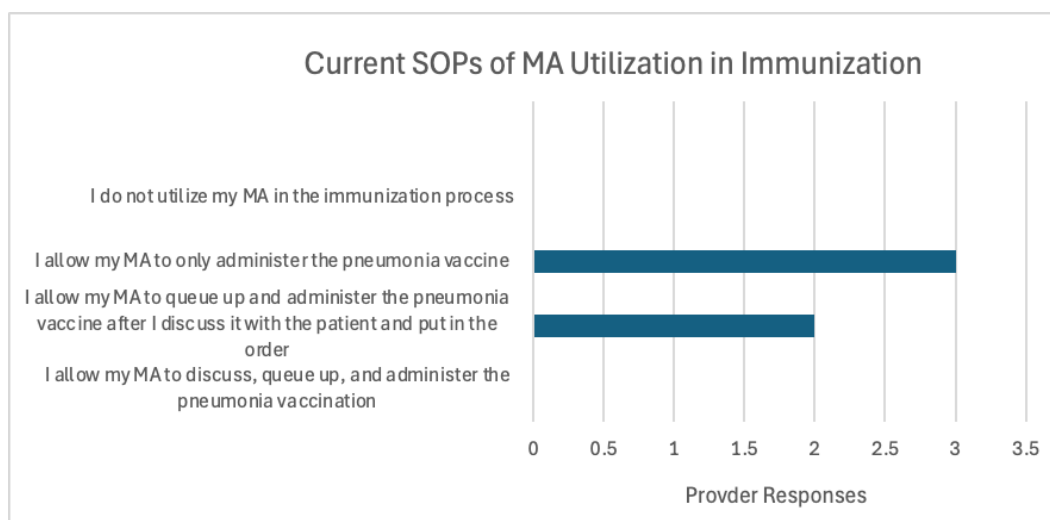
Providers were given a series of questions to assess their current perceptions and practices on vaccination before the educational intervention. Providers were asked how often they currently recommend the pneumonia vaccine to their patients aged 65 or older. The majority, 60% (N=3), responded that they only address this during an annual exam, and the remaining 40% (N=2) only address pneumonia vaccination when they remember. Providers were also asked about their current standards of practice involving their clinic support staff (MAs). Eighty percent (N=4) of the providers responded that they only allow their MA to administer the pneumonia vaccine. In contrast, 20% (N=1) responded that the MA is allowed to queue up and administer the pneumonia vaccine only after they have discussed it with the patient and placed the order. This data is represented in Figures 2 and 3 below.

Figure 2

Recommendations for Pneumonia Vaccine in Adults ≥ 65 Years

**Figure 3**

Provider SOPs for Pneumonia Vaccination



The additional three questions assessed current comfortability, confidence, and awareness of the pneumonia vaccine using a 5-point Likert scale. The first question addressed comfortability discussing the need for pneumonia vaccine among patients 65 years and older,

with 40% (N=2) reporting somewhat uncomfortable, 40% (N=2) reporting neither uncomfortable nor comfortable, and 20% (N=1) reporting somewhat comfortable. The second question assessed confidence in the current ACIP recommendations for vaccination in adults 65 years and older with the majority, 80% (N=4), reporting as somewhat unconfident and the final provider, 20% (N=1), responding as extremely unconfident. The third question then addresses awareness of the risks associated with adults 65 years and older not receiving the pneumonia vaccine, where 60% (N=3) rated as moderately aware and the remaining 40% (N=2) reported as extremely aware. These counts and percentages are represented in Table 4 below.

Table 4

Providers Perceptions and Current Practices Questionnaire Responses

Question	Answer	N %	
How comfortable are you with discussing the need for pneumonia vaccine with your patients?	Extremely uncomfortable	0	0%
	Somewhat uncomfortable	2	40%
	Neither uncomfortable nor comfortable	2	40%
	Somewhat comfortable	1	20%
	Extremely comfortable	0	0%
How confident are you in the current ACIP pneumococcal vaccine recommendations?	Extremely unconfident	1	20%
	Somewhat unconfident	4	80%
	Neither confident nor unconfident	0	0%
	Somewhat confident	0	0%
	Extremely confident	0	0%
How aware are you of the risks associated with patients aged 65 years and older who do not receive the pneumonia vaccine?	Not at all aware	0	0%
	Slightly aware	0	0%
	Somewhat aware	0	0%
	Moderately aware	3	60%
	Extremely aware	2	40%

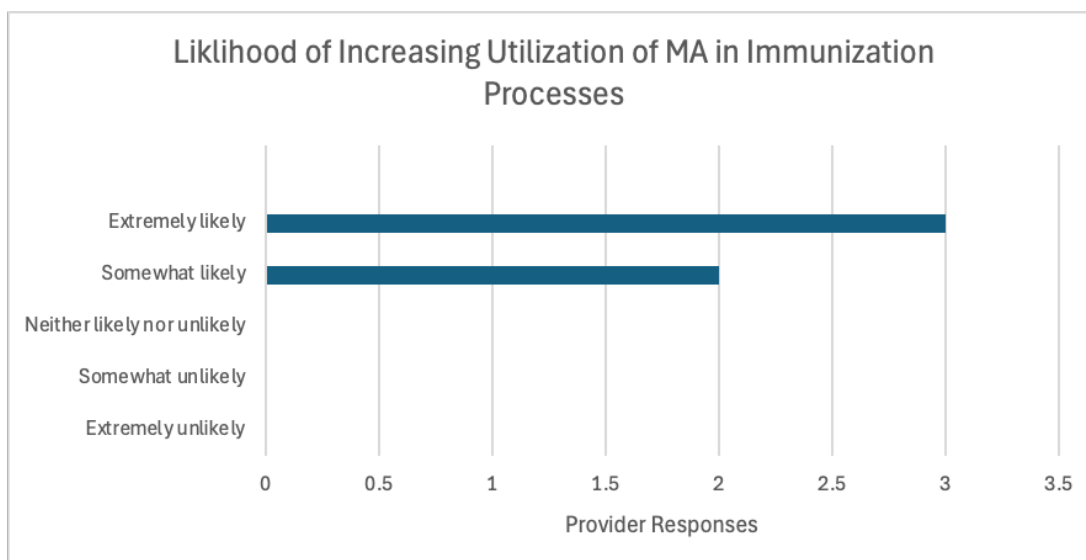
Post-Knowledge Questionnaire Provider Perceptions

Following the educational intervention, providers were administered a post-questionnaire to evaluate for an increase in baseline knowledge regarding pneumococcal vaccination recommendations for adults 65 years and older, practice intent, confidence levels, and the likelihood of revising current SOPs to incorporate MAs in the immunization processes. This data was assessed utilizing a 5-point Likert scale as well. The first question assessed for an increased likelihood of overall recommendation of the pneumonia vaccine with 40% (N=2) reporting somewhat likely and the other 60% (N=3) reporting extremely likely. The second question evaluated for an increase in comfortability in the recommendation of the pneumonia vaccine, where 100% (N=5) reported strongly agreeing. The third question asks about increased knowledge regarding the ACIP pneumonia vaccine recommendations for adults 65 years and older, 20% (N=1) responded as somewhat agree and the remaining 80% (N=4) responded as strongly agree. The fourth question on the questionnaire also evaluates for increased knowledge of the risks associated with patients 65 years and older who do not receive the pneumonia vaccine. With this question, 100% (N=5) of the providers responded as strongly agree. Overall, based on questionnaire responses, provider comfortability and knowledge regarding the pneumonia vaccine in adults 65 years and older showed moderate improvement. This data is represented in Table 5 below.

Table 5*Providers Perceptions Post-Educational Intervention*

Question	Answer	N	%
After viewing the presentation, how likely are you to recommend the pneumonia vaccine more often to your patients?	Extremely unlikely	0	0%
	Somewhat unlikely	0	0%
	Neither likely nor unlikely	0	0%
	Somewhat likely	2	40%
	Extremely likely	3	60%
The presentation increased my comfort in discussing the benefits of pneumonia vaccine and recommending it to my patients.	Strongly disagree	0	0%
	Somewhat disagree	0	0%
	Neither agree nor disagree	0	0%
	Somewhat agree	0	0%
	Strongly agree	5	100%
The presentation increased my knowledge of the ACIP pneumonia vaccine recommendations for adults 65 years and older.	Strongly disagree	0	0%
	Somewhat disagree	0	0%
	Neither agree nor disagree	0	0%
	Somewhat agree	1	20%
	Strongly agree	4	80%
The presentation increased my knowledge of the risks associated with patients aged 65 years and older who do not receive the pneumonia vaccine.	Strongly disagree	0	0%
	Somewhat disagree	0	0%
	Neither agree nor disagree	0	0%
	Somewhat agree	0	0%
	Strongly agree	5	100%

The final perception question in the post-questionnaire addresses the likelihood of increasing clinical support staff (MAs) in the immunization process. This question also utilized the 5-point Likert scale for evaluation. Of the five participating providers, 40% (N=2) reported as somewhat likely and the remaining 60% (N=3) reported as extremely likely. This data is represented in Figure 4 below.

Figure 4*Provider Likelihood of MA Utilization***Pre/Post-Responses to Knowledge Questions****Provider Knowledge Assessment**

The providers were given the same four questions to evaluate for improved knowledge of pneumonia vaccination in the pre- and post-educational intervention questionnaires. All four questions were presented in multiple-choice format with an option of “I’d have to look this up.” In the pre-questionnaire, the data analysis shows that 40% (two out of five providers) knew the one-year dosing interval between PCV15 and PPSV23 for adults 65 years and older, the other 60% (three out of five providers) reported they would have to look up this information. After the educational intervention, 100% (five out of five providers) answered the correct dosing interval between PCV15 and PPSV23 for adults 65 years and older in the post-questionnaire, representing a 60% knowledge improvement.

For the second question addressing which pneumococcal vaccination should be given at 65 years if the patient had previously received PPSV23 at any age, 20% (one out of five providers) answered correctly with PCV15 or PCV20, 20% (one out of five providers) answered incorrectly, and 60% (three out of five providers) responded as needing to look up the information. The post-questionnaire showed slight improvement with 40% (two out of five providers) answering correctly, 20% (one out of five providers) answering incorrectly, and the other 40% (two out of five providers) answering as needing to look it up.

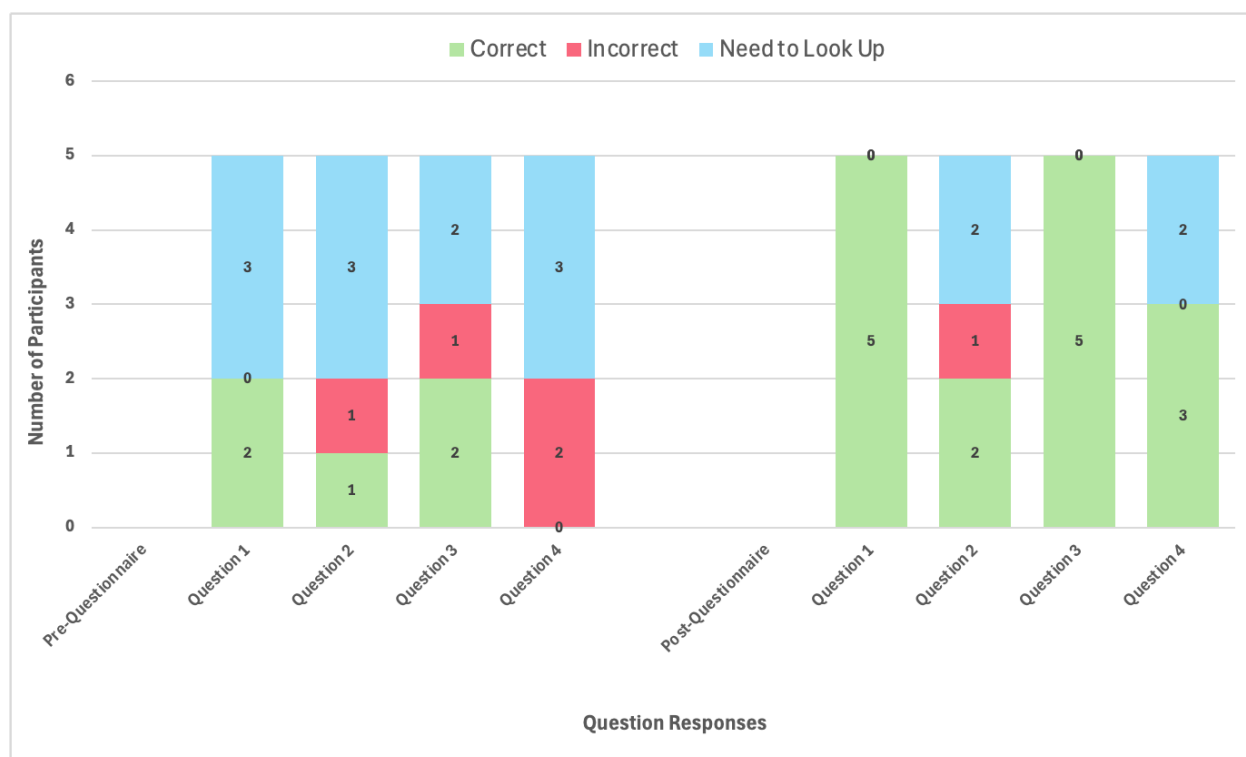
The third knowledge question gives a scenario of a 65-year-old woman with no prior pneumococcal vaccination history and asks which vaccine should be administered at this visit. Results showed that 40% (two out of five providers) answered correctly with PCV20, 20% (one out of five providers) responded incorrectly, and 40% (two out of five providers) answered as needing to look up the information. This question was very successful in the post-questionnaire as 100% (five out of five providers) answered correctly after the educational intervention, noting a 60% knowledge improvement from the pre-questionnaire

The final knowledge question addresses a patient who has received the complete pneumococcal vaccination series with PCV13 before 65 years and the PPSV23 at 65 years or older. The question asks which vaccine should be administered next and when with PCV20 five years or more after the patient's last dose as the correct answer. In the pre-questionnaire, 0% (zero out of five providers) answered correctly, 40% (two out of five providers) responded incorrectly, and the remaining 60% (three out of five providers) answered as needing to look up this information. There was some improvement in the post-questionnaire as 60% (three out of five providers) answered correctly, 0% (zero out of five providers) responded incorrectly, and

the other 40% (two out of five providers) still needed to look this answer up. This data signifies a 60% increase in comprehension. Overall, the data analysis supports an increase in provider knowledge regarding pneumococcal vaccination in adults 65 years and older following the implementation of this QI project. Figure 5 shows a visual comparison of the pre-and post-questionnaire knowledge questions.

Figure 5

Pre- and Post-Educational Knowledge Questionnaire Responses



DISCUSSION

Summary

The overall purpose of the QIP was to increase provider knowledge on pneumococcal vaccine benefits and updated guidelines and demonstrate intent to improve clinic workflow for

immunization processes. The project aimed to enhance understanding and awareness via a recorded asynchronous educational presentation. The project evaluated for increased baseline knowledge regarding pneumococcal vaccination recommendations for adults 65 and older, practice intent, confidence levels, and the likelihood of revising SOPs to incorporate MAs in the immunization processes to improve vaccine uptake. The findings from this project support asynchronous video-formatted educational interventions as an effective method for provider knowledge improvement in immunization. Objectives included an asynchronous educational PowerPoint presentation to increase providers' knowledge on the importance of recommending pneumococcal vaccination, the updated ACIP pneumococcal vaccination recommendations, and the importance of clinical support staff in the immunization process, as evidenced by a pre- and post-questionnaire. Pre- and post-questionnaire results exemplify significant score improvements, demonstrating increased provider knowledge and practice intent.

Interpretation

Provider Perceptions

The strongest predictor of pneumococcal immunization uptake in adults 65 and older is simply being offered the vaccine by a healthcare provider (Nicholls et al., 2021). Healthcare providers at this facility were not routinely screening and recommending standard vaccines to all eligible patients or reviewing and recommending immunizations at each clinical visit. After providers received education on the ACIP recommendations for pneumonia vaccine in adults 65 and older, more than 50% responded that they planned to improve current practices by addressing this health maintenance measure more often. Proposing immunizations to patients at

each clinical visit reduces missed opportunities for vaccination, especially among patients who do not routinely attend annual wellness visits (Fernandes et al., 2023).

Poor understanding of the vaccine and disease is identified as one of the main barriers impacting vaccine uptake and efficacy (Huang et al., 2022; McKeirnan et al., 2021; Nicholls et al., 2021). Comfort and knowledge in discussing and recommending the pneumococcal vaccination with patients showed a 78.6% and 166% improvement, respectively, when reassessed post-intervention. Greater awareness and targeted education around vaccine benefits and schedules are necessary to enhance vaccination acceptance and decrease missed opportunities.

Standards of Practice

Nurses and medical assistants have the potential to play a significant role in vaccine delivery services, specifically by educating patients on vaccines and addressing concerns or hesitancy before the provider sees the patient. Prior to education, the MAs were only allowed to queue up and administer the pneumonia vaccine based on provider recommendations and placed orders. Post QIP, 60% of the providers responded that they plan to revise and improve their current SOPs to allow the MA more autonomy and ability to practice to the fullest extent of their education. This change is consistent with the literature which supports implementing changes or new workflows in the vaccination process, particularly supporting the independence of nonphysician staff in evidence-based techniques to provide strong vaccine recommendations and accelerate immunization (Persell et al., 2020; Thaker et al., 2023).

Provider Knowledge

There are obvious provider knowledge gaps regarding adult pneumococcal vaccine recommendations, leading to suboptimal coverage. These knowledge gaps can be attributed to the complexity of the dosing regimens for the vaccine. The pneumococcal vaccine has different dosing schedules depending on the age of the patient and other factors, such as whether they have comorbidities or have received a previous pneumococcal vaccination. Several contributing factors pose an issue to the complexity of the ACIP recommendations for pneumococcal vaccinations, which add to the general confusion regarding administration (McKeirnan et al., 2021). Recommendations are individualized depending on two to 15 months of age, 19-64 years, adults 65 and older, adults with immunocompromising conditions, and patients with chronic respiratory disease (CDC, 2023c). In addition, there are two types of pneumococcal vaccines, PCV (PCV15 and PCV20) and PPSV, with up to a four-dose regimen depending on age range. The order in which each vaccine is received can affect the immune response to the various serotypes, adding to the complexity of the immunization schedule (CDC, 2023c). Each vaccine helps to protect against different serotypes of pneumococcal bacteria, emphasizing the importance of each. Also, as of June 2024, the Food and Drug Administration (FDA) approved a new PCV valent, PCV-21, for use in adults aged 18 and older. This new vaccine does not contain serotypes included in other pneumococcal vaccines but does add eight new serotypes, contributing to increased coverage (CDC, 2023c). The ACIP is currently reviewing this latest information with plans to incorporate this new valent into the recommendations, further complicating dosing regimens for providers and proposing a need for future additional education.

This healthcare advancement is a good reminder of how important continuing education is for providers. Guidelines and recommendations are constantly being revised and updated, leaving the providers responsible for staying up to date with new evidence-based research. The educational intervention presented within this QI project successfully improved provider knowledge regarding pneumococcal vaccination and dosing regimens in adults 65 years and older, as evidenced by a consistent 60% improvement in all pre- and post-questionnaire responses. This data also supports asynchronous video-formatted educational interventions as an effective method for provider knowledge improvement in immunization.

Implications (Practice, Education, Research and Policy)

An educational presentation regarding improving pneumococcal vaccination in adults 65 years and older and incorporating a supplemental provider workflow handout by the CDC increased provider knowledge on ACIP recommendations and improved practice intent for immunization. As a result of these outcomes, providers will better meet the facilitators and overcome barriers to pneumococcal vaccination in adults 65 years and older. This project demonstrates asynchronous educational interventions as an effective method for increasing awareness and knowledge levels of pneumococcal vaccination in older adults. Future investigations should include examining for increased vaccine uptake with improved immunization SOPs and utilizing clinical support staff in the immunization process. Another potential QI project could include developing a shared decision-making tool to help providers identify adult patients needing pneumonia vaccine and aid in guiding discussion and recommendation.

Although state immunization registries are available, a nationwide adult vaccination system would be significantly beneficial in allowing providers access to patient vaccination records and aiding in future recommendations. Also, incorporating a feature that would allow the ability to integrate a patient's vaccine record from the state into the EHR. This could help combat the barrier of patients being unaware of what vaccine(s) they have already received. Future healthcare organization policies should include asynchronous educational interventions similar to the presentation provided in this project to further improve knowledge and awareness of immunization.

Strengths and Limitations

A key strength of this project was the accessibility of the educational presentation via a pre-recorded asynchronous Zoom format. This allowed for the ability to coordinate with various schedules and allow providers to complete the project when their schedule allotted time. In addition, it will continue to help educate other providers and clinic personnel who could not view the presentation during the project implementation period. Additionally, the availability of all educational materials being readily available to the participants through the recruitment/disclosure email, increased the ease of access for participants. Lastly, results remained anonymous throughout the entire project, preventing potential biases and encouraging honest answers among participants.

Despite the success of the project, several limitations should be highlighted. Knowledge of the provider and perception of pneumococcal vaccination in adults 65 years and older was generated from a small sample size. The participants were limited to APRNs located at one family practice clinic in southeastern Washington, where only five of the seven providers opted

to participate. Additionally, the sample size only partially represented all direct patient care roles within the clinic. Including clinical support staff (MAs) in the future may be beneficial as this QI project is recommending increased involvement in the vaccination process. While the presentation delivery through a recorded presentation was done to meet the clinic and provider's needs best, there was decreased engagement between the PI and the participants. This may have prevented staff questions from being adequately addressed.

DNP Essentials Addressed

The Doctor of Nursing Practice (DNP) essentials outline the foundational competencies that are crucial for advanced practice nurses (AACN, 2006). This project addresses DNP Essentials III, VI, and VII.

DNP Essential III

Essential III, Clinical Scholarship and Analytical Methods for Evidence-Based Practice highlights the importance of integrating evidence-based knowledge into practice to improve patient health outcomes. This essential was incorporated into this QI project through the use of evidence-based literature to support the project's purpose and objectives and improve current practice.

DNP Essential VI

DNP Essential VI, Interprofessional Collaboration for Improving Patient and Population Health Outcomes, incorporates effective team collaboration to lead change within a healthcare system (AACN, 2006). This project highlighted the importance of clinical support staff and offered guidance on improved ways to incorporate MAs in the immunization process to potentially improve pneumococcal vaccine uptake and overall practice intent.

DNP Essential VII

Finally, DNP Essential VII, Clinical Prevention and Population Health, for Improving the Nation's Health, focuses on interventions for health promotion and disease prevention (AACN, 2006). This QI project provided education on the importance of recommending pneumococcal vaccination, the updated ACIP pneumococcal vaccination recommendations, and the role of clinicians in educating patients about pneumonia and the associated vaccines to improve vaccine uptake among patients aged 65 and older.

Conclusions

The educational asynchronous presentation and provider handout on the dosing schedule for pneumococcal vaccination for adults 65 years and older presented to provider staff at one family practice clinic in southeastern Washington successfully increased knowledge and practice intent for discussing vaccination among patients and utilizing clinical support staff in the vaccination SOPs. Despite the lack of statistical significance due to a relatively small sample size, there was an evident increase in individual awareness, knowledge, and confidence in pneumococcal vaccination benefits, risks, and recommended immunization schedules in adults aged 65 and older. Provider recommendation is the best practice for improving pneumococcal immunization rates therefore, continued encouragement through opportunities such as clinic staff meetings for providers and MAs to recommend this vaccine is strongly supported.

Plan for Sustainability

To maintain the sustainability of this project, the content will need to be reviewed frequently utilizing the PDSA cycle to make the necessary changes to continue to enhance implementation and response. Future improvements may include updating the educational

presentation and CDC provider workflow handout to include the new PCV21 vaccine and ensuring the most recent evidence-based information is available. The presentation will continue to be available and accessible online for any provider or clinical support staff to review.

Plan for Dissemination

An executive summary of findings and recommendations was shared with this family practice clinic in southeastern Washington. Also, a final defense presentation of the project and results was conducted with the project committee members. Further dissemination outside of this family practice clinic and University includes expanding outreach through professional conferences, ultimately helping to enhance pneumococcal vaccination knowledge and uptake in primary care settings.

Funding

This project did not receive funding.

APPENDIX A

TOTAL CARE CLINIC SITE APPROVAL | THE UNIVERSITY OF ARIZONA
INSTITUTIONAL REVIEW BOARD AUTHORIZATION

Total Care Clinic
1776 Fowler St.
Richland, WA 99352

April 15, 2024

University of Arizona Institutional Review Board
c/o Office of Human Subjects
1618 E Helen St
Tucson, AZ 85721

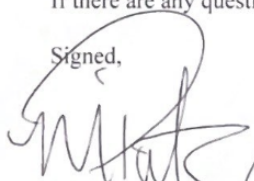
Please note that Ms. Taylor Wicht, UA Doctor of Nursing Practice student, has permission of the Total Care Clinic to conduct a quality improvement project at our facility for her project, "Increasing Pneumococcal Vaccination Rates in Adults 65 Years and Older."

Ms. Wicht will conduct a pre- and post-education survey, present an asynchronous educational zoom presentation on the pneumococcal vaccine, and obtain pre- and post-intervention Healthcare Effectiveness Data and Information Set (HEDIS) measures for Adult Immunization Status (AIS-E). She will verbally recruit interested providers. Once verbal consent is obtained, an email will be sent that provides a description of the project, what they will be asked to do, the time involved, and a link to the pre- and post-survey and asynchronous zoom presentation. Ms. Wicht's activities will be completed by September 1, 2024.

Ms. Wicht has agreed to provide to my office a copy of the University of Arizona Determination before she recruits participants. She will also will present aggregate results to the providers at their monthly staff meeting.

If there are any questions, please contact my office.

Signed,



Melissa Pistoljevic
Director of Operations at Total Care Clinic
1776 Fowler St, Richland, WA 99352
P: 509-735-9355 F: 509-222-151
E: melissapistoljevic@totalcaretricity.com

IRB APPROVAL LETTER



University of Arizona IRB
845 N Park Ave., Suite 537A
Tucson, AZ 85719
Fax: 520-621-9810
VPR-IRB@arizona.edu

NOT HUMAN RESEARCH

July 11, 2024

Dear Taylor Wicht:

On 7/11/2024, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	Increasing Pneumococcal Vaccination in Adults 65 Years and Older in Primary Care
Investigator:	Taylor Wicht
IRB Submission ID:	STUDY00004905
Sponsor:	None
Prime Sponsor:	None
IND, IDE, or HDE:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Advisor Attestation.pdf, Category: Institutional Approval; • IRB Protocol for Determination of Human Research v2023-12 (1).docx, Category: IRB Protocol; • Outline of Clinical Staff Educational Presentation.docx, Category: Participant Material; • Post-Educational Knowledge Questionnaire.docx, Category: Participant Material; • Pre-Educational Knowledge Questionnaire.docx, Category: Participant Material; • Provider Handout , Category: Participant Material; • Recruitment_Disclosure Email.docx, Category: Recruitment Materials; • Site Authorization .png, Category: External Site Authorization;

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any



APPENDIX B
RECRUITMENT MATERIAL (RECRUITMENT EMAIL)

Dear Total Care Clinic Provider Staff,

My name is Taylor, and I am a doctoral Nurse Practitioner student at the University of Arizona DNP FNP program. I am inviting you to participate in my quality improvement (QI) project of an educational intervention to help facilitate pneumococcal vaccination among adults aged 65 years and older. This is an opportunity to learn how to provide better education and recommendations for the pneumococcal vaccine to your patients and improve standards of practice.

If you choose to participate, you will be asked to:

1. Complete a pre-education questionnaire
2. View an asynchronous Zoom presentation
3. Complete a post-educational questionnaire

In total, the entire project will take no more than 25 minutes of your time. The first implementation will begin today. Your participation in completing the questionnaire will be your consent to this QI project. The educational materials will be available for the next two weeks to allow for an optimal amount of time to review before the start of the data collection period. It is completely voluntary to participate in this project and each aspect described above is optional. This project has been approved by the Total Care Clinic and reviewed by the University of Arizona Institution Review Board.

Below you will find a link to the project materials.

Link for pre-educational knowledge questionnaire:

https://qualtricsxm3bwg7v5zf.qualtrics.com/jfe/form/SV_bEoU0LegmkIV5Ai

Link for post-educational knowledge questionnaire:

https://qualtricsxm3bwg7v5zf.qualtrics.com/jfe/form/SV_1RkkCSMCEGBvkJo

Link for video presentation:

https://arizona.zoom.us/rec/share/9hRwA7TL9C1SBu6hN_bzawxftiYxDu7xBh3mwk1FC6qxC7fKiNEECD5KvzIFKbKD.NP378Vv_voeKVQbo

Your contributions to this QI project are highly appreciated. If you have any questions or concerns, please contact Taylor Wicht at taylorwicht@arizona.edu

Thank you,

Taylor Wicht

APPENDIX C

EVALUATION INSTRUMENTS (PRE- AND POST-SURVEY)

Pre-Educational Knowledge Questionnaire

1. I have ___ years of experience as an APRN:
 - a. 0-3 years
 - b. 4-6 years
 - c. 7-9 years
 - d. ≥ 10 years
2. How often do you currently recommend the pneumonia vaccine for your patients 65 years and older?
 - a. Only during an annual wellness exam
 - b. At every visit if there is a deficit
 - c. Only when I remember
 - d. I do not recommend this vaccine
3. How comfortable are you with discussing the need for pneumonia vaccine with your patients?
 - a. Extremely uncomfortable
 - b. Somewhat uncomfortable
 - c. Neither uncomfortable nor comfortable
 - d. Somewhat comfortable
 - e. Extremely comfortable
4. How confident are you in the current ACIP pneumococcal vaccine recommendations?
 - a. Extremely unconfident
 - b. Somewhat unconfident
 - c. Neither unconfident nor confident
 - d. Somewhat confident
 - e. Extremely confident
5. How aware are you of the risks associated with patients aged 65 years and older who do not receive the pneumonia vaccine?
 - a. Not at all aware
 - b. Slightly aware
 - c. Somewhat aware
 - d. Moderately aware
 - e. Extremely aware
6. What are your current standards of practice involving your clinical support staff (MAs) for pneumonia vaccination in patients 65 years and older?
 - a. I allow my MA to discuss, queue up, and administer the pneumonia vaccination
 - b. I allow my MA to queue up and administer the pneumonia vaccine after I discuss it with the patient and put in the order

- c. I allow my MA to only administer the pneumonia vaccine
 - d. I do not utilize my MA in the immunization process
7. For adults 65 years and older, if PCV15 is given, when should the following dose of PPSV23 be administered?
- a. 6 months
 - b. 1 year**
 - c. Neither a nor b is correct
 - d. I'd have to look this up
8. If an adult previously received PPSV23 only at any age, which pneumococcal vaccine(s), if any, should be administered when they turn 65?
- a. PCV20
 - b. PCV15
 - c. None
 - d. Either a or b is correct**
 - e. I'd have to look this up
9. A 65-year-old otherwise healthy woman with no history of prior pneumococcal vaccination sees you for an annual wellness visit. Which, if any, pneumococcal vaccine(s) should be administered at this visit?
- a. PPSV23
 - b. PCV20**
 - c. Neither a nor b is correct
 - d. Either a or b is correct
 - e. I'd have to look this up
10. If an adult patient has a complete vaccine series with PCV13 given at any age and PPSV23 given at ≥ 65 years, which vaccine can be administered and when?
- a. PCV15 ≥ 1 year after the last dose
 - b. PCV15 ≥ 5 years after the last dose
 - c. PCV20 ≥ 1 year after the last dose
 - d. PCV20 ≥ 5 years after the last dose**
 - e. I'd have to look this up

Post-Educational Knowledge Questionnaire

1. After viewing the presentation, how likely are you to recommend the pneumonia vaccine to your patients?
 - a. Extremely unlikely
 - b. Somewhat unlikely
 - c. Neither likely nor unlikely
 - d. Somewhat likely
 - e. Extremely likely
2. The presentation increased my comfort in discussing the benefits of the pneumonia vaccine and recommending it to my patients.
 - a. Strongly disagree
 - b. Somewhat disagree
 - c. Neither agree nor disagree
 - d. Somewhat agree
 - e. Strongly agree
3. The presentation increased my knowledge of the ACIP pneumonia vaccine recommendations for adults 65 years and older.
 - a. Strongly disagree
 - b. Somewhat disagree
 - c. Neither agree nor disagree
 - d. Somewhat agree
 - e. Strongly agree
4. The presentation increased my knowledge of the risks associated with patients aged 65 years and older who do not receive the pneumonia vaccine.
 - a. Strongly disagree
 - b. Somewhat disagree
 - c. Neither agree nor disagree
 - d. Somewhat agree
 - e. Strongly agree
5. After viewing the educational presentation, how likely are you to increase the utilization of clinic support staff (MAs) in clinic processes for immunizations?
 - a. Extremely unlikely
 - b. Somewhat unlikely
 - c. Neither likely nor unlikely
 - d. Somewhat likely
 - e. Extremely likely

6. For adults 65 years and older, if PCV15 is given, when should the following dose of PPSV23 be administered?
 - a. 6 months
 - b. 1 year**
 - c. Neither a nor b is correct
 - d. I'd have to look this up
7. If an adult previously received PPSV23 only at any age, which pneumococcal vaccine(s), if any, should be administered when they turn 65?
 - a. PCV20
 - b. PCV15
 - c. Either a or b is correct**
 - d. I'd have to look this up
8. A 65-year-old otherwise healthy woman with no history of prior pneumococcal vaccination sees you for an annual wellness visit. Which, if any, pneumococcal vaccine(s) should be administered at this visit?
 - a. PPSV23
 - b. PCV20**
 - c. Either a or b is correct
 - d. I'd have to look this up
9. If an adult patient has a complete vaccine series with PCV13 given at any age and PPSV23 given at ≥ 65 years, which vaccine can be administered and when?
 - a. PCV15 ≥ 1 year after the last dose
 - b. PCV15 ≥ 5 years after the last dose
 - c. PCV20 ≥ 1 year after the last dose
 - d. PCV20 ≥ 5 years after the last dose**
 - e. I'd have to look this up

APPENDIX D

PARTICIPANT MATERIAL (PRESENTATION OUTLINE | PROVIDER WORKFLOW
HANDOUT)

Outline of Clinical Staff Educational Presentation

1. Background in pneumococcal pneumonia
 - a. Pneumonia occurs in 649 to 847 adults per 100,000 population and causes roughly 1.6 million hospitalizations per year, putting adults aged 65 and older at a ten times greater incidence rate than those under 65 years (Shoar & Musher, 2020).
 - b. In 2021, the rate of influenza/pneumonia mortality was 5.9 per 100,000 of the total population accounting for nearly 500 deaths (CDC, 2022).
 - c. The more underlying comorbidities, the more fragile the patient and the higher the likelihood of requiring intensive care unit (ICU) admission. Those requiring ICU admission endure an increase in mortality rate, reaching up to 55.9% (Osman et al., 2021).
 - d. Influenza and pneumonia cost the U.S. \$34.7 billion in outpatient visits, hospitalizations, and mortality each year for adults older than 65 years old alone (Lippert et al., 2022).
 - e. It is expected that the number of Americans aged 65 and older is projected to increase by 47% from 2022 to 2050, which is going to increase the significance of the burden of CAP in the years to come, making immunization even more crucial (PRB, 2024).
2. Background in pneumococcal immunization
 - a. The U.S. National Health Interview Survey from 2021 reported a 65.8% coverage rate with one or more doses of the pneumococcal vaccine among adults aged 65 and older (CDC, 2023e).
 - b. In 2019, 63.2% of Medicare beneficiaries aged 65 and older had claims for any pneumococcal vaccination, 46.2% for PPSV23, 49.3% for PCV13, and 32.3% for both PCV13 and PPSV23 (CDC, 2021).
 - c. National pneumococcal vaccination rates continue to remain below the Healthy People 2020 goal of achieving a 90% vaccination rate for adults ages 65 years and older. Despite being an older objective, the significance lies in the fact that this goal continues to remain unmet which will ultimately affect the ability to meet the Healthy People 2030 objective which is to reduce the rate of hospital admissions for pneumonia among older adults (Healthy People 2030, n.d.).
3. Risk Factors
 - a. Age: Certain factors such as a weakened or suppressed immune system, the presence of comorbidities, diminished cough reflex, and/or overall poor functional status all contribute to an increase in incidence and prevalence among older adults (Osman et al., 2021).
 - i. Changes in lung physiology because of aging including decreased elastic recoil, increased air trapping, decreased chest wall compliance, and reduced respiratory muscle strength all contribute to why disease in older adults is usually more severe (Cho & Stout-Delgado, 2020).
 - b. Current health status: The presence of comorbidities increases the risk of more severe disease and death due to CAP by two to fourfold. These risk factors tend to

be significantly associated with the older population and include chronic obstructive pulmonary disease (COPD), asthma, diabetes, congestive heart failure (CHF), immunosuppression, cancer, and smoking (Chebib et al., 2021; Brown et al., 2018).

4. Bar graph for Medicare beneficiaries' claims from 2010-2019
 - a. The proportion of Medicare beneficiaries aged 65 and older with claims submitted for pneumococcal vaccination, regardless of prior vaccination – United States, 2010–2019 (CDC, 2021).
5. Table of vaccination by demographics and medical condition (CDC, 2021)
 - a. The proportion of Medicare beneficiaries aged 65 and older with claims submitted for pneumococcal vaccination regardless of prior vaccination broken down by age and presence of chronic and immunocompromising medical conditions. Data is from December 2019.
 - b. Includes all beneficiaries continuously enrolled in Medicare Parts A and B at least one year before December 31, 2019.
6. Table of Medicare beneficiaries in Washington State (CDC, 2021)
 - a. Snapshot of ten states in comparison to Washington state. When compared to the provided states, Washington ranks third lowest in the number of claims for any pneumococcal vaccination.
7. Available vaccines
 - a. There are two formulations of pneumonia vaccines, polysaccharide vaccine (PPSV23) and conjugate vaccine (PCV15 or PCV20)
 - b. The two new PCVs (PCV15 and PCV20) were recently introduced in 2021 and are differentiated by the number of serotypes they protect against. They protect against more strains of the bacteria that cause pneumococcal pneumonia than the previously used PCV13 (CDC, 2023c).
 - c. The PPSV has been approved since 1983 and offers protection against 23 strains of the *S. pneumoniae* bacterium that account for approximately nine out of ten cases of pneumococcal disease (Kirubarajan et al., 2023).
8. CDC and ACIP Recommendations (CDC, 2023e; NCQA, 2022)
 - i. Vaccine Schedules: The CDC and ACIP recommend routine administration of the PCV20 alone or the PCV15 in combination with PPSV23 for all adults aged 65 or older who have reported never receiving a PCV or if vaccination history is unknown
 1. For no or unknown vaccination history: administer PCV20, or PCV15 followed by PPSV23 ≥ 1 year after last dose
 2. For those who have previously received PPSV23 only at any age: follow with PCV20 or PCV15 ≥ 1 year after the last dose
 3. For those who have previously received PCV13 only at any age: follow with PCV20 or PPSV23 ≥ 1 year after the last dose
 4. For those who previously received PCV13 at any age and PPSV23 at < 65 years: PCV20 or PPSV23 ≥ 5 years after last dose
 5. For those who have previously completed the series by receiving PCV13 at any age and PPSV23 at 65 years of age or older, shared

clinical decision-making needs to occur to determine if PCV20 should be given. If it is decided to continue with the administration of PCV20, it should be five years or more after the last dose was given

9. Best practice recommendations for educating patients on the pneumococcal vaccine
 - a. Understanding the facilitators
 - i. The strongest predictor of pneumococcal uptake in older adults aged 65 and greater was being offered by a healthcare provider (Nicholls et al., 2021)
 - ii. The most significant reasons patients choose not to receive the pneumococcal vaccine include a lack of trust in the effectiveness or safety and an overall lack of knowledge regarding the vaccine or disease (Huang et al., 2022).
 - b. Common barriers: inadequate knowledge regarding pneumococcal disease and immunization, lack of recommendation from a healthcare provider, low perceived infection risk, and no perceived benefit from vaccination (McKeirnan et al., 2021).
10. Patient education to be included in the recommendation to overcome vaccine hesitancy and facilitate increased immunization
 - a. Safety and efficacy of the pneumococcal vaccine
 - i. The pneumococcal vaccine is 60% to 70% effective in preventing diseases caused by serotypes in the vaccine (CDC, 2023c).
 - b. Costs and coverage
 - i. Inflation Reduction Act of 2022
 1. The new law improves access to affordable treatments and strengthens the Medicare program by expanding benefits, lowering drug costs, and stabilizing prescription drug premiums (CMS, 2023).
 2. As of January 1, 2023, certain ACIP-recommended preventative adult vaccines are free of charge for people under Medicare prescription drug coverage (CMS, 2023).
 - ii. Medicare covers preventative services, including vaccines (CDC, 2023a)
 1. Part B covers some preventative vaccines including flu, hepatitis B, COVID-19, and pneumococcal. It also covers vaccines after exposure to dangerous viruses such as rabies or tetanus.
 2. Part D covers RSV, shingles, tetanus/diphtheria (Td), tetanus-diphtheria, pertussis (Tdap), hepatitis A, and hepatitis B.
 - iii. If you are uninsured, Washington State provides recommended vaccines at no cost
 1. The Washington State Adult Vaccine Program (AVP) is a federally funded program that provides vaccines for adults 19 years of age and older who are uninsured or underinsured (WSDOH, 2024)
 2. The clinic is not currently a participating location for this program therefore patients will have to be referred to a location with

enrolled providers, but this remains an option for those needing assistance

11. Importance of including clinical support staff in immunization SOPs

- a. Assessing vaccination status requires significant time reviewing medical records, state registries, and sometimes even calling pharmacies to compile vaccination histories for adults. Training nurses and medical assistants and supporting them in working to the full extent of their licensing can result in improved rates of preventative services including immunizations (Hunter et al., 2020).
- b. Nurses and medical assistants regularly interact with patients, putting them in the perfect position to help bridge the gap and serve as promoters of immunization (Thaker et al., 2023).
- c. Interventions include clinical decision support changes to facilitate documentation, changes to the rooming workflow for medical assistants to promote vaccination, prepare orders, document care done elsewhere, and record patient refusals (Persell et al., 2020).
- d. Providers can help increase vaccination rates by writing standing orders and by advocating for nurses and medical assistants to receive training and protected time for assessing and documenting vaccination histories and administration (Hunter et al., 2020).
- e. Nurses and medical assistants play a significant role in vaccine delivery services specifically by educating patients on vaccines, alleviating concerns, and vaccine hesitancy, and are well-positioned to facilitate coordination efforts within their scope of practice (Thaker et al., 2023).

12. Provider workflow handout from CDC

13. Provider education

- a. Billing codes (AAFP, 2024)
 - i. ICD 10 codes
 1. Z23 - Encounter for immunization
 - ii. HCPCS Code
 1. G0009 - Administration of pneumococcal vaccine
 - iii. CPT Codes
 1. 90670 – Pneumococcal conjugate vaccine, 13-valent (PCV133), for intramuscular use
 2. 90671 - Pneumococcal conjugate vaccine, 15-valent (PCV15), for intramuscular use
 3. 90677 - Pneumococcal conjugate vaccine, 20-valent (PCV20), for intramuscular use
 4. 90732 - Pneumococcal polysaccharide vaccine, 23-valent (PPSV23), adult or immunosuppressed patient dosage, when administered to individuals 2 years or older, for subcutaneous or intramuscular use

14. New pneumococcal conjugate vaccine (FDA, 2024).

- a. On June 17, FDA licensed CAPVAXIVE (Merck), a 21-valent pneumococcal conjugate vaccine (PCV21), for use in adults aged 18 years and older. This

PCV21 targets several serotypes not included in other PCV brands that cause serious pneumococcal disease more often in adults than in children. It does not include certain serotypes in the PCV brands recommended for children.

- b. CAPVAXIVE (V116) is specifically designed for adults and covers serotypes responsible for approximately 84% of invasive pneumococcal disease in adults 50 years of age and older.
- c. The U.S. CDC Advisory Committee on Immunization Practices is expected to meet in the next few weeks to discuss and make recommendations for the use of CAPVAXIVE in adults.
- d. Indications for use: prevention of invasive disease and pneumonia caused by *S. Pneumoniae* serotypes 3, 6A, 7F, 8, 9N, 10A, 11A, 12F, 15A, 15B, 15C, 16F, 17F, 19A, 20A, 22F, 23A, 23B, 24F, 31, 33F and 35B in individuals 18 years of age and older.










Provider Workflow Handout

Pneumococcal Vaccine Timing for Adults

Make sure your patients are up to date with pneumococcal vaccination.

Adults ≥65 years old

Complete pneumococcal vaccine schedules


Prior vaccines	Option A	Option B
None*		 → ≥ 1 year [†] → 
PPSV23 only at any age	≥ 1 year → 	≥ 1 year → 
PCV13 only at any age	≥ 1 year → 	≥ 1 year [†] → 
PCV13 at any age & PPSV23 at <65 yrs	>5 years → 	>5 years [‡] → 

* Also applies to people who received PCV7 at any age and no other pneumococcal vaccines

[†] Consider minimum interval (8 weeks) for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak (CSF) leak

[‡] For adults with an immunocompromising condition, cochlear implant, or CSF leak, the minimum interval for PPSV23 is ≥ 8 weeks since last PCV13 dose and ≥ 5 years since last PPSV23 dose; for others, the minimum interval for PPSV23 is >1 year since last PCV13 dose and >5 years since last PPSV23 dose

Shared clinical decision-making for those who already completed the series with PCV13 and PPSV23

Prior vaccines	Shared clinical decision-making option
Complete series: PCV13 at any age & PPSV23 at ≥ 65 yrs	≥ 5 years →  Together, with the patient, vaccine providers may choose to administer PCV20 to adults ≥ 65 years old who have already received PCV13 (but not PCV15 or PCV20) at any age and PPSV23 at or after the age of 65 years old.



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APPENDIX E
PROJECT TIMELINE

Completion Date	Planning	Pre-implementation	Implementation	Evaluation
May 19, 2024	Submit proposal to project chair			
June 3, 2024		Proposal approved by committee chair		
June 7, 2024		Schedule Proposal Defense with committee		
June 20, 2024		Proposal Defense Presentation		
July 3, 2024	Submit to College of Nursing Research Committee			
July 11, 2024		Obtain IRB approval		
July 22, 2024 - July 28, 2024			IMPLEMENT Collect Data	
August 5, 2024 - September 1, 2024				Analyze Data
October 21, 2024				Final Defense Presentation of Project Results

APPENDIX F
LITERATURE REVIEW GRID

Project Question: Will this family practice clinic in southeastern Washington improve immunization SOPs and practice intent for offering patients 65 years and older pneumonia vaccines after an asynchronous presentation has been given to providers regarding the importance of pneumococcal vaccine in adults 65 years and older?

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
2023; Alqifari et al.	A Structured Educational Intervention Aims to Improve Pneumococcal Vaccination Practices in Primary Healthcare Centers	Quasi-Experimental Study	<ul style="list-style-type: none"> - US Current CDC recommendations for the two available pneumococcal vaccine types can be confusing for providers and nursing staff, introducing the potential for administering the wrong product to patients - Focusing education on nursing staff by clinical pharmacists on proper vaccine use does not appear to be as effective - Need for further training on proper vaccine use for nursing and mid-level providers - Noted a noticeable increase in the urge to dispense vaccines to patients' post-educational activity - The rate of vaccination records checking for patients who sought medical help for reasons other than vaccination showed some growth ($p < 0.05$). 	<ul style="list-style-type: none"> - Desire for improvement in practices is evident in the overwhelming desire for participation in educational sessions by nursing staff and providers - Confirms the complex nature of vaccine practices and the need for further training on proper vaccine use - Education needs to occur among the provider staff and not just nursing or support staff
2023; Fernandes et al.	Vaccine Knowledge, Attitudes, and Recommendation Practices Among Providers in New York State	Prospective Descriptive Study	<ul style="list-style-type: none"> -Vaccine knowledge and attitudes of healthcare providers significantly influence vaccine recommendation practices -Interventions should include 	-Recommending but not administering vaccines in the clinical setting reduces ease of access to vaccinations and may

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			<p>reaching all providers to promote vaccination for disease prevention</p> <ul style="list-style-type: none"> -Understanding differences in vaccine knowledge and attitudes by provider roles can guide targeted interventions to promote vaccine confidence and therefore increase vaccine recommendation practices and patient vaccine acceptance 	<p>contribute to reduced vaccine uptake</p> <ul style="list-style-type: none"> -Providers are still not routinely recommending vaccines to all eligible patients or reviewing and recommending immunizations at each clinical visit resulting in missed opportunities for vaccination
2022; Huang et al.	Enabling Factors, Barriers, and Perceptions of Pneumococcal Vaccination Strategy Implementation: A Qualitative Study	Qualitative Study	<ul style="list-style-type: none"> - Common themes that prevented healthcare specialists from participating in pneumococcal vaccination: vaccinations are irrelevant to the field of services they provide, they would increase daily workload, insufficient time to educate patients effectively - Attitudes among vaccine providers include lack of venues available for distributing the vaccine, ill-defined criteria for determining high-risk individuals and patient eligibility, inconsistent supply and vaccine cost - Factors effective vaccine hesitancy: preventing pneumococcal infection, encouragement from doctors or Government, safety 	<ul style="list-style-type: none"> - Increase knowledge of current modifiable factors contributing to vaccine hesitancy among patients - Identifies common attitudes among providers that hinder vaccination education and recommendation - Evidence that providing knowledge and instruction after the immunization is just as important as before immunization

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			<p>concerns, lack of knowledge on vaccination</p> <ul style="list-style-type: none"> - Insufficient medical advice and instruction provided before and after the vaccine and strict eligibility criteria making it less accessible 	
2020; Hunter et al.	Vaccination of Adults in General Medical Practice	Systematic Review	<ul style="list-style-type: none"> -Clinicians making strong recommendations for immunizations may convince many patients to get vaccinated -Beginning vaccine conversations with presumptive statements made by the nursing staff and medical assistants may increase patient acceptance of immunization recommendations. Ex: "These are the vaccines you need today" -Increasing adult vaccination rates will require that clinic processes for scheduling and administering will be convenient for patients and staff 	<ul style="list-style-type: none"> -Training nursing staff and medical assistants to work to the full extent of their licensing can improve workflow processes and increase vaccination rates -Assessing adults' vaccination status at every clinical encounter lays the foundation for implementing vaccination recommendations -Assessing vaccination status requires a lot of time reviewing the medical record and tracking down vaccine histories to ensure patients are receiving the right vaccination
2019; Leung et al.	Educating Healthcare Providers to Increase Human Papillomavirus (HPV) Vaccination Rates: A Qualitative Systematic Review	Qualitative Systematic Review	<ul style="list-style-type: none"> - High-quality recommendations from healthcare providers are an effective and practical strategy to increase vaccine uptake, but a wide range in baseline knowledge is a barrier 	<ul style="list-style-type: none"> - Education may fill the gap or reinforce necessary knowledge of pneumococcal vaccine and current recommendations - Supports the need for and importance of further

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			<ul style="list-style-type: none"> - Provider-specific interventions are effective in improving provider knowledge and vaccine uptake - There is a need for healthcare providers to have comprehensive training to acquire the necessary knowledge to provide quality counseling to parents and patients - Provider-specific education (didactic sessions and communication training) with complimentary interventions increased knowledge and vaccine series initiation and completion - Common themes highlighted providers' lack of general and vaccine knowledge, and low self-confidence in counseling and addressing patient concerns 	<p>provider education and the role providers play in patients' determining whether to get vaccinated or not</p> <ul style="list-style-type: none"> - Provides evidence-based research to support the need for further provider education on vaccines in general
2023; Lip et al.	Vaccine Hesitancy Educational Tools for Healthcare Providers and Trainees: A Scoping Review.	Scoping Review	<ul style="list-style-type: none"> - Interventions studied: online modules/role-play simulation, lecture video/simulation, virtual simulation, simulation/video/module, slides/video/simulation, asynchronous online course, video tutorial, in-person training workshop, presentation/communication training/simulation, videos/in- 	<ul style="list-style-type: none"> - Identifies several possible combinations of successful interventions to improve provider education - Supports the idea of implementing provider education to decrease vaccine hesitancy

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			person training simulation, video/physical training, video - Interventions increased HCP self-perceived confidence and comfort in engaging vaccine-hesitant individuals - Interventions may result in a reduction in vaccine refusal	
2021; McKeirnan et al.	Improving Pneumococcal Vaccination Rates Among Rural Older Adults Through Academic Detailing: Medicine, Nursing and Pharmacy Partnership	Quasi-Experimental Study	- Enhanced workflows: medical assistants starting the conversation for vaccination, EHR alerts notifying patients they are eligible for vaccination, exam room posters - increased average number of pneumococcal vaccinations given by providers - Interprofessional academic detailing intervention increased pneumococcal vaccination rates among rural-dwelling older adults - Educational outreach is needed to improve healthcare access and outcomes	- Proposes a good workflow for starting the conversation about immunizations with patients. The more that are educated and able to provide vaccine knowledge will lead to increased promotion of vaccines and therefore aid in the rate of uptake - Increasing access to vaccines is essential in combination with provider education
2021; Michel & Goldberg	Education, Healthy Ageing and Vaccine Literacy	Randomized Control Trial	- Appropriate vaccine communication is essential to reassure people about vaccine efficacy, safety, and possible side effects while also underlining the protective benefit - Important to adjust communication to the	- The study helps to identify important aspects surrounding vaccine education and literacy - Identifies that education might be happening just not at the correct health literacy level for their patients to fully understand

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			<p>educational or health literacy level of the intended audience</p> <ul style="list-style-type: none"> - Specific vaccine communication training is essential to increase vaccine communication skills among healthcare providers 	<ul style="list-style-type: none"> - Volunteers the idea that appropriate communication training among providers may help improve communication with patients to understand the importance of immunization better and therefore increase uptake
2021; Nicholls et al.	Older Adults' Vaccine Hesitancy: Psychosocial Factors Associated With Influenza, Pneumococcal, and Shingles Vaccine Uptake	Cross-Sectional Survey	<ul style="list-style-type: none"> - The proportion of participants who had received the influenza vaccine in the last 12 months (83.6%) was higher than the proportion who had ever received the pneumococcal (60.2%) and shingles (58.9%) vaccines. - Awareness of eligibility for the pneumococcal and shingles vaccines, along with rates of having ever been offered them, were lower than for the influenza vaccine - 82.1% of participants intended to get the influenza vaccine in the next 12 months but only 27.1% and 34.6% of those who had never received the pneumococcal and shingles vaccines, intended to receive them in the future - Independent predictors of not getting the pneumococcal vaccine included age, sense of 	<ul style="list-style-type: none"> - The study helps understand some of the reasons for vaccine hesitancy among older adults - Confirms the lack of education among patients and their eligibility for receiving the pneumococcal vaccine due to limited education provider by providers - The study helps verify the overall lack of understanding and awareness surrounding the pneumococcal vaccine and how it compares to influenza and shingles vaccines.

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			collective responsibility, and concerns about profiteering - 69.5% of participants were unaware of their eligibility for the pneumococcal vaccine	
2020; Persell et al.	Measured Performance and Vaccine Administration After Decision Support and Office Workflow Changes for Influenza Vaccination	Cross-Sectional Analysis Study	-Implementing team changes or new workflows involving the vaccination process, particularly with the independence of support staff has led to increased vaccination -Clinical decision support changes to facilitate documentation, changes to rooming workflow for medical assistants to promote vaccination, prepare orders, document care done elsewhere, and record patient refusals were associated with large improvements and a significant increase in clinic-administered influenza vaccination	-Systematically changing the way practices address vaccination is an important strategy for maximizing vaccine uptake -Utilizing support staff can improve vaccination processes and increase immunization rates
2022; Thaker et al.	Nurses' Perceptions, Experiences, and Practices Regarding Human Papillomavirus Vaccination: Results from a Cross-Sectional Survey in Montana	Cross-Sectional Survey	-Training nurses and support staff in evidence-based techniques to provide strong vaccine recommendations to accelerate vaccination -Nurses play a significant role in vaccine delivery services by educating parents and patients on vaccines, alleviating parental concerns and vaccine hesitancy, and are	-Great patient informational needs and limited time for vaccine discussions identified as barriers to the HPV vaccine -Non-physician healthcare providers could help bridge this gap and serve as champions and promoters of vaccines

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			well-positioned to facilitate coordination efforts within their practices	<ul style="list-style-type: none"> -Nurses serve as primary stakeholders in developing and implementing health promotion initiatives -Providing education and recommendations on vaccinations is well within the scope of practice of clinical support staff (MAs and nurses)
2023; Zhang et al.	Evaluation of online educational curriculum on HPV vaccination practices among adult primary care providers.		<ul style="list-style-type: none"> -There was a significant improvement in knowledge from the pre-test to the post-test -There was a significant improvement in mean confidence for all providers from pre-test to post-test to identify patients who needed vaccination -There was a significant improvement in the likelihood of counseling eligible patients on the risks of HPV infection -The post-test demonstrated retention of improved knowledge, confidence, and self-reported behavior 	<ul style="list-style-type: none"> -The study demonstrated that an asynchronous online module was effective at improving the confidence, knowledge, and self-reported behavior of adult primary care providers -The study suggests that an online educational intervention can be a powerful tool to encourage increased utilization and delivery of the HPV vaccine

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