INCREASE IN PNEUMOCOCCAL IMMUNIZATION IN ADULTS OVER 65 YEARS OF AGE IN A FEDERALLY QUALIFIED HEALTH CENTER

A Scholarly Project Submitted to the Faculty of Liberty University

In partial fulfillment of the requirements for the degree

Of Doctor of Nursing Practice

By

Mara J Dominguez

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Lynchburg, VA

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Scholarly Project Chair Approval:

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ABSTRACT

Pneumococcal disease is a healthcare concern with increasing financial and societal burden for adults over the age of 65 years and their caretakers. The Center for Disease Control and Prevention (CDC) recommends the use of pneumococcal vaccines in this population as a preventive measure helping minimize the mortality and morbidity. This project aimed at increasing the rate of pneumococcal vaccines in a Federally Qualified Health Center (FQHC). The interventions implemented included the use of audit, feedback and provider educational intervention aimed at increasing the knowledge and the intent to change and improve their practice. The key results indicated an increase in aggregate pneumococcal vaccines in the organization as well as an increase in individual and historical vaccination rates for the organization and individual providers. The implications for practice include the improvement in vaccination rates significantly impacting the health of the community, as well as an increase in education provided regarding vaccination. The questionnaire provided positive feedback on the intervention. Further research to determine vaccination availability and re-vaccination should be considered.

Keywords: pneumococcal vaccine, older adults, chart audit, and provider feedback.

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List of Abbreviations

Agency for Healthcare Research and Quality (AHRQ)

American Lung Association (ALA)

American Thoracic Society (ATS)

Capital Area Health Network (CAHN)

Center for Disease Control and Prevention (CDC)

Chief Medical Officer (CMO)

Collaborative Institutional Training Initiative (CITI)

Community-acquired pneumonia (CAP)

Community-Acquired Pneumonia Immunization Trial in Adults (CAPiTA)

Continuing Professional Development (CPD)

Doctor of Nursing Practice (DNP)

E-Clinical Works (ECW)

Electronic Medical Records (EMR)

Evidence-based practice (EBP)

Infectious Diseases Society of America (IDSA)

Institutional Review Board (IRB)

Invasive pneumococcal disease (IPD)

Federally Qualified Health Center (FQHC)

Food and Drug Administration (FDA)

Health Resources and Services Administration (HRSA)

National Committee for Quality Assurance (NCQA)

Nurse Practitioners (NP)

Pneumococcal conjugate vaccine (PCV13)

Pneumococcal polysaccharide vaccine (PPSV23)

Pneumonia (PNA)

Random controlled trial (RTC)

Standing order program (SOP)

SECTION ONE: INTRODUCTION

Pneumococcal disease is a healthcare concern that could be detrimental to the health of the population, exposing an increasing financial and societal burden for adults over the age of 65 years and their caretakers. The use of pneumococcal vaccines is a preventive measure helping minimize the mortality and morbidity in this population, as well as improving the quality of life of individuals (Mangen, Huijts, Bonten & de Wit, 2017). The Center for Disease Control and Prevention (CDC) recommends individuals over the age of 65 to receive the pneumococcal vaccine to prevent the severe consequences of this disease process. The selected Federally Qualified Health Center (FQHC) for the project has a low rate of pneumococcal vaccination in the selected population, evidencing the risks of the community. In 2016, there were 98 pneumonia (PNA) and influenza deaths in the city of Richmond, VA (CDC, n.d.). The use of audit and feedback as a tool to improve professional practice is established as an effective way to influence health professional behaviors (Ivers et al., 2012). The purpose of this project was to implement a chart audit and provider educational intervention aimed at increasing the pneumococcal vaccination rates in adults older than 65 years of age in the FQHC. The project also evaluated the providers' intent to improve their practice based on the information provided.

Background

PNA is an infection of the lungs and can lead to mild and severe illness in people all ages, with higher risk in individuals 65 years of age and older (CDC, 2017a). Community-acquired pneumonia (CAP) is a common cause of hospitalization in the elderly, while invasive pneumococcal disease (IPD) is the most severe form of pneumococcal disease (Falkenhorst, Remschmidt, Harder, Hummers-Pradier, Wichmann & Bogdan, 2017).

The role of infections continues to play a crucial part in mortality of older adults, with PNA being one of the most severe infections, especially among men and women over 85 years of age (CDC, 2005). The CDC (2005) estimates the 30-day death rate of PNA is 11% to 70%, depending on the type of PNA and comorbidities of the individual. In adults over the age of 65, PNA can be deadly. Pneumococcal pneumonia kills about one out of 20 individuals who contract it while Pneumococcal bacteremia kills about one out of five individuals infected (CDC, 2017b). Pneumococcal meningitis causes death in about one in five individuals with the disease (CDC, 2017b).

An estimated 1.3 million annual cases of CAP affect adults over the age of 65 years, nearly 40% of these episodes will result in a hospitalization averaging 5.6 days of inpatient services (Brown, Harnett, Chambers & Sato, 2018). The financial burden for each episode can reach an excess of $18,000, causing Medicare an estimated $13 billion annually (Brown et al., 2018). This number is expected to grow with the increasing older population in the United States since elderly residents are increasing at twice the rate of the general population (CDC, 2005). The future economic cost of PNA hospitalization could increase annually by $2.5 billion (Drijkoningen & Rohde, 2014). CAP risk increases with age, from 18.2 cases per 1,000 person/years in the 65 to 69 year-old population, to 52.3 cases per 1,000 person/years in individuals older than 85 years of age (Brown et al., 2018).

The Food and Drug Administration (FDA) approved two vaccines to prevent pneumococcal disease. The Pneumococcal conjugate vaccine (PCV13 or Prevnar 13) includes purified capsular polysaccharide of 13 serotypes of *Streptococcus pneumoniae* (CDC, 2017a). The Community-Acquired Pneumonia Immunization Trial in Adults (CAPiTA), a randomized,

double-blind placebo-controlled trial of 84,496 community-dwelling immunocompetent adults over 65 years of age demonstrated:

- 45.6% efficacy of PCV13 against vaccine-type pneumococcal pneumonia
- 45.0% efficacy against vaccine-type non-bacteremic pneumococcal pneumonia
- 75.0% efficacy of PCV13 against vaccine-type IPD (CDC, 2017a).

The pneumococcal polysaccharide vaccine (PPSV23 or Pneumovax 23) contains antigens from 23 types of pneumococcal bacteria (CDC, 2017a). This vaccine is 60% to 70% effective in preventing invasive disease (CDC, 2017a). The CDC (2017a) recommends the following guidelines in the use of pneumococcal vaccines:

- Give a dose of PCV13 to adults 65 years or older who have not previously received a dose. Then administer a dose of PPSV23 at least one year later.
- If the patient already received one or more doses of PPSV23, give the dose of PCV13 at least one year after they received the most recent dose of PPSV23.

To further support the use of the vaccines, studies show that at least one dose of pneumococcal vaccine protects 75 in 100 older adults against invasive pneumococcal disease and 45 in 100 older adults against pneumococcal PNA (CDC, 2017a). Despite the efficacy of these vaccines, the current rate of vaccination in the older adult population ranges from 59.7% to 66.9% (CDC, 2017a), leaving a significant percentage of the community at increased risk and vulnerable to this disease.

Also, relevant to the project are health disparities and the incidence of chronic disease in the elderly. In 2006, African American men older than 65 years of age were nearly 7% more likely to die from influenza and PNA than their counterpart in the Caucasian population (American Lung Association [ALA], 2010). These numbers exposed that African Americans are

37% less likely than Caucasians to be vaccinated against PNA, while Hispanics are 46% less likely to be vaccinated against PNA than Caucasians (ALA, 2010).

The project took place in a FQHC with a low rate of pneumococcal vaccination documented in the patient's charts. Preliminary data shows that 3% of adults over the age of 65 who were seen by providers between January 1, 2018, and June 30, 2018, have a documented pneumococcal immunization. Documentation indicates that the vaccine was received in the clinic. Providers can also document if the patient refused to receive the vaccine in the preventive medicine section of the medical record; this can be determined by chart review only. Immunizations received at another facility are documented historically in the immunization section.

Problem Statement

Pneumococcal disease is a serious condition increasing the risks of complications and decreasing quality of life for adults older than 65 years of age (CDC, 2017a). The CDC recommends scheduled vaccinations in this population to prevent this complicated and possibly fatal illness (2017a). The patients at the FQHC are at higher risk of contracting this preventable disease due to the low rate of pneumococcal vaccines documented, but also due to the population characteristics. Preliminary data shows only 3% of the selected population had received the immunization this year. This fact exposes the gap in quality of care related to pneumonia prevention in the community of individuals over 65 years of age and older.

Purpose of the Project

The purpose of this project was to implement a chart audit and provider educational intervention aimed at increasing the Pneumococcal vaccination rates in adults older than 65 years of age in the FQHC. The project also aimed to improve the provider's intent to improve their

practice related to Pneumococcal immunizations. The chart audit was used to determine Pneumococcal vaccination practices and documentation. The educational intervention incorporated current recommendations by the CDC, as well as resources describing efficacy, benefits, and vaccination schedules.

Clinical Question

In providers working at a FQHC (P), does a chart audit and educational feedback intervention (I) increase pneumococcal vaccination rate in older adults (O)?

SECTION TWO: LITERATURE REVIEW

A literature review was conducted to evaluate current guidelines for pneumococcal vaccination, as well as effectiveness and safety. The information researched also focused on the impact of vaccination, financial and health-related, and resources for educational interventions. These topics were selected as all-inclusive areas of interest when analyzing PNA immunization, overarching to provide an understanding of the possible challenges preventing vaccination in older adults, as well as strategies to address the problem in similar settings.

Search Strategy

Pneumonia vaccine. A literature search was completed using PubMed, CINAHL, and MEDLINE. The search strategy includes keywords: Pneumococcal vaccine, older adults, elderly, seniors, geriatrics. The parameters of the search contained articles published in the English language within the last five years. Peer-reviewed articles and full-text articles were considered for review. A total of 266 articles were found. After reviewing abstracts and synopsis, 15 articles were selected. Articles with lower Melnyk level of evidence or opinions were excluded, from the remaining collection, the project leader chose articles in different categories with higher Melnyk level of evidence. The first 15 articles with these characteristics

were selected. These articles encompass the broad spectrum of the project and help understand the need for a project to increase pneumococcal vaccination rate in primary care and its impact on the older population.

Audit and feedback. A literature search was also completed using the same databases utilizing the keywords *audit* and *feedback*. The parameters of the search contained articles published in the English language within the last ten years. Peer-reviewed articles and full-text articles were considered for review. A total of 3043 articles were found, further evaluation of articles for systematic reviews and meta-analysis yielded 161 articles. After reviewing abstracts and synopsis, four articles were selected based on the level of evidence and the use of both, audit and feedback in clinical practice.

Critical Appraisal

Pneumonia vaccine. The articles selected were analyzed individually, and as a whole; the appraisal was completed using the Melnyk Levels of Evidence. From the 15 articles selected, five articles were level one, indicating systematic review, meta-analysis, and guidelines. One article was level two, a random controlled trial (RTC). The next six articles belong to level four, describing cohort studies or pilot tests. From the last three articles, one is level five and two are level seven. These articles are used to provide background information to evaluate possible educational content. A table of evidence for each article is located in Appendix A. Some of the research analyzed was developed in foreign countries, which could pose some limitations. Data analysis is also performed utilizing current CDC guidelines, which help ground clinical practice in the United States.

The FDA licensed PCV13 in 2010 based on studies comparing serological response in children who received PCV13 to PCV7 (CDC, 2017a). Immunogenicity and vaccine efficacy in

older adults was conducted in the CAPiTA trial from 2008 to 2013 (CDC, 2017a). Evidence from this trial provided signs suggesting benefits of PCV13 vaccination in older adults, resulting in lower IPD incidence among unvaccinated persons of all ages (CDC, 2017a). Vaccination with PPSV23 shows that more than 80% of healthy adults vaccinated develop antibodies against the serotypes contained in the vaccine, with an immune response within two to three weeks (CDC, 2017a). The CDC (2017a) indicates that older adults, as well as people with some chronic conditions or immunodeficiency, may not respond as well with antibodies declining quicker than in healthy adults. Overall, PPSV23 is 60% to 70% effective in preventing invasive disease (CDC, 2017a). The PNA vaccination rate in older adults was 63.6%, indicating that more than six out of 10 individuals were vaccinated. This group was characterized by individuals older than 75 years of age, non-Hispanic white, and not poor (CDC, 2017a), pointing to health discrepancies in the health system. Based on this evidence, the literature review will focus on vaccine immunogenicity and effectiveness, the financial and societal burden of PNA, and strategies to increase the vaccination rate in specific settings.

The systematic review by Remschmidt, Harder, Wichmann, Bogdan & Falkenhorst (2016) did not include any reports on the effectiveness of pneumococcal vaccination, the sections on immunogenicity and re-vaccination are still considered in this review. Huss et al.'s (2009) results on all-cause mortality in double-blind trials and the little evidence of vaccine protection among the elderly contradict other research. This article was analyzed, and although a level one on the Melkyn evidence grading, the results will not be included at this time. Several articles were included to take notice of the financial burden of pneumococcal disease and explore, not only the health risks of the disease but also the economic consequences, personal and societal. The article by Drijkoningen & Rohde (2014) was included to provide clinical information in the

disease process. This resource, along with the CDC and guidelines by the Infectious Diseases Society of America (IDSA) and the American Thoracic Society (ATS) (Mandell et al., 2007), provided grounded knowledge to incorporate in the educational intervention.

Audit and feedback. The articles selected were analyzed individually, and an appraisal was completed using the Melnyk Levels of Evidence. The four articles selected are level one, indicating systematic review and meta-analysis. These articles provide evidence of the effectiveness of a chart audit and feedback on the improvement of professional practice (Ivers et al., 2012)

Synthesis

Pneumonia vaccine. There were consistent reports across the articles indicating the benefits of the pneumococcal vaccine and the risks of remaining unvaccinated. Baldo et al. (2016) concluded that there is a high mortality rate among older patients admitted to the hospital for pneumonia and indicated that the PCV13 vaccine has a protective role against the disease. The study by Mangen et al. (2017) reported lower quality of life in the cohort of patients surviving hospitalization for CAP and a six fold-increase of mortality in individuals diagnosed with CAP. Literature also shows several categories, pointing at the full benefits of pneumococcal immunization. These categories include (a) healthcare cost savings, (b) health gains, (c) prevention of comorbidities, (d) risk reductions, and (d) decrease in nosocomial infections (Cafiero-Fonseca et al., 2017).

The financial burden of contracting PNA is rising. The hospitalization rate for older adults diagnosed with PNA in increasing, showing a 20% surge in the period between 1988-1990 and 2000-2002 (Vila-Corcoles & Ochoa-Gondar, 2015). Calculations of hospitalization costs due to CAP are expected to be between $7000 and $8000 per episode (Vila-Corcoles & Ochoa-

Gondar, 2015). Given these numbers and the increased elderly population, prevention is crucial. The vaccination cost for CAP is approximately $40.2 million; this amount includes pneumococcal and influenza vaccines (Brown et al., 2018).

Two articles were evaluated for innovating strategies that could be used in a primary care setting to increase the rate of pneumococcal vaccination. One study evaluated the implementation of a standing order program (SOP) for staff to assess the individuals' immunization states, ascertain if a pneumococcal vaccine is appropriate, and administer the vaccine (Nowalk et al., 2014). This approach is underutilized in primary care offices, but the proper utilization and evaluation of this tools can potentially increase the vaccination rate. Park et al. (2016) proposed the implementation of a program that would increase vaccination rates by (a) implementing a protocol, (b) staff education, (c) identification of eligible patients, and (d) automated outreach and immunization scheduling. Although the project was not implemented, it offers a protocol that could be adapted to a FQHC. One major challenge would be the financial resources to implement and sustain the plan.

Finally, and most relevant, is the data pertaining to vaccine efficacy and effectiveness. Studies by Falkenhorst et al. (2017) and Mandell et al. (2007) support the overall effectiveness of PCV23 against invasive pneumococcal disease on people over the age of 65 years. The article describing the guidelines by the DSA and ATS by Mandell et al. (2007) indicated that efficacy may decrease with age, supporting Remschmidt et al. (2016) concepts of re-vaccination. The use of PCV13 is also reinforced as safe and effective by Deursen et al. (2018), reducing the first episode of CAP and IPD.

Audit and feedback. The Cochrane review of audit and feedback (Ivers et al., 2012) concluded that this process could lead to small but potentially important improvement in

professional practice. This analysis was supported by the subsequent secondary analysis by Ivers et. al (2014), also indicating that audit and feedback is most effective in specific circumstances such as (a) delivered by a supervisor or respected colleague, (b) presented frequently, (c) featuring both specific goals and action-plans, (d) aiming to decrease the targeted behavior, (e) baseline performance is lower, and (f) recipients are non-physicians. Colquhoun et al. (2013) also utilized the Cochrane review to evaluate the use of theories in the development and implementation of audits and feedback. The results from the analysis indicated that the explicit use of theories was rare (Colquhoun et al., 2013). Tuti et al. (2017) aimed at determining the effectiveness of electronic audit and feedback and encountered that given the heterogeneity of the studies, the effects of using an electronic approach was highly variable.

Conceptual Framework/Model

The Iowa Model was used as a conceptual framework for this project. This model provides a guideline for the implementation of evidence-based practice (EBP) in a variety of settings, focusing on organization and collaboration (Iowa Model Collaborative, 2017). Permission to use the framework and its tools has been obtained (Appendix E). The Iowa Model has several steps: (a) identify a problem, (b) form a team, (c) gather evidence, (d) critique and synthesize the evidence, (e) determine the validity and appropriateness of the evidence, (f) pilot change, (g) determine if the change is appropriate for practice, (h) implement, and (i) disseminate results (Iowa Model Collaborative, 2017). This model has several key features:

- Use of flowchart to guide decision-making
- Use of problem-solving steps
- Use of feedback loops to guide changes in processes
- Interdisciplinary approach (Schaffer, Sandau & Diedrick, 2013).

The first step in the Iowa Model is to identify a problem for the organization, either a problem-focused or knowledge-focus trigger (Brown, 2014). Problem-focused triggers arise from risk management and financial data, or a clinical problem; knowledge-focused triggers derive from new research findings, or new practice guidelines are identified (Brown, 2014). Once the problem is identified, the project leader needs to determine if it is a priority for the organization, issued with higher volume or higher cost will have priority and will assist in the organizational buy-in process (Brown, 2014). Then, the team is selected, with an interdisciplinary approach, to develop, evaluate and implement the EBP change (Brown, 2014). The next step is to gather and critique pertinent research and develop a problem question (Brown, 2014). At that point, the team needs to determine if sufficient research exists to implement a practice change (Brown, 2014). If there is no sufficient evidence, then further research needs to be conducted. If the data is sufficient, a pilot test can be implemented. If the intervention is successful, the change can be adapted to an organizational change (Brown, 2014) and results disseminated.

The project investigated a problem-focused issue for the organization, the low rate of pneumococcal immunization in older adults. The next step was to form a team to address this problem. The stakeholders were selected based on the topic, and were responsible for the development, implementation, and evaluation of the plan. The team leader was the DNP student. The project leader was also responsible for literature review and identifying appropriate resources. The project leader then critiqued, synthesized and evaluated the validity of data; the information used in the project was based on EBP and current clinical guidelines. The team used the CDC's recommendation and scheduled immunization guidelines as a reference for all educational interventions and resources. Once the evidence was sufficient, the project leader

designed and implemented the intervention selected. For this project, several factors needed to be taken into account (a) willingness of providers to participate in the project, (b) organizational resources, (c) time constraints, and (d) consistency between different offices. The chart audit provided aggregate and individual data to be included in the educational intervention. The aggregate data was disseminated to all providers, and each provider received individual feedback based on their audits. The interventions selected included providing evidence-based information to providers in a teaching format completed in the different locations as well as resource materials such as immunization schedules and information sheets. After the educational intervention was finalized, the providers completed a questionnaire indicating their intent to change their practice based on the information provided. The project leader then encouraged the providers to implement the knowledge provided and apply guidelines into practice. The next step in the Iowa Model was to collect and report post-intervention data. This data assisted in determining the outcomes of the project and if the implementation was appropriate for the practice. At this point, the project leader met with providers and the Chief Medical Officer (CMO) to disseminate findings and obtain input. A sustainable practice change was set to continue the analysis of performance data on a quarterly basis and report the findings during the providers' meetings.

Summary

The literature review yielded important information regarding pneumococcal immunization. The benefits of the vaccine and risk of PNA were established, but still, a large number of patients at the FQHC remain unvaccinated. The financial burden of hospitalization and the quality of life of individuals who contracted the disease increased the risks of comorbidities and mortality in the elderly population. The current guidelines of the CDC, and

recommendations by DSA and ATS encouraged the implementation of strategies to ensure pneumonia vaccination in older adults. Preventive measures are critical to ensuring that individuals over the age of 65 years are vaccinated. The literature addressed the effectiveness and efficacy of the pneumococcal immunization, but more research is needed regarding interventions to increase the vaccination rate. The purpose of this project is to increase the rate of pneumococcal immunizations in older adults in primary care. The project focused on chart audits and feedback, as well as educational interventions for providers in the FQHC to impact the number of individuals over 65 years of age vaccinated against PNA. The providers also completed a questionnaire indicating their intent to change their practice based on the information received.

SECTION THREE: METHODOLGY

Design

The EBP project followed a quasi-experimental design evaluating the rate of pneumococcal vaccination before and after the educational intervention. This EBP project also followed the Iowa Model to guide the process and decision-making. The selection of this project design is congruent when randomization is not logistically feasible in the chosen setting (Harris et al., 2006). The intervention phase was implemented in a 30-day time frame, allowing for educational interventions and the understanding and allocation of written materials provided. The project leader performed chart audits and feedback focusing on documentation related to PNA vaccination for each provider in the clinics. An intervention implementing audits and feedback is based on the assumption that healthcare professionals will modify their practice when provided with performance feedback indicating that their clinical practice is inconsistent with a specific target (Ivers et al., 2012). The intent to change practice survey was used to

determine the impact of this intervention on clinical practice. This method is more effective when the audit and feedback are provided more than once, is given verbally and in writing, and include specific targets and an action plan (Ivers et al., 2012). The educational intervention was implemented once IRB approval was completed. This educational intervention was focused on providers' practices and consisted on an instructional meeting, with information provided verbally and in written form. The rate of pneumococcal immunization in the selected population was collected pre-and post-intervention. This information was obtained utilizing Electronic Medical Records (EMR) reporting and audits.

Measurable Outcomes

- Outcome 1: Increase the aggregate pneumococcal vaccination rate in patients over the age of 65 years.
- Outcome 2: Increase in individual providers' pneumococcal vaccination rate in patients over the age of 65 years.
- Outcome 3: Provider intent to change and improve their practice based on the interventions.

Setting

The project took place at the Capital Area Health Network (CAHN), a FQHC in the Richmond area. This FQHC offers several services: primary care, mental health, wellness, dental and diabetes education. CAHN has six locations in the Richmond Area, each site provides primary care services, two locations offer dental services, and one site has mental health services. Most insurances are accepted, but a large number of patients are uninsured and underinsured. For patients who are uninsured, payment for services is based on income and determined by a sliding scale fee, ranging from $35 to $150 per appointment. A flat laboratory

fee of $15 will include all tests ordered during the appointment. The organization also accepts Virginia Coordinate Care, a program offered by the Virginia Commonwealth University Medical Center, for uninsured individuals who meet the financial qualifications. This program offers access to affordable care in the Greater Richmond Area (VCU Health, n.d.). CAHN is a community partner providing primary care services for individuals with VCC. Given the characteristics of the population, health disparities are evident, making a gap in care and lack of preventive services a crucial step for the health of the community.

CAHN is committed to improving the health of the community with preventive medicine and to eliminating health disparities (CAHN, 2018). The organization's vision is to promote social responsibility, improve health equity, and optimize the quality of life of the community (CAHN, 2018). These values support the project by utilizing preventive services to ensure older adults decrease their risk of contracting PNA and reducing the associated risks. The CMO was informed of the project in several conversations; he had verbally agreed to support the project at the last meeting on June 2018. A copy of the project site support letter is included in Appendix D.

Population

The project was comprised of a primary and secondary population. The primary population consisted of the providers in the organization, four physicians and four nurse practitioners (NP). The providers considered for the project were part of the organization during both audit periods. The participants were contacted in person, prior to the education and feedback intervention for recruitment. A recruitment and consent form was signed before initiating the chart audit process. Providers were not required to participate as a job requirement,

and their performance measures did not impact their employment. The letter of support (Appendix D) from the organization is included.

The secondary population will consist of patients 65 years and older (Table 1). Exclusion criteria will consist of individuals new to the practice after the intervention period.

Nath, Costigan & Hsia (2016) indicated that individuals attending FQHC are low income, young, uninsured or Medicaid-insured, and from racial and ethnic minorities. Data for the City of Richmond shows that in 2017, 11.5% of the population was over the age of 65 years of age, 44.2% are white, and 48.6% are African American, and 25.4% of the population live in poverty (United States Census Bureau, 2017).

Table 1.

Demographic information for patients over the age of 65 years of age.

All	1001
Gender	
Male	403
Female	598
Race	
American Indian or Alaskan Native	3
Asian	31
Native Hawaiian or other Pacific	1
Black or African American	707
White	160
Other	63
Other Pacific Islander	1
Unreported/Refused to report	32
More than one race	0
Ethnicity	
Hispanic/Latino	56
Non-Hispanic /Latino	931
Refused to report	11
Insurance	
Medicare Managed Care	144
Medicare Non-Managed Care	368

Medicaid Managed Care	17
Medicaid Non-Managed Care	4
Other public payors non-managed	102
Private non-managed care	90

Note. Patient demographics. Characteristics of patients over the age of 65 years seen in the FQHC between 01/01/2018 and 06/30/2018.

Ethical Considerations

The intervention was started after being approved by the lead institution Institutional Review Board (IRB) (Appendix B). The project leader also obtained a letter of support from the CMO (Appendix D), and a letter from the human resource department approving the project and indicating that participants will not be required to participate as a job requirement, and their performance measures will not impact their employment (Appendix E). The project leader included the certificate from the Collaborative Institutional Training Initiative (CITI) indicating completion of human research training (Appendix C).

Confidentiality was maintained at every step of the project. The reports did not include patients' identifiers. Data from the pre-and post-intervention was kept in computer files. The information was password protected and only accessible by the project leader. Electronic files were backed up regularly, and copies kept with the questionnaires. The questionnaire results were stored in a safe and secure location, a locked cabinet only accessible by the project leader. A master list (Appendix K) was being used to protect the provider's privacy. All the data collected will be store for three years, after this time, electronic data will be deleted using software designed to remove all data from the storage device. Hard copies will be shredded and

recycled. The disposal of the data will be documented indicating how and when it was completed.

Data Collection

Data collection took place at two points in time, pre-and post-intervention, 30 days apart. Data collection for the pre-intervention period was done in the same period the previous year. The reports were run by the project leader and recorded utilizing the provider identification (Appendix K) list and the chart audit form (Appendix J). The chart audit was done pre-and post-intervention as well. The project leader audited up to 15 charts for patients over the age of 65 years, selecting the first 15 charts. If a provider did not see that many patients in the secondary population, the audit was done in all patients seen. The chart audit (Appendix I) will include documentation for pneumococcal vaccines:

- Prevnar 13
- Pneumovax 23
- Historical immunization Prevnar 13
- Historical immunization Pneumovax 23
- Education provided
- Refused by patient

Tools

The organization uses E-Clinical Works (ECW) as the EMR, reports, and charts were obtained from this application. The audit process was handled via chart review and results secured in an electronic file. The feedback process is more effective when is the data is delivered verbally by a trusted source, and the feedback is anchored in an overarching quality improvement structure (Agency for Healthcare Research and Quality [AHRQ], 2017). The

feedback report was “provider friendly” and included the following components to improve effectiveness:

- Actual performance is displayed
- Reports are accompanied by a specific improvement plan that facilitates goal achievement, in this case, the educational intervention
- The report format facilitates correct interpretation and highlights important patterns in performance (AHRQ, 2017).

The Continuing Professional Development (CPD) reaction questionnaire (Appendix G) is a tool to assess the impact of CPD activities on clinical practice (Légaré et al., 2011; Légaré et al., 2014, Légaré et al., 2017). This questionnaire shows adequate validity and reliability, the Cronbach’s coefficients are 0.77 to 0.85 (Légaré et al., 2017; Légaré et al., 2014). The questionnaire is a 12-item integrated model, combining social cognitive theories for explaining healthcare providers’ clinical behaviors through the proxy of intention (Légaré et al., 2017). The questionnaire proposes three categories (a) intention to adopt a particular behavior, (b) belief about their capabilities, and (c) past behavior and habits (Légaré et al., 2017). The CPD reaction questionnaire is published with permission to use (Université Laval, 2013). The generic CPD questionnaire was adapted by replacing the word “behavior” in each item with “prescribe pneumococcal vaccine.” The items in the questionnaire are precoded with Likert-type scale values (Table 2) (Légaré et al., 2017). The item score ranges from one to seven with assigned values, strongly disagree=1, strongly agree=7; never=1, always=7 (Légaré et al., 2017) (Appendix H).

Table 2.

Summary of CPD-Reaction questionnaire scores on items and constructs.

Construct scale	Items[a]		Responses choices	Pre-coded item value[b]	Final item score[c]	Score by construct[d]
Intention	I_1	I intend to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	$(I_1+I_7)/2$
	I_7	I plan to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Social influence	I_2	To the best of my knowledge, the percentage of my colleagues who [*behavior*] is…	0–20%	1	1.4	$(I_2+I_6+I_9)/3$
			21–40%	2	2.8	
			41–60%	3	4.2	
			61–80%	4	5.6	
			81–100%	5	7	
	I_6	Now think about a co-worker whom you respect as a professional. In your opinion, does he/she [*behavior*]?	Never/Always	1 to 7	1 to 7	
	I_9	Most people who are important to me in my profession [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Beliefs about capabilities	I_3	I am confident that I could [*behavior*] if I wanted to.	Strongly disagree/agree	1 to 7	1 to 7	$(I_3+I_5+I_{11})/3$
	I_5	For me, [*behavior*] would be…	Extremely difficult/easy	1 to 7	1 to 7	
	I_{11}	I have the ability to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Moral norm	I_4	[*Behavior*] is the ethical thing to do.	Strongly disagree/agree	1 to 7	1 to 7	$(I_4+I_{10})/2$
	I_{10}	It is acceptable to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Beliefs about consequences	I_8	Overall, I think that for me [*behavior*] would be…	Useless/Useful	1 to 7	1 to 7	$(I_8+I_{12})/2$
	I_{12}	Overall, I think that for me [*behavior*] would be…	Harmful/ Beneficial	1 to 7	1 to 7	

[a] Item number (e.g., I_1 = Item 1)
[b] Pre-coded item value is a Likert scale assigned value (i.e., Strongly disagree = 1, Strongly agree = 7; Never = 1, Always = 7, etc.)
[c] Final item score is the score by item for each participant (possible range scale = 1 to 7)
[d] Score by construct = mean score by construct (possible range scale = 1 to 7).
Note: for constructs with two items, no imputed values are possible. For constructs with three items, the raw score of the scale is missing if two or more items are missing. In the case of one missing item, the missing item is imputed from the mean of the two other item.

Note. CPD-Reaction questionnaire score table was retrieved from Légaré, F., Freitas, A., Trucotte, S., Bourdas, F., Jacuques, A., Luconi, F., …Labrecque, M. (2017). Responsiveness of a simple tool for assessing change in behavioral intention after continuing professional development activities. PLos, One, 12(5), e0176678. doi: 10.1371/journal.pone.0176678

Intervention

Pre-intervention.

- The preconception of the project originated from conversations with other providers who acknowledged the gap in preventive services related to pneumococcal vaccines in the older population of the center.

- In May 2018, the project leader consulted with the CMO regarding the implementation of a scholarly project to increase the rate of pneumococcal vaccines in patients over the age of 65 years.
- The CMO verbally agreed to the project and produced a letter of support (Appendix D).
- A preliminary report was requested from the IT department to determined rates of pneumococcal vaccination for adults over 65 years of age between January 1, 2018, and June 30, 2018. This information was used when discussing the initiative and needs assessment in care.
- The recruitment process took place before the initiation of the chart audit process at each provider's office. Providers willing to participated signed a consent form (Appendix L).
- The educational intervention was conducted via a presentation where the project leader visited the different clinics on a selected day to engage with the providers and complete the intervention.
- The information for this presentation includes current pneumococcal vaccination rates and recommendation by the CDC, the IDSA and the ATS (Mandell et al., 2007).
- A chart audit was completed before the educational intervention to identify current practices by providers, feedback of these results was included in the educational session along with current guidelines.

Intervention.

- This stage of the process was grounded in the educational intervention to increase awareness of the current status of pneumococcal vaccination and the need to improve preventive services.

- The presentation took place at each office; the project leader met with the providers and presented the information, in verbal and written form.
- After the educational intervention, the providers completed the CPD reaction questionnaire.

Post-intervention.

- After the intervention was completed, the project leader began the data analysis.
- The analysis focused on the effectiveness of this intervention and future applicability and sustainability if successful.
- Once data was analyzed, results evaluated and implication determined, the dissemination process began.
- Project results were shared with providers and the CMO. Individual provider's measures were not shared with the organization or other providers.
- Each provider received a report with their vaccination rate for self-assessment.

Data Analysis

Pneumococcal vaccination rate in the organization. The data analysis for this outcome was completed by comparing the pneumococcal vaccination rate before and after the intervention. The data obtained from the chart review and the EMR report included (a) number of patients with documented pneumococcal vaccine in the chart, either PCV13 or PPSV23, (b) number of patient with a documented history of receiving either PCV13 or PPSV23, (c) number of patient receiving PNA vaccine education, and (d) number of patients refusing to receive the vaccine. This data allowed analyzing the impact of the intervention in the ordering and administering of the vaccine.

Pneumococcal vaccination rate for each provider. The data analysis for this outcome was completed by comparing the pneumococcal vaccination rate before and after the intervention for each provider's panel. The data obtained from the chart review and the EMR report included (a) number of patients with documented pneumococcal vaccine in the chart, either PCV13 or PPSV23, (b) number of patient with a documented history of receiving either PCV13 or PPSV23, (c) number of patient receiving PNA vaccine education, and (d) number of patients refusing to receive the vaccine.

Provider intent to change and improve their practice based on the interventions. The data analysis for this outcome was completed by analyzing the results of the CPD questionnaire. This information determined if the chart review, feedback, and educational intervention precipitated a change in practice with PNA vaccination.

SECTION FOUR: RESULTS

This section presents the results of the data analysis, including the qualitative analysis of the chart audit results and the CPD questionnaire. The demographic data is described for the primary population. Key findings are highlighted based on the project outcomes.

The primary population consisted of eight providers (*n*=8), four physicians and four NPs, in the pre- and post-intervention periods. The sample size for the secondary population pre-intervention was *n*=96 patients, while post-intervention was *n*=120 patients. The chart audit pre-intervention was completed between December 4, 2017, and January 4, 2018. The chart audit post-intervention was completed between December 4, 2018, and January 4, 2019. One provider left the practice before the intervention took place. The CPD questionnaire was completed by providers on December 3, 2018, the same day the intervention took place. A total of eight

participants (*n*=8) completed the CPD questionnaire after the educational intervention, with a response rate of 100%. One questionnaire had three answers not selected with a comment noted.

Objective One: Increase Aggregate Pneumococcal Vaccination Rate

The documented pneumococcal vaccination rate pre-intervention in the organization was *n*=2, with Prevnar (*n*=1) and Pneumovax (*n*=1) vaccines documented as given during this time frame (Figure 1). The documented vaccination rate of historical pneumococcal vaccine was *n*=20 (Figure 2). From this group, Prevnar (*n*=6) and Pneumovax (*n*=14) were received the vaccines in the past.

The post-intervention audit shows *n*=13 individuals received a pneumococcal vaccine during the post-intervention period (Figure 1). From this population, Prevnar (*n*=10) and Pneumovax (*n*=3) were received during the post-intervention period. The documented vaccination rate of historical pneumococcal vaccine was *n*=36 (Figure 2). From this group, Prevnar (*n*=15) and Pneumovax (*n*=21) were documented as received in the past.

Figure 1. Pneumococcal vaccines documented pre- and post-intervention.

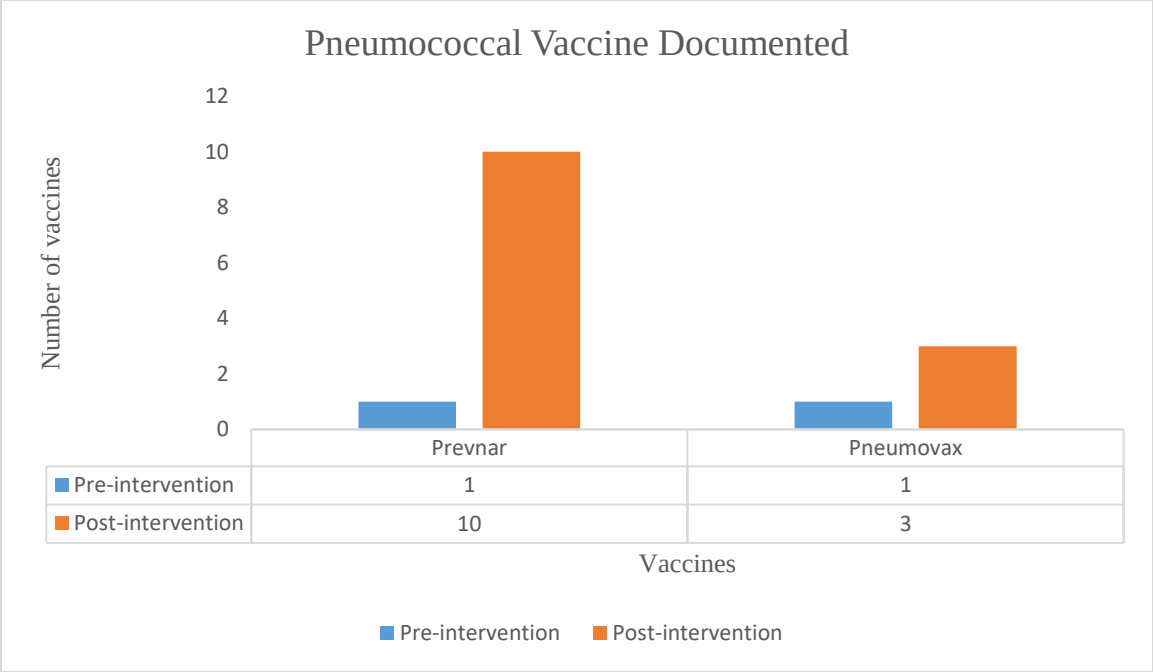
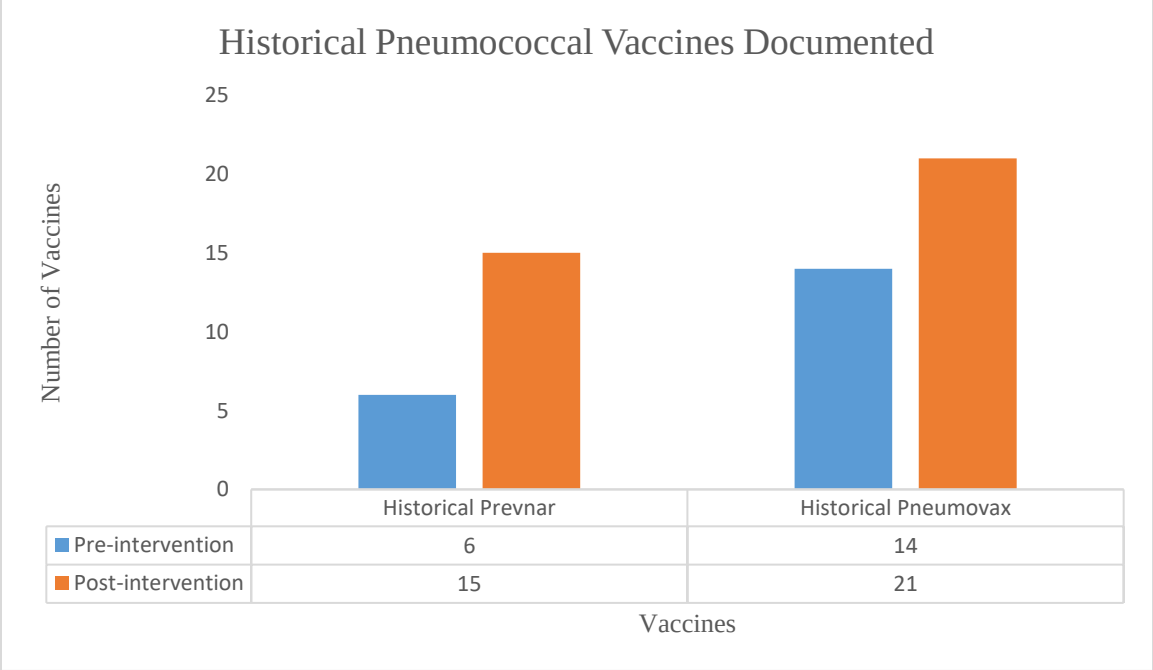


Figure 2. Historical pneumococcal vaccines documented pre- and post-intervention.



Objective Two: Increase Individual Pneumococcal Vaccination

The individual outcome showed that four providers (*n*=4) increased the administration of pneumococcal vaccines in the post-intervention period. The other four providers (*n*=4) maintain the same rates. These providers did not provide vaccination during the pre- and post-intervention periods. The historical vaccination rates were increased in five of the providers (*n*=4) while two providers (*n*=2) maintain the same rates pre- and post-intervention. One provider (*n*=1) decreased the historical vaccination rate.

Objective Three: Provider Intent to Change and Improve their Practice Based on the Interventions

The CPD questionnaire offers insight into the provider's intent to change and improve their practice based on the intervention provided. This questionnaire measures construct answers on a Likert-type scale, with scores ranging from one to seven with assigned values, strongly disagree=1, strongly agree=7; never=1, always=7. Mean scores above the midpoint reflect more favorable whereas those below the midpoint are less-favorable. One provider did not answer questions two, six and nine; instead, the provider wrote a sentence. Other scores from this provider are included in the data analysis and evaluation. The intention construct showed a score of 7, indicating a strong intent to change practice. The social influence construct yielded a score of 3.75 indicating low social influence in the ordering of pneumococcal vaccines in individual practice. The construct related to belief about capabilities showed a score of 6.83, representing a strong belief in the individual's capability to order pneumococcal vaccines. The moral norm construct displayed a score of 6.93, indicating strong moral reasoning on the needs of the vaccine. Moreover, finally, the construct belief about consequence was 7, showing a strong sense of the pneumococcal vaccine being useful and beneficial.

SECTION FIVE: DISCUSSION

This project sought to increase the rate of pneumococcal vaccine in a FQHC by implementing a chart audit and provider educational intervention. The project also aimed at assessing the provider's intent to prescribe more pneumococcal vaccines through the use of a questionnaire. It was established that pneumococcal bacteria could cause mild to severe illness, but it could also be deadly for adults over the age of 65 years of age, individuals with chronic conditions, and immunocompromised (CDC, 2017a).

Implication for Practice

The project showed an increase in pneumococcal vaccines provided to patients pre- and post-intervention (n=2, n=13 respectively). There was a noticeable increase in vaccination rates in three providers. Although the vaccination rate did not reach a goal of 100%, it is important to mention that an increase in vaccination can significantly impact the population. Even though herd immunity limits the transmission of the bacteria, specific populations like the one described in the project, do not intrinsically achieve excellent anti pneumococcal response (Berical, Harris, Cruz, Possick & Dela Cruz, 2016), evidencing the need for effective vaccination in the adult over 65 years of age population.

There was also an increase in historical vaccination between the pre- and post-intervention periods (n=20, n=36 respectively). It is unclear at this point and with the information collected the vaccination dates. It is possible that providers, who were aware of the project, were prescribing the vaccines due to their knowledge before the intervention. Regardless of the administration date, the patients benefited from an increase in vaccination. It is important to take under consideration for further research, the intervals between both vaccines, Prevnar and Pneumovax since CDC guidelines are very specific. The impetus to use Prevnar in

the elderly population was based on robust immunogenicity data and supported by the CAPiTA project (Berical et al., 2016). It is important to consider also, that as life expectancy continues to increase, this population will need to achieve vaccine efficacy in cases known to wane over time project (Berical et al., 2016) creating concerns for future public health demands.

The sample size from the pre- and post-intervention were noticeable different (*n*=96, *n*=120, respectively). In this case, some providers did not get to see 15 patients in the selected secondary population in the selected timeframe. This matter could have played a part in the lower rates noted pre-intervention.

Similar to research findings, vaccine provision was a strong predictor of individuals receiving the vaccine (Schneeberg et al., 2014). Providers documented educating patients on the importance of the vaccine and, in cases where the pneumococcal vaccine was not available, education was provided to receive the vaccine on the next office visit. This problem was noted in one of the CPD questionnaires, where one provider instead of answering questions five, indicated that the vaccine is easy to order but "the problem sometimes is getting it." This issue can be addressed in the sustainability section, where an increment in vaccines ordered can be addressed based on vaccines administered. Regardless of these problems, research shows that recommendation from a healthcare provider is a strong predictor of vaccination (Schneeberg et al., 2014) and the patient should be encouraged to receive the vaccines in the office or the pharmacy, and this should be documented.

The CPD questionnaire provided information on the intent to change practice based on the interventions provided. The results of the questionnaire provided positive feedback on the intervention, indicating a strong desire to order more pneumococcal vaccines. As mentioned previously, one provider did not answer three questions. Two of these questions belong to the

social influence construct, creating a lower than expected score. The third question was included in the beliefs about capacity construct, also lowering this score. Given this information, the results in these two categories will need to be evaluated separately.

The process of audit and feedback was successful in increasing the rate of pneumococcal vaccine in adults over the age of 65 years. This strategy was implemented to increase compliance with desire practice and improve patient outcomes (Ivers et al., 2012). A strong organizational structure and culture focused on quality improvement, and feedback can assist in professional behavioral changes (Ivers et al., 2012) by impacting the quality of care provided.

The project had several limitations. First, the pre-intervention sample size (n=96) was significantly smaller than the post-intervention sample size (n=120). Second, participants were recruited from a convenient sample, lacking randomization. Third, the project was conducted in one FQHC with limited generalizability. Four, the lack of vaccines in some locations could have hindered the capacity of the patient from receiving the vaccine. Last, the limited time for the educational intervention and feedback to providers could have an impact on the provider's enthusiasm and participation.

Sustainability

The sustainability plan to continue the practice change is influenced by the interest of the senior management and individual providers. The successful implementation of this project can encourage the CMO to include pneumococcal vaccination as an outcome measure being tracked on the provider's meetings at least every quarter. The National Committee for Quality Assurance (NCQA) has a measure to improve processes, in this case, the National Quality Strategy Domain: Community/Population Health measures the Pneumococcal Vaccination Status for Older Adults. Measures from NCQA are used by FQHC for patient-center medical homes

(PCMH) and Health Resources and Services Administration (HRSA) initiatives. One of the main concerns is feasibility. The convenience of pneumococcal vaccination is in having the necessary supplies in hand to offer patients the vaccine while they are in the office. This can be challenging from a logistic standpoint due to the number of offices within the FQHC. The organization and selected personnel need to be proactive on the vaccines ordering process and have a delegated person to address the needs in the different offices. Offering and ensuring patients are vaccinated is a cultural change within an organization. Any nursing staff member can perform this task. The sustainability plan can also include nurses assessing if a vaccine was received or if it is needed and documenting it in the patient's chart. This task can be addressed during the flu season when asking the patient if they would like to receive both vaccines, influenza and pneumococcal.

Dissemination Plan

The dissemination of the project results took several steps. First, providers were met individually and provided with a post-intervention feedback report. This report incorporated the pre- and post-intervention vaccination rates individually and aggregate. This printed report was given to each provider to keep. The aggregate results were also discussed in the monthly provider's meeting. A discussion of the project took place, guided by the CMO and feedback was presented to improve future endeavors.

Other nursing staff also became part of the audience for the dissemination plan. The morning huddle meetings were selected to report the project results. This aimed at incorporating the organization in the project and a step in the direction of cultural change. No written information was provided, but a verbal report of the improvement in pneumococcal vaccination was given.

Pneumococcal disease is a potential healthcare concern that could be prevented with the use of recommended vaccinations. Focusing on the pneumococcal vaccination rate in the FQHC addresses a cultural change to advance patient and provider outcomes. The use of a chart audit, provider education, and feedback were successful at increasing the knowledge and the intent to change and improve clinical practice, as well as significantly impacting the health of the community.

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APPENDICES

Appendix A

Evidence Table

Name: Mara Dominguez

Clinical Question: In providers working at an FQHC (P), how does an educational intervention providing evidence-based information on pneumococcal immunizations (I), addresses pneumococcal vaccination in older adults (O)?

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Mangen, M. J., Huijts, S. M., Bonten, M. M., & de Wit, G. A.	To quantify the difference in health-related quality of life of	Cost, Health status and Outcomes of CAP (CHO-CAP) was	A matched cohort study, nested in a prospective randomized,	The one-year quality-adjusted life years and health-related	Level 4-cohort study.	Possible healthy participant effect, where healthier	I would consider this evidence to support a change in

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
(2017). The impact of community-acquired pneumonia on the health-related quality-of-life in elderly. *BMC Infectious Diseases, 17*1	elderly with and without community-acquired pneumonia (CAP) during a 12-month period.	executed parallel to the Community-Acquired Pneumonia Immunization trials in Adults (CAPiTA). CAPiTA participants were	double-blind placebo-controlled trial evaluating the effectiveness of a 13-valent pneumococcal vaccine in individuals older than 65 years of age.	quality of life were lower for CAP patients. Mortality in the follow-up year was 8.4% for CAP patients and 1.2% for non-diseased people.		participants were willing to participate versus non-responding CAP patients.	combination with the CAPiTA results to provide a more comprehensive understanding of immunizations.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
-9. doi:10.1186/s12879-017-2302-3		approached at the time of vaccination to participate in the CHO-CAP study. Health-related quality of life was assessed in 562 individuals hospitalized	Health-related quality of life was determined one to two weeks after hospital discharge and one, six, and 12 months after that. One year				

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
		with suspected CAP and 1145 unaffected person matched to pneumonia cases on age, sex, and health status.	quality-adjusted life years were estimated for diseased and non-diseased cohorts				
Baldo, V.,	To examine	Individuals 65	Retrospective	The one-year	Level 4.	Limitations	The

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Cocchio, S., Gallo, T., Furlan, P., Romor, P., Bertoncello, C., & ... Baldovin, T. (2016). Pneumococcal Conjugated Vaccine Reduces the	the role of anti-pneumococcal vaccination as a factor associated with pneumonia-related mortality at one year.	years old and older hospitalized with CAP were enrolled in their first hospitalization. 4766 individuals were identified, after	observational cohort study. Individuals were assigned to three groups: Not vaccinated, PPV23 and PCV13. Patients were followed up at one year and	survival rate after hospitalization was 83.6% in the unvaccinated group, 85.9% in the PPV23 group and 89.3% in the PVC12 group. The risk of		include (a) small sample for the PCV13 vaccine group and (b) hospital discharge records lacking microbiology data.	information supports the use of OVC 13 as a protective agent against pneumococcal disease.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
High Mortality for Community-Acquired Pneumonia in the Elderly: an Italian Regional Experience. *Plos ONE*, *11*(11), 1-11.		exclusion criteria, 4030 participants were divided into three groups.	the outcome investigated was mortality.	death to pneumonia increase with age, shorter hospital stay, and male gender.			

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
doi:10.1371/journal.pone.0166637							
Falkenhorst, G., Remschmidt, C., Harder, T., Hummers-Pradier, E., Wichmann, O., &	To evaluate the efficacy and effectiveness of PPV23 against invasive pneumococcal	Search pertinent clinical trials and observational studies in databases MEDLINE,	Systematic review and meta-analysis, using the Cochrane Risk for Bias tool and the Newcastle-	Significant vaccine effectiveness/ efficacy of PPV23 against invasive pneumococcal	Level 1: systematic review and meta-analysis.	Limitations include (a) use of only two random clinical trials in a specific population in Japan, (b)	The information will be used to support PPV23 use in clinical practice and the project.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Bogdan, C. (2017). Effectiveness of the 23-Valent Pneumococcal Polysaccharide Vaccine (PPV23) against Pneumococcal Disease in the	disease and pneumococcal pneumonia in adults older than 60 years of age living in industrialized countries.	EMBASE, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systematic Reviews. 1199 articles were	Ottawa Scale, quality rated using the GRADE criteria.	disease and pneumococcal pneumonia by any serotype in the elderly. This is comparable to the efficacy of PVC13 against vaccine-serotype		wide confidence interval around the pooled vaccine effectiveness/ efficacy, and (c) available data is insufficient to determine the	

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Elderly: Systematic Review and Meta-Analysis. *Plos ONE*, *12*(1), 1-18. doi:10.1371/journal.pone.0169368		identified, 17 studies were analyzed.		disease in the recent clinical trial.		duration of protection provided by PPV23.	
Cafiero-	To assess the	5857 articles	Systematic	Most studies	Level 1.	Limitations	I would use

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Fonseca, E. T., Stawasz, A., Johnson, S. T., Sato, R., & Bloom, D. E. (2017). The full benefits of adult pneumococcal vaccination: A systematic	extent to which literature has empirically captured the benefits of adult pneumococcal vaccines.	were identified, and 150 articles were analyzed. Eligibility criteria and PICO criteria were described.	review and meta-analysis. Researchers reviewed PubMed and Embase for articles regarding the full benefits of adult pneumococcal immunization,	indicated health benefits and cost savings. The studies focusing on PVC13 deal more with economic benefits.		include (a) English-only studies, (b) inability to use tools to determine bias, and (c) other vaccinations can affect the potential benefits of the	this information to support change because it provides additional data supporting the benefits of the vaccine.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
review. *Plos ONE, 12*(11), 1-23. doi:10.1371/journal.pone.0186903			a list of benefits was also provided.			pneumococcal vaccine.	
Remschmidt, C., Harder, T., Wichmann, O., Bogdan, C., &	To systematically assess the effectiveness and safety of	1164 articles were identified, and 14 were analyzed.	A systematic review in MEDLINE, EMBASE and Cochrane	None of the studies reported on effectiveness. Immunogenici	Level 1.	Limitations include (a) difficulty interpreting data due to	I would consider this information as evidence to support

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Falkenhorst, G. (2016). Effectiveness, immunogenicity, and safety of 23-valent pneumococcal polysaccharide vaccine revaccinations in the elderly: a systematic	PPSV23 revaccination.		Central Register of Controlled Trials. Articles compared the effectiveness, immunogenicity, and safety of PPSV23 as a primary versus	ty studies revealed that during the first two months' antibodies level were lower after revaccination, but no obvious differences in		differences in the composition of study and follow up, (b) high risk of bias in studies, and (c) lack of adjusted immunological data.	change in cases where past immunization is unknown.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
review. *BMC Infectious Diseases, 16*1-12. doi:10.1186/s12879-016-2040-y			revaccination dose in people 50 years and older.	antibody levels were detected. Revaccination was associated with an increased level of adverse effects; however, they			

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
				were mild and self-limiting.			
Vila-Corcoles, A., & Ochoa-Gondar, O. (2013). Preventing Pneumococcal Disease in the Elderly. *Drugs &*	To review data about the burden of pneumococcals in the elder as well as evidence of immunogenicity, efficacy, and cost-	No specific information on article selections. No mention of number of articles identified and analyzed.	This is a review article, indicates a literature search in PubMed, Scopus, and Cochrane database with specific terms.	The article describes in detail PPV23 and PCV13, immunogenicity, risk, and benefits	Level 5	No limitations mentioned.	I will not use this article to support change given the low level of evidence provided.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Aging, *30*(5), 263-276. doi:10.1007/s40266-013-0060-5	effectiveness.		No other description of methodology.				
Park, N. J., Sklaroff, L. M., Gross-Schulman, S., Hoang, K., Tran, H.,	To describe a program in the Los Angeles County Department of	The program will be implemented across more than 120 Patient-	Quasi-experiment. The design will use a three-pronged approach to	The proposed plan has not been implemented, no results to review.	Level 7	Pfizer provided funding for the project, and the patient can	I will not use this information since the program was not

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Campa, D., & ... Guterman, J. J. (2016). Innovative Strategies Designed to Improve Adult Pneumococcal Immunizations in Safety Net Patient-	Health Services to increase vaccination rates.	Centered Medical Homes (PCMH) that care for more than 450000 patients	increase vaccination: Immunization protocol with provider and staff education, an electronic algorithm to identify at-risk individuals,			only be contacted if the demographic information is accurate.	implemented. The article contains an adult immunization form indicating the protocol selected which can be used in a clinical

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Centered Medical Homes. *Population Health Management*, *19*(4), 240-247. doi:10.1089/pop.2015.0099			and automated multimodal outreach and scheduling.				setting.
Nowalk, M. P., Nolan, B.	To evaluate the use of the	Four primary care practices	The pilot test required three	PPSV rates increased	Level 4	Limitations include (a)	The information

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
D., Nutini, J., Ahmed, F., Albert, S. M., Susick, M., & Zimmerman, R. K. (2014). Success of the 4 Pillars Toolkit for Influenza and Pneumococcal Vaccination	four Pillars Toolkit, a standing order program (SOP), allowing non-providers to assess the patient's immunization status and administer	in Pennsylvania, convenient sampling.	data collection and strategies (a)qualitative data using onsite observation and interviews, (b)survey of practice staff, and (c)	overall for high-risk adults but not for older adults. Influenza vaccination increased significantly in three of four sites.		Convenient sampling, (b) unknown how well the toolkit would be adopted in offices without electronic medical records.	will be considered but not used in the project.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
in Adults. *Journal For Healthcare Quality: Promoting Excellence In Healthcare, 3 6*(6), 5-15. doi:10.1111/jhq.12020	vaccines.		vaccination rates.				

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Van Werkhoven, C. H. & Bonten, M. J. (2015). The Community-Acquired Pneumonia Immunization Trial in Adults (CAPiTA):	The article summarizes the main results of the CAPiTA study where efficacy and safety of PCV13 was assessed in immunocompetent	A total of 84,946 participants were included and enrolled between 15 September 2008 and 30 January 2010.	Subjects were randomized in a 1:1 ratio to receive PCV13 or placebo and followed up for a mean time of 4 years.	PCV13 is safe and effectively reduces the incidence of CAP and IPD in elderly over 65 years of age.	Level 2	No limitations included in this article.	I will use this information to support change due to the methodology and results.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
What is the future of pneumococcal conjugate vaccination in elderly? Future Microbiology, 10(9), 1405+. Retrieved from http://go.galeg	community-dwelling individuals of age 65 and above living in The Netherlands he most important eligibility criteria were the age of 65						

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
roup.com.ezproxy.liberty.edu/ps/i.do?p=AONE&u=vic_liberty&id=GALE%7CA430076861&v=2.1&it=r&sid=summon#	years or above, not living in a nursing home or long-term care facility and being immunocompetent						
Hoshi, S., Kondo, M., &	To address the efficiency of	All individuals	A cost-effectiveness	Compared to the current	Level 4	Limitations include (a)	I will not consider this

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Okubo, I. (2015). Economic Evaluation of Immunization Program of 23-Valent Pneumococcal Polysaccharide Vaccine and the Inclusion of 13-Valent	alternative strategies of PPSV23 programs and efficiency of PCV13 inclusion in the list of the single-dose vaccine in the national immunization	eligible for the subsidized PPSV 23.	analysis with Markiv modeling from payers' perspective. The strategies selected were (a) current PPSV23 strategy, (b) 65 to 85 years of age and (c)	PPSV 23, the 65 to 85 strategy cost less but gained less while the incremental cost-effectiveness of the 65 years and older was		insufficient data of municipalities, (b) did not consider the herd effect of PCV7 and PCV 13, and (c) did not account for the advertising	study since it deals mainly with the economic aspect of a specific vaccine.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Pneumococcal Conjugate Vaccine in the List for Single-Dose Subsidy to the Elderly in Japan. *Plos ONE, 10*(10), 1-16. doi:10.1371/journal.pone.0	program.		65 years and older.	better.		costs of manufacturers.	

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
139140							
Huss, A., Scott, P., Stuck, A. E., Trotter, C., & Egger, M. (2009). Efficacy of pneumococcal vaccination in adults: a	To evaluate the vaccine's efficacy on clinical outcomes as well as the methodologic quality of the trials.	516 articles were identified, and 22 were analyzed.	Systematic review and meta-analysis are evaluating clinical trials that compared pneumococcal polysaccharide vaccine with a control.	The results for all-cause mortality in double-blind trials were similar to those in all trials combined. There was	Level 1	Limitations include (a) erroneous diagnosis, (b)adverse events were not systematically examined as planned.	I will consider this information when planning and designing the intervention and measuring outcomes.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
meta-analysis. *CMA J: Canadian Medical Association Journal*, *180*(1), 48-58.			Researchers examined rates of pneumonia and death, taking the methodologic quality of the trials into consideration.	little evidence of vaccine protection among elderly patients or adults with chronic illness in analyses of all trials.			
Schneeberg, A., Bettinger,	To improve the	863 participants	Cross-sectional	58% of participants	Level 4	Participants received the	I will use this information

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
J. A., McNeil, S., Ward, B. J., Dionne, M., Cooper, C., & ... Halperin, S. A. (2014). Knowledge, attitudes, beliefs, and behaviors of older adults	understanding of factors influencing vaccination.	completed the survey, inclusion and exclusion criteria were included.	study where a self-administered survey was completed by seniors participating in a clinical trial of seasonal influenza vaccine at	indicated receiving the pneumococcal vaccine. The stronger factors were being offered the vaccine by the primary care provider. Other variables		influenza vaccine, meaning they are agreeable with immunization.	when considering educational material.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
about pneumococcal immunization, a Public Health Agency of Canada / Canadian Institutes of Health Research Influenza			eight centers in Canada.	influencing the decision of receiving the vaccine include having heard about it and agreeing with its importance.			

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Research Network (PCIRN) investigation. *BMC Public Health*, *14*(1), 1-16. doi:10.1186/1471-2458-14-442							
Mandell, L.	The article is	The	The process	The	Level 1	No specific	I will use this

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
A., Wunderink, R. G., Anzueto, A., Bartlett, J. G., Campbell, G. D., Dean, N. C., & ... Whitney, C. G. (2007). Infectious Diseases	a guideline by the Infectious Diseases Society of America (IDSA) and the American Thoracic Society (ATS) to be used by primarily for use by	guidelines recommendation are graded and the strength evaluated.	of guideline development started with the selection of committee co-chairs by the presidents of the IDSA and ATS, as well as other leaders in the respective	guidelines address (a) site of care decisions, (b) diagnostic testing, (c) antibiotic treatment, (d) other treatment recommendations, (e)		limitations noted.	evidence to support change since it is a recommendation by two organizations and the data provided is based on evidence-based

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in	emergency medicine physicians, hospitalists, and primary care practitioners.		societies.	unresponsive to treatment, and (f) prevention.			practice.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
adults. *Clinical Infectious Diseases: An Official Publication Of The Infectious Diseases Society Of America, 44 Suppl 2*S27-S72.							

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Brown, J. D., Harnett, J., Chambers, R., & Sato, R. (2018). The relative burden of community-acquired pneumonia hospitalizatio	To compare the financial burden of CAP with other illnesses.	A total of 1,949,352 individuals were included in the study; inclusion criteria are as followed: Adults aged 65 to 89 years with	This retrospective cohort analysis of claims between 2014 and 2015 and compared Hospitalizatio n for CAP to myocardial	Overall, CAP had a higher burden of hospitalizatio n with disproportiona te prevention efforts.	Level 4	Limitations include (a) lack of certain information in the database and errors or omissions in claims coding, (b) data from a single insurer, (c)	I will use this information to support the project since it provides information on the lack of prevention.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
ns in older adults: a retrospective observational study in the United States. *BMC Geriatrics, 18* (1), 92. doi:10.1186/s12877-018-0787-2		continuous Medicare Advantage with Prescription Drug Plan (MAPD) enrollment in the dates of the study.	infarction, stroke, and osteoporotic fractures.			limited the cohort to members who did not have one or more hospitalizations in 2014, and (d) primary hospital diagnosis.	

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Drijkoningen, J.C. & Rohde, G U. (2014). Pneumococcal infection in adults: Burden of disease. Clinical Microbiology and Infection,	The article provides detail information on the different aspects of the pneumococcal disease.	No sample.	No specific methods described, the article provides clinical information.	No results.	Level 7	No limitations described.	The information in this article provides an understanding of the pneumococcal disease.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
20, 545-51. Doi: 10.1111/1269-0691.12461							
Tuti, T., Nzinga, J., Njoroge, M., Brown, B., Peek, N., English, M., & ... van der	The assess the effectiveness of electronic audit and feedback (e-A&F) interventions	Researchers analyzed seven studies comprising of 81,700 patients being cared for by	Systematic analysis. Data were extracted by two independent review	Given the high heterogeneity of identified studies, the effects of e-A&F were	Level 1	Limitations include (a) use of electronic intervention as a keyword, and (b)	I will use this evidence in the project, indicating that electronic audit and feedback is

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Veer, S. N. (2017). A systematic review of electronic audit and feedback: intervention effectiveness and use of behaviour change	in primary care and acute care and to identify theoretical mechanisms of behavior change.	329 healthcare professionals/ primary care facilities. E-A&F interventions were described as a summary of clinical performance	authors, who determined the domains within the Theoretical Domains Framework (TDF). Authors completed a meta-analysis of e-A&F	found to be highly variable.		included five studies in the meta-analysis regardless of their risk of bias.	variable, and will not be recommended for this project.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
theory. *Implementation Science, 12*1-20. doi:10.1186/s13012-017-0590-z		delivered through an interactive computer interface to healthcare providers.	effectiveness and a narrative analysis of the nature and patterns of TDF domains and potential links with the intervention effect.				
Ivers, N.,	To assess the	140 studies	Systematic	Audit and	Level 1		I will use this

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Jamtvedt, G., Flottorp, S., Young, J. M., Odgaard-Jensen, J., French, S. D., & ... Oxman, A. D. (2012). Audit and feedback: effects on professional	use of audit and feedback on clinical practice and patient outcomes, as well as to examine the factors that might explain its variation in effectiveness.	were included in the review, with 82 comparisons from 49 studies with dichotomous outcomes included in the primary analysis. Inclusion and	review of randomized controlled trials of audit and feedback. Risk of bias and the effects of interventions were discussed in detail.	feedback lead to small but potentially important improvements in professional practice. Its effectiveness depends on how the feedback is			article to support the use of audit and feedback as an intervention in the project.

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
practice and healthcare outcomes. *The Cochrane Database Of Systematic Reviews*, (6), CD000259. doi:10.1002/14651858.CD000259.pub3		exclusion criteria were included.		provided.			
Ivers, N. M.,	The purpose	Of the 140	Systematic	Feedback	Level 1	The limitation	Yes, I will use

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Grimshaw, J. M., Jamtvedt, G., Flottorp, S., O'Brien, M. A., French, S. D., & ... Odgaard-Jensen, J. (2014). Growing literature, stagnant	of this article is to expand the findings of the Cochrane systematic review of audit and feedback to explore the estimate of effect over time and	randomized clinical trials (RCTs) included in the Cochrane review, 98 comparisons from 62 studies met the criteria for inclusion. The cumulative	Review, this article is a secondary analysis of data from the previously published Cochrane systematic review of audit and feedback.	appears most effective when: delivered by a supervisor or respected colleague; presented frequently; featuring both specific goals and action-		mentioned in the article was that the clinical topic and context could potentially impact the effectiveness of the intervention.	this evidence to support the use of chart audit and feedback as an intervention in the project.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
science? Systematic review, meta-regression and cumulative analysis of audit and feedback interventions in health care. *Journal Of General*	assess for new research to add knowledge regarding this process.	analysis indicated that the effect size became stable in 2003 after 51 comparisons from 30 trials.	The effect size across studies was recalculated as studies were added to the cumulative analysis.	plans; aiming to decrease the targeted behavior; baseline performance is lower, and recipients are non-physicians.			

Article Title, Author, etc. (Current APA Format)	**Study Purpose**	**Sample (Characteristics of the Sample: Demographics, etc.)**	**Methods**	**Study Results**	**Level of Evidence (Use Melnyk Framework)**	**Study Limitations**	**Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.**
Internal Medicine, 29(11), 1534-1541. doi:10.1007/s 11606-014-2913-y							
Colquhoun, H. L., Brehaut, J. C., Sales, A.,	This study aimed to determine the extent to	A total of 140 studies in the 2012 Cochrane	A systematic review of the use of theory in the studies	The explicit use of theory in studies of audit and	Level 1	Our inclusion criteria limited our focus to	I will not use this article in the project; no theory is

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
Ivers, N., Grimshaw, J., Michie, S., & ... Eva, K. W. (2013). A systematic review of the use of theory in randomized controlled trials of audit and	which theory was explicitly reported in studies incorporated in the Cochrane review of 2012. Also to consider the types of theories used	update on audit and feedback interventions were independently reviewed by two investigators. Researchers extracted data related to the	included in the Cochrane review. Theory name, associated reference, and the location of theory use as reported in the study were extracted. Theories were	feedback was rare. Rogers' Diffusion of Innovations and Bandura's Social Cognitive Theory were the most widely used (3.6% and 3%,		randomized controlled trials, and we only utilized what was included in the study report alone. It is possible that study authors did incorporate	incorporated into the project and evidence is not supporting its use.

Article Title, Author, etc. (Current APA Format)	Study Purpose	Sample (Characteristics of the Sample: Demographics, etc.)	Methods	Study Results	Level of Evidence (Use Melnyk Framework)	Study Limitations	Would Use as Evidence to Support a Change? (Yes or No) Provide Rationale.
feedback. *Implementation Science*, *8*(1), 1-8. doi:10.1186/1748-5908-8-66	and its purpose.	use of theories in the study designs.	organized by type and theory utilization.	respectively)		theory into their study, but did not report it in the article, or only provided limited detail	

Appendix B

IRB Approval Documentation

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

November 14, 2018

Mara Dominguez
IRB Approval 3524.111418: Increase in Pneumococcal Vaccination in Adults Over 65 Years of Age in a Federally Qualified Health Center

Dear Mara Dominguez,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

5. Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis). (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(4). This listing refers only to research that is not exempt.)

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

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UNIVERSITY.
Liberty University | Training Champions for Christ since 1971

Appendix C

CITI Certificate

CITI PROGRAM

Completion Date 02-Jun-2018
Expiration Date 01-Jun-2021
Record ID 27333263

This is to certify that:

Mara Dominguez

Has completed the following CITI Program course:

Biomedical Research - Basic/Refresher (Curriculum Group)
Biomedical & Health Science Researchers (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Liberty University

CITI
Collaborative Institutional Training Initiative

Appendix D

Letter of Support from the Organization

CAPITAL AREA cahn HEALTH NETWORK

Our Mission

To provide effective, accessible and culturally responsive patient care, education and advocacy that promote health and quality of life for all residents in Metropolitan Richmond.

Vernon J. Harris Medical and Dental Center
719 N. 25th Street
Richmond, VA 23223

Bermuda Medical Center
2740 Bensley Commons Blvd.
North Chesterfield, VA 23237

Glenwood Medical and Dental Center
2711 Byron Street
Richmond, VA 23223

Southside Medical Center
101 Cowardin Ave., Suite 102
Richmond, VA 23224

Northside Medical Center and Corporate Office
2809 North Ave.
Richmond, VA 23222

Greater Fulton Community Medical Center
1718 Williamsburg Rd
Richmond, VA 23223

Capital Area Health Network Corporate Office
P.O. Box 27947
Richmond, VA 23261
804-780-0840

cahealthnet.org

August 8, 2018

Attention: IRB
Liberty University
Lynchburg, Virginia

IRB Members:

Mrs. Dominguez, MSN, AGNP-C, Liberty University Doctor of Nursing Practice Student has proposed to conduct Mrs. Dominguez Doctor of Nursing Practice Scholarly Project: Increase in pneumococcal immunization in adults over 65 years of age in a Federally Qualified Health Center.

Capital Area Heath Network (CAHN) is committed to providing the most advanced, comprehensive care for our patients, facilitated by the pursuit of quality improvement. Mrs. Dominguez' Scholarly Project aligns with our commitment that every patient receives the ultimate quality health care.

CAHN is pleased to support Mrs. Dominguez' Scholarly Project Proposal: Increase in pneumococcal immunization in adults over 65 years of age in a Federally Qualified Health Center.

Please feel free to contact me if I can be of further assistance.

Respectfully,

[redacted]

Dr. Torrio Jennings
Chief Medical Officer
804-780-0840

We Are the Heart of the Community

Appendix E

Human Resources Letter of Approval

From: Mara Dominguez
Sent: Friday, September 28, 2018 10:36:56 AM
To: Takeisha Brown
Subject: Support for scholarly project

Dear Mrs. Brown,

I am writing this email to let you know about the scholarly project I will be conduction in the upcoming months. I have already received a Support Letter from Dr. Jennings, the Chief Medical Officer, approving this project. The project is evidence-based practice and will focus on increasing pneumonia vaccination rate in adults over the age of 65 year old. I will be doing an educational intervention along with chart audits and providing performance feedback to providers. The providers will not be required to participate as a job requirement, and their performance measures will not impact their employment.

Please respond to this email indicating your support.

Mara Dominguez NP-C

From: Takeisha Brown
Sent: Monday, October 1, 2018 4:35 PM
To: Mara Dominguez
Subject: Re: Support for scholarly project

Good afternoon Mara,

I stand in agreement with Dr. Jennings, and you have my support in this scholarly project.

Thank you in advance for the work you will do!

Sincerely,

Takeisha Brown | Human Resources Director
CAPITAL AREA HEALTH NETWORK
P.O. BOX 27947 | Richmond, VA 23261-7947
t (804) 780.0840 x1851 | f (804) 420-1151
website | map | email

Appendix F

Permission to Use the Iowa Model

Kimberly Jordan - University of Iowa Hospitals and Clinics <noreply@qualtrics-survey.com>

Reply all

Sat 6/9, 8:16 PM
Dominguez, Mara J

Flag for follow up. Start by Tuesday, July 03, 2018. Due by Tuesday, July 03, 2018.

Action Items

You have permission, as requested today, to review and/or reproduce *The Iowa Model of Evidence-Based Practice to Promote Quality Care (Revised 1998).* Click the link below to open.

The Iowa Model of Evidence-Based Practice to Promote Quality Care (Revised 1998)

Copyright is retained by University of Iowa Hospitals and Clinics. **Permission is not granted for placing on the internet.**

Citation: Titler, M. G., Kleiber, C., Steelman, V. J., Rakel, B.A., Budreau, G., Everett, L. Q., ...Goode, C. J. (2001). The Iowa model of evidence-based practice to promote quality care. *Critical Care Nursing Clinics of North America, 13*(4), 497-509.

In written material, please add the following statement:
Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 1998. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098 .

Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

Appendix G

CPD Reaction Questionnaire

Title of the activity Date

Please answer each of the following questions by indicating the number that best describes your opinion about the behavior indicated . Some of the questions may appear to be similar, but they do address somewhat different aspects of the behavior stated.

1. I intend to *[behavior]*.
   Stongly disagree 1 2 3 4 5 6 7 Stongly agree
2. To the best of my knowledge, the percentage of my colleagues who *[behavior]* is:
   0-20% 21-40% 41-60% 61-80% 81-100%
3. I am confident that I could *[behavior]* if I wanted to.
   Stongly disagree 1 2 3 4 5 6 7 Stongly agree
4. *[Behavior]* is the ethical thing to do.
   Stongly disagree 1 2 3 4 5 6 7 Stongly agree
5. For me, *[behavior]* would be:
   Extremely difficult 1 2 3 4 5 6 7 Extremely easy
6. Now think about a co-worker whom you respect as a professional. In your opinion, does he/she *[behavior]*?
   Never 1 2 3 4 5 6 7 Always
7. I plan to *[behavior]*.
   Strongly disagree 1 2 3 4 5 6 7 Strongly agree
8. Overall, I think that for me *[behavior]* would be:
   Useless 1 2 3 4 5 6 7 Useful
9. Most people who are important to me in my profession *[behavior]*.
   Stongly disagree 1 2 3 4 5 6 7 Stongly agree
10. It is acceptable to *[behavior]*.
    Stongly disagree 1 2 3 4 5 6 7 Stongly agree
11. I have the ability to *[behavior]*.
    Stongly disagree 1 2 3 4 5 6 7 Stongly agree
12. Overall, I think that for me *[behavior]* would be:
    Harmful 1 2 3 4 5 6 7 Beneficial

*[behavior]** to be adapted for each CPD activity according to the objectives proposed for the activity

The CPD reaction questionnaire development was funded by a Partnership for Health System Improvement grant from the Canadian Institutes of Health Research (CIHR; 2010-2013; grant # 200911PHE-216868-PHE-CFBA-19158) and by the Ministère de la Santé et des Services Sociaux du Québec (MSSS), QC, Canada.

Appendix H

CPD Reaction Questionnaire Scores on Items and Constructs

Construct scale	Items[a]		Responses choices	Pre-coded item value[b]	Final item score[c]	Score by construct[d]
Intention	I_1	I intend to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	$(I_1+I_7)/2$
	I_7	I plan to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Social influence	I_2	To the best of my knowledge, the percentage of my colleagues who [*behavior*] is…	0–20%	1	1.4	$(I_2+I_6+I_9)/3$
			21–40%	2	2.8	
			41–60%	3	4.2	
			61–80%	4	5.6	
			81–100%	5	7	
	I_6	Now think about a co-worker whom you respect as a professional. In your opinion, does he/she [*behavior*]?	Never/Always	1 to 7	1 to 7	
	I_9	Most people who are important to me in my profession [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Beliefs about capabilities	I_3	I am confident that I could [*behavior*] if I wanted to.	Strongly disagree/agree	1 to 7	1 to 7	$(I_3+I_5+I_{11})/3$
	I_5	For me, [*behavior*] would be…	Extremely difficult/easy	1 to 7	1 to 7	
	I_{11}	I have the ability to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Moral norm	I_4	[*Behavior*] is the ethical thing to do.	Strongly disagree/agree	1 to 7	1 to 7	$(I_4+I_{10})/2$
	I_{10}	It is acceptable to [*behavior*]	Strongly disagree/agree	1 to 7	1 to 7	
Beliefs about consequences	I_8	Overall, I think that for me [*behavior*] would be…	Useless/Useful	1 to 7	1 to 7	$(I_8+I_{12})/2$
	I_{12}	Overall, I think that for me [*behavior*] would be…	Harmful/ Beneficial	1 to 7	1 to 7	

[a] Item number (e.g., I_1 = Item 1)
[b] Pre-coded item value is a Likert scale assigned value (i.e., Strongly disagree = 1, Strongly agree = 7; Never = 1, Always = 7, etc.)
[c] Final item score is the score by item for each participant (possible range scale = 1 to 7)
[d] Score by construct = mean score by construct (possible range scale = 1 to 7).
Note: for constructs with two items, no imputed values are possible. For constructs with three items, the raw score of the scale is missing if two or more items are missing. In the case of one missing item, the missing item is imputed from the mean of the two other item.

Note. Retrieved from Légaré, F., Freitas, A., Trucotte, S., Bourdas, F., Jacuques, A., Luconi, F., …Labrecque, M. (2017). Responsiveness of a simple tool for assessing change in behavioral intention after continuing professional development activities. PLos, One, 12(5), e0176678. doi: 10.1371/journal.pone.0176678

Appendix I

CPD Questionnaire Permission to Use

The CPD reaction questionnaire development was funded by a Partnership for Health System Improvement grant from the Canadian Institutes of Health Research (CIHR; 2010-2013; grant # 200911PHE-216868-PHE-CFBA-19158) and by the Ministère de la Santé et des Services Sociaux du Québec (MSSS), QC, Canada.

CPD-KT research team
France Légaré MD, PhD – Université Laval
Francine Borduas MD – Université Laval
André Jacques MD – Collège des Médecins du Québec
Francesca Luconi PhD –McGill University
Gaston Godin PhD – Université Laval
Michel Labrecque MD, PhD – Université Laval
Michel Rousseau PhD – Université du Québec à Trois Rivières
Jeremy Grimshaw PhD – University of Ottawa
Joan Sargeant PhD –Dalhousie University
Andrée Boucher MD – Université de Montréal
Gilles Voyer MD – University of Sherbrooke
Réjean Laprise PhD – Fédération des médecins spécialistes du Québec

Project coordinator: Adriana Freitas PhD

The CPD-KT research team thanks all the partners of this project who contributed to the development of The CPD Reaction Questionnaire.

Partners of the research project
Fédération des médecins spécialistes du Québec
Collège québécois des médecins de famille
Fédération des médecins omnipraticiens du Québec
The Canadian Medical Protective Association

You may use this questionnaire at no cost without permission.

Suggested citations:

Legare F, Borduas F, Jacques A, Laprise R, Voyer G, Boucher A, Luconi F, Rousseau M, Labrecque M, Sargeant J, Grimshaw J, Godin G (2011) Developing a theory-based instrument to assess the impact of continuing professional development activities on clinical practice: a study protocol. Implement Sci 6: 17.

Légaré F, Borduas F, Freitas A, Jacques A, Godin G, Luconi F, Grimshaw J and the CPD-KT team (2014) Development of a simple 12-item theory-based instrument to assess the impact of continuing professional development on clinical behavioral intentions. PLoS ONE 9(3): e91013. doi:10.1371/journal.pone.0091013.

Appendix J

Pneumonia Vaccine Documentation Spreadsheet Template

Provider Case Number	**Provider ID Code**	**Provider Category Code** (0=MD; 1= NP; 2=PA)	**Pneumonia Vaccine Documentation 0= Documentation Not done 1= Documentation Done**					
			PCV13	**PPSV23**	**Historical PCV13**	**Historical PPSV23**	**Education**	**Refused**

Appendix K

Master List: Provider Identification

Provider Name	Assigned Provider ID Code

Appendix L

Participant Consent Template

CONSENT FORM

Increase in Pneumococcal vaccination in adults over 65 years of age in a Federally Qualified Health Center

Mara Dominguez
Liberty University
School of Nursing

You are invited to be in a research study on Pneumococcal vaccination rate in adults over the age of 65 years. You were selected as a possible participant because you are a provider at Capital Area Health Network (CAHN) employed during the periods between 12/04/2017 to 01/03/2018 and 12/04/2018 to 01/03/2019. Please read this form and ask any questions you may have before agreeing to be in the study.

Mara Dominguez, a doctoral candidate in the School of Nursing at Liberty University, is conducting this study.

Background Information: The purpose of this study is to implement a chart audit, feedback, and provider educational intervention aiming at increasing the rate of Pneumococcal vaccination rates in adults older than 65 years of age at a Federally Qualified Health Center.

Procedures: If you agree to be in this study, I would ask you to do the following things:

1. Participate in an educational intervention lasting less than 10 minutes.
2. Participate in a chart audit feedback process lasting less than five minutes.
3. Complete a questionnaire to determine your intent to change and improve your practice based on the information provided, taking about five minutes.
4.

Risks: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Benefits: The direct benefits participants should expect to receive from taking part in this study are to increase their knowledge about current guidelines and an insight into their current practice. The project will provide feedback on their performance related to pneumococcal vaccination.

Benefits to society include an increase in the pneumococcal vaccination rate in adults over the age of 65 years, decreasing morbidity and mortality in this population

Compensation: Participants will not be compensated for participating in this study.

Confidentiality: The records of this study will be kept private. In any sort of report, I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

Participant's privacy will be maintained using a master list and providers' identification form. A questionnaire with provider's name will be kept locked. The provider feedback report will be de-identified, and the educational feedback will not include the individual provider performance reports.

Data will be stored in a password protected computer and only accessible by the project leader. The questionnaire results will be stored in a safe and secure location, locked, only accessible by the project leader. All the data collected will be stored for three years, after this time, electronic data will be deleted using software designed to remove all data from the storage device. Hard copies will be shredded and recycled. The disposal of the data will be documented indicating how and when it was completed.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University and CAHN. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you, will be destroyed immediately and will not be included in this study.

Contacts and Questions: The researcher conducting this study is Mara Dominguez. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at 703-217-1617 or mjdominguez@liberty.edu. You may also contact the researcher's faculty chair, Dr. Dorothy Murphy at dlmurphy1@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent: I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

_____

Signature of Participant Date

Signature of Investigator Date