5-14-2021

Increasing Vaccination Rates in Pregnancy Using a Multifaceted Approach Including Patient Education and Reminder/Recall Interventions

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INCREASING VACCINATION RATES IN PREGNANCY USING A MULTIFACETED APPROACH INCLUDING PATIENT EDUCATION AND REMINDER/RECALL INTERVENTIONS

by

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EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions

of Valparaiso University,

Valparaiso, Indiana

in partial fulfillment of the requirements

For the degree of

DOCTOR OF NURSING PRACTICE

2021

	5-14-2021	Electronic Signature- Scarlet R. Spain 5/10/21	
Student	Date	Advisor	Date

TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

ABSTRACT

Given the global tragedy that this most recent pandemic has caused, more attention has been given to the devastating outcomes that the spread of infectious disease outbreaks can have. Similar to those with comorbid conditions, pregnant women are also extremely vulnerable to infectious diseases, as disease manifestation does not only affect the mother, but the fetus as well. Thus, the prevention of both the influenza virus and pertussis are two major goals when providing care for this population. Preventing both of these disease processes during the intrapartum period helps to ensure optimal wellness for both mother and baby and overall limits the potential for disease-related complications throughout the lifespan. The purpose of this evidence-based practice (EBP) project is to evaluate the effectiveness of a multifaceted approach using patient education and reminder/recall interventions to help remind pregnant women to receive both their influenza and Tdap vaccine. The Iowa model was used to guide this project as this theoretical framework uses a step by step approach to EBP. The sample consisted of one group of 32 pregnant women who receive care at a community based and certified midwife led clinic in urban north Indianapolis. The intervention consists of providing in-person education regarding vaccination importance during pregnancy in the office, followed by a series of either text messages or phone calls (participant preference) over the course of the study period. Outcomes will be measured by assessing the number of participants who received their vaccine(s). Outcomes will be verified using the medical chart to ensure that vaccine(s) have been documented as either given or not given. Secondary outcomes will measure the percentage of participants who contracted either influenza or pertussis during her pregnancy. Demographic data was collected prior to the intervention and recorded. This data will be analyzed using a chi-square test to assess the effectiveness of patient education coupled with reminder/recall techniques on vaccination uptake in the pregnant population.

CHAPTER 1

INTRODUCTION

Background

Infectious diseases, some even once deemed nearly eradicated, are beginning to pose challenges to health care providers (HCPs) as vaccination rates decline (Colgrove, 2016). What is known to many as, “anti-vax” or “anti-vaccine” culture, is beginning to yield devastating effects while herd-immunity is inevitably diminishing (Colgrove, 2016). This means that if vaccination rates continue to decline, recurrence of many infectious diseases could begin to resurface and wreak havoc on communities, especially those with vulnerable populations.

Vaccination uptake has been a rather controversial topic in the field of medicine, nursing, and public health due to the increasing popularity to go without or adjust the immunization schedule (Colgrove, 2016). Regardless of which option is chosen, the fact remains that being non-compliant with the current vaccination recommendations puts individuals at risk, and further reduces herd-immunity. While vaccinations given during pregnancy should be considered with great care, two commonly indicated vaccinations during pregnancy, influenza and Tdap have been shown over time to be safe for pregnant women and overall provide more benefit than harm (American College of Obstetricians and Gynecologists, 2017). Furthermore, the topic of vaccination in pregnancy is one that is of great importance and significance when it comes to maternal safety and preventing both maternal and fetal complications.

Pregnant women are considered one of the highest priority groups in risk of infectious diseases and represent a vulnerable population (McMillan et al., 2014). Pre-existing immunity exists for pregnant women from a prior contraction of influenza and/or pertussis, prior immunization against these diseases or both. However, the concentration of antibodies in pregnant women is often not sufficient enough to provide passive immunity to the fetus (Raya, 2017).

Furthermore, the effects of a pertussis infection can be extremely detrimental with nearly all fatalities of the disease occurring in infants younger than three months of age in the United States and statistically make up for 88% of reported pertussis deaths (Raya, 2017). Thus, infants younger than one year of age have the highest per-population incidence of pertussis (Raya, 2017). Unfortunately, 75-85% of pertussis cases in infants are spread from close contacts or family members with mothers being the culprit of transmission more than 50% of the time (Jones et al., 2016).

Since influenza is often associated with fever, contraction of influenza by a pregnant mother could pose risks such as neural tube defects in the fetus (Centers for Disease Control , 2020). Additionally pregnant mothers may also experience seizures, difficulty breathing, persistent dizziness, lethargy, and overall decreased fetal movements while battling influenza infections. All of these factors not only increase the chances of influenza related pneumonia, but also hospitalization (Centers for Disease Control, 2020). Furthermore, influenza contraction during pregnancy has been linked to premature labor, as well as preterm birth (March of Dimes , 2021). Thus, it is very important that pregnant women regularly receive their annual influenza vaccinations.

With more individuals, including pregnant women, straying away from standard vaccination schedules and recommendations, the importance of patient-provider relationships becomes even more vital in combating this major health issue (Colgrove, 2016) and striving towards the U.S. Health and Human Services' Healthy People 2020 goal to vaccinate at least 80% of pregnant women against the flu (American College of Obstetricians and Gynecologists, 2018). Since pregnant women are one of the most vulnerable populations to infectious diseases and outbreaks, the need for mechanisms to better promote and increase vaccination uptake among these women is evident. Vaccination for both influenza and pertussis will not only protect women, but their fetuses as well. All in all, vaccination for these two diseases in pregnancy

helps to provide better maternal and fetal outcomes and works to prevent the rise of immune-mediated complications stemming from an infection.

Data from the Literature Supporting Need for the Project

During influenza seasons 2010-2011 and 2017-2018, pregnant women between the ages of 18-44 years accounted for 24-34% of reported influenza-related hospitalizations in the U.S. Despite public health recommendations, vaccination rates during pregnancy have been historically low, with only 52.2% of pregnant women reporting receiving the influenza vaccination within the 2013-2014 influenza season (Jones et al., 2016). This percentage has since decreased, with only 35.6% of pregnant women reporting receiving the influenza vaccine during the 2017 influenza season (CDC, 2017b). Comparing both flu seasons, the rate for vaccination uptake has dropped dramatically in the last few years, further indicating a need for practice change.

Compared to the non-pregnant general population of individuals who were eligible to receive the influenza vaccine in the 2018-2019 influenza season, only 47.9% of eligible persons in the state of Indiana actually received the vaccine (CDC, 2019a). For the influenza season of 2018-2019, only 33% of individuals aged 18-49 received the influenza vaccine in the state of Indiana. For individuals under the age of 18 years old, only 45.3% of individuals were immunized (CDC, 2019b). These statistics not only show the relatively low rate of compliance for the influenza vaccine in the general population in Indiana but further support the need to implement evidence-based interventions to help combat this issue in pregnant women. With more individuals opting out of the seasonal flu vaccine, the greater the chance of pregnant women contracting the illness becomes, thus presenting a major health risk to pregnant women.

Tdap vaccination rates, on the other hand, have increased since the year of 2016 with a rate increase from 48.8% to 50.4% (CDC, 2018) in pregnant women. However , only 34.8% of pregnant women report receiving both vaccines before or during their pregnancies (Lindley et al., 2019). As for health care providers, the influenza vaccine was offered or recommended to

pregnant women in 73.3% of instances, where the Tdap vaccine was recommended 76.0% of the time (Lindley et al., 2019). Of pregnant women who were offered influenza vaccination, 65.7% of them went on to receive the vaccine. Similarly, 70.5% of women who were offered the Tdap immunization received the vaccine during pregnancy (Lindley et al., 2019). This further supports the idea that healthcare providers play a vital role in the prevention of communicable disease in this population. Thus, healthcare providers must be diligent in performing evidence-based interventions to address vaccine uptake and be available for questions or additional information that patients may need.

Data from the Clinical Agency Supporting Need for the Project

Community Health Network, a well-established health care entity throughout the state of Indiana is a well-rounded network that has been ranked among the nation's most integrated healthcare systems ("About Community Health Network", 2019). Community Physician Network Women's Midwifery Clinic North is a multi-faceted clinic that provides both women's care and maternal services by women's health nurse practitioners (WHNP) and certified nurse-midwives (CNM). Thus, vaccination uptake is a constant priority for providers practicing at this clinic with the goal of sustaining positive fetal/maternal outcomes and healthy pregnancies in general. Like many practice settings, this clinic struggles with finding effective strategies for promoting vaccination uptake in the maternal population.

The area which the clinic serves consists of a multitude of cultures, races, ethnic backgrounds, and economic backgrounds (*Data.census.gov,* 2021). Thus, providers at the clinic often struggle with finding effective methods to promote vaccination during pregnancy in such a broad and ever-changing population. The current practice at the clinic involves patient education via hand-outs published by the Centers of Disease Control. Hard copy educational hand-outs are given out after the initial verbal offer at the clinic. Up until project implementation, this process was the extent to which vaccines were promoted. Using this method offered little to no follow-up, opportunity for feedback, or questions from the patient. Ultimately, a practice change

related to vaccination is something that has been identified as a major priority in the pregnant population at this facility thus, diverse and evidence-based practice changes were welcomed by key stakeholders at the facility (L. Kendrick, personal communication, May 18, 2020).

When speaking with a nurse midwife at the clinic, it was explained that many pregnant women often have good intentions when it comes to getting educated about vaccines. This demonstrates that the population of women that are served are genuinely concerned with the health and safety of both themselves and their fetuses. However, patients are often overcome with anxiety at the thought of possible vaccination-related reactions or complications. Many of the concerns that have been shared regarding vaccines are related to fear of contracting the illness in which the individual is being vaccinated against, fear regarding the safety profile of ingredients contained in vaccines, worry about how the vaccine will affect their future health, and fear of the vaccine causing birth defects or mental retardation in fetus. (L. Kendrick, personal communication, April 16, 2020). With increased access to information and contradicting messages regarding vaccine safety and efficacy at the tips of one's fingers, promoting vaccination importance poses a difficult task for CNMs and other health care providers (HCP) alike in the clinic.

Purpose of the Evidence-Based Practice Project

Evidence-based practice (EBP) is the conscious act of using current and available evidence to guide practice and decision making in the clinical setting (Melnyk & Fineout-Overholt, 2019). The process begins with a systematic search to locate the best and most relevant external evidence for critical appraisal. Next, the clinician should use his or her clinical knowledge and expertise along with internal evidence generated from outcomes management, patient-assessments, or evidence-based quality improvement projects. Most importantly, evidence-based practice integrates patient preferences/values into every clinical scenario (Melnyk & Fineout-Overholt, 2019). The purpose of this EBP project is to evaluate how implementing reminder/recall interventions affects the uptake of both influenza and/or Tdap

vaccination in pregnant women. Vaccination uptake of either of these two indicated vaccines during the study period is the primary outcome of this project.

PICOT Question

Unlike research, evidence-based practice poses questions slightly differently. Instead of a true research question, many clinicians use the standard PICOT model. This acronym is used to describe the population, intervention of interest, comparison of interest, outcome of interest, and time of the intervention, or project (Schmidt & Brown, 2019). Specifically, this project will address the following PICOT question: In pregnant women, how do reminder/recall interventions and patient-directed education compared to standard practice affect vaccination uptake rates within 12 weeks?

Significance of the EBP Project

The focus of this doctorate of nursing practice (DNP) project is extremely significant and important in preventing negative outcomes due to preventable infections, in particular influenza and pertussis, in pregnant women. The overarching goal of increasing vaccination uptake in pregnant women is to ultimately reduce the number of cases of maternal influenza and pertussis. Vaccine-preventable diseases such as influenza and pertussis can leave devastating effects on pregnant women, and even their fetuses, as mentioned prior. Infants under the age of one who contract pertussis are more likely to be hospitalized and are at risk for serious complications such as pneumonia, convulsions, apnea, encephalopathy, or even death (CDC, 2017a). Furthermore, pregnant women who contract the flu are also more likely to be hospitalized than non-pregnant women and suffer complications such as pneumonia, premature labor, and even premature birth (March of Dimes, 2020). Additionally, febrility from the flu can even cause devastating birth defects such as neural tube defects, or spina bifida (March of Dimes, 2020). Thus, this project is extremely important to the livelihood and safety of pregnant women and infants worldwide. If simple evidence-based interventions such as reminders/recalls can be implemented with relative ease into a variety of clinical settings to help to increase

vaccination rates among pregnant women, a great chance exists that many lives will not only be saved but also, many more women could carry on with healthier, non-complicated pregnancies

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

According to Ingersoll (2000), evidence based practice is “the conscientious, explicit, and judicious use of theory-derived, research-based information in making decisions about care delivery to individuals or groups of patients and in consideration of individual needs and preferences” (p.152). Thus, the three primary components of EBP are research-based information, clinical expertise, and patient preferences. This chapter will review the model used throughout this DNP project, the literature review conducted, evidence of literature appraisal, and an overview and synthesis of the included pieces of literature along with identification best practice strategies.

Overview of EBP Model

The evidence-based practice model that guides this DNP project is the Iowa model. The Iowa model helps to provide nurses and other healthcare providers to make decisions regarding clinical and administrative practices that can positively or negatively affect outcomes (Melnyk & Fineout-Overholt, 2019). The Iowa model incorporates continuous feedback loops and its overall design is widely recognized for its applicability and ease of use by clinicians (Melnyk & Fineout-Overholt, 2019). This model was selected for its ability to help interdisciplinary health care professionals to translate research into practice and produce real and sustainable health outcomes.

Step 1: State the Question or Purpose. The first step of the Iowa model instructs clinicians to inquire about practice change opportunities to determine a clinical facility's specific needs. This includes identifying triggers, or opportunities for improvement. The next step within the Iowa model involves stating the purpose or PICOT question. Having a clear focus and objective for an evidence-based practice project helps to clarify boundaries among key stakeholders.

Step 2: Selecting a Topic Priority. Next, the Iowa model encourages the clinician to pinpoint the organization's top priority for practice change and hone in on resources that will facilitate an evidence-based practice improvement (Melnyk & Fineout-Overholt, 2019). For instance, a clinician may consider prioritizing issues that pertain to "patient safety; high-volume, high-risk, or high-cost topics; those that are closely aligned with the institution's strategic plan; or those that are driven by other institutional or market forces (e.g., changing reimbursement)" (Melnyk & Fineout-Overholt, 2019, p. 439).

Step 3: Form a Team. After prioritizing the clinical need, the Iowa model recommends forming a team. An evidence-based practice team is composed of key stakeholders such as nurses, managers, advanced practice registered nurses (APRN), interprofessional colleagues, representatives of shared governance committees, and organizational or community leaders (Melnyk & Fineout-Overholt, 2019).

Step 4: Assemble, Appraise, and Synthesize Body of Evidence. The next step within the Iowa model includes assembling, appraising, and synthesizing evidence. This process involves selecting, critiquing, reviewing, and synthesizing all available evidence (Melnyk & Fineout-Overholt, 2019). This step may be improved with the aid of a nursing librarian, as their skill and knowledge involving online databases and other resources strengthen the specificity and relevance of the literature search (Melnyk & Fineout-Overholt, 2019).

Step 5: Obtaining Sufficient Evidence. After appraising the evidence, the Iowa model calls for the clinician to determine whether or not there is sufficient evidence. This means that the clinician must consider whether the evidence selected is of high quality, and if it is not, considering whether to include related evidence or evidence or lower quality (Melnyk & Fineout-Overholt, 2019).

Step 6: Design and Pilot the Practice Change. According to the Iowa model, the next step includes designing and piloting a practice change. Piloting the change helps to keep

patients/participants in the loop and further helps to identify potential issues or barriers before rolling out the intervention in full form 9 Melnyk & Fineout-Overholt, 2019).

Step 7: Decide if the Change is Appropriate for Practice. After the information has been collected from the pilot phase, it is important for the clinician to next decide if the change is appropriate for practice. The pilot phase will allow the clinician to determine if revisions or modifications need to be made (Melnyk & Fineout-Overholt, 2019). If practice change is deemed inappropriate, the clinician can consider redesigning the practice change, waiting for new knowledge to develop, collaborating with other experts or researchers in the area, or conducting research to guide practice decisions (Melnyk & Fineout-Overholt, 2019). However, if the pilot phase showed positive results, the clinician is to continue with the formal roll-out of the practice change (Melnyk & Fineout-Overholt, 2019).

Step 8: Integrate and Sustain the Practice Change. The last step of the Iowa model includes actually integrating and sustaining the practice change. This is done with the aid of key stakeholders. To help sustain the practice change, the clinician will need local champions, opinion leaders, and senior leadership support to promote the practice change (Melnyk & Fineout-Overholt, 2019). After the practice change has been implemented, continuous monitoring and evaluation of the change should occur. The goal of this step is to integrate the change into daily practice so that it becomes a part of the facility's standard of practice.

Application of EBP Model to DNP Project

Step 1: State the Question or Purpose. The initial step taken following implementation of this model in the policy change consisted of stating a purpose for the desired practice change at the women's clinic. This potential area of change was later confirmed to be relevant and warranted at this facility by one of the on-site CNMs, who is also the clinical site facilitator. According to the site facilitator key elements of the clinical problem surrounding vaccination uptake include fear of adverse effects, cost, and disbelief in the need for vaccination. Other

pertinent data regarding project interventions, and potential primary/secondary outcomes were identified and discussed with facility staff.

Step 2: Topic Priority. Next, the clinical site facilitator was queried regarding clinical priorities and specific areas of need within the facility. After discussion, it was found that there is a need for more effective strategies to help promote maternal vaccination uptake. There is a great fear among the clinical population surrounding the adverse effects of vaccination during pregnancy and thus serves as a major barrier to becoming immunized in this patient population (L. Kendrick, personal communication, 2020). Vaccination uptake was deemed the number one priority for this clinical facility during the projected study period by facility staff. Furthermore, vaccination of pregnant women was also considered a top priority due to the current global pandemic involving COVID-19 and the possible heightened risks of respiratory infections during this time (Terreri, 2020). Since the COVID-19 pandemic, there was a much greater sense of overall panic and fear within the clinic from patients. Patients' concerns for contracting serious respiratory illnesses was obviously heightened, and thus the desire to complete influenza vaccination was seen as dramatic compared to previous years, according to clinic staff.

Step 3: Form a Team. After the priority issue was presented to both the CNM and other clinic staff at the facility, there was a consensus that there is a clinical indication for implementing evidence-based practice within the facility and a team to help implement a practice change was formed. The team consists of the clinical site facilitator, three other CNM providers in the clinic, and the clinic supervisor. Members of the team were briefed on the preliminary details of the intervention for practice change and consulted regarding their knowledge and experience with the topic of vaccinations in this population.

Step 4: Assemble, Appraise, and Synthesize Body of Evidence. Evidence was carefully searched using online scholarly databases, evidence was selected using stringent inclusion and exclusion criteria, limited for relevancy, and evaluated/critiqued for quality. Assistance from a library professional was sought, and feedback regarding search techniques

was given. After following professional recommendations from the nursing librarian, the selected literature was reviewed and shared with key stakeholders at the clinical site.

Step 5: Obtaining Sufficient Evidence. Sufficient and high-quality evidence was found within the literature by using a multitude of scholarly databases. It was purposeful that different types of evidence were included in the final review of literature, as to fully encompass the great span of knowledge that has already been explored surrounding the topic of vaccination.

Step 6: Design and Pilot the Practice Change. Next, a plan was designed to pilot the practice change. During the pilot phase, I discovered both resources and barriers that could impact the effectiveness of the final intervention. Resources included on-site computer access and wifi. Barriers found during this phase include lack of overall staff compared to patient load, limited time for additional activities during the clinical workflow, and hesitancy of patients to sign up for automated messages or phone calls. A draft of the practice protocol was given to all involved providers and clinic staff, keeping in mind the clinic flow and complexity. Research measures were simplified to reflect the process and focus of the evidence-based practice project.

Step 7: Decide if the Change is Appropriate for Practice. After more information was collected from the pilot phase, a decision was made regarding the appropriateness of the project in the clinical setting. Modifications and adjustments were made to the design of the project based on provider/patient feedback. For example, instead of only stating that the patient would receive automated text-messages or phone calls without stating at what frequency, clinic staff agreed that using the phrase “weekly reminders” produced better outcomes and made patients more willing to sign up for reminders, as it is believed that patients were more comfortable knowing that they would only be contacted weekly, instead of daily, or every other day, for instance. Additionally, it was found that information entry into the digital platform was easier and less confusing when one person was appointed to perform the task, as compared to multiple individuals.

Step 8: Integrate and Sustain the Practice Change. After entry of data into the digital platform was complete, continuous monitoring of the medical chart was performed by all nursing personnel such as the MAs and RNs. A new job role was created to reflect the new responsibilities of the staff. Reminders posters stating “Remember to perform maternal vaccination education at the end of all prenatal visits, as well as collect contact information for vaccine reminders!” were set in high traffic areas to remind all staff of the new clinic procedures and to help further solidify this practice change in the everyday clinical flow. Additional time was incorporated into patient appointment times in order to account for the amount of time in-person vaccination education using hand-outs, as well as time for the collection of phone numbers for automated reminders.

Strengths and Limitations of EBP Model for DNP Project

The Iowa evidence-based practice model is an ideal model for students and clinicians to use when conducting evidence-based practice due to its detailed and concise steps. The nature of this model allows the project leader to continuously receive feedback, and thus make adjustments to the intervention in order to best suit the clinical environment. More so, this model includes a pilot step that serves great benefit to the clinician in that it allows for a mock trial of the intervention to highlight and address potential flaws or adjustments that need to be made. Additionally, this model encourages a collaborative and team approach to research, which is especially relevant to the very nature of evidence-based practice in the nursing discipline.

A limitation of this model is that it does not facilitate evidence-based practice for individual clinicians. Since this model encourages a team-based approach, implementation of interventions was difficult at times due to all key stakeholders not always being on the same page for the practice change. Additionally, this model required a pilot phase to take place before the formal implementation of the intervention. This phase was a barrier as clinicians were already working in a facility with time-constraints as far as appointment scheduling and limited

resources/staff. The pilot phase took additional time, thus, this extra step seemed to be somewhat time burdening on the staff.

Literature Search

Sources Examined for Relevant Evidence

Sources examined for this DNP project were drawn from five scholarly databases including the Joanna Briggs Institute (JBI), the Cochrane Library, the Turning Research into Practice (TRIP) database, the Cumulative Index of Nursing and Allied Health Literature (CINAHL) database, and MEDLINE (See Table 1.1). Within JBI, search terms included vaccin* OR immuniz* OR immunis* OR inoculat*AND uptake OR improv* OR promot* OR attain* limited by publication date of 2015 or beyond. This search strategy yielded 138 results, in which two pieces of literature were selected for inclusion. Articles excluded from selection included articles that mentioned vaccination or immunization but did not list any interventions for increasing uptake. The next database that was searched was the Cochrane Library. Search terms in this database included vaccin* OR immuniz* OR immunis* OR inoculat* AND increas* OR promot* OR uptake OR attain* OR improv*. This strategy yielded 62 results in which three articles were selected. This search was limited by the publication year 2015 and later. Articles that were focused on pediatric populations only, or listed no intervention were eliminated. Next, the TRIP database was searched using a title search for the keyword: vaccine OR immunization OR immunisation, AND (uptake OR improv*). The search was limited to a publication date of 2015 and beyond. Further limitations included systematic reviews, evidence-based synopses, and clinical guidelines. Of the 145 results, four articles were selected. Articles that pertain only to neonatal patients, or interventions aimed at reducing pain during vaccinations were excluded. The CINAHL database was searched next utilizing the major subject heading and key terms: (MM "Immunization") AND uptake OR improv* OR promot* OR attain* AND intervent*. This search was also limited to the publication date of 2015 or later. Articles were only selected if they were scholarly, peer-reviewed journals in the English language, or research articles. Three

out of 286 articles were selected for inclusion. Articles that focused on only neonatal populations, or only provider-based interventions were excluded. Lastly, the MEDLINE database was searched using the following heading and key terms: (MM "Vaccination+") AND uptak* OR intervent*. This search was limited to the publication year of 2015 and later. Only scholarly or peer-reviewed articles, journals, or articles in the English language were included. No articles were selected for inclusion from this database.

Table 1.1

Literature Search Grid

Database/Resource Searched	Keywords/Phrases Used	Limiters Used	Number of Results from Search	Number of Pieces of Evidence Selected for Use
JBI	vaccin* OR immuniz* OR immunis* OR inoculat*AND uptake OR improv* OR promot* OR attain*	Year: 2015-Current	138	2
Cochrane	vaccin* OR immuniz* OR immunis* OR inoculat* AND increas* OR promot* OR uptake OR attain* OR improv*	Year: 2015-2020	62	3
TRIP	(title:vaccine OR vaccination OR immunization OR immunisation) AND (uptake OR improv*)	Year: 2015-2020 Systematic Reviews Evidence-based synopses Clinical Guidelines	145	4

CINAHL	(MM "Immunization+") AND uptake OR improv* OR promot* OR attain* AND intervent*	Year: 2015-2020 Scholarly (Peer Reviewed) Journals English Language Research Article	286	3
MEDLINE	(MM "Vaccination+") AND uptak* OR intervent*	Year: 2015-2020 Scholarly (Peer Reviewed) Journals English Language	247	0
	List the Title of the Original Evidence that contained relevant Reference		**Number of Pieces Searched**	**Number of New Pieces of "Chased" Evidence Selected for Use**
Pieces of Evidence selected that were "Citation Chased" from systematic reviews, evidence summaries, guidelines, etc.	Patient reminder and recall interventions to improve immunization rates (Review)	N/A	1	0
	List the Title of the Journal(s) that were "Hand Searched"	**List the Years/Time Frame that**	**Number of Pieces Evaluated**	**Number of New Pieces from "Hand Searching"**

		was Searched		Selected for Use
Pieces of Evidence selected that were "Hand Searched" from the table of contents of specific journals				0
			Total Number of pieces of Evidence Identified for Use:	12

Levels of Evidence

The evidence reviewed within this DNP project was reviewed and leveled using the Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool. This tool is divided into two separate tools that evaluate both research and non-research evidence. The research appraisal tool identifies level I evidence as studies that involve manipulation of an independent variable, a control group, and random assignment to intervention and control groups, thus including randomized-control type of studies (RCT) and systematic reviews containing all RCTs. Level II evidence was identified as evidence that involved the manipulation of an independent variable and the presence of a control group, but no randomization of groups, or only manipulation of an independent variable. This type of study is thus identified as quasi-experimental. Additionally, level II evidence includes systematic reviews containing a combination of RCTs and quasi-experimental, or quasi-experimental only. Level III evidence is recognized as evidence that does not involve any of the three previously listed criteria and thus is categorized as non-experimental. This also includes systematic reviews that contain a combination of RCTs, quasi-experimental, and nonexperimental, or nonexperimental only evidence. This type of data is often either descriptive, comparative, correlational, or secondary

data. The non-research portion of this appraisal tool recognizes both clinical practice guidelines and consensus or position statements as level IV evidence. Clinical practice guidelines are defined as systematically developed recommendations that are composed of known experts in the field and based on research evidence. Consensus or position statements are defined as systematically developed recommendations that are based on the opinions of recognized experts that lead professional organizations of specific disciplines. Literature reviews and integrative reviews are classified as level V evidence according to the Johns Hopkins appraisal tool. Literature reviews are recognized as summaries of publicly available literature, while integrative reviews consist of summaries of research evidence and theoretical data. Also included in level V evidence are quality improvement data, financial evaluations, program evaluations, case-reports, and community standards, clinician experience, or consumer preference literature.

Using the Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool, two pieces of evidence fall into the category of level I, six pieces are level II, and four pieces are level IV (See Table 1.2).

Appraisal of Relevant Evidence

Quality appraisal was done using the same tool used for rating the levels of the evidence, the Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool. For the research evidence section of this tool, quantitative evidence is rated as high quality if it offers consistent and generalizable data. High-quality data also utilized adequate sample size, sufficient control, and definitive conclusions. High-quality literature (Grade A) incorporates a thorough and nearly exhaustive literature review process that references scientific data. Good quality literature (Grade B) is detailed as data that presents reasonably consistent results, some degree of control, adequate sample size, and fairly definitive conclusions. The literature review for good quality data is usually only fairly comprehensive, in contrast to high-quality data. Low-quality literature (Grade C) is literature that provides

inconsistent results, with an inadequate sample size. Conclusions are not able to be accurately drawn from low-quality data.

Figure 1.1

PRISMA Flow Diagram

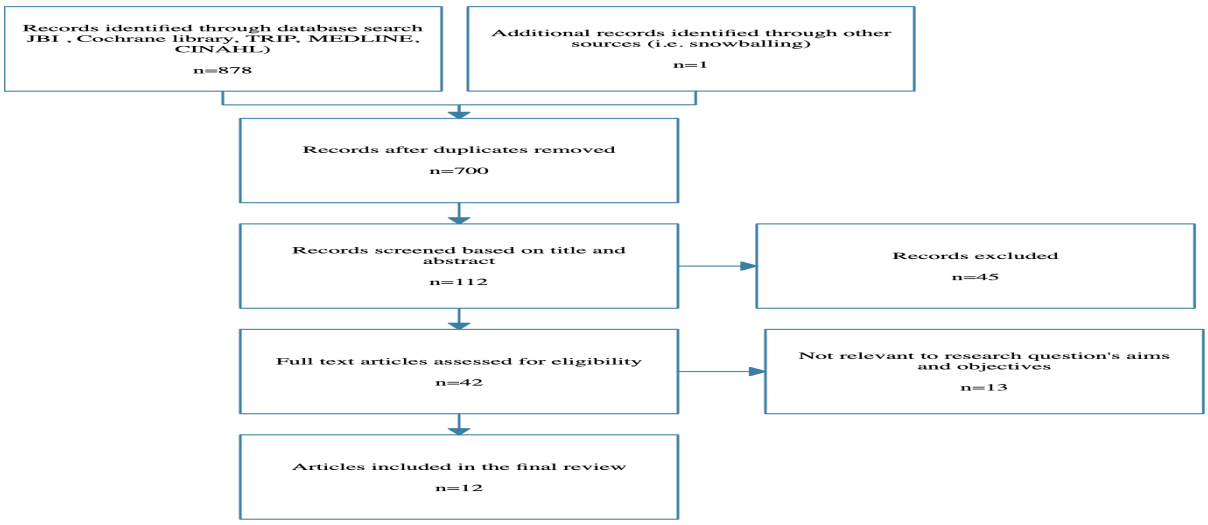


Table 2.1

Evidence Table

Citation (APA)	Purpose	Design	Sample	Measurement/ Outcomes	Results/Findings	Level/ Quality
Abdullahi, L. H., Kagina, B. M., Ndze, V. N., Hussey, G. D., & Wiysonge, C. S. (2020). Improving vaccination uptake among adolescents. *Cochrane Database of Systematic Reviews*, *1*. https://doi.org/10.100	To evaluate and assess the effectiveness of various approaches to increase the number of adolescen	Integrative Review	16 clinical trials including: Randomized trials, cluster randomized trials,	Multimodal interventions compared to usual practice including: Health education, multi-	- Health education improves uptake of HPV vaccination compared to the standard of care: *RR* 1.43, 95% CI	Level I A

2/14651858.CD011895.pub2	ts who get vaccinated.		non-randomized trials, and a controlled before-after study	component complex health education, financial incentives, health education plus financial incentives, mandatory vaccination, provider prompts, education with performance feedback, class based vaccination, multi-component provider intervention, and multi-component provider and parent interventions Outcomes: 1. Adolescent vaccination coverage	(1.16 to 1.76) - Complex multi-component health education results in little to no difference in completing Hepatitis B vaccination series: *RR* 0.98, 95% CI (0.96 to 0.99) - Financial incentives for patients may improve HPV vaccination uptake: *RR* 1.45, 95% CI (1.05 to 1.99) - Effectiveness of health education plus financial incentives for attaining Hepatitis B vaccination cannot	

				2. Equitable uptake of vaccination 3. Reduced VPD morbidity 4. Reduced VPD mortality 5. Reduced time lost from time and school due to VPDs	be determined: *RR* 1.38, 95% CI (0.96 to 2.00) - Mandatory vaccination may lead to increased Hepatitis B vaccination uptake: *RR* 2.94, 95% CI (2.66 to 3.25) - Provider prompts make little to no difference in obtaining any of the four vaccinations (HPV,Tdap, Meningoccocal conjugate, Influenza) *aOR* 0.99, 95% CI (0.55 to 1.81), *aOR* 1.28, 95% CI (0.59 to 2.80), aOR 1.09, 95% CI (0.67	

					to 1.79), *aOR* 0.91, 95% CI (0.61 to 1.34) respectively	
ACOG Committee Opinion No. 772. (2019). Obstetrics & Gynecology, 133(3). https://doi.org/10.1097/aog.0000000000003130	The purpose of this committee opinion is to review and disseminate evidence-based Immunization Implementation Strategies for Obstetrician–Gynecologists	Clinical Practice Guideline	N/A	N/A	- Obstetrician–gynecologists should include immunizations as an integral part of their practice. - Obstetrician–gynecologists and other health care providers should talk with each patient directly and strongly recommend indicated immunizations - Providers should routinely discuss and, administe	Level IV A

					r recommended vaccines, including: influenza, Tdap, HPV	
Australian and New Zealand Society for Geriatric Medicine. (2018). Australian and New Zealand Society for Geriatric Medicine Position Statement No. 7: Immunisation of Older People. Australasian Journal on Ageing, 38(3), 220–220. https://doi.org/10.1111/ajag.126	The purpose of this guideline is to provide vaccine-specific education and considerations, as well as strategies for increasing vaccination uptake among older adults.	Clinical Practice Guideline	N/A	N/A	-Advice from healthcare providers, reminder notices through mail or by telephone, institutional policies to offer the vaccine to all patients, vaccinating inpatients on hospital discharge, using educational forums to emphasize the benefits of and barriers to vaccination, setting up displays in common areas	Level IV B

					including pharmacies and store fronts, on-site pharmacy vaccinations and rewarding doctors for achieving certain vaccination rates.	
Cutrona, S. L., Golden, J. G., Goff, S. L., Ogarek, J., Barton, B., Fisher, L., Preusse, P., Sundaresan, D., Garber, L., & Mazor, K. M. (2018). Improving Rates of Outpatient Influenza Vaccination Through EHR Portal Messages and Interactive Automated Calls: A Randomized Controlled Trial. JGIM: Journal of General Internal Medicine, 33(5), 659–667. https://doi-org.ezproxy.valpo.edu/10.1007/s11606-017-4266-9	To evaluate how patient portal and IVR outreach improve influenza vaccination rates.	Randomized controlled trial	Adults with no documented influenza vaccination 2 months after the start of influenza season	**IV**: Patient portal reminders/messages and IVR outreach **DV:** Influenza vaccination rates	Among portal users, 14.0% of those receiving both portal messages and IVR calls, 13.4% of those receiving messages only, 12.8% of those receiving calls only, and 11.6%of the usual care group received EHR-documented influenza vaccines.	Level I A

					Patient portal users were more likely to receive influenza vaccinations than those with usual care; call recipients were also more likely than usual care recipients to receive influenza vaccinations (OR 1.15, 95% CI 1.02–1.30) Among portal users overdue for pneumococcal vaccine, 13.6% of those receiving both portal messages and calls, 13.3% of those receiving portal message	

					s only, 15.0% of those receiving IVR calls only, and 15.1% of the usual care group received pneumoc occal vaccines.	
James, A.H. (2018). Child immunization in developing countries: Interventions to increase coverage [Evidence Summary]. *The Joanna Briggs Institute EBP Database*, Retrieved from? JBI@Ovid. JBI7388.	To summariz e best available evidence on practices and strategies to promote and sustain child vaccinatio n coverage in developin g countries.	Eviden ce Summa ry	Nine sources of evidenc e including : - Cochran e Review - Narrativ e review of systema tic reviews - (2) Systema tic reviews - Systema tic literature review - Literatur e Review - Cochran e Systema	To increase and sustain high childhood immuniza tion coverage	All articles contained recomme ndations regarding interventi ons to increase child vaccinatio n status: Implemen tation of training, home visits, alteration s of the immuniza tion schedule and promoting better coordinati on and integratio n of immuniza tion with other health related	Lev el I B

			tic Review - Pre-test post-test experimental study - RCT		disciplines such as nutrition and education Mass media campaigns, education regarding vaccination benefits	
Vann, J. C. J., Jacobson, R. M., Coyne-Beasley, T., Asafu-Adjei, J. K., & Szilagyi, P. G. (2018). Patient reminder and recall interventions to improve immunization rates. *Cochrane Database of Systematic Reviews*. doi: 10.1002/14651858.cd003941.pub3	To evaluate and compare different reminder and recall interventions on the improvement and uptake of vaccinations	Systematic Review	75 studies including: randomized trials, controlled before and after studies, and interrupted time series	Reminder/recall interventions on increasing vaccination rates including: Patient telephone reminder or recall, Patient letter reminder or recall, Patient postcard reminder or recall, patient text message reminder or recall, Patient autodialer message reminder	Study Findings: Patient telephone reminder or recall: *RR* 1.75, 95% CI (1.20, 2.54) Patient letter reminder or recall: *RR* 1.29, 95% CI (1.21 to 1.38) Patient postcard reminder or recall: *RR* 1.18, 95% CI (1.08 to 1.30) Patient text message	Level I A

				or recall , combination of patient mail and telephone reminder or recall , combination of patient reminder or recall with outreach intervention, combination of patient reminder or recall with provider reminder intervention Outcomes: childhood immunizations, childhood influenza immunizations, adult immunizations (besides influenza and/or travel), adult influenza immunizations,	reminder or recall: *RR* 1.29, 95% CI (1.15 to 1.44) Patient autodialer message reminder or recall: *RR* 1.17, 95% CI (1.03 to 1.32) Combination of patient mail and telephone reminder or recall: *RR* 1.28. 95% CI (1.14 to 1.45) Combination of patient reminder or recall with outreach intervention: *RR* 1.22, 95% CI (1.10 to 1.35) Combination of patient reminder or recall with	

				adolescent immunizations	provider reminder intervention: *RR* 2.91, 95% CI (2.67 to 3.19) (p.4-5)	
Molokwu, J., Dwivedi, A., Mallawaarachchi, I., Hernandez, A., & Shokar, N. (2019). Tiempo de Vacunarte (time to get vaccinated): Outcomes of an intervention to improve HPV vaccination rates in a predominantly Hispanic community. Preventive Medicine, 121, 115–120. https://doi.org/10.1016/j.ypmed.2019.02.004	The purpose of this study was to evaluate how a culturally tailored, evidence-based HPV vaccine educational intervention impacted psychosocial factors and vaccine uptake and completion	Prospective pre-test/post-test design	1796 adults aged 18–26 years or parents/ guardians of children (POC: parents of children) aged 9–17 years who had not previously completed the three-dose vaccine series. 63.99 were female and self-identified as Hispanic (97.4%).	**IV**: outreach, education, navigation and provision of vaccines to eligible individuals. **DV**: HPV vaccination uptake	-Overall vaccine **initiation**: 67.1% (95%CI: 64.8%, 69.2%) -adult initiation: 77.4% (95%CI: 74.6%, 80.0%) -Children initiation: 55.8% (95%CI: 52.4.6%, 59.1%). -Overall vaccine **completion**: 39.8% (95%CI: 37.5%, 42.1%) -Adult completion: 31.6% (95%CI: 28.6%, 34.7%) -Children completion: 48.7% (95%CI:	Level II A

					45.3%, 52.1%)	
Moola, Sandeep. (2018). Patient reminder and recall interventions to improve immunization rates [Evidence Summary]. *The Joanna Briggs Institute EBP Database,* JBI@Ovid. JBI19946.	To summarize the best available evidence regarding improving immunization rates using patient reminder and recall interventions	Evidence Summary	Systematic Review of 75 RCTs, controlled before and after studies, interrupted time series studies, and controlled, non-randomized studies	Various methods of reminder/ recall interventions on the improvement of vaccination uptake on multiple populations including infants, children, adolescents, and adults in various settings	All articles contained recommendations regarding interventions to increase vaccination uptake: The implementation of patient reminder and recall interventions should be put in place to improve immunization rates in the primary care setting (Grade B) Reminder and recall interventions should be individualized to providers and practice needs to enhance immunization rates (Grade B)	Level I B

					Telephone and/or letter reminders should be utilized over combination interventions, however feasibility and appropriateness should be considered individually "Practitioners should consider tailoring billing systems to function as a reminder/ recall system for simple procedures" (p.2-3)	
Mazzoni, S. E., Brewer, S. E., Pyrzanowski, J. L., Durfee, M. J., Dickinson, L. M., Barnard, J. G., . . . O'Leary, S. T. (2016). Effect of a multi-modal	To evaluate the effectiveness of a multimodal intervention on	Retrospective Quasi-Experimental Pretest/ Posttest Design	-12,717 women in influenza cohort -2650 women in Tdap cohort	**IV:** reminder/ recall systems, use of standing orders, staff education	Influenza vaccination Baseline: 35.4% Post: 46.0%	Level II A

	intervention on immunization rates in obstetrics and gynecology clinics. American Journal of Obstetrics and Gynecology, 214(5). doi:10.1016/j.ajog.2015.11.018	vaccination uptake for Tdap, influenza and HPV in an outpatient obstetric/gynecologic environment.		-4869 women in HPV cohort	regarding immunizations, use of an immunization champion, **DV:** immunization receipt, or uptake	Tdap vaccination Baseline: 87.6% Post:94.5 % HPV vaccination Baseline: 7.1% Post: 23.7%	
	Posadzki, P., Mastellos, N., Ryan, R., Gunn, L. H., Felix, L. M., Pappas, Y., … Car, J. (2016). Automated telephone communication systems for preventive healthcare and management of long-term conditions. Cochrane Database of Systematic Reviews. https://doi.org/10.1002/14651858.cd009921.pub2	To assess the effects of ATCS for preventing disease and managing long-term conditions	Systematic Review	-132 trials including: Randomized, cluster- and quasi-randomized trials, interrupted time series and controlled before-and-after studies	Automated telephone communication systems Outcomes: immunization rates	Immunization rates increased at: -4 month follow up: (RR 1.25, 95% CI 1.18 to 1.32). -15 month follow up: (RR 1.06, 95% CI 1.02 to 1.11)	Level II A
	Region of Peel – Public Health. Improving Human Papilloma Virus (HPV) Vaccine Uptake: A rapid review. Mississauga, ON: Region of Peel – Public Health; 2019.	To summarize evidence regarding best practice recommendations for	Rapid Review	Three systematic reviews published from 2007 onward	N/A	HPV vaccination coverage (vaccine series completion for several	Level IV A

	interventions that can impact HPV vaccine uptake among school-aged children and youth				different vaccines including, but not limited to the HPV vaccine): Reminders, vaccine requirements in schools and national permissive recommendations are effective at improving coverage among youth -HPV vaccine uptake (initiation and/or completion of the series): School-based immunization clinics are effective at improving uptake among children and youth. Reminder	

					s, healthcare provider interventions and social marketing campaigns have mixed effects on HPV vaccine uptake	
National Institute for Health and Care Excellence. (2018, August 22). Flu vaccination: Increasing uptake: Guidance. Retrieved July 02, 2020, from https://www.nice.org.uk/guidance/ng103	To describe interventions aimed at increasing vaccination uptake in eligible individuals	Clinical practice guideline	N/A	N/A	-Inform and/or advise patients about vaccination during face-to-face interactions -Inform patients of the benefits of vaccination -Use written reminders (including text messages, letters and email), phone calls from staff or an auto dialer, social media, or a	Level IV B

					combination of methods, to contact people in eligible groups whose vaccines are due	

In regards to the non-research evidence appraisal tool, clinical practice guidelines, and consensus, or positions statements, are rated as either high, good, or low quality evidence. High-quality data is usually sponsored by a public or private professional agency or organization and includes evidence of a systematic literature search strategy. Results will be consistent and include an adequate amount of well-designed studies. Furthermore, high-quality data must also be published within the last five years. Good quality evidence is literature that is sponsored by an organization or government agency. The literature search is fairly exhaustive and appropriate. The results in good quality evidence are only fairly consistent and are published within the last five years. Lastly, low-quality evidence is evidence that is not officially sponsored by a professional, public, or private institution and does not provide a well-defined or complete literature search strategy. Additionally, there is no overview of strengths and limitations, and no reasonably consistent results or data are evident.

Level I Evidence

Cutrona et al. (2018). This randomized controlled trial evaluated the effect of patient reminders delivered via an electronic health record (EHR) patient portal and interactive voice response (IVR) calls on the uptake of influenza vaccinations in adults who have no documented receipt of an influenza vaccine after two months into the annual influenza season to evaluate the effectiveness of this intervention on increasing vaccination uptake rates. This randomized controlled trial included 20,000 patients that were split into intervention groups. Within these

groups, participants were to receive either (a) receipt of a portal message promoting influenza vaccines, (b) receipt of an IVR call with similar content, (c) both A and B, or (d) only usual care. No specific description of usual care was noted. Participants were selected for inclusion into the study if they actively visited a medical group primary care provider (PCP) and were at least 18 years of age. Participants who had a documented influenza vaccine allergy in the EHR, or who requested to be on the do-not-call list were excluded. Secure reminder messages sent via the patient portal were in letter form and signed by each patient's individual primary care provider. An email was sent containing a link to complete an influenza questionnaire. Also contained within the portal reminder was information from the CDC on vaccinations. IVR intervention strategies consisted of automated phone calls using voice recognition technology to elicit patient self-report of influenza vaccination uptake at an outside facility or source. If patients reported no uptake of the influenza vaccination, the automated service then asked the patient about what barriers were present and responded with concise and targeted health education. Out of the four intervention groups, 14.0% (702) received both portal messages and calls, 13.4% (669) received only portal reminders, 12.8% (642) received only call reminders, and 11.6% (582) received usual, or standard care. Using a multivariate analysis, those receiving portal reminders alone or IVR calls alone were more likely than usual care recipients to be vaccinated (OR 1.15 95% CI 1.02–1.30). Those receiving portal reminders and IVR calls were also more likely than the usual care group to be vaccinated (OR 1.29, 97.5% CI 1.13, 1.48). Among non-portal users, 8.5% of call recipients and 8.6% of usual care recipients received influenza vaccines. Thus, the authors concluded that both patient portal reminders and IVR calls proved to be clinically and statistically significant, and useful for implementation into clinical practice for improving influenza vaccination rates in adult patients. This RCT was rated as high quality, or grade A using the Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool.

James (2018). A JBI evidence summary looking into the best available data regarding interventions to increase and sustain child immunization status reviewed over 22 high-quality

scholarly sources. The purpose of this evidence summary was to review evidence-based interventions that have been shown to produce a significant difference in vaccination uptake. The studies under review were conducted worldwide including in the USA, Zimbabwe, Mexico, Nicaragua, Nepal, Pakistan, India, Ghana, Uttar Prades, Kenya, South America, South East Asia, Central/South America, and Mali. Interventions such as conducting home visits, re-organizing clinic procedures to shorten wait times, vaccinating patients who present to the office for unrelated reasons, reminders/recall strategies, door to door canvassing, mass media campaigns and health education were analyzed and reviewed and recommended as effective strategies for increasing vaccination uptake (Grade B). Reminder interventions such as vaccination reminder cards given to patients in the office and verbal in-office reminders were recommended in several studies within this evidence summary. Such reminder strategies have been shown to be effective, yet cost efficient for health care facilities, thus further supporting the use of these simple measures. The overall quality assessment of this evidence summary is rated as good quality, as this review included a thorough literature search with fairly consistent results.

Moola (2018). Sandeep Moola published a good quality (Grade B) JBI evidence summary in 2018 detailing the effectiveness of reminder/recall intervention in the uptake of vaccines in the general population. This evidence summary analyzed the best available evidence regarding patient reminder and recall interventions for improving vaccination status. This evidence summary analyzed a level I systematic review published in 2018, which included 75 studies. Specific reminder/recall interventions under review included: person-to-person telephone calls, mailed letters, postcards, text messages, and autodialed calls. Combinations include either: letters or postcards plus telephone or autodialer calls, and provider reminders, coupled with a patient reminder or recall interventions. Telephone reminder or recall interventions were shown to increase receipt of vaccines as well (RR 1.75; 95% CI 1.20 to 2.54). Individuals who received letters or physically mailed reminders were 1.29 more times

likely to receive vaccination than those who did not receive those reminders (95% CI 1.21 to 1.38). Those who received postcard recalls were also more likely to become vaccinated than those individuals who did not receive postcard recalls (RR 1.18; 95% CI 1.08 to 1.30). Text message reminders significantly proved more efficacy in improving vaccination uptake compared to standard practice and those within the control group (RR 1.29; 95% CI 1.15 to 1.44). Autodialer reminder interventions were also shown to induce improvements in immunity compared to standard of practice (RR 1.17; 95% CI 1.03 to 1.32). Overall, this evidence summary indicates that patient-focused reminder/recall interventions, specifically telephone calls and mailed letter reminders are more effective at increasing vaccination rates than provider focused interventions (RR 1.28; 95% CI 1.23 to 1.35). Furthermore, combining multiple interventions also provided some confirmation of efficacy, as participants who received both mail and telephone reminder or recall combination interventions were 1.28 times more likely to receive immunizations than those who did not (95% CI 1.14 to 1.45). Participants who received patient reminder or recall interventions in combination with provider outreach were more likely to receive immunizations than those who did not (RR 1.22; 95% CI 1.10 to 1.35). Lastly, participants who received a combination of patient reminder or recall interventions and provider reminder interventions were more likely to receive immunizations than the control group participants (RR 2.91; 95% CI 2.67 to 3.19). Ultimately, the author of this evidence summary concluded that patient-focused reminder/recall interventions should be implemented to help increase vaccination uptake. Furthermore, this author suggests the implementation of different types of reminders/recalls that best suit individual clinical environments and practice needs.

Region of Peel (2019). A rapid review conducted by the Region of Peel public health and communicable diseases division analyzed the literature to evaluate what interventions impact HPV vaccine uptake among adolescents. Three systematic reviews were selected for inclusion. Studies chosen for inclusion were in the English language and had a publication date of 2007 and onward. The literature search was also limited to only include synthesized literature or

guidelines. Studies that focused on HPV effectiveness/efficacy that took place in developing countries or focused on cost/benefits were excluded from this review. Synthesis of the literature showed that HPV vaccination uptake is somewhat increased with the implementation of school or class-based vaccination. Two of the included studies concluded that HPV vaccine uptake among females aged 10-17 years who were offered the vaccine at school-based clinics was increased compared to control groups (OR 6.56, 95% CI 3.99 to 10.78). Another study included in this review revealed that school-based vaccination increased the uptake of at least one HPV dose significantly more among females in the sixth grade (RR 1.69, 95% CI 1.21 to 2.36) and seventh grade (RR 2.56, 95% CI 1.34 to 4.88) compared to controls. In seven of the studies, reminder/recall interventions significantly increased vaccination uptake. Interventions included mailed letters, telephone calls, home visits, scripted provider interactions, and a combination of web-based reminders with educational brochures. Of the included studies, reminder/recall interventions produced variable effects, as different increases in uptake rates were with each dose of the HPV vaccine. In one study, the initial HPV dose uptake did not increase (RR 1.1, 95% CI 1.0 to 1.2), but uptake of the second (RR 1.2, 95% CI 1.1 to 1.3) and third doses (RR 1.4, 95% CI 1.2 to 1.5) were significantly improved among participants who received automated telephone calls compared to those who did not receive calls. Conversely, in another study reminder/recall interventions showed no effect on HPV vaccination uptake among participants aged 18-26 years old. These individuals received preference-based reminders in the form of telephone calls, mailed letters, text messages, e-mails, and/or private Facebook messages. In three of the studies, provider interventions included a “1:1 scripted provider intervention and a web-based reminder system to prompt telephone calls paired with an educational brochure for parents”, a webinar by the CDC coupled with weekly follow up emails, and a provider tip sheet with online training combined with posters, brochures, radio public service announcements and a website (p. 17). These interventions were also shown to be statistically significant in increasing HPV vaccination uptake among females aged 11-12 years by 4.9% using in-person

interventions, and 5.3% using web-based strategies ($p<0.05$). Due to the presence of an adequate literature search strategy and relatively consistent results, this review was rated as good quality, (Grade B).

Level II Evidence

Abdullahi et al. (2017). This systematic review includes a thorough literature search of 11 scholarly databases as well as two clinical trial platforms, electronic databases of grey literature, and reference lists of relevant articles. The inclusion criteria for this systematic review includes eight individually randomized trials, four cluster randomized trials, three non-randomized trials, and one controlled before and after study. For inclusion, articles had to have at least two intervention groups and two control groups. Controlled before and after studies also required at least two intervention groups and at least two comparable control groups, with simultaneous data collection. Data that were excluded from the review included simple pre-post designs, cluster-randomized and non-randomized trials with only one intervention or control group, and controlled before-after studies without concurrent data collection among both intervention and control groups. Additionally, articles that focused on interventions to remind providers of immunization services were excluded, as there is already a systematic review covering this topic. The studies under review analyzed interventions that were targeted toward a wide range of populations including adolescent boys or girls or both (seven), parents (four), and providers (two). Five studies used a mixed participant population including adolescents and parents, adolescents and healthcare providers, and parents and healthcare providers. Outcomes analyzed within this systematic review were: uptake of human papillomavirus (HPV) hepatitis B, tetanus-diphtheria–acellular–pertussis (Tdap), meningococcal, and influenza vaccines. According to this review, health education by means of structured interactive education sessions on the target disease, vaccine recommendations, vaccine schedule,vaccine efficacy, and vaccine safety improved HPV vaccine uptake compared to the standard practice (RR 1.43, 95% CI 1.16 to 1.76). Furthermore, complex multi-component health education

resulted in little to no improvement in vaccination uptake for hepatitis B than simplified information leaflets, or handouts (RR 0.98, 95% CI 0.97 to 0.99). Complex multi-component health education consisted of a resource fact sheet and assessment, an informational video and corresponding questions designed to engage the adolescent audience, small group discussions, and an activity to locate resource information on the Internet. Another intervention that was analyzed within this systematic review was financial incentives. According to the cumulative results of the studies reviewed, financial incentives such as shopping vouchers upon vaccination completion improved vaccination uptake slightly more than standard of practice (RR 1.45, 95% CI 1.05 to 1.99). However, when coupled with health education, the efficacy of these two interventions is not well established and thus is not statistically significant in the promotion of vaccination uptake (RR 1.38, 95% CI 0.96 to 2.00). Mandatory vaccination was found to produce significant findings in one study of 6,462 participants (RR 2.94, 95% CI 2.66 to 3.25). Studies that compared the utilization of provider reminder prompts to standard of care found that reminder prompts made little to no difference in the uptake of Tdap (OR 1.28, 95% CI 0.59 to 2.80), meningococcal (OR 1.09, 95% CI 0.67 to 1.79), HPV (OR 0.99, 95% CI 0.55 to 1.81), and influenza (OR 0.91, 95% CI 0.61 to 1.34) vaccines. Provider education with performance feedback was found to be slightly effective in increasing HPV vaccination uptake in participants with a 5.7% increase in initial dose uptake for participants seeing providers that performed vaccination education with performance feedback compared to standard practice. Vaccination education with performance feedback consisted of providers performing patient education and afterwards receiving a medical record generated performance feedback report with each provider's rate of captured HPV vaccination opportunities. Additionally, the educational session for providers was a 1-hour webinar that described current vaccination rates in the network, data on vaccine safety and efficacy, and strategies for overcoming barriers to vaccination uptake. School or class-based vaccination was also shown to increase vaccination uptake (RR 1.09, 95% CI 1.06 to 1.13). Lastly, multi-component provider interventions that included an education

session, repeated contacts, individualized feedback, and incentives significantly improved HPV vaccination uptake compared to standard practice (RR 1.41, 95% CI 1.25 to 1.59). The authors concluded while many different techniques have been implemented to increase vaccination uptake, more research needs to be conducted to further enhance a clear definition of best practice for improving immunization status. While this review did include some quasi-experimental, non-randomized, and non-controlled trials, the literature search strategy was appropriate and extensive, including a review of grey literature and citation chasing. However, this review is limited as the overall certainty of the results is reduced due to its evidence level. Moreover, due to the extensive literature review, consistent results, and inclusion of eight randomized-controlled trials, this review was rated as high quality (Grade A).

Mazzoni et al. (2016). A quasi-experimental study conducted at two separate clinics evaluated the effect of a multimodal intervention on rates of immunization with Tdap, HPV, and influenza vaccines in outpatient obstetric/gynecology settings. Strategies that were a part of the multimodal intervention included stocking of vaccines in the clinics, modification to standing orders, development of a reminder/recall program, identification of an immunization champion, expansion of a payment assistance program, and staff education. All women age 15 or older who visited the clinic during the influenza season were included in the influenza study cohort. Participants who delivered a baby during the study period and had been to at least one prenatal check-up during pregnancy were included in the Tdap cohort. Non-pregnant women who frequented the clinic during the study period aged 15-26 were enrolled in the HPV cohort. The demographic of the study population consisted mainly of Hispanic, English-speaking, and publicly insured women. Staff education was administered in the form of 2 separate education sessions with one covering HPV, and the other covering Tdap vaccination during pregnancy. Existing vaccine standing orders were revitalized and expanded dependent on the specific vaccine. For instance, standing orders were optimized to include the influenza vaccine in the out-patient setting, as it was previously only auto-ordered for in-house patients within the larger

health care system. The deployment of an immunization champion was also utilized within this study. Immunization champions were registered nurses who performed periodic chart reviews and provided real-time feedback when opportunities for vaccines were missed. Additionally, feedback from staff was collected at the mid-way point in the study and used for intervention improvement. Furthermore, staff began to order and stock Tdap vaccines in the clinic, as these were typically not available for same-day administration pre-implementation. Education hand-outs were also given to patients at prenatal and ultrasound visits. Due to the disparity in health insurance coverage that persists in the surrounding clinic area, the clinic had a pre-established payment assistance program that aided uninsured women to cover the cost of the HPV vaccine at one of the clinics. Revitalization of this program included the expansion of the payment assistance program to both clinics. Reminder/recall interventions were instituted to notify patients when the second and third doses of the vaccine were due. At the initial dose administration, patients were queried as to whether they preferred telephone or mail communication. After communication preferences were established, the immunization champion then contacted each patient up to three times when their next doses were due. Post-intervention, influenza vaccination uptake increased from 35.4% to 46%. After controlling for age, race/ethnicity, and insurance, the authors concluded that participants were more likely to receive vaccination post-intervention than they were pre-intervention ($P < .001$). The overall percentage of Tdap uptake increased from 87.6% pre-intervention period to 94.5% post-intervention period. Compared to the pre-intervention period, overall vaccination rates were significantly increased after intervention implementation ($z = 4.58$, $P < .0001$). HPV uptake also increased, as rates increased from 7.1% before the intervention to 23.7% after the intervention. A stratified analysis also revealed that HPV vaccination uptake rates were increased in all insurance groups. Those with private insurance saw an increase from 7.8% to 19.3% after ($P=.0155$). Participants who carried public insurance saw an increase in vaccination rates from 6.5% before to 22.3% after ($P < .0001$). Lastly, uninsured participants HPV vaccination rates

were significantly improved from 7.6% before to 24.3% after (P<.0001). This article was chosen based on its high quality (Grade A) and consistent results. The authors used an adequate sample size for the intervention and provided consistent conclusions and recommendations based on pre-existing literature and statistical tests used within the study.

Posadzki et al. (2016). Posadzki et al. (2016) conducted a systematic review that analyzed 132 randomized, cluster- and quasi-randomized trials, and controlled before-and-after trials selected from 10 different scholarly databases. The purpose of this systematic review serves to explore and synthesize the best available evidence for the role of automated telephone communication systems (ATCS) on preventative health care and management of long-term conditions. ATCS send voice messages and collect health information from people using their telephone's touch-tone keypad or voice recognition software, which could replace or supplement telephone contact between health professionals and patients. Articles that targeted only health professionals or teachers were excluded. Additionally, articles that offered no health promotion or interactive elements, or involved only a non-ATCS component such as face-to-face communication or written communication, were also excluded. Primary outcomes measured included health behaviors changes? and clinical outcomes. Changes in health behavior were defined as physical activity, adherence to medications/uptake of recommended laboratory, or other testing/procedures, which includes vaccinations. Of the 132 included studies, Forty-one studies evaluated ATCS for delivering preventive healthcare, 84 for managing long-term conditions, and seven studies for appointment reminders. In regards to preventative health care, ATCS improved vaccination uptake in children by 1.25 times (95% CI 1.18 to 1.32). While this same intervention was shown to also improve vaccination uptake in adolescents, the efficacy in this population is much lower (RR 1.06, 95% CI 1.02 to 1.11). Unfortunately, the effects of ATCS in adults remains unclear (RR 2.18, 95% CI 0.53 to 9.02). From these results related to vaccination uptake, the author concludes that ATCS interventions have the ability to improve patient health behaviors and impact key areas of health such as

immunization, screening, appointment attendance, and adherence to medications or tests. Due to this review's systematic and exhaustive literature search and consistent results, this piece of evidence was rated as high quality, or grade A.

Molokwu et al. (2019). Molokwu et al. conducted a prospective quasi-experimental community-based study utilizing a pre-test post-test design. This study was conducted to evaluate the effects of culturally tailored EBP interventions on HPV vaccination rates and psychosocial factors in a largely Hispanic, low-income population. A total of 1796 participants who have no documentation of receipt of the HPV vaccine series were included in the study with ages ranging from 9-26 years old. Furthermore, participants had to be underinsured, or uninsured, and have a Texas address. A series of interventions performed in this study include patient outreach, education, and navigation, and the provision of vaccines to eligible individuals. Materials for education sessions were inspired by the Health Belief Model (HBM) and guided by findings from a series of other clinical studies. Education materials were provided in both English and Spanish languages. Information about cervical cancer, HPV transmission, HPV vaccine indications, series schedule, contraindications, and adverse reactions was included in the material. Consequently, the education resources also addressed reasons why many individuals do decide to vaccinate, thus correlating positive benefits with vaccination. The intervention was even performed verbally with accompanying audiovisual aids which have been shown to increase knowledge in similar low-income Hispanic communities. Furthermore, interventions were delivered by bilingual community health workers to further address any potential cultural or language barriers. The navigation portion of the intervention consisted of designated staff who functioned to gather community resources, assist with scheduling, transportation assistance, and also initiated vaccine tracking and reminders. Reminder phone calls were made during the study period at 2, 6, and 12 months. If no contact was made by at least the third phone call, navigators sent participants a letter with program contact information, and further communication was ceased. Access to vaccination was also impacted as a part of

this multi-component intervention, as free HPV vaccines were offered to qualifying participants, and administered on-site or scheduled for a later date. Overall, the HPV vaccine initiation and vaccine completion rates were 67.1% and 39.8% respectively for both children and adults. Within the study, adults showed higher vaccination initiation rates at 77.4% (95% CI 74.6% to 80.0%) compared to children at 55.8% (95% CI 52.4.6% to 59.1%). Contrastingly, the completion rate for the series among adults was only 31.6% (95%CI: 28.6% to 34.7%) compared to 48.7% in children (95% CI 45.3% to 52.1%). Overall, greater than half of the study population (55.5%) completed two doses of the vaccination series. This level II evidence has been categorized as high quality (Grade A) based on its consistent results and manipulation of a variety of different independent variables.

Vann et al. (2018). A systematic review analyzing 75 randomized trials, controlled before and after studies, and interrupted time-series studies evaluated patient reminder or recall interventions in children, adolescents, and adults in outpatient, community-based, primary care, and other settings. Patient reminder or recall interventions consisted of telephone and autodialer calls, letters, postcards, text messages, a combination of mail or telephone, or a combination of patient reminders or recall with outreach. Individually implemented interventions such as postcards, text messages, and autodialer calls significantly increased vaccination uptake among participants in the reviewed studies (RR 1.18, 95% CI 1.08 to 1.30; RR 1.29, 95% CI 1.15 to 1.44; RR 1.17, 95% CI 1.03 to 1.32) respectively. Telephone calls (RR 1.75, 95% CI 1.20 to 2.54) and mailed letters (RR 1.75, 95% CI 1.20 to 2.54) also improved vaccination uptake, however with a lesser degree of certainty than the previously mentioned interventions. When combined, mail and telephone reminder/recall strategies also showed increases in vaccination uptake in children, adolescents, and adults (RR 1.28, 95% CI 1.14 to 1.45). The combination of patient reminder or recall with provider outreach interventions also resulted in significant results for increasing vaccination uptake (RR 1.22, 95% CI 1.10 to 1.35). For adult populations, reminder/recall interventions result in a 1.29 increased chance of vaccination uptake (95% CI

1.17 to 1.43). Furthermore, the authors concluded that overall, reminder/recall interventions improved vaccination uptake in childhood (RR 1.22, 95% CI 1.15 to 1.29) and adolescence (RR 1.29, 95% CI 1.17 to 1.42). This systematic review was included in this DNP project due to its wide array of different reminder/recall interventions tested within the literature, consistent and significant results, and extensive literature review search strategy. Thus, this review was rated as high quality (Grade A).

Level IV Evidence

American College of Obstetricians and Gynecologists (2019). This clinical practice guideline (CPG) was developed by the American College of Obstetricians and Gynecologists' Immunization, Infectious Disease, and Public Health Preparedness Expert Work Group to extensively review the best available evidence from the literature and expert opinion regarding interventions to increase vaccination uptake among pregnant women. According to the committee, OB-GYNs and other providers alike should first begin by providing education to patients in an evidence-based manner. Furthermore, after formal education has taken place, the provider should then document whether the patient received or refused the vaccine, and discuss options and alternatives with patients who decide to decline vaccination at the time of visit while making sure to remind and offer the specified vaccine at the next clinic appointment. Furthermore, immunization should be delegated among other clinic staff, and an immunization champion should be delegated. The immunization champion would then be responsible for ordering, receiving, and ensuring vaccines are kept and stored and appropriately, while also serving as a vaccine resource for other staff and patients. ACOG also endorses paper or electronic reminders for providers, such as those built into electronic medical records (EMRs). These types of reminders highlight opportunities when patients are in the office for regularly scheduled appointments and can help to catch patients in-person for real-time vaccination education and administration. This guideline was rated as high quality (Grade A), as evidence was derived from the literature and scientific evidence, and not solely expert opinion.

Australian and New Zealand Society for Geriatric Medicine (2018). This CPG was developed to inform and educate about the importance of increasing vaccination uptake in the adult population. This guideline reviews considerations and indications gathered from the Cochrane Library database for many vaccinations including influenza, tetanus, herpes zoster, pertussis, and pneumococcal vaccines. In regards to strategies for increasing vaccination uptake, this CPG suggests provider recommendations and education to promote positive attitudes towards vaccination. Reminder/recall interventions in the form of telephone calls or mailed letters were also referenced from the literature as beneficial methods for improving uptake. Furthermore, this guideline also endorses mandated vaccination policy implementation, as it states that "institutional policies to offer the vaccine to all residents/patients" should also be considered (p. 3). However, it does mention that participants should have the option to refuse. Other recommended strategies that have been trialed in the literature consist of: vaccinating in-patients upon discharge from the facility, encouraging medical specialists to emphasize and individualize vaccination recommendations when communicating with other PCPs, using educational forums to emphasize the benefits of and barriers to vaccination, and setting up displays in common areas including pharmacies and storefronts. Additionally, this CPG recommends implementing on-site vaccination clinics in pharmacies and other similar establishments. Due to the lack of an exhaustive literature search strategy, and degree of expert opinion, this CPG was rated as good quality (Grade B).

The National Institute for Health and Care Excellence (2018). Strategies aimed at increasing vaccination uptake in eligible individuals are analyzed and described in great detail within this CPG. This guideline was developed for the purpose of bringing about awareness surrounding the need for vaccines, and how to use all opportunities in primary and secondary care facilities to help identify people who should be encouraged to become immunized. Similar to other data found in the literature, this guideline suggests a multi-component intervention strategy to achieve significant results for vaccination uptake. First,

medical staff who are prone to come into close and regular contact with eligible unvaccinated individuals should be educated about vaccinations and their safety/efficacy profiles. Regarding the influenza vaccine, education surrounding eligibility for the vaccine, benefits of vaccination for people at high risk from the flu and its complications, how the flu is transmitted, and how the vaccine is administered (either via nasal spray or intramuscular injection). Accordingly, providers should inform and offer eligible patients flu vaccination during face-to-face visits, and whenever the opportunity arises. Furthermore, when inviting individuals to receive a vaccination, medical staff should ensure that invitations and other health information come from a provider that the patient knows, and includes a degree of personalization to the patient's clinical status such as in pregnancy or a chronic health condition. More importantly, invitations to vaccinate should discuss the potential risks of not being vaccinated and any accompanying complications. Like many other suggestions in the literature, this guideline recommends using written reminders (text messages, letters, and email), phone calls from medical staff and/or autodialer messages, social media, or a combination of strategies. Since recommendations from this CPG were derived from nationally recognized experts based on research evidence, this piece of evidence was rated as high quality (Grade A).

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

After a thorough review of the literature, five common themes were found. These themes include reminder/recall interventions, provider and patient-directed education, school-based vaccination, financial incentives/assistance, and designation of an immunization champion.

Reminder/Recall Interventions. Arguably one of the most cited interventions in the literature, reminder/recall interventions have been shown to significantly improve/increase vaccination rates all over the globe. Cutrona et al. (2018), used these interventions via the EHR patient portal and IVR calls. These methods showed increases in vaccination uptake both when implemented independently and in combination with one another, compared to participants

receiving standard or usual care within the study. James (2018) also mentions reminder/recall strategies in her extensive evidence summary as an evidence-based method proven to increase vaccine uptake. Another JBI evidence summary conducted by Moola (2018) reviewed reminder/recall information specifically in the forms of person-to-person telephone calls, immunization reminder or recall letters, immunization reminder or recall postcards, text messages, immunization reminder or recall autodialer calls, a combination of letter or postcard plus telephone or autodialer calls, and provider reminders, combined with patient reminder or recall interventions. Although all of the reminder/recall interventions that the author analyzed proved to be statistically significant (RR 1.28; 95% CI 1.23 to 1.35), text message reminders showed the highest level of statistical significance and certainty among the included studies within this evidence summary (RR 1.29; 95% CI 1.15 to 1.44). The Region of Peel (2019) also endorsed reminder/recall interventions in their CPG detailing the use of mailed letters, telephone calls, and web-based reminders, as these strategies were found to be effective in the literature. In their systematic review, Abdullahi et al. (2017) analyzed 16 studies that incorporated reminder/recall interventions in the form of provider prompts and compared those strategies to patients receiving standard of care. Provider reminder prompts were found to make little difference in increasing the uptake of Tdap, influenza, HPV, or meningococcal vaccines. In their quasi-experimental study, Mazzoni et al. (2016) implemented a multifaceted intervention that tested the development of a reminder/recall program amongst five other evidence-based strategies. The combination of these strategies produced both statistically and clinically significant improvements in vaccination status. Influenza uptake rates went from 35.4% to 46% after the intervention. Tdap uptake increased from 87.6% to 94.5% in the post-intervention period, and HPV uptake also increased, as rates went from 7.1% to 23.7% after the intervention. Similar to Cutrona et al.'s study, Posadzki et al. (2016) systematically reviewed 132 studies that implemented automated telephone communication systems (ATCS) to increase vaccination uptake. This reminder/recall intervention helped to improve adolescent vaccination

uptake rates, however, produced variable results in the adult population. In the study conducted by Molokwu et al. (2019), culturally tailored interventions were implemented in a largely Hispanic population to improve vaccination uptake of the HPV vaccine. This study also utilized a multifaceted approach, as it included the use of education, provider outreach, and assistance with access to vaccines. In this study, phone calls were implemented at 2, 4, and 6 months into the study to help remind patients about upcoming vaccine doses. Of the previously non-vaccinated participants, adults produced a vaccination initiation rate of 77.4% compared to children at 55.8%. However, completion rates for the vaccine series only ended up being 31.6% for adults compared to 48.7% in children. Vann et al. (2018) also systematically reviewed interventions related to reminder/recall interventions for the uptake of vaccinations. Telephone and autodialer calls, letters, postcards, text messages, a combination of mail or telephone calls, or a combination of patient reminder or recall with provider outreach were all found to be effective interventions. Postcards, text messages, and autodialer calls produced the most significant findings when implemented alone amongst the different reminder/recall interventions. When combined, the effects of these interventions proved even greater effects than when used alone, thus supporting use for multicomponent intervention strategies within this systematic review. In their 2019 position statement, the American College of Obstetricians and Gynecologists endorsed paper and/or electronic reminders for providers. These reminders functioned to highlight opportunities for providers to vaccinate and catch patients while they were in the office, thus increasing the frequency of real-time vaccination uptake interventions. The Australian and New Zealand Society for Geriatric Medicine (2018) also mentioned reminder/recall interventions and recommended telephone calls or mailed letters as evidence-based methods for promoting immunization in adults. Similarly, the National Institute for Health and Care Excellence (2018) also recommends these interventions in their CPG, along with text messages, letters, email, autodialer messages, social media, and/or a combination of

strategies. However, there are no specific guidelines for how often, these reminder modalities should be used, thus no specific recommendations regarding frequency is available at this time.

Education. In regards to providing education as a means of increasing vaccination uptake, James (2018) and The Region of Peel (2019) recommends providing patient-directed education in the form of brochures,mass-media campaigns, radio public service announcements, and websites. Abdullahi et al. (2017) suggest that simple, patient-directed vaccine-related information is effective at increasing uptake, however, this systematic review also noted that education that is complex or has multiple components was found ineffective at increasing vaccination uptake, and produced insignificant results (RR 0.98 95% CI 0.96 to 0.99). This systematic review also concluded that provider-directed education coupled with performance feedback helped to increase HPV vaccination uptake by 5.7% for the initial dose. In relation to provider or staff-directed education, Mazzoni et al. (2016) tested a multimodal intervention consisting of stocking vaccines in the clinics, modifying standing orders, developing a reminder/recall program, designation of an immunization champion, expansion of the payment assistance program, and staff education. Staff education was implemented in this study by having staff attend two separate training sessions, each focused on either HPV or Tdap vaccination during pregnancy. The sum of the study interventions produced significant results, with influenza vaccination uptake rates increasing from 35.4% to 46%. These methods also produced increases in Tdap uptake, as the rate went from 87.6% pre-intervention period to 94.5% post-intervention. Increases in HPV uptake were also seen, as rates increased from 7.1% to 23.7% after the study period. Molokwu et al. (2019) utilized education as a study intervention and found that providing educational materials in conjunction with other evidence-based strategies significantly helps immunization rates. Specifically, these authors provided patient-directed education in both English and Spanish languages. The session went over information about cervical cancer, HPV transmission, HPV vaccine indications, series schedule, contraindications, and adverse reactions that could be expected. ACOG (2019) and the

Australian and New Zealand Society for Geriatric Medicine (2018) recommend evidence-based provider-focused education interventions such as educational forums, and direct provider to patient communication. Specifically, the Australian and New Zealand Society for Geriatric Medicine recommends that providers and other staff educate patients about the safety and efficacy profiles of each vaccine. Education regarding vaccination should be performed in-office and in real-time according to the Australian and New Zealand Society for Geriatric Medicine. Unlike many other sources, patient education regarding vaccination is preferred to take place in-person, for a more direct patient-provider interaction.

School-based Vaccination. According to The Region of Peel (2019), school or class-based vaccination has been shown to significantly impact vaccination rates in school-aged individuals, specifically females in the sixth and seventh grades. Abdullahi et al. (2017) also synthesized evidence in the literature to support class or school-based vaccination, as it was found to increase vaccination rates by 1.09 (95% CI 1.06 to 1.13).

Financial Incentives/Assistance. Assistance with covering the costs of vaccines, or simply being rewarded monetarily was another common theme found within the literature to increase vaccination rates. Abdullahi et al. (2017) analyzed how effective financial incentives were in the form of shopping vouchers on vaccination completion. Unsurprisingly, financial incentives proved to increase uptake by nearly one and a half times (95% CI 1.05 to 1.99). In the study conducted by Mazzoni et al. (2016), patients experienced significantly higher vaccine rates after adjustments to the already in place payment assistance program was made. Essentially, after revamping this assistance program to include the other participating clinic in the study, participants who were uninsured produced a spike in vaccination rates from 7.6% before to 24.3% and from 6.5% before to 22.3% in the underinsured. Similarly, Molokwu et al. (2019) provided free vaccines for qualifying participants as a part of their multimodal intervention.

Designation of an Immunization Champion. Another common theme found within the literature involves assigning staff or clinic members to the role of immunization champion. According to Mazzoni et al. (2016), the immunization champion in this study was a registered nurse who served to perform chart audits and provide real-time feedback to providers and staff about missed vaccination opportunities and recommendations for improvement. ACOG (2019) also recommends the implementation of an immunization champion. In addition to providing feedback, they recommend the immunization champion to be responsible for ordering, receiving, and ensuring vaccines are kept and stored and appropriately within the facility.

Best Practice Model Recommendation

The recommendation for best practice has been derived strictly from the literature. According to this evidence, and the number of significant results found for multiple interventions, it was found that increasing vaccination uptake is best tackled using a multi-component strategy. When reviewing the literature, the two most effective strategies include reminder/recall interventions and patient-directed education. Since the vaccination gap in the general population is increasing, implementing these simple, yet effective strategies is of paramount importance for both the health and safety of pregnant women and their fetuses (Baggio & Gétaz, 2019). This combination of interventions has been shown in the literature to repeatedly produce significant results and improve vaccination status worldwide. Reminder/recall interventions in the form of phone calls, text-messages, postcards, letters, automated messages, social media, and email have produced significant results in a majority of the articles reviewed in this project. Of these interventions, text-message and telephone calls show the highest rate of vaccination uptake in the literature (Australian and New Zealand Society for Geriatric Medicine 2018; Moola 2018; Vann et al., 2018). Although reminder/recall interventions have proven to be the most effective intervention for vaccination uptake in the literature, a majority of the evidence includes educational efforts in regards to vaccination uptake. Education done via simple measures such as face-to-face communication, written mail, telephone

conversations, presentations, printed materials, and websites should be chosen over more complex methods, as this has been statistically shown to produce greater outcomes (Abdullahi et al., 2017; American College of Obstetricians and Gynecologists, 2019 Australian and New Zealand Society for Geriatric Medicine, 2018; Cutrona et al., 2018; James, 2018; Mazzoni et al., 2016; Molokwu et al., 2019; Region of Peel, 2019; The National Institute for Health and Care Excellence, 2018). Although vaccination education can be delivered through multiple modalities, face-to-face education could be viewed as easier and more cost-efficient to implement, as it does not require the purchase or distribution of additional educational materials. Furthermore, face-to-face education provides patients the opportunity to express concerns and ask questions in real-time, further strengthening patient rapport (Posadzki et al., 2016; The National Institute for Health and Care Excellence, 2018. These methods have shown the best evidence in regards to increasing vaccination uptake, and thus should be considered in order to increase immunization rates in the unvaccinated and under-vaccinated, and ultimately close the vaccination gap among pregnant women. These interventions derived from the literature will help to further highlight and address the vaccination gap and provide easy, yet effective means to improving vaccination rates. Simple measures such as reminder/recall strategies have been shown throughout the literature to be effective in various populations, thus this intervention strategy will be implemented into a women's health clinical facility in hopes of reciprocating the significant findings in the literature.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

A multicomponent strategy including patient-directed vaccination education and automated text-message and/or reminder phone calls was implemented in a maternal health office. The implementation phase of this project took place over the period of 14 weeks. The purpose of this combination of interventions was to measure the effectiveness of these strategies on increasing uptake of Tdap and influenza vaccination in the pregnant population.

Participants and Setting

The implementation phase of this project was performed at one facility located in the northern region of Indianapolis. This clinical facility specializes in midwifery and is equipped with five in-house CNMs, with three of those providers holding doctoral degrees. In addition to providers, this facility is also staffed with two medical assistants (MAs) and two RNs. Of the four CNMs at the clinic, there is over 50 years of combined experience as four of the providers are senior-level practitioners holding over 15 years experience each. The newest CNM at the clinic has just over 6 years of experience. The population that the clinic serves is primarily of the white race, over the age of 25, married, and possess commercial insurance (L. Kendrick, personal communication, 2020). The clinic averages about 25 patients a day with a little over half of those appointments requiring prenatal care to some degree (L. Kendrick, personal communication, April 16, 2020). As of January, 2020, there were 35 pregnant patients being seen at this clinic. Furthermore, this clinic has also seen an increasing number of first-time mothers, as the practice of midwifery becomes better known and trusted among mothers and mothers-to-be in the surrounding area (L. Kendrick, personal communication, April 16, 2020). Thus, patients being seen by all CNMs at the clinic were recruited in order to obtain a larger sample size. Patients under the age of 18, those with immune-related illnesses, or those with allergies to either the influenza vaccine or the Tdap vaccine werel be deemed ineligible for participation.

Pre-Intervention Group Characteristics

Due to COVID-19, providers at the clinic were practicing on a rotating basis, having only one provider in-office at a time to see patients up until December of 2020. Thus, each provider would go to the clinic one day a week to see patients, perform tele-health appointments the remaining business days, and attend live births on the other days of the week. During that time, physical office appointments were limited, which could have possibly impacted the amount of patients who planned to come in for vaccination visits. The practice flow for pregnant patients consists of them being checked in by the front office staff, being seen and having vitals collected by nursing personnel such as the MA or staff RN, and being seen and assessed by the CNM. After performing an individualized assessment, answering patient related questions/concerns, and collecting pertinent labs or tests, patient education was performed on each topic covered during a patient's visit and appropriate vaccines were offered at this time. Along with in-person education and verbal offers, hard-copy handouts published by the CDC were given out to patients that detail the benefits of both influenza and Tdap vaccines for pregnant women and fetuses. After the initial offer, no further follow up was scheduled or anticipated by the patient. The vaccine protocol was rather vague and non-specific, as there was no measurable goal set forth regarding the number of pregnant patients to be vaccinated within the clinic.

Intervention

Preparation and planning for this DNP project was guided by the Iowa model for evidence-based practice. After conducting a facility assessment to determine specific population-based needs, confirmation was made that vaccination uptake was a high priority at the clinical agency. Thus, a literature search was performed to identify scholarly literature and evidence was gathered and appraised to determine quality and evidence level. After forming a clinical team, the evidence was then synthesized to determine the best available practice recommendations.

The standard of practice for offering and promoting vaccination within the clinic was verbal and written, in-person education. This practice consisted of a verbal offer at 27-36 weeks gestational age for the Tdap vaccine and at the next office visit immediately after the seasonal influenza vaccines arrived. The initial vaccine offer is followed up with a brief overview of the material presented on a hard copy hand-out regarding vaccination safety and importance sponsored by Centers for Disease Control (CDC). This practice strategy, while it does utilize best practice techniques such as simple education, is lacking the multicomponent aspect that could help to boost vaccination rates. A reminder/recall component was added to the current vaccination regime practiced at the office, and the implementation of reminder text-messages and/or phone calls served as the primary intervention.

After assessing allergies/adverse effects in all participants who were at least 27 weeks gestational age, the Tdap vaccine was offered. Standard of practice education took place at this time which included a brief overview of an evidence-based hand-out outlining the importance of prenatal/maternal vaccination for influenza and Tdap vaccines. At 24 weeks gestational age, participants received either a text-message or phone call (based on communication preference) once per week with a simple reminder message stating, “You are almost due for your Tdap vaccine! Please make sure to schedule your vaccine by or at your next office visit!”. Participants continued to receive one text-message and/or phone call per week until receipt of vaccination took place and was documented. If vaccination uptake had not been documented by 36 weeks, no further interventions were implemented. Similarly for the influenza vaccine, participants received a text-message and/or phone call (based on communication preference) once per week as soon as the clinic received the first shipment of seasonal influenza vaccines which was in early October 2020. This message stated: “You are due for your seasonal influenza vaccine! Please make sure to schedule your vaccination by or at your next office visit!”. Participants continued to receive one text-message/phone call per week until receipt of vaccination took

place and was documented. If vaccination uptake did not take place by the 10th week of the project, no further interventions were implemented.

Comparison

Compared to the current standard of practice which included simple face-to-face education, participants were better held accountable for the combined health of themselves and their fetuses using weekly reminder/recall strategies of each woman's preference coupled with patient-directed education. While the educational component will remain the same, the supplementation of either text-message and/or phone call reminders will only serve to keep the idea of vaccination fresh on participants' minds on a weekly basis. The idea of a steady and constant communication system in place to bring attention and awareness to the importance of vaccination was expected to improve uptake rates. By connecting with participants on such a consistent basis, vaccination uptake was put on the forefront of participants' minds and helped to establish vaccination as an on-going priority throughout the duration of pregnancy, instead of just at the initial offer.

To replace the practice policy in place, a new strategy was presented to the clinic staff and tried during the pilot phase as indicated by the Iowa model to assess any barriers or modifications that needed to be made prior to the final practice change. The new practice change detailed in the previous paragraphs was placed in respective employee work rooms. Both nursing staff and providers had their own practice change alert reminders posted in high traffic areas for each profession. Nursing staff were made responsible for collecting phone numbers (with capability of receiving phone calls or text message) at the end of the initial visit in which vaccination against either influenza or Tdap was offered. Amongst all of the nursing staff, one individual was chosen to input phone numbers into the digital application for future automated texting and/or calling, as modeled in the literature as a change champion. At the previously mentioned time intervals, the change champion scheduled either the automated text-message or phone call reminder, and consequently monitored the EHR for documentation of the

completion of either the influenza vaccine, Tdap vaccine, or both, until completion of the project timeline. In order to sustain this policy change, a long-term subscription with the automated communication platform was purchased by the clinic, and a role title was created in order to recognize the individual who would now become responsible for performing the reminder/recall interventions on a daily basis. This new role was denoted as, “vaccine champion” and was assumed by one of the clinic staff who performed data entry and monitoring during the project period, thus she was already very familiar with the platform and prepared to continue the duties.

Outcomes

The primary outcome of this DNP project is to evaluate the percentage of vaccination uptake among pregnant women after the intervention. This outcome was evaluated by performing chart audits on each eligible participant both during the intervention period and at the end of the 14 week period. These chart audits revealed the number of participants who became vaccinated with either the influenza vaccine or the Tdap vaccine during the project period and the number of those who did not become vaccinated. Secondary outcomes include the overall percentage of participants who became ill with either influenza or pertussis and what percentage of those individuals received prior immunization.

Time

The implementation phase of the project began on October 15th, 2020, as this time coincided with the arrival date of the first shipment of influenza vaccines. This project took place over the course of 14 weeks, as this time period served as an ample opportunity for influenza vaccination uptake within the prime of flu season. Furthermore, since Tdap vaccination is indicated between 27 and 36 weeks gestation, a 14 week time frame was adequate to offer and provide the vaccine throughout the entirety of the indicated period (9 weeks).

Protection of Human Subject

Prior to the implementation phase of the project, ethics and privacy certification was obtained through the Collaborative Institutional Training Initiative (CITI) program. Furthemore,

the Valparaiso University Institutional Review Board (IRB) was also consulted to approve the nature of the DNP project and approve the level of clearance needed based on the level of risk assigned to the project. Only after confirmation from both the Valparaiso IRB and the faculty advisor, was the project launched. Chart access was granted via an in-person training hosted by the affiliated health care corporation and log-in credentials will be kept in a secure off-site location. Chart audits will be conducted only while on a secure network, and in the privacy of a secured office environment. No patient identifiers will be stored after the duration of the project, and a confidentiality contract will be signed prior to initiation of the intervention. After the study period has ended, chart access will be automatically revoked and all identifiable data destroyed.

CHAPTER 4

FINDINGS

The purpose of this DNP project was to utilize a variety of evidence-based interventions to implement a policy in an urban/suburban region located near northern Indianapolis to increase vaccination uptake among pregnant patients. This project specifically looked to increase vaccine uptake for seasonal influenza and Tdap. This was undertaken by providing pregnant patients who presented to a midwifery clinic in Indianapolis, Indiana, with in-person education consisting of reputable hand-out information from the CDC, coupled with weekly reminders in the form of either text-message or phone call, based on participant preference. After agreeing to participate, participants elected to receive either a text-message, or phone call on a weekly basis until completion of either/both vaccines, or until the end of the project period. Once documentation of a completed influenza or Tdap vaccine was observed in the EHR, text-messages/phone calls ceased to be made. The projected outcome for these interventions was to observe increased vaccination uptake within the practice, as mentioned in the PICOT question. Secondary outcomes assessed the number of patients who contracted either influenza or pertussis during her pregnancy in relation to vaccination status throughout the project period.

Participants

The sample for this DNP project consisted of 34 pregnant patients, all residing in the surrounding Indianapolis area who received prenatal care at the site of implementation. The initial goal was to have at least 50 participants, however constraints due to the on-going pandemic affected the number of patients who were allowed to visit the clinic at a time. Half of the participants were married, while the other half were unmarried. Those that self classified as unmarried labeled themselves as in a relationship, or without a romantic partner completely. A majority of the participants, specifically 41.2% (n=14) were between the ages of 15-30 years old. Twelve of these participants were between the ages of 30 and 45 (35.3%), while only eight

were over the age of 45 years (23.5%). Of the participants, 20.6% (n=7)were pregnant for the first time, while 32.4% (n=11) were on their second pregnancy and another 32.4% (n=11) were on their third pregnancy. Lastly 14.3% (n=5) were on their fifth pregnancy at the time of the intervention. Slightly over a quarter of the sample population, or 26.5% had attained their bachelor's degree(n=9). This made up a majority of the sample. On the other hand, only 8.8% (n=3) of the participants were educated at the doctoral/professional level. Only 17.6% (n=6) of the participants had attended some high school, while 23.5% (n=8) had only completed high school. Those with graduate degrees comprised 11.8 % (n=4) of the sample population. Those who completed trade schooling or some other form of alternative education made up 5.9% (n=2) of the sample collectively.

A majority of the sample, or 29.4% was made up of participants who made between $25,000-$50,000/year (n=10) . Seven participants (20.6%) made less than $25,000/year, 23.5%(n=8) made between $50,000-$100,000/year, 17.6% (n=6) made between $100,000-$200,000/year, 5.9% (n=2) made over $200,000/year, and 2.9%(n=1) preferred not to disclose this information.

Slightly over a quarter of participants (26.5%) were of African American descent (n=9), 17.6% were of Asian descent, 17.6% (n=6) were of Caucasian descent (n=6), 11.8% were of American Indian or Alaskan Native descent (n=4), 8.8% were of Hawiian or Pacific Islander descent, 8.8% were of Hispanic heritage (n=3), and another 8.8% identified as another unlisted race (n=3). See Table 4.1. All participants who began the project completed it, thus no attrition was observed. Completion of the project was considered as continuing to receive text-messages/phone calls for the entire duration of the project without choosing to opt out, or without electing to stop receiving reminders.

Information regarding prior uptake of either the influenza or Tdap vaccine was collected prior to the intervention. Prior to the intervention, 73.5% (n=25) of participants admitted that they had received the influenza vaccine in the last 365 days, or the last flu season. Even though they

had received a vaccine for influenza in the last 365 days, another influenza vaccine was still indicted at this time, as each year the influenza strains differ. Similarly only 26.5% (n=9) had admitted to refusing or missing the influenza vaccine within this same time-frame. Meanwhile, 85.3% of participants admitted to receiving their Tdap vaccine either in their last pregnancy or at the time that the last booster vaccination was due, for example, after ten years. Nine, or 14.7% of participants denied either receiving the Tdap vaccination during their last pregnancy, or at the time the last booster vaccination was due. Thus, it is clear from the data that more participants began the project with having received their Tdap vaccine (85.3%), as compared to the influenza vaccine (73.5%).

Figure 2.1

Participant Demographics-Race

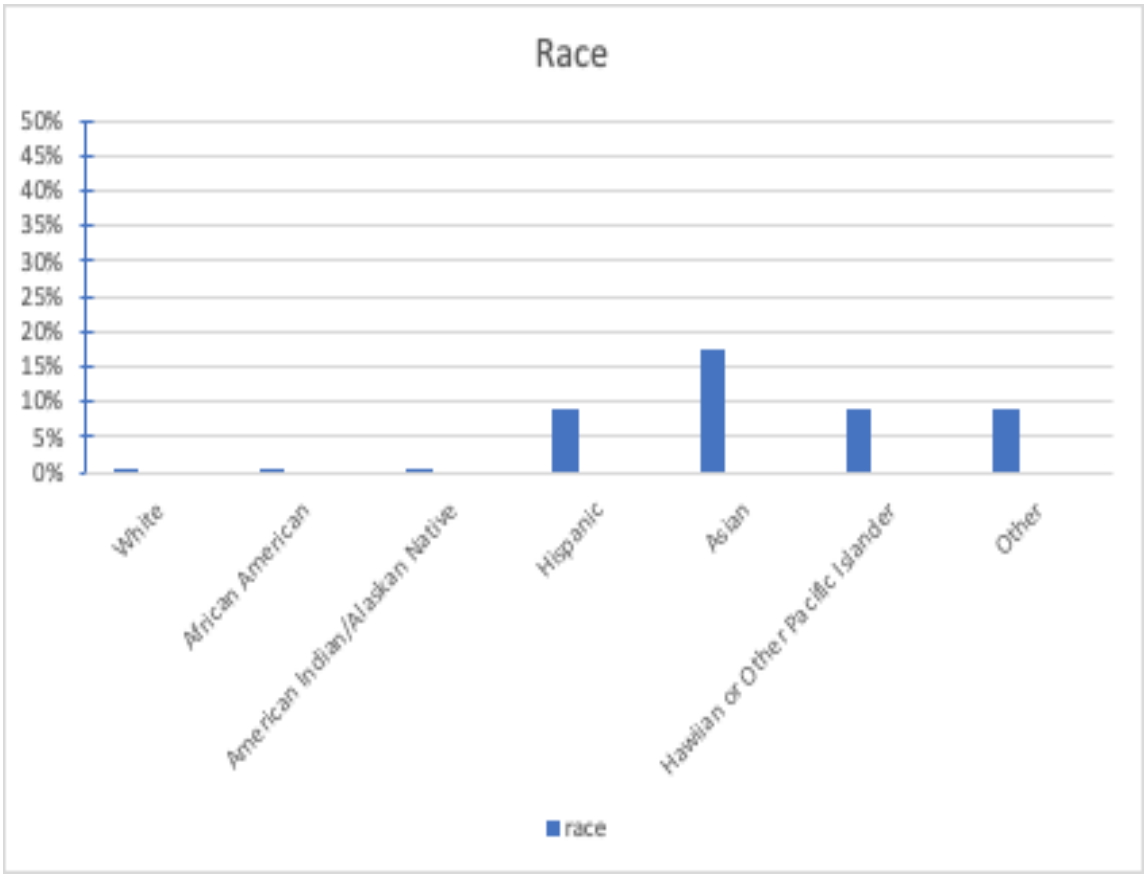


Figure 3.1

Participant Demographics- Marital Status

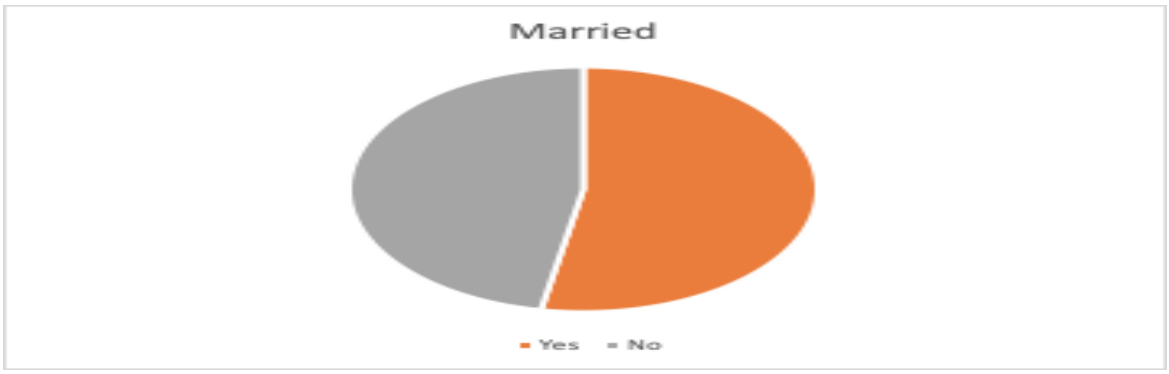


Figure 4.1

Participant Demographics- Age

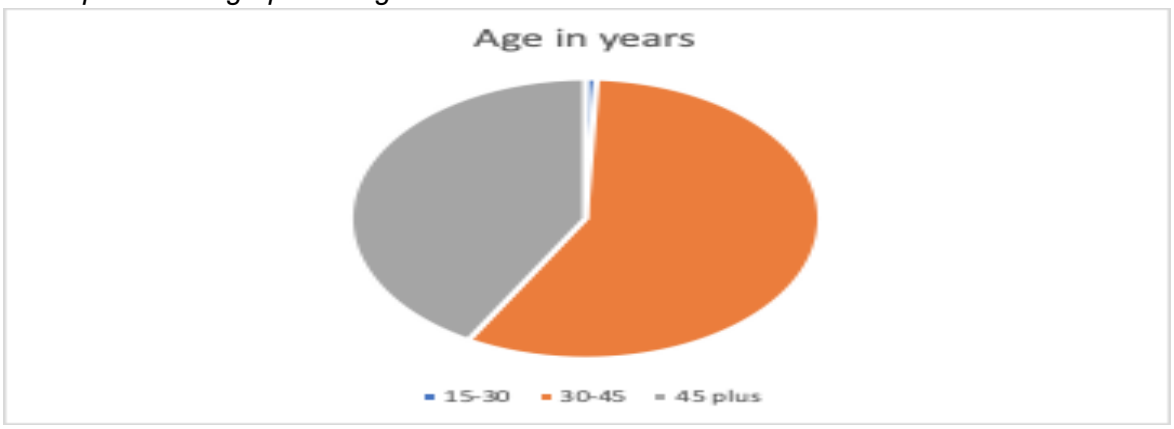


Figure 5.1

Participant Demographics- Income

Figure 6.1

Participant Demographics- Times Pregnant

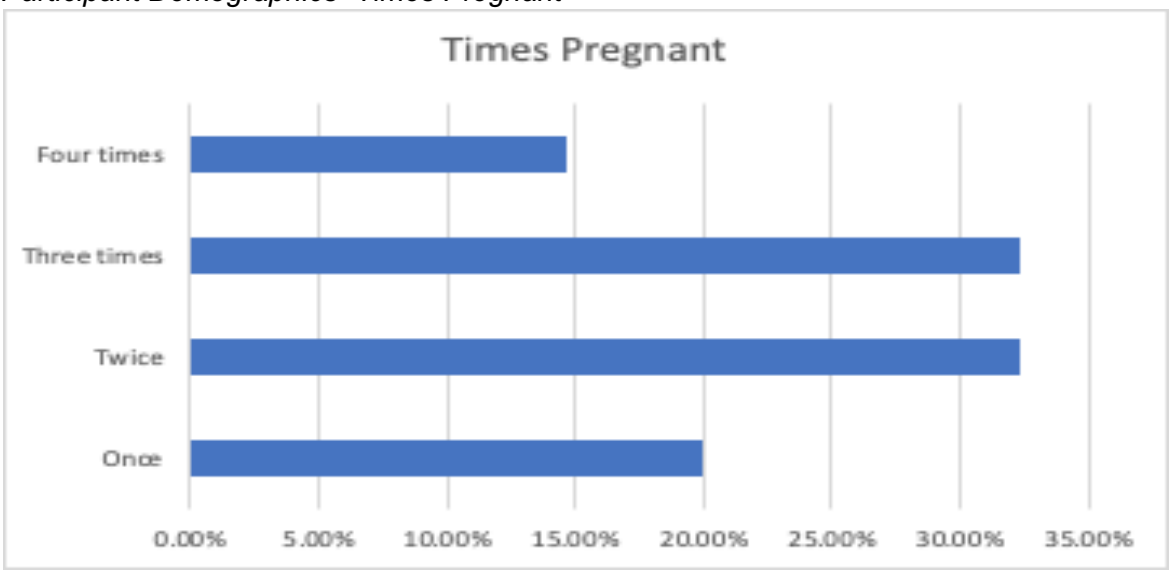


Figure 7.1

Participant Demographics- Education Level

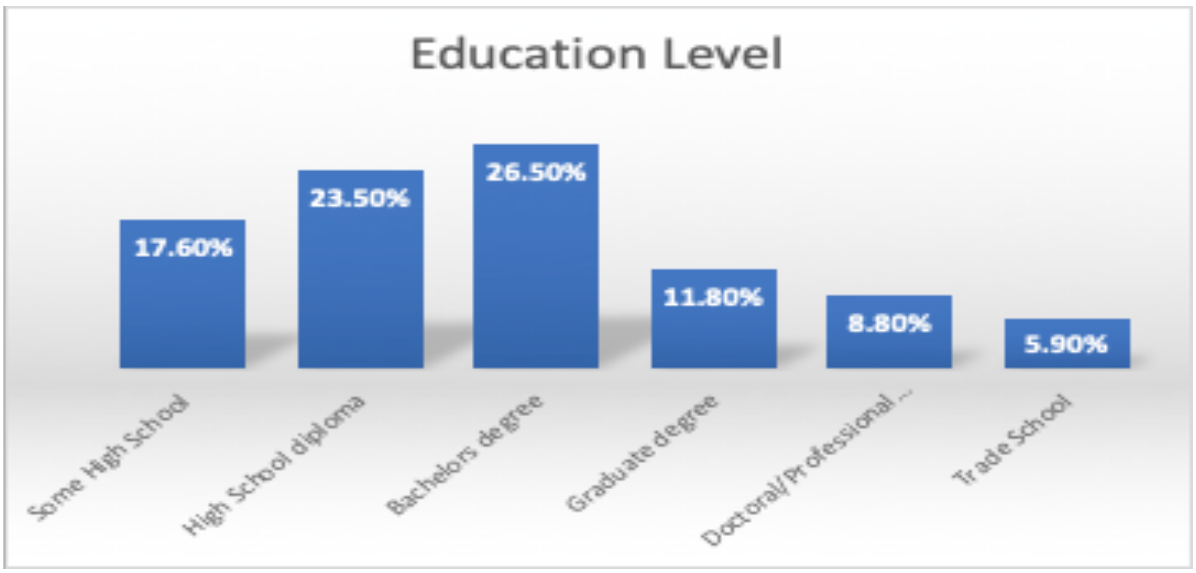


Figure 8.1

Participant Demographics- Previous Influenza Vaccine Uptake

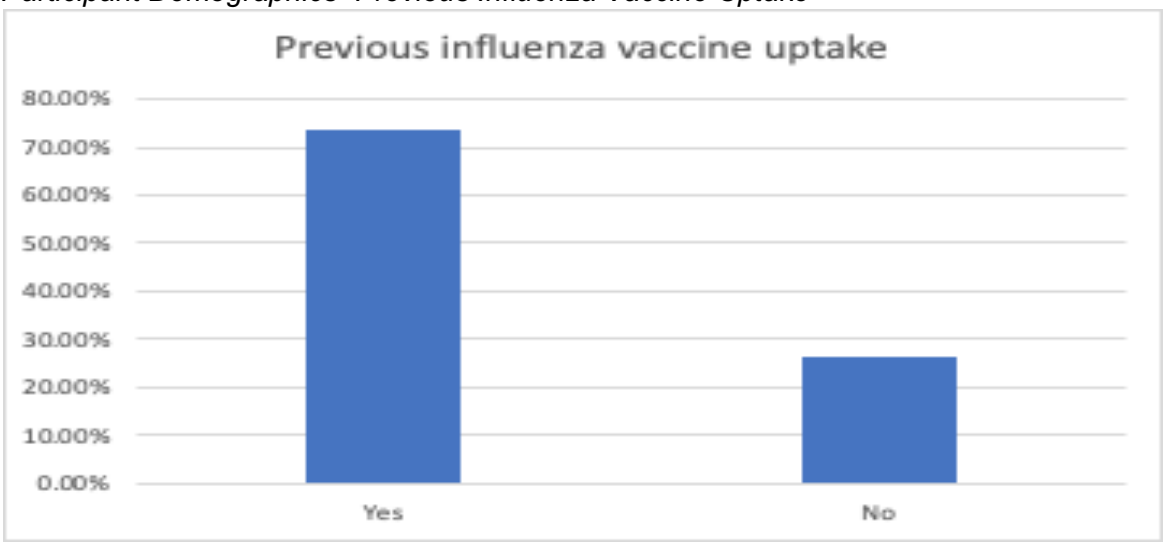


Figure 9.1

Participant Demographics- Previous Tdap Vaccine Uptake

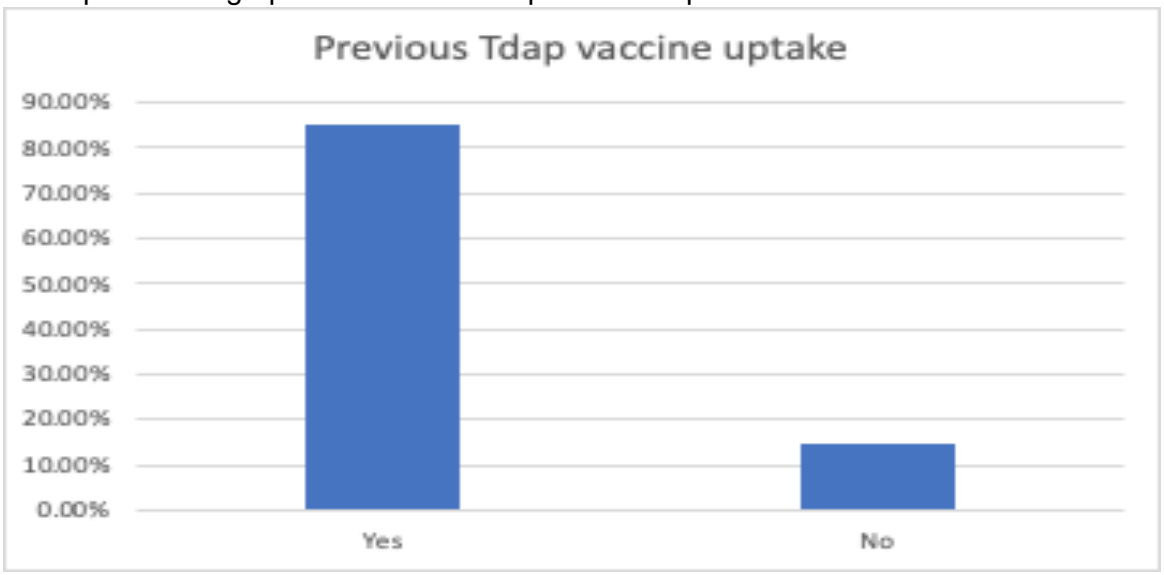
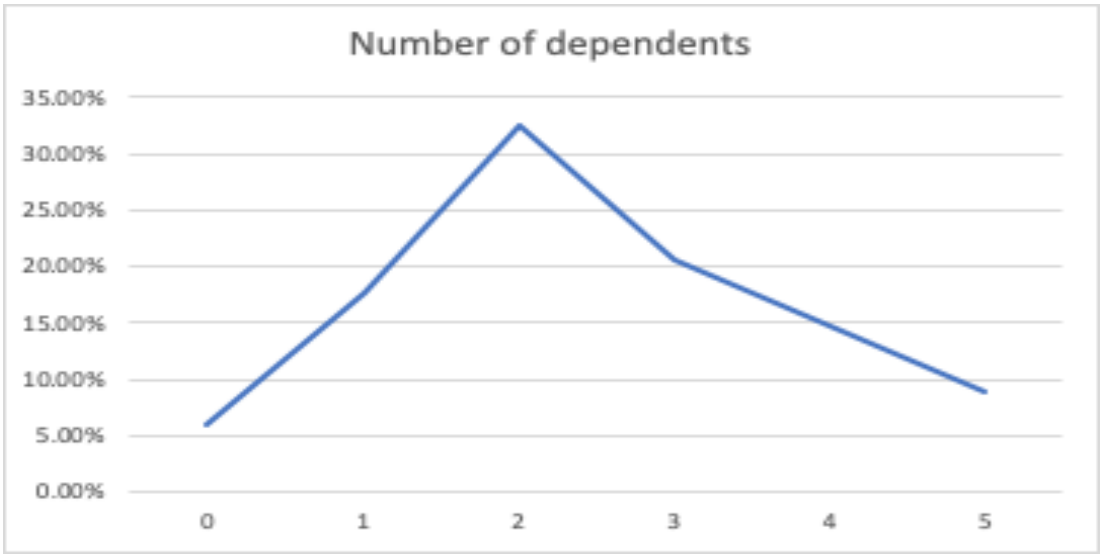


Figure 10.1



Changes in Outcome

To determine the significance of all outcomes, data were entered and analyzed using the International Business Machine (IBM) statistical analysis program, SPSS. Baseline data were obtained from all participants via an in-office paper survey. Over the project period, vaccination uptake was closely monitored by the project leader and clinic personnel via the EHR. Once vaccination was complete, documentation of which vaccine was given, the route of the injection, dose, location, and lot number and expiration number were recorded. Secondary outcomes were defined by the documentation of a verified positive influenza test or confirmation of the pertussis bacterium within the EHR.

Statistical Testing and Significance

Effectiveness of the combination of interventions was evaluated for statistical significance of the proposed PICOT question using a paired sample t-test. Secondary analysis using chi-square analysis was performed to evaluate the differences in demographic data variables amongst the participants. A paired sample t-test was performed in order to assess the mean difference in vaccination uptake among participants prior to the intervention and post-intervention. The mean number of participants who admitted to receiving an influenza vaccine

prior to the intervention was not statistically different from the mean status post intervention (M = 0.117, *SD* = .64). Similarly, the paired sample t-test did not reveal a statistically significant difference between pre-intervention uptake of the Tdap vaccine (M = .029, *SD* = .45) from post-intervention uptake of the Tdap vaccine.

Table 3.1

Mean Comparison of Influenza and Tdap Vaccination Prior to and After the Intervention

	Mean	Std. Deviation	Std. Error Mean	Lower (95% CI)	Upper (95% CI)	t	df	*p* value
Influenza vaccine	.11765	.64030	.10981	-.10576	.34106	1.071	33	.292
Tdap vaccine	.02941	.45960	0.7882	-.13095	.18977	.373	33	.711

Chi-square tests of independence were performed to compare the frequency of demographic data variables of participants in relation to vaccination uptake prior to the intervention and after the intervention. Variables assessed include marital status (X^2 (1)= .234, p>0.05) race (X^2 (1)= 16.3, p<0.05), income (X^2 (1)= 10.8, p<0.05), education (X^2 (1)= 15.6, p<0.05), number of times pregnant (X^2 (1)= 1.7, p>0.05), number of independents (X^2 (1)= 3.3, p>0.05), and prior uptake of either the influenza vaccine (X^2 (1)= 0.38 p>0.05) and/or Tdap vaccine (X^2 (1)= 2.1, p>0.05). A significant difference was found amongst those with higher education levels and vaccination uptake for pertussis, as those with higher levels of education were more likely to have received their Tdap vaccine in the past. Race also produced a statistically significant difference amongst those participants who chose to become vaccinated for pertussis both before and after the intervention, in that minority groups such as

Hawiian/Pacific Islanders, African Americans, and Hispanics were less likely to have received their Tdap vaccine when compared to other races. Chi-square tests also determined that there was a significant difference between income level and Tdap vaccination uptake. Only those who made $25,000-$50,000, or over $200,000 a year were the only groups of participants who did not choose to become vaccinated against pertussis. For the influenza vaccine, there were no significant differences amongst the demographic variables.

Table 4.1

Chi-Square Analysis of Prior Tdap Vaccination and Education

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.619	6	.016

Table 4.2

Chi-Square Analysis of Prior Tdap Vaccination and Education

	Value	*df*	*Asymptotic Significance (2-sided)*
Pearson Chi-Square	*16.284*	*6*	*.012*

Table 4.3

Chi-Square Analysis of Prior Tdap Vaccination and Income

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.880	*5*	.050

CHAPTER 5

DISCUSSION

The purpose of this EBP project was to evaluate the effectiveness of a policy implementation that initiated a combination of evidence-based patient education and reminder/recall interventions in the form of text-messages and/or phone calls in efforts of increasing vaccination uptake for both influenza and pertussis in pregnant patients. Patient education was performed using evidence based hand-outs during in-person clinic visits where providers took extra time to thoroughly review the literature regarding the benefits of maternal vaccination, as well as to answer any patients questions or concerns related to vaccine safety and efficacy. Reminders were sent out via automated text-message or phone call based on participant preference. Contraction of either the influenza virus or pertussis during the project period was measured as a secondary outcome measure.

Explanation of Findings

The PICOT question, “In pregnant women, how do reminder/recall interventions and patient-directed education compared to standard practice affect vaccination uptake rates within 12 weeks?” was answered by measuring vaccination uptake rates for both the influenza vaccine and the Tdap vaccine both prior to and after the intervention. Of the participants who received an influenza vaccine during the prior flu season, 69% also went on to receive their influenza vaccine during the project period (post intervention). Of those participants who received either their last indicated Tdap booster, or received a booster during their last pregnancy, 89.7% also went on to receive their Tdap vaccine during the project period. Overall, there was a higher uptake rate of the Tdap vaccine amongst the participants compared to influenza vaccination.

When comparing mean pre-intervention vaccination uptake rates to post-intervention vaccination rates using paired sample t-tests, there was no significant difference found, $p>0.05$).

Participants who held bachelor's degrees or higher (graduate, professional,or doctoral) made up the percentage of participants who chose not to receive their Tdap vaccination during the project period (post-intervention), in relation to education level. Those who identified as Hawiian/Pacific Islander or Hispanic were least likely to receive their Tdap vaccines after the intervention. Only 33.3% of Hawiian/Pacific Islanders and 33.3% of Hispanics received their Tdap vaccines post-intervention, compared to other races. Furthermore, only 50% of participants who made over $200,000 (individually; not per household) or more a year, and 60% who made $25,000-$50,000 a year went on to receive their Tdap vaccine after the intervention.

These results, while clinically significant, were not consistent with results of similar projects in the literature and other research studies. Of the studies reviewed in chapter two, many of them included expanded strategies for reminding patients to schedule vaccine visits. Of the literature analyzed in this EBP project, less than half of the studies utilized postcards or mailed items to remind patients to receive their indicated vaccines. While this EBP project did not utilize this method of communication to remind patients to receive their vaccines, a multimodal approach using both text-message/telephone reminders coupled with in-person education on a weekly basis for 14 weeks was implemented, as these two interventions showed the highest efficacy for increasing vaccination uptake within the current literature. The reason for this inconsistency could be attributed to a variety of factors. For example, much of the research regarding increasing vaccination uptake rates was conducted on either the general population, or specific, unrelated populations such as pediatrics or geriatrics, and not specifically pregnant women. Furthermore, studies within the literature assessed a vast amount of vaccines, and not just influenza and pertussis, thus possibly causing inconsistencies in outcomes due to the varying levels of perceived risk for different vaccines. Additionally, the time in which the intervention took place was in the midst of a global pandemic, thus the clinic was performing

more virtual appointments than usual, and patients were less willing to physically come into the office for appointments. Furthermore, the small sample size was likely due to the environmental factors that were occuring at the time of the EBP project.

Secondary outcomes measured the percentage of participants who contracted either influenza or Tdap in relation to vaccination status. Of all 34 participants who enrolled and completed the project, zero contracted either illness during the project period. This outcome was measured with assistance from the EHR. After the 14 week project period, the EHR was thoroughly searched for all enrolled participants for documentation of a positive influenza test, or diagnosis of influenza, or a diagnosis of pertussis. While uptake of both influenza and Tdap vaccines were not successfully met at 100% completion rate, none of the participants suffered adverse effects due to contraction of either illness.

Unexpected findings for this project were the rates of Tdap vaccination amongst those participants who had higher levels of education. As mentioned above, those participants holding bachelor's degrees or higher, were less likely to become vaccinated against pertussis. This finding was not anticipated, as this demographic statistic is not consistent with the literature, as those with higher levels of education were shown to be more likely to become vaccinated in other studies as discussed in the literature review.

Theoretical Framework

The theoretical framework used for this EBP project was Nola J. Pender’s health promotion model. This model was chosen based on its relevance to the project purpose, as it focuses on individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcomes as they relate to health promotion, and overall wellness (Petiprin, 2020). Thus, the overall purpose of this theoretical model is to increase a patient's sense of well-being and health. This theoretical framework was also chosen based on its focus on individuals’ personal characteristics that make each person behave differently, in regards to health behaviors. Since the overarching goal, or theme of this framework is to increase wellness

and good health, it was fitting to guide this project, seeing as though vaccination is a form of primary prevention for many different illnesses.

The health promotion theoretical model makes four assumptions. The first assumption is that individuals seek to self regulate their behavior (Petiprin, 2020). In other words, individuals strive to take control of their own lives, and make their own active health decisions. The second assumption that this framework makes is that individuals interact with their environments, which transforms the environment, as well as the individual themself (Petiprin, 2020). The third assumption of this model is that healthcare professionals, such as nurses directly influence patient's lives and decisions, as they are part of their interpersonal environment, which ultimately affects people throughout the lifespan (Petiprin, 2020). Finally, the last assumption this theoretical framework makes is that self-initiated reconfiguration of the person-environment interactive patterns is essential to changing behavior (Petiprin, 2020).

The strengths of this theoretical framework include its ability to address individuals' own personal behaviors and how they relate to their health status along with how past behaviors, and their frequency affect future behaviors. Seeing as though the purpose of this project focused on primary prevention and reducing adverse effects from influenza and pertussis amongst pregnant women, this theoretical model was very fitting.

A weakness of this model is that it does not take into account the indications in which a person is unable to perform health sustaining behaviors. Since this theoretical framework considers health promoting behaviors as the end-point for health promotion, it fails to take into consideration those individuals who cannot partake in such behaviors due to direct contraindications, religions, personal beliefs, or current health status. For example, those who were allergic to either vaccine, declared as immunocompromised, or otherwise inappropriate to receive either vaccine were not eligible for participation in the project, and thus this framework was unable to be applied to this population.

EBP Framework

The EBP framework, or model used for this project was the Iowa Model. This model was selected based on its usefulness in implementing EBP for clinicians who are just beginning, or unfamiliar with the process of implementing evidence based interventions. It was also selected for use due to the inclusion of a pilot stage, allowing change agents to modify and realign the proposed intervention with project goals prior to the final intervention. This model uses a step-by-step approach to implementing evidence based practice. The first step of the Iowa model is to identify an area of practice that warrants a practice change, or modification. Next, it is the responsibility of the change agent to use clinical reasoning to determine if the selected problem at hand is of enough importance and priority to the organization to pursue. The next step in the Iowa model is to gather individuals in order to develop, evaluate, and implement the EBP change. After this is done, the next step is to gather and analyze the evidence related to the practice change and then develop a PICOT question. Once evidence has been gathered, the change agent should then critique and synthesize the evidence. If there is enough evidence to justify a practice change, progression to the next step may occur. After the desired change has been justified by both the project leader and key stakeholders as a priority and a vital way to improve organizational success, the next step involved is to conduct a pilot study. This means that parts of the overall intervention will be implemented on a smaller scale, in order to assess effectiveness, and determine what modifications need to be made when conducting the final change. Lastly, it is important to always evaluate the effectiveness of the intervention. During this phase, evaluation of feasibility and appropriateness should occur before decisions are made to implement the intervention across other departments/units/organizations.

Strengths of this model include the use of a pilot phase, especially for those individuals who are new to EBP, or who have never implemented a project before. This was considered a major strength, as this time period allowed the project facilitator to better judge the feasibility of the intervention prior to fully implementing it. During this period, only one patient per day was invited to participate in the project. This was done to determine both the likability and usability of

the evidence based educational hand-out used for patient education, and to allow clinic staff enough time to configure the digital application for sending automated reminders. Clinic staff all took turns using the digital application and practiced sending out trial text-messages to their own cellular phones to ensure that the program sent messages quickly and in the correct format. Likewise, staff members practiced scheduling phone calls using their own cellular phones and listened to the message to ensure that the automated voice was clear, audible, and spoke at an appropriate speed so as to ensure maximal efficacy of this intervention.

One weakness of this model is that it does not address what would be the final step in implementing EBP, maintaining the practice change. While it does encourage clinicians and implementers to disseminate results/findings, it does not specifically state any mechanisms in order to sustain a practice change. Seeing as though the ultimate goal is to share evidence based data with other like-minded peers, this EBP model lacks the ability to ensure that clinicians and other healthcare professionals alike are being consistent with their interventions, in order to produce sustainable outcomes for both patients and staff.

Modifications that were made during the pilot phase consisted of adding more time to patient appointment visits to account for dedicated time for patient education and collection of contact information for reminder/recall interventions. Providers and patients collectively voiced an appreciation for the additional time set aside for patient education, as well as time for patient questions and concerns to be addressed. Additionally, one clinic staff member was dedicated to perform data entry into the digital application in order to send out automated text-messages and/or phone calls. This was decided after the initial pilot phase, as there were inconsistencies in usage of the digital application amongst staff members.

When considering future implementation of a similar project, modifications that would be made include initially designating one clinic staff member to be in charge of entering phone numbers into the digital application for automated reminders. This should be done for efficiency, as well as consistency in the use of the application. Further modifications would be to add a

third reminder/recall format such as a mailed postcard, or email reminder. As evidenced in the literature, communication in the form of various styles (text-message, telephone call, email, postcard, patient portal reminder, etc.) helps to increase vaccination uptake, especially when combined.

Strengths and Limitations of the DNP Project

Strengths

Although the sample size was small, there was no attrition for this EBP project. All 34 participants who enrolled in the project completed the project throughout its entire duration (14 weeks). Additionally, appreciation was voiced by both providers and patients regarding the extended appointment times for patient teaching. Providers mentioned that the additional time spent with patients allowed for rapport building, as well as the opportunity to provide reassurance to concerned patients regarding the safety and efficacy of both the influenza and Tdap vaccine. Patients mentioned that they felt as though the additional time at the end of appointments was useful, and helped them feel more comfortable about receiving vaccinations during pregnancy. Furthermore, patients voiced that the educational hand-out received clear and succinct information, without the use of medical jargon, or “pushy” language. Lastly, although the results were not found statistically significant, vaccination uptake rates did not decrease from the clinic’s prior year’s average vaccination uptake rate. Thus, the intervention did not have a negative impact on vaccination uptake at the clinic.

Limitations

The small sample size could likely be contributed to the changes and modifications to clinic procedures during the global COVID-19 pandemic. Since an effort was made to practice social distancing, even in health care environments, clinic appointments were restricted and limits were placed on the number of occupants in the building at any given time. Due to this, additional time was already implemented into the clinic procedure for more thorough disinfecting and sanitizing of all equipment before and after each appointment, and thus reduced the

number of overall patients seen per day at the clinic. Further, there was some initial lag in recruitment, as the initial consent form was rather lengthy, making it less likely that patients would read it, let alone agree for participation in the project.

Implications for the Future

After conducting this EBP project and observing the overall effects of the reviewed interventions, there were many implications for future research and practice observed. These implications fall into the category of clinical practice, EBP, research, and education.

Practice

Based on both patient and provider feedback, it was determined that clinic routine will be changed indefinitely to accommodate new procedures for promoting vaccination uptake. One staff member should be designated for usage of the digital application, as this was found to keep use consistent during the project period, and reduced the time needed for orienting other staff members on how to use the application as frequently. Further, additional time should continue to be incorporated into office visits to allow for patient education and entry of communication preferences into the digital application.

EBP Model

The Iowa model was found to be very effective and relevant to guide this EBP project. This model is a great tool for clinicians who are new to EBP, as it utilized a pilot phase to essentially test the intervention on a smaller scale for deficiencies or areas of improvement prior to performing the full scale practice change. This aspect of the model served especially useful for this EBP project, as this site had never previously completed EBP, nor any formal quality improvement projects. The pilot phase helped both the project facilitator and staff adjust to the proposed change, and make corrections as seen necessary for the clinic staff.

Research

Due to the limited number of research articles specifically targeted towards pregnant women and vaccination uptake strategies, further research on this population would be helpful. Much of the research was geared towards the general population, pediatrics, or geriatrics. Since pregnant women are a vulnerable population, limited research evidence involving vaccine uptake strategies were found. Attempts at future research should explore additional barriers to vaccination within this population, as well as additional strategies targeted towards these individuals that would assist in increased vaccination uptake. For example, reminders/recalls in this population could be given in the form of calendars, specifically for pregnancy that could include appointments, indicated tests/screenings, reminders, fetal growth benchmark statuses, and much more.

Education

Seeing as though education was a major component of this EBP project, education will need to continue to occur at the end of patient appointments using the evidence-based hand-outs that patients can then take home and keep for review. More importantly the effectiveness of APRN led patient education was highlighted throughout this EBP project. With the aid of additional time during appointments, provider-led education was found to help build rapport with patients and also help patients to feel more at ease when making the decision to become vaccinated. Specific time set aside for education should continue to be incorporated into the clinic's routine, as this helped patients to feel a more personal connection to their providers, as well as a sense of comfort knowing that their providers cared for them enough to sit down and discuss vaccination, as well as address any concerns, or questions that the patient may have.

Conclusion

This EBP project, while not found statistically significant, was found helpful to the clinic. This project helped to highlight the ease of some very basic interventions to help increase and sustain vaccination uptake amongst pregnant women by using commonly used communication modalities such as text-message and telephone. This EBP project not only modified clinic

procedure, but also helped to broaden the perspective of the patients visiting the clinic regarding the importance of vaccination during pregnancy. Further, providers at the clinic were better set up to initiate patient education sessions, and attend to patients needs more efficiently. All in all, this EBP project was considered successful by clinic staff, and efforts to sustain this practice change were put into place prior to termination of the project to ensure a smooth transition for the permanent policy adjustment. This was done by designating a single individual to input communication data into the application. Due to the ease and familiarity of digital applications to many, the use of this intervention may easily be translated to other clinics, and even other disciplines as well.

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BIOGRAPHICAL MATERIAL

Ms. McGee attended Indiana University-Purdue University Indianapolis (IUPUI) from 2014 to 2018 which culminated with graduation from the Indiana University School of Nursing (IUSON) with her Bachelor in Science in Nursing. During her studies at the IUSON, she acquired a student nursing job within the Indiana University Health academic health center, and upon graduation, she accepted a position within this health network as a critical care registered nurse in surgical intensive care. Currently, she enjoys orienting new graduate nurses, fulfilling charge nurse responsibilities, and most importantly, stabilizing and providing care for critically ill patients. During this time, Ms. McGee also chose to begin graduate studies at Valparaiso University to pursue her Doctorate of Nursing Practice to become a family nurse practitioner. Since 2018, Ms. McGee has been a member of the Sigma Theta Tau International Nursing Honor Society- Alpha chapter. She has also participated as an active member of both Alpha Lambda Delta and Phi Beta Sigma International honor societies. After graduation this May, Ms. McGee plans to engage in her dream of practicing family/internal medicine and providing much needed care for underserved and at-risk populations . Ms. McGee aims to move to the west coast to fulfill her duties as a healthcare provider, leader, consultant, and change agent. After obtaining clinical experience as a provider, Ms. McGee plans to enter the realm of teaching and scholarly nursing education to arm the next generation of nurses with the skills they need to work in an ever-changing health care system .

ACRONYM LIST

ACOG: American College of Obstetricians and Gynecologists

APRN: Advanced Practice Registered Nurse

ATCS: Automated Telephone Communication Systems

CDC: Centers for Disease Control

CINAHL: Cumulative Index of Nursing and Allied Health Literature

CITI: Collaborative Institutional Training Initiative

CNM: Certified Nurse Midwife

DNP: Doctor of Nursing Practice

EBP: Evidence-Based Practice

EHR: Electronic Health Record

FNP: Family Nurse Practitioner

HCP: Health Care Professionals

HPV: Human Papillomavirus

IBM: International Business Machine

IRB: Institutional Review Board

IVR: Interactive Voice Response

MA: Medical Assistant

RN: Registered Nurse

PCP: Primary Care Provider

WHNP: Women's Health Nurse Practitioner

JBI: Joanna Briggs Institute

RCT: Randomized Controlled Trial

Tdap: Tetanus, diphtheria, acellular pertussis

TRIP: Turning Research Into Practice