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Affecting TDAP Vaccination Rates Among Women: a Multifaceted Intervention

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AFFECTING TDAP VACCINATION RATES AMONG WOMEN:

A MULTIFACETED INTERVENTION

by

SONEKA WYNTER

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions

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DEDICATION

To my wonderful son Michael who cheered me on while I chased my dream. He inspires me with his constant strength, laughter and love. I also dedicate this to Rosemary, a beloved mother with a strong and gentle soul, who taught me to trust in God, believe in hard work, and see the good in everything. And to my amazing sisters Ngombe and Fota, who believed in me even when I didn't believe in myself - my soul mates and my rock.

"Anytime you see a turtle up on top of a fence post, you know he had some help."

- Alex Haley.

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ABSTRACT

Despite the availability of a preventive vaccine, the incidence of pertussis in the United States has continued to increase over the past two decades and it is now considered the most common preventable infectious illness. Highly contagious in nature, it is estimated that about 50 million people are infected each year, and approximately 300,000 deaths occur worldwide (Centers for Disease Control and Prevention [CDC], 2012). In 2013, Indiana reported 616 cases (Indiana State Department of Health [ISDH], 2014). In spite of CDC recommendations on strategies that can improve vaccine delivery, rates of immunization remain low nationwide (CDC, 2014). The purpose of this evidence-based practice project was to determine if implementation of a multifaceted intervention that consisted of provider reminder and education, and standardization of Tdap vaccine delivery would increase vaccination rates among women aged 18 years and older. The Iowa Model of Evidence-based Practice and Kurt Lewin's change theory were utilized for guidance to facilitate the transition of best evidence into practice. Within a women's health clinic in Northern Indiana, a retrospective chart review was conducted prior to project implementation followed by a ten-week period during which provider education, provider prompts attached to charts of eligible patients, and a standardized protocol for vaccine delivery was introduced. A five-fold increase in immunization receipt was noted with 1.5% ($n = 5$) immunized pre-intervention, compared to 11.7% ($n = 31$) immunized during intervention; results revealed a statistically significant association between the intervention and vaccine receipt ($\chi^2 = 26.555$, $p < .0001$). Additionally, chi-square was used to analyze variables of interest including age, ethnicity, type of visit (obstetric, post-partum, well visit or acute visit), and type of insurance coverage, which were examined to determine whether they affected vaccination receipt. Findings revealed that none of the variables significantly influenced the rate of immunization among the women. Results of this EBP project lend support to the recommendation of use of this multifaceted approach as a strategy to increase rate of immunizations.

Keywords: tdap, vaccination, immunization, provider reminders, provider prompts

CHAPTER 1

INTRODUCTION

Background

Pertussis, commonly known as whooping cough, is a respiratory infection caused by the bacterium *Bordetella pertussis* (Centers for Disease Control and Prevention [CDC], 2012). The disease is characterized by coughing and laryngeal spasms that result in a noisy inspiratory stridor called whooping, hence the common name of *whooping cough*. Transmission of pertussis occurs mainly through direct contact with respiratory droplets from mucous membranes of those infected, but can also occur from contact with recently contaminated items from an infected person (CDC, 2008). Toxins from the pertussis bacteria attack the victim's airway, resulting in a paralytic effect and interfering with one's ability to clear respiratory secretions (CDC, 2012). Communicability therefore is very high, with an estimated 90% attack rate in household contacts developing the disease after exposure (CDC, 2010). Pertussis results in substantial morbidity among adults, adolescents, and children, and its clinical course can be complicated by pneumonia, hypoxia, convulsions, and death (CDC, 2012; Stedman, 2006). It is well documented that neonates and small children are the most vulnerable population (Zastrow, 2011). Infants experience the highest rates of disease, compared with any other age group, with incidence ranging from 27 to 127 cases per 100,000 population from 1991-2011 (American Academy of Pediatrics [AAP], 2006; CDC, 2012). The CDC (2012) also reported that from 2000 to 2012, 76% of all pertussis-related deaths occurred in infants younger than two months of age. Prior to this age, infants are not eligible to receive the diphtheria-tetanus toxoid-acellular pertussis (DTaP) vaccine. The CDC's Advisory Committee on Immunization Practices (ACIP) has noted that although the source of pertussis in many infants is often unknown, patients with the disease, new mothers, and other adult close-contacts are found as an important source when a source is identified (CDC, 2012). Owing to the severity of

pertussis symptoms in infants, the primary goal of pertussis outbreak control efforts is to decrease morbidity and mortality among infants, with a secondary goal aimed at decreasing morbidity among people of all ages (CDC, 2012).

Widespread immunization against pertussis was implemented in America as early as the 1940s (Frere et al., 2013). Following that period, and owing to high immunization coverage, the incidence of the disease was dramatically decreased (CDC, 2012; Paisley, Blaylock, & Hartzell, 2012). However, since the 1980s, the number of reported cases has steadily increased, particularly among the infant and adolescent age groups (AAP, 2006). According to Rittle (2010), immunity attained from childhood vaccination wanes over time, placing adolescents and adults at risk for contracting pertussis and potentially spreading the infection to infants and others who may lack immunity. Pertussis infection rose to a reported 40-year high of more than 25,000 cases in 2004, followed by 21,003 cases in 2005, 13,144 in 2006, 8,739 in 2007, 9,499 in 2008, and 13,506 cases in 2009 (CDC, 2010). Approximately 27,600 cases and 27 pertussis related deaths were reported in 2010 (CDC, 2012). This resurgence of pertussis, as well as recent serious outbreaks, continues to put the lives of many vulnerable people at risk for the disease and its complications (AAP, 2006; Pierson, Malone, & Haas, 2015; Ndiaye et al., 2005).

Statement of the Problem

Data from the Literature Supporting the Project

Pertussis is a highly contagious disease and despite the availability of a preventive vaccine, outbreaks persist in the United States (CDC, 2010). Despite the availability of safe and effective vaccines, immunization rates remain low, especially among adults. While pertussis can be life-threatening, the disease process and its complications can also result in social and economic as well as physical costs that can ultimately disrupt a healthcare system (CDC, 2015a). Even though immunization levels in the United States are high, gaps still exist, and vaccination remains underutilized in adults. “Despite adult vaccination being listed as a *Healthy People 2020* objective, current systems of medical care in the United States are not meeting

this need” (Steiner, Swamy, & Walter, 2014, p. 411). Increasing rates of infection and the high risk of mortality that pertussis presents for infants less than six months of age, necessitates a thorough review of best practice standards. Therefore, as a protection for these infants’ immunological naiveté, maternal immunization has been identified as an effective strategy to guard them from disease. Increasing incidence of pertussis among the young and loss of immunologic protection in adolescents and adults was the impetus for the CDC’s ACIP to recommend Tdap vaccination during each pregnancy irrespective of the woman’s previous Tdap receipt (CDC, 2012). This approach is believed to ensure that newborn infants are protected from birth through transplacental acquisition of “protective levels” of maternal pertussis-specific antibodies (CDC, 2008; Gonik, Puder, Gonik, & Kruger, 2005). Theoretically, this passive protection could protect infants until the first or second dose of the primary immunization series is completed. The CDC (2011) has also urged all caregivers and family who are in close contact with an infant to receive the Tdap vaccine. The metaphor of *cocooning* is used to describe the practice of vaccinating everyone who comes in contact with an unvaccinated infant in order to protect the child from disease (Dardis, Koharchik, & Dukes, 2015).

The CDC’s ACIP, a group of medical and public health experts, provide advice and guidance to the Director of the CDC regarding use of vaccines and related agents for control of vaccine-preventable diseases in the civilian population of the United States. The group took note that despite sustained high coverage for childhood pertussis vaccination, pertussis remains poorly controlled, and vaccination coverage among adolescents and adults is suboptimal. The group then decided to revisit earlier recommendations for Tdap immunization that had been made available in 2005. In conducting the revision, the group considered, among other things, factors such as the epidemiology of pertussis, provider and program feedback, and data on the barriers to receipt of Tdap (CDC, 2011). Additional recommendations were then made that

would facilitate removal of identified barriers and programmatic gaps that contribute to suboptimal vaccination coverage.

Pertussis can be prevented through immunizations, and, in response to the resurgence of the disease, new vaccination guidelines have been established (CDC, 2012). The pertussis vaccine is the most effective means for disease prevention (Spratling & Carmon, 2010). Much of the literature has identified adolescents and adults as the primary carriers of the disease (CDC, 2012; Rittle, 2010). The CDC (2011) recommends universal immunization of adolescents, and adults, with the latter receiving a single dose of Tdap, and subsequent booster doses of tetanus diphtheria (Td), every ten years. Currently, the diphtheria-tetanus toxoid-acellular pertussis (DTaP) vaccine is recommended in early childhood, and the tetanus toxoid, reduced diphtheroid, and acellular pertussis (Tdap) is recommended for adolescents and adults (CDC, 2012). There are currently two Food and Drug Administration (FDA) approved pertussis vaccines on the market today. In 2005, Adacel (Sanofi Pasteur, Swiftwater, PA) was licensed as a pertussis vaccine for use in people aged 11-64, and in 2008 Boostrix (GlaxoSmithKline: Biologicals: Rixensart, Belgium) was approved for use in those aged 10-64 years (CDC, 2010). Murphy et al. (2011) have recommended pertussis vaccinations for all adolescents and adult women of childbearing age.

Clinical Agency Data Supporting the Project

Located in Northern Indiana, Clinic X is a women's health center that provides comprehensive, affordable, and quality health care for women of all ages. This community-based clinic offers obstetric and gynecological care, acute and well-visits, as well as preventative care for women in the community. A growing and significant population of the community served is of low income. The clinic accepts Medicaid, Medicare, and private insurance, and offers a sliding fee scale based on income guidelines for the uninsured. Aware of the importance of Tdap immunization in prenatal and postpartum mothers, as well as non-gravid women, the nurse practitioner at the clinical site expressed concern for the low number of

vaccinations administered to women who attend the clinic. The clinic did not have a formalized quality assurance process, which made it difficult to assess statistical data. There was no policy in place for administration of the Tdap vaccination and therefore, the practitioner offered the vaccine sporadically. Discussion between the Doctor of Nursing Practice (DNP) student facilitator and the nurse practitioner affirmed the need to develop interventions that could assist in increasing vaccination rates at the clinic. The nurse practitioner cited barriers such as the availability of vaccines, time constraints, as well as client's lack of knowledge about pertussis and the Tdap vaccine. Reported low rates of Tdap immunization at the clinic necessitated a time-efficient evidence-based project that would facilitate thorough review of barriers and practice standards, and implement strategies that could aid in improving Tdap coverage among women who attended the clinic. Following IRB approval, an on-site assessment was conducted to identify previous immunization administration rates and to establish a benchmark for project success. This clinic did not have a policy for vaccine immunization, and a chart audit revealed that only 1.5 percent of women were vaccinated during a six week period.

Purpose of the Evidence-Based Practice project

History has shown that immunization with the pertussis vaccine has the ability to decrease transmission rates of the disease (CDC, 2008; Spratling & Carmon, 2010). Increasing Tdap immunization among the women who attend Clinic X had the potential to reduce morbidity and mortality for mothers and their offspring, as well as in the overall reduction of pertussis infection in the community.

The purpose of this project therefore, was to determine if Tdap immunization rates at Clinic X could be improved by implementing a Tdap protocol. The proposed protocol used a multifaceted approach consisting of provider prompting, an education component, and standardization of vaccine delivery. It was anticipated that success of the EBP project would ultimately contribute to conversations that are necessary to discuss the need for further support from the larger organization for providers of women's health care. Hence, the compelling clinical

question read as follows: What is the effect of a multifaceted intervention consisting of provider education and prompting, as well as patient education, on the Tdap vaccination rates in women aged 18 and older?

Once a clinical inquiry is encountered, a clinical question can then be developed (Melnik & Fineout-Overholt, 2011). The PICOT (i.e., patient population, intervention of interest, comparison intervention or status, outcome, and timeframe) format was used to guide the project and facilitate retrieval of the best available evidence. Therefore, the PICOT question for the project was: In women 18 years and older, what is the effect of a multifaceted intervention that includes provider prompting, an education component, and standardization of vaccine delivery, compared to usual practice, on Tdap vaccination rates over a 6-week period?

Significance of the EBP Project

Even though the prevention of life-threatening pertussis in young infants in the 21st century is indeed a challenging prospect, healthcare providers have a responsibility to protect the vulnerable persons and can contribute greatly to maintain or increase immunization rates among patients seen in their practice. Low immunization rates have been associated with factors such as lack of knowledge regarding the importance of pertussis immunization, confusion regarding vaccination history, and mistrust of vaccines (Vitek et al., 2011). Resurgence of a vaccine-preventable disease such as pertussis highlights the need to focus on immunization rates. Not unlike this DNP student facilitator, nurse scientists have the responsibility to examine the best approach to affecting immunization rates in efforts to impede the progression of pertussis in their communities. "Women of reproductive age represent a population with unique vaccination needs" (Vitek et al., 2011, p 2024), and women's health care, more specifically prenatal and postnatal care, presents a unique opportunity for providers to contribute to the elimination of infectious diseases as well as health disparities among low-income women.

There is abundant evidence in the literature that identifies patient barriers to immunizations. These include factors such as (a) lack of knowledge regarding the importance of pertussis immunization, (b) mistrust of vaccines, (c) concerns about side effects, and (d) lack of provider recommendations (Rittle, 2010; Spratling & Carmon, 2010; Vitek et al., 2011). However, provider-focused barriers are also prevalent and include factors such as (a) lack of a standardized policy for Tdap immunization, (b) lack of an effective reminder system, (c) lack of patient immunization history, and (d) limited time and staff support (Clark, Adolphe, Davis, Cowan, & Kretsinger, 2006; Rittle, 2010; Spratling & Carmon, 2010; Vitek et al., 2011). It is apparent that in order to increase vaccination rates against pertussis, provider and patient education must be improved. Advanced practice nurses (APNs) should be able to adequately address immunizations with every appropriate patient encounter, and provide vaccinations to all patients whom are considered eligible. A clear understanding of the risks and susceptibility of infants to pertussis, utilizing current U.S. immunization guidelines, as well as taking into consideration implementation of strategies that will increase immunization rates, will provide a strong foundation for the prevention of pertussis exposure in infants, women, and the community as a whole.

CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

Evidence-based practice (EBP) is the conscientious and judicious use of current best evidence in conjunction with clinical expertise and patient values to guide health care decisions (Schmidt & Brown, 2015). Implementing evidence-based practices can be challenging, and necessitates strategies that can address the complexity of systems of care, individual practitioners, leadership, and, ultimately, health care cultures, to be evidence-based practice environments. According to Melnyk and Fineout-Overholt (2011), the challenge and complexities associated with changing clinical practice can be overcome by using a model to systematically guide implementation of EBP. Along with the integration of current, high-quality research evidence, the DNP student facilitator considered the targeted population's clinical status and circumstances, their preferences and actions, healthcare resources and (personal) clinical expertise when making decisions about implementing EBP change. Recognizing the importance of the need for a systemic approach to practice change, the DNP student facilitator used Kurt Lewin's change theory model as the theoretical framework for the implementation of interventions that were intended to aid in the increase of vaccination rates. To aid in the facilitation of the translation of evidence into practice, the Iowa Model of Evidence-Based Practice was utilized.

Theoretical Framework

Overview of Kurt Lewin's Change Theory

Regarded by some as the father of change theory, Kurt Lewin concerned himself with offering a deeper explanation of human behavior while uncovering ways to improve human behavior (Bozak, 2003). According to Burnes (2004), Lewin's work stemmed from his concern to find an effective approach to resolving social conflict through changing group behaviors. He viewed change as driving forces and resisting forces that were pushing in opposite directions

(Bishop, 2011). Lewin's theory of change provides the structure for understanding people's behavior during times of change and ways in which said behaviors can be improved when a change is introduced. According to Bozak (2003), Lewin's operational framework for change is his Force Field Analysis Model, a model that provides an understanding of individual and group behavior as determined by motivation and intention. Lewin identified two dynamic forces. The first was 'driving forces' which move toward a positive effect and therefore encourage change to occur, and the second force identified was 'static forces', identified as restraining forces. Static forces were those forces often seen to attempt to maintain the status quo (Bozak, 2003). Both forces have an impact on the change process in an environment. According to Bozak, a driving force might be the result of external forces compelling the change, but it may also result from problems within the current system or simply the desire to improve a specific situation. Restraining forces tend to create barriers that prevent change from happening (Bozak, 2013).

Therefore, in order for change to transpire successfully, driving forces must be identified and strengthened in favor of the change, while all efforts are made to weaken the restraining forces, or even eliminate them altogether. Kurt Lewin's change theory offers a strategic approach that can aid in the planning, implementation, and evaluation of practice change. Within the model, Lewin noted that a successful change should involve three stages identified as unfreezing, changing, and refreezing (Bishop, 2011; Bozak, 2003; Burnes, 2004).

Unfreezing is the initial stage of the change process. During this stage individuals recognize the need for change and prepare for change to occur. During this stage, current practices and processes have to be reassessed in order for wheels of change to be set in motion. Individuals have to be engaged to gain perspective on usual ways, unlearn bad habits, and open up to new ways of reaching the objective (Bishop, 2011). According to Bozak (2003), this step often evokes feelings of discomfort, apprehension, and distress. Use of the model can aid in recognizing and address these behaviors as well as other resistive forces. Good communication and education regarding the change can enhance the strength of driving forces

and facilitate transition from the first to the second stage of Lewin's model (Bozak, 2003; Bishop, 2011).

The second stage of the process is the changing stage. The changing phase, sometimes referred to as 'transitioning' or 'moving' stage, is marked by the implementation of the change. During this stage people begin to learn new behaviors, processes and ways of thinking. Initiatives should be implemented to encourage individuals to move towards the desired state. According to Bozak (2003), it is during this stage that the actual change occurs and the driving forces have equalized or overcome the restraining forces, which is why education, communication, support, and time are critical. Additionally, initiatives should be implemented to encourage individuals that the desired outcomes will be a positive change. Individuals who understand the benefits of the change are more likely to actively engage in activities that will drive the change forward (Bozak, 2003). This is the hardest step to overcome.

The final stage is called refreezing. According to Bozak (2003), Lewin, in his theoretical works, identified this stage as the 'freezing' stage, but current literature identifies the stage as the 'refreezing' stage. Refreezing symbolizes the act of reinforcing, stabilizing, and solidifying the new state after change has occurred. During this stage, change has been successfully reached as evidenced by new practices incorporated into routine procedures and practices within the setting (Bozak, 2003; Bishop, 2011). Efforts have to be made to guarantee that change is cemented into the organization's culture and maintained as the acceptable way of usual practice. Application of Lewin's model during this stage can aid with maintenance and evaluation as functions stabilize and the change is incorporated into the system (Bozak, 2003).

Application of Lewin's Change Theory to EBP Project

Immunizations are an essential part of patient care. The persistence of overall immunization rates below national targets indicates the need for strategies that can improve immunization delivery. APNs, who often serve as the patient's primary health providers, are required to practice preventive medicine and have the responsibility to ensure delivery of

currently recommended vaccinations as part of their role in preventing the spread of infectious diseases. According to Spratling and Carmon (2010), nurse practitioners can play a specific role in the prevention of pertussis by way of providing education, administering the vaccine, and identifying disease outbreaks in a timely manner. Kurt Lewin's model of change was therefore used to guide this EBP project that aimed to determine if Tdap immunization among women who attend Clinic X could be improved by implementing a change that used a multifaceted approach consisting of provider prompting, an education component, and standardization of vaccine delivery.

During the first stage (unfreezing stage), the student facilitator identified the people who would be affected by this change and included all players of the practice change. According to Bozak (2003) in order to accomplish the unfreezing stage, it will be necessary to identify and prioritize driving and restraining forces within the practice setting (Bozak, 2003). Even though the nurse practitioner at the clinical site had acknowledged the low rates of immunizations at this clinic, the need and importance of addressing immunizations at each and every patient encounter was re-emphasized. Education and review of practice guidelines was initiated in efforts to change from usual practice. Other barriers to immunization such as inadequate vaccine supply, time constraints, lack of cooperation among clinic staff, were addressed accordingly. The clinic staff was also encouraged to identify obstacles they perceived could possibly inhibit or prevent the desired goal from being reached. This information was generated by brainstorming and collaborating with the nurse practitioner at the clinical agency, as well as having meetings with the medical assistants. Other potential driving forces included adequate training, positive feedback, and reward systems. Awareness of the factors that encourage and those that impede change was a vital factor in the effective transition from the old system to the proposed protocol change practice. Clinic staff members were kept informed of all events relative to the progression of the project and the new roles or responsibilities that resulted from the project change.

The second stage of the model involves perusing the plan that is proposed in the first stage, and actually implementing the change (Bozak, 2003; Bishop, 2011). During this stage, open communication, education, feedback, support, and encouragement of team players was continued. According to Bozak (2003), people are more likely to actively engage in the change process when they understand the benefits. Acknowledgement of opinions and suggestions is very important while continuing to closely monitor for changes in attitudes and behaviors throughout this stage (Bozak, 2003). The change will undoubtedly disrupt 'normal' or usual workflow, and therefore this change may evoke negative feelings among some team players. When this is evident, use of Lewin's model can be used to reverse to strategies used during the unfreezing stage and attempt to reassess the situation (Bozak, 2003; Bishop, 2011). The student facilitator set up meetings with the clinical agency staff at least once a week. Open communication, availability and accessibility to staff was apparent throughout the project period. Occasionally, unplanned visits and meetings were made as necessary, to accommodate questions, concerns or suggestions by the team.

The third and final stage in Lewin's change theory is the refreezing stage. During this stage, stabilization and reevaluation of the EBP change can be accomplished. Education and support of all clinic staff was continued during this stage. The student facilitator made certain that resources would always in place to support the clinical agency after the EBP project concluded. In order to maintain desired behavior, ongoing evaluation to determine if the practice change met personal, professional, and organizational standards were carried out.

During implementation of the EBP project, the student facilitator ensured that the proposed change was viewed as a challenge rather than a threat. The theoretical framework that was used provided a structured approach and aided the student facilitator in overcoming challenges such as lack of cooperation, or lack of motivation among the clinic staff, as well as other barriers that threatened to impede the transition. Another strength of the model was that stages could be revisited and reassessed whenever barriers appeared in any of the three

stages. Therefore, the resulting well-formulated strategy encouraged adaptation to change, rather than resistance. Setting of project goals, careful planning, good communication skills, involvement of those affected by the change, and staff support, were some of the essential components in the provider system that was aimed at increasing immunizations among the women who attended the clinic. Integration of Lewin's change theory provided the necessary framework for planning, implementing, and evaluating the acceptance and success of the EBP project.

Limitations for use of Lewin's model with this EBP project were related to the limited time of project implementation. Oftentimes when a structure is in place for a while, people become set in their ways and routines may be difficult to change. Some people take longer than others to change, and therefore people in the same setting may be at varying degrees of unfreezing. Another noted limitation was the limited time that would be dedicated to bringing stage three to fruition. The end objective of the EBP project was to increase vaccination rates at the clinical site, and there was very limited time in which to evaluate and solidify the full capacity of practice change.

Evidence-Based Practice Model

Developed in 1994, the Iowa Model of Research-Based Practice to Promote Quality Care was first implemented at the University of Iowa Hospitals and Clinics (UIHC). As confirmation of the model's mass utility and popularity, originators of the model were awarded the 1997 Sigma Theta Tau International Research Utilization Award (Titler et al., 2001). The increasing challenge over the years to provide clearly measureable care of the highest quality which is evidence-based, was the impetus for revising the model to become the Iowa Model of Evidence-Based Practice to Promote Quality Care (Titler et al., 2001). The revised model incorporated new terminology and feedback loops, addressed changes in the current health care climate, and also made it appropriate to use both research and non-research evidence to guide practice (Titler et al., 2001). In order to effectively translate evidence into practice, the

Iowa Model of Evidence-Based Practice was used for this EBP project whose purpose was to determine whether Tdap immunization among women who attend Clinic X could be improved by implementing a protocol that used a multifaceted approach consisting of provider prompting, an education component, and standardization of vaccine delivery.

Overview of Iowa Model

The Iowa model focuses on organization and collaboration incorporating delivery of care and use of evidence, both research and non-research (Titler et al., 2001). According to Schmidt and Brown (2015) "The Iowa model for EBP to promote quality care is a systematic method that explains how organizations change practice" (p. 445). Use of this model will allow the user to focus on knowledge and problem-focused triggers that will lead to questioning current practices and whether care can be improved through the use of current evidence. To effectively guide users through the EBP process, the Iowa model includes several feedback loops, reflecting analysis, evaluation, and modification based on the data of both process and outcome indicators (Melnik & Fineout-Overholt, 2011). High applicability of the model is achieved by following seven steps that use a basic problem solving approach while simplifying the process. A description of the steps and how each step applies to this EBP project follows in the paragraphs below.

Step 1. Selecting a topic for evidence-based practice, takes into consideration several factors. The priority and magnitude of the problem and how it fits into organizational needs should be taken into account. How its contribution will improve care as well as the availability of data and evidence in the problem area should be adequately assessed. Commitment of staff should also be considered. Selection of the topic for this EBP project was closely linked to the needs of this women's clinic. The highly contagious nature of pertussis and the low immunization rates at the clinical agency were considered factors that warranted attention and immediate intervention. Additionally, the EBP project was viewed as a high priority for this clinic

which had a high number of pregnant patients. Ability of the staff to undertake such a project was also considered.

Step 2. This step involves the formation of a team. "A team is responsible for development, implementation, and evaluation of the EBP" (Titler et al., 2001, p. 503). Composition of the team should be directed by the chosen topic and should include all the stakeholders that are essential for the realization of the project. Aware of the importance of Tdap vaccinations, the practitioner at the clinic was willing to be a participant to what she considered a very important project. Medical assistants at the site were recruited to participate in the project's implementation.

Step 3. Once a topic is selected and a team has been formed, the next step is to identify available sources and key terms that can be used to guide the search for evidence. Searches in electronic databases such as CINAHL, Medline, and Cochrane, were used in addition to traditional methods of retrieving published literature such as searching reference lists, consulting with the school librarian, as well as the assistance from the project advisor. "Particular attention is given to including evidence-based guidelines, systematic research reviews, meta-analyses, and clinical studies on the topic" (Titler et al., 2001, p. 504). A search of the literature was conducted for the best evidence that supported use of provider reminders to impact vaccination rates.

Step 4. Grading the evidence is an important step that can be achieved by critiquing and synthesizing the research. This step addresses quality areas of the research that will be used, assessing the overall strength of the body of evidence. Once a study has been critiqued, a decision can be made as to whether it can be used in the synthesis of the project (Titler et al., 2001). A study's inclusion into the synthesis process is considered when (a) the study has overall scientific merit, (b) similarity of the study's subjects to that of the type of population of those in the study to be applied to, and (c) the study has clinical relevance. For this EBP project,

evidence was gathered and critiqued; a table depicting results of this step within the Iowa model is included as Table 2.1.

Step 5. Upon completion of literature critique, determination of whether there is sufficient research to guide practice is made during this step. The resulting recommendations for practice should be based on identifiable benefits and risks to the patients. (Titler et al., 2001).

Relevance, feasibility, appropriateness, meaningfulness and effectiveness for practice should be considered as well as patient preferences. When it is determined that sufficient research to guide practice, the necessary modifications to practice can be suggested. Recommendations for practice change were made based on the need to increase vaccinations in women at the clinical agency, as well as the potential for such a project to increase compliance of provider recommended clinical guidelines. The practice change was guided by the best evidence that was retrieved to support provider reminder systems with favorable impact on immunizations.

Step 6. This step involves implementation of EBP. Decisions to adopt an intervention should take into account aspects such as written policy, procedures, and guidelines that are evidence-based. Diffusion of the evidence should focus on the strength and perceived benefits of research findings. Securing organizational support is a critical factor of this stage. The comprehensive implementation plan should be communicated to all key leadership personnel in efforts to obtain necessary support. For successful implementation to occur, all team members should be informed, educated or trained on the practice change, and necessary feedback provided whenever it is warranted. Project implementation began on November 2nd 2015, after successful IRB approval.

Step 7. Evaluation is the final step in this process. Measurement of the value and contribution of the evidence into practice provides useful information for other care providers, administrators, as well as policy makers. Evaluation will highlight impact of the practice change and provide important insight into outcomes of the change. In order to capture all stages of the impact of practice change, evaluation should be carried out at different periods during and

following the intervention. At the end of each week, the student facilitator tallied all collected data and made observations that compared the number of patients that were seen to the number of patients that received vaccinations. Forms were also assessed for proper completion and missing information or incorrect entries.

A strength of the Iowa model, when applied to this EBP project, was that it allowed the DNP student facilitator to focus on knowledge and problem-focused triggers. A weakness of the model, when applied to the EBP project, related to time. Time constraints prohibited a complete assessment of the full impact on immunization rates.

Literature Search

Sources of Evidence

A literature search was performed to identify sources of evidence that are relevant to address the PICOT question “In women aged 18 and above, what is the effect of a multifaceted intervention consisting of provider prompting, an education component, and standardization of vaccine delivery on Tdap vaccination rates over a 6-week period?” Databases used included Cumulative Index to Nursing and Allied Health Literature (CINAHL), ProQuest Nursing and Allied Health source, MEDLINE via PubMed, and the Cochrane Database of Systemic Review. Additional searches were conducted of the CDC and the National Guideline Clearinghouse websites to identify policy recommendations and applicable guidelines. A significant amount of hand searching was used in the search as reference lists were investigated for relevant studies. Varied combinations of the key words ‘Tdap’, ‘vaccination’ OR ‘immunization’ and ‘provider reminders’ OR ‘provider prompts’ were utilized throughout the data bases searched. Studies were considered when they were published in English from 2000 to the present time. The DNP student facilitator selected to expand the literature search by beginning with the year 2000 after an initial search for evidence revealed that much of the newer evidence focused on computer-based prompts, while the chosen clinical agency continues to use paper charts. To further retrieve more specific evidence, articles had to be peer reviewed and occasionally ‘EBP’ was

applied to the search. An aggregate of abstracts of 35 studies were reviewed in detail after duplicate studies were eliminated. Of the 19 studies that were identified using the CINAHL database, five were reviewed in detail but were later excluded due to factors that included (a) addressing patient reminders, (b) focusing on hospital based programs, (c) using electronic medical records for intervention, and (d) focusing on outcomes that did not measure immunization rates. The 243 hits in ProQuest database were narrowed down to 16 relevant articles that were reviewed in detail. Two were duplicates from PubMed and therefore excluded; whereas upon application of inclusion criteria that included reminder interventions that were multifaceted and application of the aforementioned exclusion criteria, two studies were considered for final appraisal. MEDLINE via PubMed yielded 109 articles with 99 of the articles being excluded for lack of limited applicability to the targeted population, hospital-based studies, patient reminder and recall focus, as well as reminder systems that utilized text messages or telephones. Ten studies were reviewed in detail, and three were considered for the final review. Even though both studies that were found in the Cochrane database addressed immunizations, they were excluded due to having a different focus than for this EBP project. Of the two guidelines that were found in the National Guideline Clearinghouse, one task force recommendation was deemed relevant and was included in the final appraisal. Four relevant studies retrieved after manual searching qualified for inclusion and exclusion standards and were included in the final analysis. Ten pieces of evidence (five systemic reviews, four prospective studies, and one clinical guideline) (see Table 2.1) were included for final review.

Appraisal of Relevant Evidence

The Critical Appraisal Skills Programme (CASP, 2013) tool was used to appraise nine of the studies that were included for final appraisal: five systemic reviews (Level I) and four prospective studies (Level IV). The tool contains ten questions designed to appraise quality of the evidence in terms of rigor, credibility, and relevance. Overall, the evidence was in great compliance with the CASP tool questions, and based on the final results of the tool analysis,

each study was found to be of good methodological quality and relevant to practice. One task force recommendation (Level VII) was appraised using the Agree II Instrument for Appraisal of Guidelines. The instrument was developed to assess the quality and reporting of clinical practice guidelines using a 23 item tool comprising six quality domains. Overall assessment of the guideline's quality was graded using a 7-point scale (1-strongly disagree to 7-strongly agree). The quality of reporting was found to be exceptional and a final grade of seven was assigned. To rate the strength of each study that was included for appraisal, the Melnyk and Fineout-Overholt Rating System for the Hierarchy of Evidence (2011) was used, and the reviewed evidence was found to be of good quality; thus they were included as the foundation for this EBP project. A summary of the evidence from Levels I-VII is included within Table 2.1.

Level I Evidence

To assess the impact of prompting physicians on health maintenance, Balas et al. (2000) conducted meta-analyses that reviewed clinical trial reports on prompting clinicians. Following systematic and manual searches to identify studies that were relevant to the topic on triggering of clinical actions, 33 studies were deemed eligible for the review. Studies satisfied eligibility when (a) they were randomized controlled trials, (b) the intervention of physician prompt applied only to the study group and no similar intervention in the control group, and (c) the effect of the number of preventive care activities was measured. Studies that were not randomized, as well as those that did not test compare the intervention and control groups at baseline were automatically excluded. The researchers also excluded studies that involved clinical specialists or focused on preventive care that was considered unique, such as alcohol abuse counseling. The University of Missouri School of Medicine was the source for many of the articles that were eligible for review. To retrieve additional data, further extensive searches were conducted, and a detailed description of the retrieval methods including the various databases searched, manual searches, and medical subject headings and text words used was provided. Eligibility of each of the studies was checked by two research associates using standardized

and reproducible methods which were described in detail. When additional information was needed, studies' authors were contacted. The authors described a scoring system that was used to evaluate the methodological quality of each of the eligible studies. One hundred and one pertinent articles were initially identified, but following further filtering, 68 studies were eliminated for reasons which were listed in the narrative. Of the 33 studies included in the final review, 17 studies randomized patients directly, while 16 studies randomized through physicians. A total of 1547 clinicians and 54,693 patients were included in the review. Three of the studies were conducted in private offices, 19 were in conducted in university-affiliated clinics, and 11 studies took place in public clinics. Further characteristics of all 33 studies were presented in a table within the body of the paper.

For purposes of the study, Balas et al. (2000) defined health maintenance rate as the ratio of the number of preventive care actions that were delivered by the physician to the number of opportunities that physicians had during encounters with eligible patients. Details of methods employed to measure the clinical effects of prompts were clearly laid out in the study. Provider prompts ranged from simple generic checklists attached to patient charts, tagged notes, prompting stickers, computer-generated encounter forms, to prompts that incorporated patient reminders. The overall prompting effect was estimated using the modified DerSimonian-Laird estimator, a link was provided for the detailed description of this model. Diversity of clinical settings and subjects for the review prompted authors to make calculations using models that were based on random-effects assumptions. Potential limitations of the study, such as simply defining health maintenance rate by sheer number of patient visits, were discussed. Along with immunization, 15 other preventive care procedures were included in the review including cancer screening, diabetes management, hemoglobin management, blood pressure management, cardiac care, cholesterol management, smoking cessation, glaucoma screening, alcohol abuse counselling, prenatal care, and tuberculosis testing. Reviewers noted that prompts to clinicians resulted in significant increase in all aforementioned procedures, an increase of 13.1% (95 %

confidence interval [CI], [10.5%-15.6%]). Clinical effects for vaccinations were reported at 18.3% (95% CI, [11.6%-25.1%]), results that pointed to the effectiveness of physician prompting. Diversity of analyzed data was not shown to have a significant impact on the clinical effect of prompting and a figure depicting cumulative rate differences for analyzed studies was provided.

Findings of this review provided support for practice change that utilizes provider prompts as a means to increase preventive care performance. Of particular importance were the results that pointed to effectiveness of provider prompts for enhancing clinical effects for vaccinations, the topic of interest for this EBP project.

To examine effects of paper and computer-based interventions for preventive care measures, Dexheimer, Talbot, Sanders, Rosenbloom, and Aronsky (2008) performed a systematic literature review which updated the previous review by Balas et al. (2000) and included 16 preventative care measures. The authors sought to examine effects of the increased use of electronic health record systems on previously recommended reminder systems. A search for relevant literature was conducted using the electronic databases PubMed via Medline, OVID, CINAHL, ISI Web of Science, Health and Psychosocial Instruments, and the Health Reference Center. Randomized controlled trials that were published in English and included combinations of the concepts (a) preventive care measure and (b) reminder system were considered for review. Details of the search terms used as well as steps of the rigorous study selection, including inclusion and exclusion criteria, were provided. Two independent reviewers scored each of the included articles using the quality assessment instrument that was applied during the Balas et al. (2000) study. Disagreements between the two were resolved by consensus discussion among four participating reviewers. The search resulted in 1535 articles which were effectively filtered down to 28 studies that were deemed eligible for review. The inclusion and exclusion process was discussed in great detail and a flow diagram depicting the process was included within the paper. These studies were combined with 33 studies from the Balas et al. 2000 study for a total of 61 studies for final analysis, and characteristics of each was

presented in a table. Thirty four studies used paper-based combined with computer-generated prompts, 19 studies used paper-based prompts and 8 were computerized studies. Reviewers acknowledged and discussed potential limitations that could result from the unavailability of details of description of each study's environment and clinical workflow. Even though each of the studies was scored, reviewers did not exclude the potential existence of possible publication bias. In efforts to make the varied groups as comparable as possible, reviewers calculated average effects by using concurrent control groups.

Provider prompting was measured on the delivery of the 16 aforementioned interventions found in the Balas et al. review. The research showed that prompts that were offered through the reminder systems were heterogeneous. The average effect of prompting ranged from 5% to 14%, and interventions that included paper-based reminder component were the most frequently used approach and revealed an average effect of 14%.

Results of the systematic review showed support for the effectiveness of clinician reminders as an intervention for increasing the rates of delivering preventive care. Dexheimer et al. (2008) also compared paper-based reminders with computerized reminders and found that the two had similar effect, 14% versus 13%, rendering further support for this EBP project.

Lau et al. (2012) undertook a systemic review and meta-analysis to examine the effectiveness of quality improvement interventions for increasing the rates of influenza and pneumococcal vaccinations among adults. The reviewers aimed to provide a comprehensive quantitative summary of results that had been reported by previous reviewers. To search for relevant studies, the authors used the databases MEDLINE, EMBASE, Cochrane Library, Web of Science, and five other databases whose names were not listed. Reference lists were also searched for additional literature. Studies that met inclusion criteria had to (a) be published in English, (b) be peer-reviewed, (c) involve elderly adults or adults with chronic diseases, (d) involve a quality improvement intervention, (e) feature a parallel control group, and (f) report influenza or pneumococcal vaccination rates. Out of 9041 records that were identified by the

search, 77 studies were included in the quantitative synthesis. A graphical depiction of the citation process, as well as tables that provided details on methodology, was included within the paper. Eligible studies were reviewed by two reviewers, and the quality of the studies was measured using the Downs and Black instrument. Publication bias was tested by visual inspection of funnel plots and using Harbord's test. Details of this test and its results were discussed. Disagreements between the reviewers were resolved by consensus, and failure to reach consensus resulted in resolution by the senior authors. For meta-analysis, the researchers sought and included studies that sufficiently estimated log odds ratios (*ORs*) and standard errors. Analyses was stratified by vaccination type and intervention category. Details of the synthesis process as well as inclusion criteria for 111 comparison groups was provided. Forty studies that used clinical reminders for quality improvement intervention were included in the meta-analysis. Lau et al. pointed out study weaknesses such as the lack of blinding of study subjects to interventions, and potential confounders such as previous vaccination status and demographic characteristics. Study biases were addressed effectively.

The pooled odds ratio that expressed the effectiveness of all quality improvement interventions for influenza and pneumococcal vaccinations was 1.61 (95% CI, [1.49-1.75]; $p < .001$). Interventions that featured clinical reminders on influenza vaccination rates was ($OR = 1.53$, 95% CI, [1.26-1.85]). Clinician reminders and education were associated with even greater improvements rates for pneumococcal vaccination ($OR = 2.13$, 95% CI, [1.50-3.03]).

Heterogeneity among clinician reminders was explained by declining odds ratios with time. The review was able to produce a comprehensive, quantitative summary of the effectiveness of interventions to improve influenza and pneumococcal vaccination rates.

Results obtained from clinician reminder interventions provided evidence to support the use of similar interventions to improve vaccination rates and aid clinicians to sufficiently meet national policy targets. Outcomes of the research also highlighted the effectiveness of clinician education, a component of this EBP intervention. Lau et al. (2012) also pointed to the use of

materials with high visual appeal and clarity as being associated with increased vaccination rates. This was of particular interest to the DNP student facilitator who also used posters displayed throughout the clinic.

Ndiaye et al. (2005) conducted a systematic review to evaluate the evidence of interventions to improve vaccination coverage. The researchers used review methods that were developed for the *Guide to Community Preventive Services*. Evidence was sought on effectiveness of 11 interventions to improve vaccination coverage in eligible subjects. A team of experts that consisted of Community Guide researchers and methodologists, Task Force members and other unnamed subject matter specialists, was recruited to provide oversight for the review. The Logic framework was used to guide strategy and intervention options for increasing vaccination coverage. Interventions that met inclusion criteria for the review included (a) interventions that increased demand for vaccination services, (b) interventions that enhanced access to vaccination services, and (c) provider or system-based interventions. These interventions could potentially provide education and timely reminders or feedback to healthcare providers, resulting in increased provider adherence to vaccination recommendation. Twelve unnamed electronic databases as well as reference lists from retrieved papers were searched for relevant studies. The search terms that were used were not explicitly reported. Studies that were published in English between 1980 and August 2001 were included if (a) they evaluated an intervention to deliver influenza, pneumococcal polysaccharide, or hepatitis B vaccinations, and (b) vaccination coverage was measured in the outcome. The screening of over 2450 articles identified 35 studies which qualified to be in the review. Standardized abstraction of the identified studies was conducted by two reviewers and any differences in assessment of study design and quality were resolved by consensus of the team. To evaluate intervention effectiveness, the researchers measured changes in the at-risk study population. Strengths and weaknesses of the review were acknowledged and discussed briefly.

Of the 35 studies that were included in the review, researchers identified 23 studies that evaluated multicomponent interventions. Details of these studies and the 26 study arms evaluating 22 different combinations of interventions were discussed in detail and displayed in a table within the paper. Seven studies included seven study arms that evaluated the combination of three specific interventions, two studies evaluated a combination of provider reminders and client reminders, two studies evaluated a combination approach consisting of client education, client reminders, and expanded access to healthcare setting, and a quadruple combination of client education, client reminders, expanded access and reduced client financial costs was evaluated in three studies. The remaining study arms evaluated combinations of interventions that were deemed unique. Techniques employed in provider reminders included the use of notations in clients' charts, chart prompts or stickers, or standardized checklists generated by clinic staff. Results of these evaluations were clearly displayed in the aforementioned table. The effectiveness of sixteen studies that included provider or system-based interventions to enhance access to vaccination coverage reported that coverage improved by a median of 16.5% (range, -5.9% to +67%).

Studies in this review provided evidence that interventions combined across categories are effective in increasing vaccination coverage in adult populations. Furthermore, the systematic review revealed evidence of effectiveness in multicomponent approaches that were directed at clients and providers, when these approaches included one or more interventions to increase demand or enhance access to vaccination. Results of this review were determined to be of good quality and provided additional support for the use of provider reminders to impact vaccination coverage in adults.

Groom et al. (2014) conducted a systematic review to assess the effectiveness of immunization information systems (IISs), and examined their capabilities and actions in increasing vaccination rates. The researchers utilized Community Guide methods to conduct the review that sought to determine the effectiveness of IIS in increasing immunization rates,

reducing vaccine-preventable disease, or enhancing vaccination program capabilities. A team of experts included staff from CDC Immunization Information Systems Support Branch in the National Center for Immunization and Respiratory Diseases, CDC field staff, immunization staff from state health departments, and various persons from academic and health care systems. This alliance worked together under the oversight of the Community Preventive Services Task Force (Task Force). Databases searched, key words, and details of the search strategy, including inclusion criteria, were clearly defined, and presented in the appendix. Team experts were consulted to identify studies that may have been omitted. The search identified 108 published articles as well as unpublished U.S. literature in the form of conference abstracts, 132 of which were included in the review. Because abstracts provided only brief summaries of information, the researchers felt compelled not to conduct quality assessments of included studies and instead opted to perform an overall assessment of limitations in the included evidence. 209 studies evaluated systems in the U.S, while 26 examined the national system in Australia. The rest of the studies evaluated other countries' national systems. Studies published in English qualified for inclusion in the review when (a) they evaluated the effectiveness of an IIS or IIS generated intervention, or capabilities of IIS in increasing vaccination rates and reducing vaccine-preventable disease, (b) they were conducted in a high-income country, and (c) when they reported one or more quantitative outcomes including changes in vaccinations rates, vaccine acceptance, and reduction in missed opportunities, or described IIS capabilities linked to vaccination rates. Two reviewers assessed each study for details and suitability using standardized criteria. Limitations of the review such as informal comparisons to determine effectiveness, were adequately discussed. Evidence gaps as well as selection biases were acknowledged. Disagreements between the reviewers were reconciled by consensus among the review team, however, details of this process were not delineated.

Forty seven studies evaluated specific interventions to increase vaccinations. Provider assessment and feedback was evaluated in 15 of the included studies, five of which measured

vaccination rates. Findings revealed a median absolute percentage point increase of nine percentage points (range, 5-15 percentage points) in vaccination rates. Three studies evaluated the use of provider reminders, and one among them evaluated effectiveness in increasing vaccination rates; Chamberlain (2010) found an absolute percentage point increase of 14.2 percentage points.

Evidence from this systematic review was used to develop a target percentage increase of vaccination rates as an indicator of project success. Overall findings demonstrated the capabilities of provider reminder systems in increasing vaccination rates. These findings provided further support for the proposed evidence-based practice change.

Level IV Evidence

Pierson, Malone, and Haas (2015) conducted a study that explored the effect of a simple paper-based provider reminder on influenza vaccination rates. The study, which was conducted in an urban clinic serving underserved and indigent women, included 3435 patients who presented to the obstetrics and gynecology clinic for care. Patients that presented to the clinic between October 25, 2011 and January 27, 2012 were included in the study. Exclusion criteria included gynecology patients who presented for preoperative appointments, patients who presented to non-resident subspecialty appointments, patients who were only filling prescriptions, as well as obstetric patients. The researchers compared rates of vaccination rates to those of the same period during the previous year. Data analysis was conducted using Excel (Microsoft, v2010), and chi square analysis was used to calculate statistical differences in vaccination rates. Heterogeneity between study groups was addressed using a post-hoc power calculation. Limitations of the study were acknowledged and discussed in detail.

As a study instrument, a brightly colored paper form was created, a copy of which was displayed in the appendix. To prompt providers to engage patients in a discussion about immunizations, clinic staff attached the form to each patient's chart during check-in. Of the 1316 patients (38.6%) who were offered the vaccination during the study period, 37% accepted and

were vaccinated. Overall, 14.2% of the total number of patients who presented for care were vaccinated, compared to only 2.2% in the previous year ($p < .001$).

Results of the study supported the use of simple straightforward clinician reminders to aid in the improvement of vaccination rates. Similar to this EBP project, Pierson et al., (2015) conducted the study at a site that did not have a standing vaccination policy, nor the use of electronic medical records for charting. Study results were therefore easily transferable to this EBP project.

Minkovitz, Belote, Higman, Serwint, and Weiner (2001) conducted a prospective study to evaluate the effectiveness of low-intensity provider prompting on vaccination rates. The researchers further examined the impact of provider prompting on missed opportunities for vaccination receipt. The study was conducted in an urban hospital-based pediatric clinic which served predominantly low-income children. A list of 654 children aged three years or younger was assigned to the control arm, while 930 children were enrolled to the intervention group. The study groups were examined for extraneous variables and internal consistency. Children were included into the study when they attended clinic for well-child visits and acute care visits. Visits for refilling of prescription or visits related to filling out documents were excluded. The Clinical Assessment Software Application and EPI-Info software was used to analyze collected data. Proportions and means were compared using chi-square analyses and analysis of variance respectively. Comparisons were conducted between vaccination and visit data abstracted from 521 medical records as baseline data, and 642 children's records as post-intervention data. Group differences were noted in tables within the paper. As a reminder for providers, computerized printouts were attached to each child's chart during each acute care visit. Minkovitz et al. (2001) found that vaccination rates rose from 70% to 78% ($p = .07$) in children aged four to 24 months and an even greater increase to 87% ($p < .01$) was noted among children enrolled in the managed care organization and the practice. Missed opportunity rates among those that were not up-to-date with immunizations declined from 65% to 45% ($p = .04$).

Findings of this study provided strong evidence of the effectiveness of low-intensity intervention, provider prompting, on improving vaccination rates. The evidence provided by Minkovitz et al. (2001) was determined to be a good quality, and the percentage of improvement noted within the study was used, along with previously reviewed evidence, to develop a target for project success.

To evaluate the efficacy of chart reminders and provider education as interventions to improve influenza vaccination rates in pregnant women, Wallis, Chin, Sur, and Lee (2006) conducted an interventional prospective study involving six physician practices. One group obstetric practice, two solo private obstetric practices, one group family medicine practice, and two single family medicine practices formed the study population. Study intervention consisted of short educational sessions regarding vaccinations for each participating physician, and reminder notes that read "Think Flu Vaccine" which were placed on patients' charts prior to the office visit. Because the study's focus was on improving and monitoring provider compliance with practice guidelines, chart reviews focused on documentation on discussion of vaccination by the provider. A total of 2084 charts met inclusion criteria and documentation of vaccination was systemically collected for the period of intervention. Statistical analysis of data was conducted, and all p values were calculated by chi-square analysis except in two practices where the two-tailed Fisher's exact test was used. Researchers acknowledged study limitations and confounding factors, such as cost and supply of vaccines, were discussed.

Results of the study demonstrated a 21.9% ($p < .001$) increase in vaccination rates after intervention, a nearly 15-fold increase, compared to base-line rates which averaged only 1.5%. Comparisons in vaccination rates in the different physician practices revealed that all were $p < .001$. Findings of this study demonstrated that simple provider chart reminders can effectively increase vaccine discussion rates and subsequently overall immunization rates. These findings rendered support to the proposed DNP project. A nearly 15-fold increase in vaccination rates

provided strong support for this planned EBP project that also utilized simple reminders and short interventional sessions to improve knowledge of ACIP recommendations.

Riley, Galang, and Green (2011) assessed the effect of provider reminders on adherence to standards of prenatal care using a reversal-design prospective study. Study participants were all prenatal patients seen at two family medicine teaching clinics. During the study period, as a provider reminder, a form which listed the patient's medical history and any maintenance care that was due, was attached to the patient's chart with every encounter. One hundred and fourteen patients were included in the baseline sample, while the intervention sample consisted of 115 patients. A post-intervention sample consisting of 169 patients was also included in the analysis. Differences between the two clinic sites, as well as differences in provider experience was addressed and scored ($p < .001$). Confounding factors and threats to validity were noted and appropriately addressed. Stata 10 was used to perform statistical analyses. Researchers corrected multiple comparisons using Bonferroni's correction to a base type 1 error probability of .05, yielding a corrected significance level of .0022. With all applicable recommendations, a single model was computed for odds of compliance. A table depicting adherence to individual guideline recommendations and p values for baseline, intervention and post-intervention periods was provided within the paper. Overall compliance increased from 9.5% pre-intervention to 55.7% ($p < .001$) during intervention. But the researchers also found that compliance declined markedly to 17.1 % ($p < .001$) post-intervention.

Improved adherence to prenatal standards and improved compliance with commonly missed standards provided strong support for the efficacy of provider reminders as a way to increase standards of care. The quality of this study was good, and the study's relatively high percentage increases in compliance rates provided good support for the planned EBP project. However, results showed evidence of compliance regression when reminders were removed, with post-intervention analyses suggesting that sustainability may be an issue with this type of intervention. Notwithstanding, the findings from this research study supported the initial

effectiveness of the intervention. It was anticipated that the DNP student facilitator's use of Lewin's theory and the refreezing process had the potential to solidify practice change within this EBP project.

Level VII Evidence

Pickering et al. (2009), an expert panel of members of the Infectious Diseases Society of America (IDSA), provided evidence-based guidelines to ensure appropriate and timely administration of recommended immunizations of infants, children, adolescents, and adults, for use by health care professionals. These 2009 guidelines were intended to replace and update previous clinical practice guidelines for quality standards for immunization that were published in 2002. The expert panel decided that additional guidelines and an update were warranted based on reasons that included (a) licensure of new vaccines, (b) availability of new combination vaccines, and (c) new recommendations for childhood immunization schedules. To address clinical questions that were delineated in the paper, an expert panel assembled by the IDSA Standards and Practice Guidelines Committee (SPGC) consisting of experts in vaccinology was identified. Panel members had experience in varied fields of medicine, and also included representatives from collaborating organizations such as American Academy of Pediatrics (AAP), CDC, American College of Obstetricians and Gynecologists (ACOG), and many others who were listed in the appendix.

A systematic search was conducted of the PubMed database and search terms and limiters were made known. The panel reviewed data published since 2000 as well as literature that was referenced in the 2002 guidelines. Randomized clinical trials, cohort and case-controlled studies, as well as uncontrolled studies, were included in the evaluation, whereas exclusion criteria was not clearly stated. Expert opinion was also considered. The researchers were not specific about the process used to evaluate the evidence, but indicated that a similar process had been used in the development of other IDSA guidelines. Results of the evaluation were displayed in a table within the paper. The entire team of experts on the panel collaborated

to draft guidelines, and feedback of prepared guidelines was provided by external reviewers whose names were published within the paper. The finalized draft was reviewed and approved by the various collaborating organizations and well as the IDSA SPGC and its board of directors before dissemination. Potential conflicts of interest were identified and addressed.

Forty-six standard guidelines were established, with many of the updates resulting in expansion of the adolescent and adult immunization schedules. Seventeen intervention arms that used reminder/recall systems alone and 12 that used reminder/recall systems in conjunction with other interventions were reviewed for evidence of effectiveness by the Task Force on Community Preventive Services. The former resulted in median improvements in vaccination coverage of 17%, while coverage in reminder systems that had combinations of other interventions revealed a 14% increase.

Among the recommendations that were proposed to overcome barriers to immunization and strategies to improve vaccination coverage, and also addressed reminder systems, the following recommendations were made (a) reminder/recall systems should be used to enhance immunization rates; (b) barriers to immunizations should be identified and eliminated or as minimized as possible; (c) immunizations should be integrated into routine health care services offered in offices and clinics; (d) immunization status of patients should be reviewed at each patient visit; and (e) all health care providers who administer vaccines should be properly educated and should receive ongoing education. Members of the task force and reviewers of the Cochrane Database found strong evidence to support reminder/recall systems to improve immunizations.

Study findings and recommended guidelines therefore lent support to this EBP project which implemented a provider reminder system into routine visits, prompting the provider to address immunization with each visit, and ultimately improving vaccination rates at the women's clinic. In order to effectively assess the quality and methodological rigor of practice guidelines that were prepared by Pickering et al., (2009) the DNP student facilitator chose to use the Agree

II instrument (Brouwers et al., 2010), for the appraisal of these clinical practice recommendations. An overall score of seven was assigned to the guidelines, a score indicative of the student facilitator's strong agreement of the high quality and rigor of development of the guidelines.

Construction of Evidence-based Practice

Synthesis of Appraised Literature

Vaccine-preventable disease rates in the United States are at extremely low levels, with currently only eight percent of adults up-to-date regarding their Tdap vaccinations (CDC, 2015a). An important component of health care providers' care is to ensure that vaccines are given to all persons who are eligible. Studies that were included in the literature appraisal commonly examined strategies to increase vaccination rates. The reviewed evidence provided strong support for interventions that used clinician reminders or provider prompts (Balas et al., 2000; Dexheimer et al., 2008; Lau et al., 2012; Minkovitz et al., 2001; Ndiaye et al., 2005; Pierson et al., 2015; Wallis et al., 2006) to improve immunization coverage. None of the studies that were reviewed contained any major conflicts and no major methodological concerns were identified. Akin to the proposed EBP project, three studies used very simple interventions consisting of bright stickers pasted on patients' charts as a reminder for the provider (Minkovitz et al., 2001; Pierson et al., 2015; Riley et al., 2011). In studies whose focus of outcome was not Tdap vaccination rates, such as studies that examined influenza vaccination rates and pneumococcal rates, there was no compelling reason not to generalize findings of those studies to this project (Lau et al., 2012; Minkovitz et al., 2001; Ndiaye et al., 2005; Pierson et al., 2015; Wallis et al., 2006). Overall prompting of clinicians was found to significantly increase preventive care performance (Balas et al., 2000; Dexheimer et al., 2008). Strategies that used a multifaceted approach were identified as highly effective especially when simple provider reminders were combined with provider and patient education, provider checklists, and in some studies, simple reward systems (Balas et al., 2000; Groom et al., 2014; Lau et al., 2012;

Minkovitz et al., 2001; Wallis et al., 2006). Studies also reported on effectiveness of provider reminders to decrease missed opportunities for vaccination (Minkovitz et al., 2001), as well as overall compliance of patients who received a vaccine at the recommendation of the provider (Riley et al., 2011).

The effectiveness of provider reminder intervention was evident throughout this literature synthesis. Collective results of the appraised studies support the use of a multifaceted approach that uses a simple provider reminder during focused office visits, which is coupled with provider education with feedback on clinical performance, to affect Tdap vaccination rates.

Best Practice Recommendation

The best practice model was developed to reflect the synthesis of the best available appraised literature on the effectiveness of provider reminders to aid in increasing vaccination rates among women at a women's health center in Northern Indiana. Best practice recommendation was intended to improve provider compliance of assessing vaccination status, and immunizing all eligible patients during each patient encounter. The Iowa model was used to provide the framework that was used to answer the PICOT question. Results and evidence from the literature synthesis was used to implement a multifaceted model that consisted of a simple provider reminder, provider education and standardized vaccine delivery, that have previously demonstrated an increase of Tdap vaccination rates among women.

Table 2.1 Evidence Summary

Author(s)/Year Publication/Title Level of Evidence	Purpose/ Objective	Sample/ Population, Setting	Design/ Measurement/ Intervention(s)	Findings/ Outcomes/ Comments
<p>Balas et al. (2000) <i>Archives of Internal Medicine</i></p> <p>Improving preventive care by prompting physicians</p> <p>Level I</p>	<p>Assessed the impact of prompting physicians on health maintenance</p>	<p>Statistical analyses of 33 studies which involved 1547 clinicians and 54,693 patients</p> <p>3 trials were conducted in private offices, 19 in university-affiliated clinics, and 11 studies in public clinics</p> <p>Average ratio of patients to clinicians was 35.3</p>	<p>Meta-analyses</p> <p>Using random-effects method, clinical effect of prompts was estimated by the difference between the health maintenance rate in the intervention and control groups. Prompting tools included checklists attached to patient chart, tagged notes, computer-generated encounter forms, prompting stickers, and patient-carried prompting cards</p>	<p>Overall prompting of clinicians was found to significantly increase preventive care performance by 13.1% [95% CI, 10.5%-15.6%]</p>
<p>Dexheimer et al. (2008) <i>Journal of the American Medical Informatics Association</i></p> <p>Prompting clinicians about preventive care measures: A systematic review of randomized controlled trials</p>	<p>Examined character types, and effects of paper and computer-based interventions for preventive care measures</p>	<p>A review of 28 RCTs that implemented a physician reminder, combined with the review of 33 RCTs from the Balas et al. (2000) systemic review</p> <p>24 of the 61 studies measured vaccination intervention</p> <p>Total of 4638 clinicians and 144,605 patients</p>	<p>Systemic Review</p> <p>264 preventive care interventions among the 61 studies.</p> <ul style="list-style-type: none"> • 34 paper-based with computer generated reminders • 19 paper-based reminders • 8 computerized reminders 	<p>Average increase for the three strategies ranged between 12%-15%</p> <p>Effect of prompting clinicians for vaccination interventions averaged 15%</p> <p>Paper-based reminders had a similar average effect as computerized reminders(14% vs. 13%)</p>

Author(s)/Year Publication/Title Level of Evidence	Purpose/ Objective	Sample/ Population, Setting	Design/ Measurement/ Intervention(s)	Findings/ Outcomes/ Comments
<p>Groom et al. (2014) <i>Journal of Public Health Management Practice</i></p> <p>Immunization information systems to increase vaccination rates: A community guide systemic review</p> <p>Level I</p>	<p>Assessed effectiveness of immunization information systems (IISs) Examined capabilities and actions in increasing vaccination rates</p>	<p>240 articles and abstracts examined 108 published articles 132 conference abstracts</p>	<p>Systemic Review</p> <p>Assessment of implementation of provider reminder systems, provider assessment and feedback, and client reminder and recall notices, through the use of an IIS or population-based vaccination database</p>	<p>Overall effects on vaccination rates: Rates in children in Australian study increased from 64% in 1997 to 92.7% in 2007. 3 US studies found an absolute point increase of 14.2% in effectiveness of provider reminder system in increasing vaccination rates</p>
<p>Lau et al. (2012) <i>Annals of Family Medicine</i></p> <p>Interventions to improve influenza and pneumococcal vaccination rates among community dwelling adults: A systemic review and meta-analysis</p> <p>Level I</p>	<p>Reviewed effectiveness of quality improvement interventions for increasing the rates of vaccinations</p>	<p>Analysis of 77 studies: 56 randomized or quasi-randomized controlled trials 7 non randomized studies 12 observational studies</p> <p>40 studies applied clinician reminder, and 20 applied clinician education interventions</p>	<p>Systemic Review and Meta-Analysis</p> <p>Random effects models were used to estimate pooled ORs, and Downs and Black tool to assess quality of studies</p> <p>Clinician reminders and education was among 12 intervention strategies</p>	<p>Interventions were associated with improvements in rates of vaccinations (111 comparisons in 77 studies, pooled OR = 1.46, 95%CI [1.49-1.75])</p> <p>Clinician reminders and clinician financial incentives were effective interventions in influenza vaccination rates, whereas clinician education was effective in pneumococcus rates</p>

Author(s)/Year Publication/Title Level of Evidence	Purpose/ Objective	Sample/ Population, Setting	Design/ Measurement/ Intervention(s)	Findings/ Outcomes/ Comments
<p>Minkovitz et al. (2001) <i>Archives of Pediatrics & Adolescent Medicine</i></p> <p>Effectiveness of a practice-based intervention to increase vaccination rates and reduce missed opportunities</p> <p>Level IV</p>	<p>To determine whether provider prompting can increase vaccination rates and decrease missed opportunities</p>	<p>List of 654 children aged three or younger was obtained for baseline data, and a list of 930 children of three or younger were enrolled for intervention. Harriet Lane Pediatric Clinic, Baltimore, Md.</p>	<p>Prospective study</p> <p>Monthly education sessions with clinicians and staff regarding vaccination policy and review of clinic vaccination rates</p> <p>Clinicians and staff received chocolate bars labeled “immunize on time, every time”</p> <p>Compared baseline and post-intervention rates of immunizations</p>	<p>Up-to-date rates for diphtheria and tetanus toxoids and pertussis, polio, measles-mumps-rubella, hepatitis, and H-influenza type b vaccines changed from 70% to 78% ($p = .07$).</p> <p>Missed opportunity rates declined from 65% to 45% ($p = .04$)</p>
<p>Ndiaye et al. (2005) <i>American Journal of Preventive Medicine</i></p> <p>Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults: A systemic review</p> <p>Level I</p>	<p>To evaluate the evidence on effectiveness of 11 interventions to improve vaccination coverage</p>	<p>35 primary research studies published from 1980-2001</p> <p>Inpatient and outpatient settings</p>	<p>Systemic Review</p> <p>23 evaluated multi-component strategies and 16 included client reminders to other interventions</p> <p>1 study evaluated effectiveness of reminder systems when implemented alone</p>	<p>Median difference in immunization coverage among the 16 studies that included reminders plus other interventions was 14% (range, -2% to +28.9%)</p> <p>Overall, strong evidence of effectiveness of combinations interventions that included provider reminders – median change +16.5 percentage points (range, -5.9 to +67 percentage points)</p>

Author(s)/Year Publication/Title Level of Evidence	Purpose/ Objective	Sample/ Population, Setting	Design/ Measurement/ Intervention(s)	Findings/ Outcomes/ Comments
<p>Pickering et al. (2009) <i>Clinical Infectious Diseases</i></p> <p>Immunization programs for infants, children, adolescents, and adults: Clinical practice guidelines by the Infectious Diseases Society of America</p> <p>Level VII</p>	<p>Guidelines and standards for optimal disease prevention through vaccination</p> <p>An update on the 2002 practice guidelines</p>	<p>Data published since 2000 and literature referenced in 2002 guidelines</p> <p>17 intervention arms used reminder/recall alone. 12 intervention arms used reminder/recall in conjunction with other interventions</p>	<p>Expert opinion</p> <p>Evaluated evidence regarding management of immunizations Systemically weighed the quality of evidence and the grade of recommendation</p> <p>The expert panel reviewed data published since 2000 and literature referenced in 2002 guidelines.</p>	<p>The median improvement in immunization coverage were 17% in reminders used alone and 14% in reminders used in combination with other interventions</p> <p>The Task Force and a Cochrane Database review concluded that strong evidence exists that reminder/recall systems improve immunization coverage</p>
<p>Pierson et al. (2015) <i>Journal of Natural Science</i></p> <p>Increasing influenza vaccination rates in a busy urban clinic</p> <p>Level IV</p>	<p>Explored the effect of a simple paper based prompt on the influenza vaccination rate in a clinic for the underserved</p>	<p>3435 individual patients who presented to the clinic for care</p> <p>Obstetrics and Gynecology urban clinic for underserved and indigent women</p>	<p>Prospective study</p> <p>Provider prompting by attaching brightly colored paper form attached to front of patient's chart during check-in</p> <p>Compared rate of vaccination during study period to the same period during the previous year</p>	<p>14.2% accepted and were vaccinated during the study period, versus only 2.2% in the previous year ($p < .001$)</p> <p>Study demonstrated that a simple, straightforward reminder to providers in the paper chart can increase rates of immunization</p>

Author(s)/Year Publication/Title Level of Evidence	Purpose/ Objective	Sample/ Population, Setting	Design/ Measurement/ Intervention(s)	Findings/ Outcomes/ Comments
<p>Riley et al. (2011) Family Medicine</p> <p>The impact of clinical reminders on prenatal care</p> <p>Level IV</p>	<p>Assess the effect of automated prenatal care reminders on adherence to guideline recommendations</p>	<p>144 prenatal patients seen at baseline 115 patients in the intervention sample 169 patients in the post-intervention sample</p> <p>Two family medicine teaching clinics</p>	<p>Reversal-design prospective study</p> <p>With every patient seen, a ClinfoTracker form was printed for the provider as a reminder</p>	<p>Overall compliance: 9.5 % of patients received all guideline recommended care at baseline, compared to 55.7% in intervention period ($p < .001$)</p> <p>Clinical reminders significantly improved overall adherence to prenatal standards and improved compliance with most commonly missed standards</p>
<p>Wallis et al. (2006) <i>Journal of American Board of Family Medicine</i></p> <p>Increasing rates of influenza vaccination during pregnancy: A multisite interventional study</p> <p>Level IV</p>	<p>To evaluate the efficacy of chart reminders and physician education as interventions to improve vaccination discussion rates between providers and patients</p>	<p>Six physician practices: 1 group obstetric practice, 2 solo private obstetric practices, 1 group family medicine practice, and 2 single provider family medicine practices</p> <p>2084 charts</p>	<p>Prospective, interventional trial</p> <p>Reminder notes reading "Think Flu vaccine" were placed on charts of all patients</p> <p>Short interventional sessions to improve knowledge of ACIP recommendation</p>	<p>Rate of vaccination discussion after the intervention demonstrated an almost 15-fold increase to 21.9% ($p < .001$)</p> <p>Study demonstrated that chart reminders are a simple but effective way to increase vaccine discussion rates</p>

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

Immunization rates in the United States continue to fall short of Healthy People 2020 goals despite evidence-based strategies known to increase vaccination rates (CDC, 2015b). Despite guidelines by governing bodies such as the CDC and ISDA regarding Tdap immunizations in women, there remains a wide gap between rates of immunization and provider adherence to guidelines (Spratling, 2010).

Participants and Setting

The focus of this EBP project was to implement a multifaceted intervention designed to evaluate the efficacy of provider reminders as interventions to improve rates of provider discussion of Tdap vaccination. This project was initiated at a women's health clinic located in Northern Indiana. The clinic operated under the umbrella of a larger organization, a private, independent, and community-owned hospital with a strong history of providing comprehensive care to the people of the community and the surrounding region. The organization has been dedicated to improving the quality of life for the surrounding community, with standards that focus on quality of care and a mission statement that supports the values of trust, respect, integrity, compassion and patient centeredness.

The goals of the women's clinic were consistent with the parent organization's mission as it provided care to women in a community whose population has been made up of diverse groups, many of whom are indigent, migrant, and underserved. Women who attended the clinic have been part of a racial mix which is approximately 45% White, 35% Black, and 20% Hispanic (Clinic X APN., personal communication, June 17th, 2015). Offering obstetric and gynecological care as well as preventive care for women of the surrounding community, the clinic was well appointed for the assessment and evaluation of this EBP project that was designed to determine if a time-efficient approach could improve Tdap vaccination rates. The clinic was

staffed by an advanced practice nurse, two medical assistants (MAs), and a receptionist. The clinic receptionist and one of the MAs were fluent in Spanish. The APN had been a provider at the clinic for more than 20 years and functioned autonomously, but had the support of consulting primary care physicians and obstetricians who operated within the larger organization. Aware of the importance of immunizations among women of the community, the clinic APN provided both verbal and written support for implementation of this project within her clinical practice.

The clinic space was well-appointed with a spacious well-furnished waiting room, five examination rooms, a laboratory, a procedure room, a filing room, a store room, and two providers' offices. The clinic accepted Medicaid, Medicare, and private insurance, and offered a sliding fee scale based on income guidelines for the uninsured. Approximately 300 to 350 patients have been seen in the clinic each month for routine prenatal care, routine and problem-based care, and post-partum care (APN., personal communication, June 17th, 2015). The clinic setting provided access to the healthcare provider and the clinic support staff who were targeted for the EBP project.

Outcomes

This EBP project examined how the use of a simple paper reminder could influence a behavioral response by the targeted provider to check patient's Tdap immunization status, and, if warranted, administer the vaccine. The primary outcome of the EBP project was the increase in Tdap immunization rates at the women's clinic. Supporting literature pointed to the increase in vaccination rates with interventions that promoted provider reminder systems (Minkovitz et al., 2001; Ndiaye et al., 2005; Pierson et al., 2015; Wallis et al., 2006). Six weeks of data collected from a retrospective sampling of charts (pre-implementation), was compared to data from sample charts of patients seen during a 6-week implementation period. Chi square analysis was used to compare vaccination rates between the periods before and after project implementation.

Secondary analyses investigated relationships between patient demographics, types of visit, and type of health insurance coverage, and vaccine acceptance.

Intervention and Planning

Following receipt of approval by the IRB boards of both Valparaiso University and the parent organization of the clinical agency, data collection began on November 2nd, 2015. A large portion of preparatory work was undertaken by the DNP student facilitator through unpaid hours that were also a part of satisfying doctoral coursework requirements. Designing instruments for data collection, printing worksheets, stickers, handouts and ordering and printing posters for use during the intervention were concluded prior to project implementation. Before reviewing the electronic health records for baseline data, a scheduled visit was made to formally inform the APN and the clinic staff about EBP project approval. As noted earlier, support from the APN was key as she maintained a dual role throughout the project (as the healthcare provider targeted for the intervention and as project site facilitator). Her support also helped to recruit and define the roles of the clinic support staff. The introductory meeting included an overview of the guidelines, recommendations, and resources related to pertussis and Tdap vaccination. The proposed protocol (see Appendix A) which was designed to meet the CDC's ACIP recommended guidelines for Tdap immunization was carefully laid out, with each team member provided with a printed version. The team was given ample opportunity to review the procedures and voice any questions, concerns, or suggestions, prior to project implementation.

The first two weeks of project implementation focused on provider education: 15 to 20 minute sessions comprised of informal, interactive, educational sessions with the provider. Well-recognized websites providing vaccine and/or disease information for health care providers were identified and reviewed. The student facilitator also provided the APN with a comprehensive list of resources including the following:

- A web site with information related to epidemiology of pertussis, clinical signs and symptoms, risk factors, transmission, complications, and vaccination (available at <http://www.cdc.gov/vaccines/vpd-vac/pertussis/default.htm>)
- A web site featuring recommendations and guidelines for improving adult vaccination rates (available at <http://www.cdc.gov/vaccines/recs/rate-strategies/adultstrat.htm>)
- ACIP recommendations on pertussis immunization for adults, pregnant and postpartum patients (available at <http://www.cdc.gov/mmwr/PDF/wk/mm6001.pdf>)
- Pertussis: Summary of Vaccine Recommendations For Health Care Professionals (accessed at <http://www.cdc.gov/vaccines/vpd-vac/pertussis/recs-summary.htm>)

Time was spent reviewing the content available at each of these established sites. The APN referenced some of the sites during project implementation. Additionally, a packet that included printed versions of aforementioned guidelines and recommendations was prepared for the provider and was often used for quick reference. A 6-minute CDC expert commentary video was broadcast for the provider at the first educational session (Rise in Pertussis/Vaccination in Pregnancy, available at <http://www.medscape.com/viewarticle/780027>). Educational sessions were designed to increase knowledge of current CDC recommendations.

At the first weekly meeting with the clinic support staff, the student facilitator provided a synopsis of (a) EBP, (b) the proposed protocol and practice change, and (c) CDC clinical practice standards. Fifteen to thirty-minute educational sessions with the provider and the clinic staff were conducted every Friday thereafter. The sessions were often conducted during the lunch period, and the student facilitator always provided a light lunch with refreshments.

The role of the MAs included ordering and maintaining vaccine supply. Vaccines were re-ordered as soon as there were less than ten remaining in the clinic supply. Vaccines were often shipped to the clinic a day after an order was placed. The student facilitator also made a point of frequently checking vaccine supply and also ensuring that there was always an

adequate supply of worksheets for daily use. As part of the usual preparation for patient visits, the MA attached a brightly colored worksheet (Appendix B) to eligible patients' charts (women 18 and older), in readiness for the patient/provider encounter. The colored worksheet was the key instrument utilized for the project. The worksheet was clearly visible to the provider whenever a patient's chart was opened and functioned as a visual prompt to influence assessment of patients' Tdap status. Extra copies of the worksheet were kept in patients' rooms as well as in the APN's office in case a chart was missing a worksheet, or in the event that the form became inadvertently detached. During the patient-provider interaction, the provider acknowledged the reminder by responding to queries on the worksheet. Following assessment, the provider indicated on the worksheet whenever vaccination was warranted. At the conclusion of the patient visit, the MA placed a "Tdap" sticker on the front of patients' charts to indicate Tdap receipt. For the patients who did not receive a vaccine, a "Check Tdap" sticker was placed on the chart, to alert the staff of the need for further review of immunization status at a future visit. (see Appendix C). Following vaccination, the MA provided vaccine recipients with a handout developed by the CDC titled "Td or Tdap Vaccine (Tetanus-Diphtheria or Tetanus-Diphtheria-Pertussis) What You Need to Know" (see Appendix D). At the completion of the visit, the colored worksheet was removed from the patient's chart and placed in a drawer within the MA's work area. At the end of each day, all the forms were collected by the APN and locked in a filing cabinet located in the APN's office.

At the end of each week, the student facilitator reviewed all the worksheets collected during the week. Information including patient's initials, age, ethnicity, appointment type, and whether or not Tdap vaccination was administered, was then transferred onto the EBP project participant sheet (see Appendix E). The form also reflected patients who were up-to-date with vaccinations. These forms were kept under lock and key in a separate cabinet within the APN's office, and the student facilitator and APN had sole access to the keys. Friday meetings with the team included updates of progress of the practice change, and a review of the data collected for

the week. The student facilitator welcomed suggestions for increasing vaccine receipt especially during the weeks when vaccination rates were very low. The Christmas holiday season which coincided with project implementation had a largely negative impact on project success as the clinic experienced several half day and full day closures. However, the clinic team was quite cognizant of the impact of the closures and adapted very well; they agreed to extend project implementation time beyond the originally agreed upon end date in order to accommodate for the lost days.

Posters obtained from the CDC (see Appendix F) were posted in the patients' waiting room as well as in each of the examination rooms. The posters were available both in English and Spanish. While these posters were originally intended for patient education, during the EBP project they concurrently served as provider reminders.

Data

Collection

Following the 6-week implementation period, a chart audit was conducted to determine the number of individuals vaccinated. Vaccination completion rates during the 6-week implementation period were compared to data collected from a six-week period prior to study implementation, and also two weeks post intervention. A sample of 362 electronic health records were audited for pre-implementation data, and compared to a sample of 357 records assessed for patients who were seen during the implementation period. Aside from noting immunization status, the patient's age, race, type of appointment, and type of insurance were recorded. The primary outcome data are nominal level, while patient's age is ratio level data and race and insurance type, ordinal level data. Weekly tallying of retrieved data provided a measure for continuous evaluation of study implementation.

Management and analysis

SPSS Version 22 was used for analysis, and parametric tests were used to test the hypothesis that clinical reminders are associated with increases in immunization rates. Binary

logistic regression analysis were performed to identify statistical differences in age between groups and chi-square analyses to identify statistical differences in variables of interest measured as nominal data: ethnicity, type of visit, and types of insurance. Data collected during the pre-intervention and intervention stages of the project was further compared to data collected from a sampling of patients seen during a 2-week period post-intervention. Ongoing evaluation enabled the student facilitator to not only assess vaccination rates, but also make a determination as to whether the newly introduced protocol met personal, professional, and organizational standards.

Data collected throughout the project period was kept securely locked in a cabinet within the APN's office. The student facilitator provided a safety box which was be used to store all data collected each day. The box was kept under lock and key and stored in the APN's office.

Protection of Human Subjects

To ensure human right protection and also in keeping with HIPAA laws, any identifying information of the patient such as name and medical record number, was kept securely in a locked cabinet. The student facilitator will keep the data locked up for up to three years, upon which time the information will be destroyed by shredding. Protection of data during chart audits was maintained throughout the project. No identifying individual patient information was revealed in the final report as data for the project were reported in aggregate form only. To further ensure the protection of human subjects, the student facilitator successfully completed training through the National Institutes of Health, focusing on the protection of human subjects.

CHAPTER 4

FINDINGS

This EBP project was designed to determine the effect of a multifaceted Tdap vaccine delivery system on vaccination rates among women aged 18 years and older. The PICOT question posed was: *In women 18 years and older, what is the effect of a multifaceted intervention that includes provider prompting, an education component, and standardization of vaccine delivery, compared to usual practice, on Tdap vaccination rates over a six-week period?*

The project was carried out in a Northwestern Indiana women's health clinic. There was only one clinician practicing at this clinic. The multifaceted intervention consisted of provider education, provider prompts, as well as introduction of standardized vaccine delivery. The clinical reminder consisted of a simple paper reminder attached to the chart of each patient that was eligible to receive the Tdap vaccine, prompting the provider to assess and recommend immunization. Data collected from a 6-week pre-intervention period, a 6-week intervention period, and a two-week period post intervention was manually entered into the *Statistical Package for the Social Services* (SPSS) for statistical analysis. Testing was performed to answer the following questions:

Question one: What are the Tdap vaccine administration rates and are they significantly different between the three project periods?

Question two: Does age influence the likelihood of being vaccinated?

Question three: Does the patient's ethnicity have an influence on vaccine receipt?

Question four: Does type of insurance coverage influence vaccine receipt?

Question five: Does type of office visit influence likelihood of being vaccinated?

Participants

Patients eligible to be vaccinated during this EBP project included women in the following categories:

- Ages 18 and above
- Patient's receiving obstetric, well-woman, post-partum or any other acute visit

Size and Characteristics

Pre-intervention group characteristics. A retrospective audit of patients' medical records was conducted to collect baseline data. Data was compiled from 362 medical records of eligible women who attended the women's health center during a six-week period dating from September 21st 2015 to October 30th 2015. The sample consisted of women ranging from ages 18 to 59. The mean age was 26.37 years (*SD* 5.57). Of the group, 50.3% (*n* = 182) were White, 37.8 % (*n* = 137) were Black, and 11.9% (*n* = 43) were Hispanic. The majority of the patients had federal or state insurance, 87.7% (*n* = 318), and women who carried private or commercial insurance amounted to 12.2% (*n* = 44). For 80.7% (*n* =292) of the women, the type of office appointment was recorded as an obstetric visit. Well-woman visits totaled 7.7% (*n* = 28), 5% (*n* = 20) were post-partum visits, while 6.1% (*n* = 22) were acute visits.

Intervention group characteristics. Data was collected from a total of 357 patients, women who attended the health center during the six-week project intervention period. Ninety-one patients were up-to-date with their vaccinations and were therefore not eligible to receive a vaccine. This left a total of 266 participants who were eligible for immunization, with ages ranging from 18 to 51 years (*M* = 26.23 years). Similar to characteristics of the pre-intervention group, the largest proportion of women were White, 46.6% (*n* = 124), 36.8% (*n* = 98) were Black, and 16.5% (*n* = 44) Hispanic. A total of 79.3% (*n* = 211) had federal or state insurance, while only 16.9% (*n* = 45) had private or commercial insurance. For 10 participants (3.8%), the type of insurance was unknown. Obstetric visits accounted for 75.6% (*n* = 201) of the

participants, 11.7% ($n = 31$) were well-woman visits, 9.8% ($n = 26$) were post-partum visits, and 3.0% ($n = 8$) were acute visits.

Changes in Outcomes

Statistical Testing and Significance

Using SPSS Version 22 for analysis, parametric tests were run to compare immunization rates among the three groups; pre-intervention ($n = 362$) intervention ($n = 357$) and post intervention ($n = 100$). Pearson Chi-Squared test was run to test association between multifaceted intervention and TDap vaccination rates. Statistical significance for all data was established as $p < .05$. The Chi-square value with 2df was 26.555 with p-value of < 0.0001 . Hence, there was a statistically significant association between this multifaceted intervention and TDap vaccination rates. To further test strength of association, the Phi test and Cramer's V test were computed, and these showed that there was a strong association between the variables ($p < .0001$). See tables 4.5 and Table 4.6.

Findings

Immunization rates increased from 1.5% pre-intervention to 11.7% of eligible women during the intervention period; a 5-fold increase in immunization rates. During the post-intervention period however, immunization rates dropped to 4.9% of eligible women.

Of the 266 patients that were eligible for vaccination, 31 of them received vaccination. Twenty-eight of the recipients were obstetric patients, two were postpartum patients, one was seen for a well woman visit, and none were acute care patients. Of the vaccinated patients, 15 (48.4%) were white, 11 (35.5%) black, and 5 (16.1%) Hispanic. The large majority of patients who received vaccination had federal or state insurance (80.6%), while 19.4% had private insurance. The average age of vaccinated women was 26 years old; their ages ranged from 24 to 31 years old.

Chi-square tests were also run to determine association between Tdap vaccination and type of office visit, health coverage, and ethnicity. Results showed that there was no statistically

significant association between Tdap vaccination and these variables: for office visit ($p < .181$); for insurance coverage ($p < .504$); for ethnicity ($p < .914$). The level of statistical significance was set at $p < .05$ for all variables tested.

Table 4.1

Age Distribution of Eligible Women

	N	Minimum	Maximum	Mean	Std. Deviation
Age	266	18.00	51.00	26.2293	5.35918

Table 4.2

Frequency Distribution for Eligible Women

Variable	Frequency	Percent
Ethnicity		
White	124	46.6%
African American	98	36.8%
Hispanic	44	16.5%
Total	266	100%
Insurance		
State/Federal	211	79.3%
Private	45	16.9%
Unknown	10	3.8%
Total	266	100%
Visit type		
Obstetrics	201	75.6%
Well Woman	31	11.7%
Postpartum	26	9.8%
Acute visit	8	3.0%
Total	266	100%

Table 4.3

Tdap Receipt During Intervention Phase

Received Tdap vaccine	Frequency	Percent
YES	31	11.7%
NO	235	88.3%
Total	266	100%

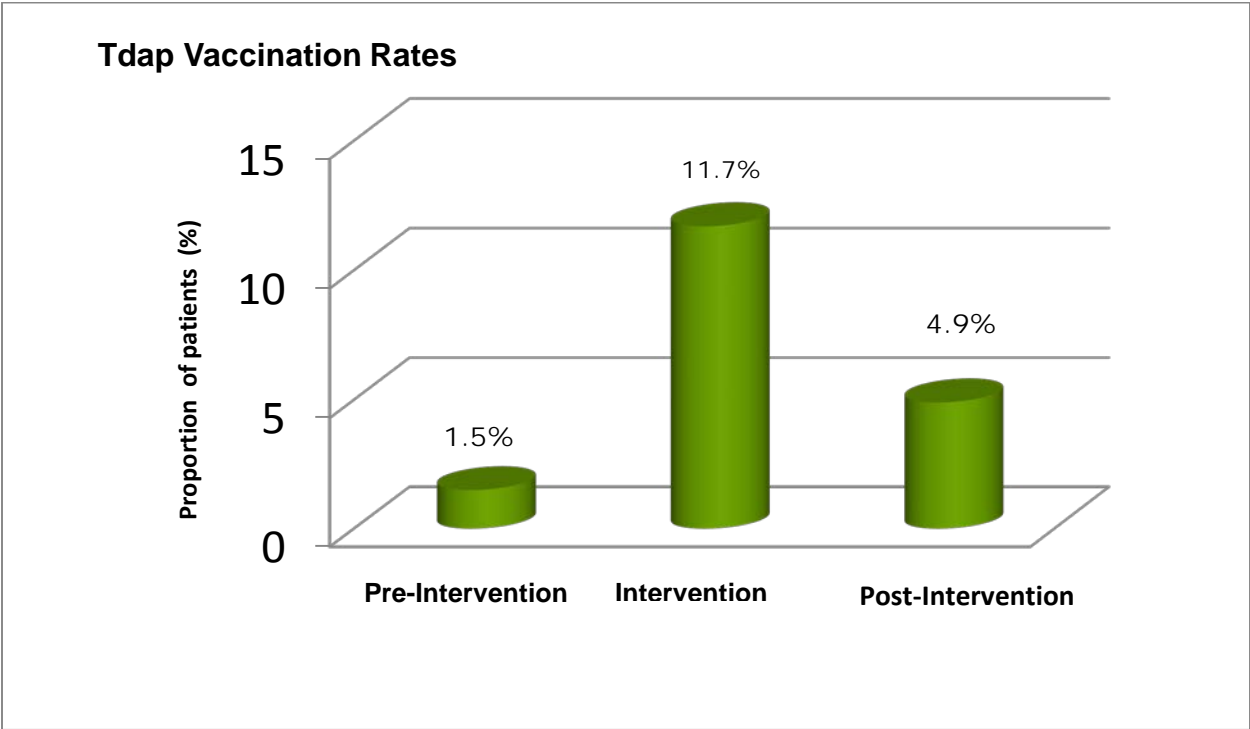
Table 4.4

Characteristics of Women Vaccinated During Intervention Period

	Total Vaccinated	Percent Vaccinated
Visit type		
Obstetric	28	90.3%
Well Woman	1	3.2%
Postpartum	2	6.5%
Acute Care	0	0.0%
Ethnicity		
White	15	48.4%
Black	11	35.5%
Hispanic	5	16.1%
Insurance type		
State/Federal	25	80.6%
Private	6	19.4%

Note. Total vaccinated during intervention period ($n = 31$)

Figure 4.1 Vaccination Rates Pre-Intervention, During Intervention and Post-Intervention



CHAPTER 5

DISCUSSION

Evidence-based practice allows for the integration of the best available evidence, clinical expertise, and patient preference (Melnyk & Fineout-Overholt, 2011). This EBP project was designed to answer the PICOT question: *“In women aged 18 and over, what is the effect of a multifaceted intervention consisting of provider reminder, an education component, and standardization of Tdap vaccine delivery, compared to usual practice, on vaccination rates over a 6-week period?”* The project which was implemented at a women’s healthcare clinic in Northwest Indiana sought to determine if a multifaceted intervention which included a clinical reminder influenced provider behavior with consequences of increased vaccination rates. Significant shifts in knowledge, attitudes and behavioral intentions due to project implementation were noted, and key factors that played a role in the success of the EBP project will be discussed in this chapter. Explanation of the project findings, evaluation of the theoretical and EBP framework utilized to guide project implementation, and implications for future projects will be outlined.

Explanation of Findings

The Promoting Action on Research Implementation in Health Services (PARiHS) framework will be used to guide project evaluation. This framework was selected because it aims to accurately represent the complexities of implementation and is useful for explaining variability in the success of the project (Rycroft-Malone et al., 2013). The PARiHS framework is a function of three key elements; evidence, context and facilitation, all of which interact to influence successful implementation of evidence-based practices.

Evidence

The CDC recommends that healthcare providers offer vaccinations at every provider-patient encounter (2015a). Based on a literature review of their efficacy, the CDC recommends

the use of clinical reminders as interventions with the potential to improve vaccination rates. However, while attention to appropriate administration of vaccinations is essential, it cannot be assumed that these vaccinations are being given to every eligible person. Providers often inadvertently overlook effective immunizations, an error of omission that contributes to hundreds of Tdap-related deaths (CDC, 2012). The Centers for Disease Control and Prevention (2015a), also emphasizes the manner in which a reminder system provides strategies to reduce missed opportunities of promoting and providing preventative care.

At the end of the project, data from the pre-intervention, intervention and post-intervention periods were compared to assess the effect of the intervention on vaccination rates at the practice. Vaccination rates increased from 1.5% pre-intervention, to 11.7% at the end of the intervention, a more than 7-fold increase. Parametric tests (chi-squared analysis, Phi-Cramer's V and Pearson's R) results showed a statistically significant and strong association between the provider reminders and increased vaccination rates ($p < .0001$). Results from this project were similar to those found in the literature. (Pierson et al., 2015; Riley et al., 2011). The distribution of vaccine receipt among eligible women closely mirrored the distribution of the population of clinic attendees.

Additionally, the DNP student facilitator was interested in testing the possible influence of age, insurance type, visit type and ethnicity, on vaccination rates. Further parametric tests were run using the data collected from the clinic. Binary logistic regression analysis showed no statistically significant association between age and vaccination rates ($p < .393$). However, results of the project indicated that the majority of the women who received the vaccine were of child-bearing age. The average age of recipients was 26 years old. Possible explanation of this finding could be that the provider recommendation of vaccine focused heavily on obstetric patients. On the other hand, it is possible that women of child-bearing age were more receptive to vaccine recommendations given their concern for the unborn child. These factors were identified as points of possible education for improving efficacy of this strategy in the future.

Implementation of a discussion tool that is short and straightforward and directed specifically to pregnant patients should be considered as a way to increase vaccinations within this group (American College of Obstetricians and Gynecologists [ACOG] 2013).

Pearson chi-squared tests also showed that vaccination rates were independent of ethnicity ($p < .914$), insurance type ($p < .504$), and type of visit ($p < .181$). Results revealed that 75.6% of the 201 eligible obstetric patients did not receive vaccination. This finding was significant because obstetric patients were the majority of those eligible. CDC guidelines recommend administration of a dose of Tdap during each pregnancy irrespective of the patient's prior history of receiving the vaccine. Optimal timing for Tdap administration is between 27 and 36 weeks' gestation, and is aimed at maximizing the maternal antibody response and passive antibody transfer to the infant (CDC, 2015a). Therefore, the high rate of unvaccinated pregnant patients within this project was disconcerting. Potential reasons for these findings could be attributed to the fact that pregnant women who had received vaccinations in a previous pregnancy, were not convinced of the need to be vaccinated with every pregnancy. Another reason for unvaccinated women could be that many of the women seen during this project intervention period were less than 27 weeks' gestation.

Race of a patient may affect adherence to vaccine receipt (Lu et al., 2015; Shugarman et al., 2009). According to Lu et al. (2015), compared to non-Hispanic white populations, uptake of vaccine among minority racial and ethnic groups has been lower historically. In this EBP project, 48.4% of vaccine recipients were white, with 35.5% reported as black and 16.1% Hispanic. While analysis of the data showed that ethnicity did not significantly affect vaccination receipt ($p < .914$), the distribution of vaccinations among the clinic population was reflective of findings within the literature (Lu et al., 2015). Discussions with the provider suggested that black and Hispanic patients were more likely to refuse vaccinations, compared to their white counterparts. Many different factors can contribute to racial and ethnic differences in vaccination uptake; differences in attitude toward vaccination, propensity to accept vaccination, and

differences in concerns about vaccine safety, are a few of the factors (Lu et al., 2015). Although this project was not designed to follow-up on the patients that refused vaccinations, it is very important that routine monitoring and reporting of vaccine coverage by race be conducted as efforts to reduce racial and ethnic disparities. According to Lu et al. (2015), and similar to this EBP project, standardization of vaccine delivery within a practice is a potential strategy for addressing racial disparity in vaccination uptake.

Results of this project demonstrated that clinical reminders are an effective strategy for improving immunization rates. Other studies within the literature showed similar efficacy (Balas et al, 2000; Groom et al, 2014; Lau et al, 2012; Pierson et al, 2015). Literature searches focusing on interventions to improve vaccination rates found strong evidence to support provider reminder interventions with a goal of decreasing missed opportunities to vaccinate. Pertinent results of the literature search were shared with the clinic team who were part of this EBP project. The clinic APN who was the provider targeted for the project, reviewed this literature that was critically appraised and summarized by the student facilitator. Especially encouraging to the APN were studies in which reminders were directed at all staff, and included notations in the charts, standardized checklists, and chart prompts or stickers at the time of patients visit (Pierson et al, 2015; Riley et al, 2011; Wallis et al, 2006). Similar to this EBP project, the study by Pierson et al. demonstrated that a simple paper provider reminder was effective in increasing vaccination rates with results that showed a 14.2% vaccination rate during the study period, compared to 2.2% prior to intervention. In the study by Wallis et al, provider reminder notes placed in the charts of patients led to an almost 15-fold increase when the vaccination rate rose to 21.9% ($p < .001$).

While healthcare providers generally agree with preventive measures and guidelines, there is substantial evidence that provider compliance with preventive measures is well below optimal. Guided by the Iowa model the DNP student facilitator addressed several factors that were deemed pertinent to the success of the project. Verbal communication with the provider

confirmed that she believed the services she was being reminded of were important and that the reminder system met her needs. The provider also agreed with the proposed approach for increasing vaccinations in the clinic. This was demonstrated when the provider recommended placing extra reminder worksheets in her office as a safeguard against process failure such as when the MA forgot to place one in a patient's chart. Improving Tdap compliance using a provider reminder system also helped to implement a structured screening process in the clinic, and provide a standard for the clinic team to follow. The team agreed that this EBP project was appropriate for the clinical setting.

The instrument used in the intervention for this EBP project was a brightly colored worksheet which reminded the provider to assess immunization status during patient encounters. However, the clinic team as well as the clinic patients were also exposed to reminders during the intervention: large posters were placed throughout the clinic which displayed images and messages about the importance of the Tdap vaccine. The posters which were obtained from the CDC, served as constant reminders to the provider, the clinic staff, as well as to the patients of the importance of the Tdap vaccine. Literature evidence was found to support provider reminders that were implemented in combination with other interventions. Multicomponent interventions included patient reminders, patient education, provider education, provider feedback, and standing orders (Groom et al, 2014; Lau et al, 2012; Ndiaye et al, 2005). Findings in the literature revealed that when combined with provider reminders, multicomponent interventions effectively improved vaccination rates (Pickering et al, 2009).

During the post-intervention period however, vaccination rates dropped to 4.9% of eligible women. While this is still higher than the 1.5% recorded pre-intervention, it raised vital questions about potential factors that influence non-adherence to recommended guidelines. The regression in vaccination rates was certainly not ideal but this trend was consistent with results found in the literature (Riley et al., 2011). During the education portion of the project, it could be inferred, from discussions with the provider, that it was not common practice to recommend

vaccination in women who were not pregnant and older women who were not within childbearing age. The lack of previously established practice to immunize non-pregnant women was also reflected in the results of this EBP project in which the vaccination rate was overwhelmingly skewed to favor obstetric patients (90.3%).

Health care providers can favorably influence patients' beliefs about and acceptance of vaccination (CDC, 2012). The APN at the clinic has practiced at the clinical site for over 15 years. Undoubtedly, her long standing relationships with the majority of the women who seek care at this clinic had an effect on vaccination uptake. Extensive clinical experience as well as knowledge of patient preferences played a significant part in the resultant significant increases in the uptake of the Tdap vaccine. According to Rycroft-Malone et al. (2013), strong support for implementation would be conditions where patient opinion and preferences are incorporated into the implementation.

Context and Facilitation

Approval for this EBP project was obtained from the IRB of the clinic's parent organization. Details of the project as well as goals and future implications for the project were discussed at length with the chair of the IRB committee. Aware of the importance of immunizations and the increasing rates of pertussis infection in northern Indiana, the chair voiced strong support for the project and requested that the board be notified of any significant adverse events related to the project. It was clearly stated that the organization would be unable to provide any financial support, and the chair advised that the project be implemented at no additional cost to the clinic. Implementation costs were therefore financed by the DNP student facilitator using personal funds. Also, the clinic staff were not required to spend additional time at work due to the practice change. The board chair requested that the DNP student facilitator submit a progress report at project completion.

"Type of patient visit" was among the variables that were studied to explore whether a relationship existed with vaccination rates. The majority of the patients that were immunized

during intervention were obstetric patients (90.3%), higher than well woman visits, postpartum visits, or visits for acute care. It is also likely that this was affected by recent changes in guidelines by the CDC. In the face of dramatic and persistent increases in pertussis disease in the United States, in February 2013 the CDC updated its guidelines for the use of the Tdap for pregnant women and recommend that a dose of Tdap is administered during each pregnancy, irrespective of prior receipt of the vaccine. The new guidance was issued based on an imperative to minimize the significant burden of pertussis disease in vulnerable newborns, the reassuring safety data on the use of Tdap in adults, and the evolving immunogenicity data that demonstrate considerable waning of immunity after immunization (ACOG, 2013). A plausible explanation therefore, for the higher rates in pregnant women could be that the provider, in accordance with the updated guidelines, placed more emphasis on the importance of the vaccine to prenatal patients as compared to patients that were seen for non-obstetric care. Although results of this study found that the type of office visit did not significantly affect vaccine receipt, others in the literature have found otherwise (Boom, Nelson, Laufman, Kohrt, & Kozinetz, 2007; Johnson, Nichol, & Lipczynski, 2008); results in these studies found statistical significant differences in capturing immunization opportunities based on the type of office visit.

In spite of project success, there are limitations to this EBP project. Having only targeted one provider for the intervention made it difficult to detect significant differences that may be caused by differences in provider attitudes to vaccinations, provider education and clinical experience, and adherence practices. A larger sample size, and preferably one that includes varied providers such as physicians and physician assistants, should be considered in future projects as a way to draw more specific extrapolations regarding vaccination rates. Studies within the literature have demonstrated positive relationship between educational strategies, motivation, level of education, and improved knowledge and adherence to clinical guidelines (Boom et al., 2007; Goins et al., 2007).

Although the increase in vaccination rate was significant as compared to baseline rates, the overall vaccination rate during project intervention was low. Another limitation to the project design was the lack of formal evaluation or follow-up of patients who refused the vaccine, information which is essential for the success of future adaptations of the EBP project. However, despite the limitations, this intervention that included a clinical reminder was found to be a plausible solution for provider adherence to assess vaccine eligibility in all patients.

Leadership within the project was guided by the Iowa project. The DNP student facilitator's subject knowledge and cordial personal relationships with the clinic staff allowed for a respectful and supportive environment for effective organization. The student facilitator introduced a protocol for standardization of vaccine delivery that was based on a rigorous review and critical appraisal of current best available evidence. Utilizing patient-centered approaches such as providing CDC pamphlets about pertussis and the Tdap vaccine, the DNP student assumed the role of educator in the delivery of program material to the provider and to clinic team. As project leader, the DNP student facilitator made certain that the entire team participated, and that all the steps necessary for project success were carried out: including activities such as placing reminder worksheets in patient's charts, maintaining adequate supplies of vaccines, monitoring refrigerator and freezer temperatures to assure maintenance of the cold chain, and documenting patient demographics. As part of participant appreciation, the DNP student facilitator often brought breakfast doughnuts and provided a light lunch at the end of each week, a practice that was appreciated and enjoyed by all team members. Minkovitz et al. (2001) proposed that clinicians' and staffs' high degree of motivation, in this case chocolate bars, enhanced effectiveness of minor practice changes. The clinic APN held a dual role: as the provider targeted for the project and as the clinical site project facilitator. Her experience with the clinic staff and firsthand knowledge of their personalities helped facilitate the project as she was able to draw on the strengths of each team member. Team work and an obviously cohesive work environment was observed in the social culture within the clinic. According to Rycroft-

Malone et al. (2013), context implies an understanding of the prevailing culture which gives the physical environment a character and a feel of human relationships within the organization.

Applicability of Theoretical Framework

Empirical evidence alone is not sufficient to direct practice change, and therefore the explanatory and predictive capability of theory are essential to both project implementation and evaluation (Green, 2000). Kurt Lewin's change theory was used as a framework to guide intervention. Lewin's theory has been used in healthcare organizations to understand human behavior as it relates to change and patterns of resistance to change (Sutherland, 2013). Successful implementation of the EBP project was attributed to careful planning and identification of behaviors that drive or oppose change, and ways to strengthen positive driving forces. Using Lewin's change theory, the DNP student facilitator was able to identify factors that promoted the practice change.

Using Lewin's three steps of unfreezing, moving or changing, and refreezing, the DNP student facilitator enhanced understanding throughout the stages of the project. Key components of the first step (unfreezing) involved communication targeted at the APN and clinic staff, to promote a sense of empowerment and help overcome resistance to change. The first two weeks of project implementation were dedicated to educating the team about pertussis and recommended guidelines for disease prevention. This instruction served to boost understanding of the Tdap vaccine, its importance, and how the project would benefit the patients. Team members engaged in discussions about their current practice, and ways to "unlearn old habits", and also shared ideas of what they believed would promote easy adoption of the proposed policy change in their clinic. The MAs engaged in preparatory activities which included taking stock of vaccinations and injection apparatus to ensure that supplies were available and adequate. Weekly meetings actively engaged the team to work towards accentuating the positive driving forces and diminishing the restraining forces.

The moving stage was represented by the period of actual change including planning and implementation. Prior to this project, the clinic did not have a standardized policy for vaccine delivery and so they readily embraced the proposed protocol. During the initial stages of implementation, the DNP student facilitator answered questions, provided feedback and also engaged in clinic activities such as chart preparation, and preparing vaccines, to assist the staff and also provide team encouragement. According to Bozak (2003), education, communication, and support are critical during this stage. Weekly meeting discussions were used to identify driving and resisting forces. Addressing restraining forces helped to promote adoption to ensure smooth implementation. During these meetings, the DNP student facilitator provided feedback on the team's performance, sharing the number of immunizations given at the end of each week, and examining ways to improve performance. During one such meeting, one of the MAs suggested that we give Tdap education pamphlets to include women that were not yet eligible to receive the vaccine (<27 weeks' gestation), so that they would familiarize themselves with the vaccine and have time to make an informed decision before it was offered.

The third stage in Lewin's change theory is the refreezing stage. Upon completion of the EBP project, an evaluation and summary of successes realized, problems confronted, and challenges encountered throughout the project was done for future reference. At the final weekly meeting, the DNP student facilitator asked each team member to share their personal experience regarding the practice change, to determine if the change met each person's personal and professional goals. In order to maintain the desired behavior (increased vaccinations), the APN was reminded to periodically refer to education tools such as pamphlets, websites, and the education package that were provided earlier during the project implementation.

Kurt Lewin's change theory has been successfully use in many organizations undergoing change. The theory was a good fit for this EBP project because it is easy to use and the steps that are used in the theory were directly applicable to the different stages of the EBP

project. The flexibility afforded by use of the theory allowed the DNP student facilitator to assess progress at various levels of implementation and to proceed or pause to make adjustments wherever they were required. When the DNP student facilitator noticed that the clinician reminder worksheet was not being placed in the charts of well women, the MAs were reminded to review vaccine eligibility criteria, which led to a positive change in behavior. Lewin's change theory allowed the student facilitator to reinforce education. Overall, the theory was an excellent fit for this EBP project.

People do not usually welcome change, and organizational culture is extremely difficult to change. Armed with this knowledge, the student DNP facilitator was confident in the choice of Kurt Lewin's change model to address organizational culture. A strength of Lewin's model is its concentration on all aspects of a change process. Open communication and essential education resulted in a successful 'unfreezing' stage. Application of the model afforded the student facilitator the leadership and direction that was required to concentrate on all aspects of the project such as communicating the vision, creating a guiding coalition, and generating short-term wins. When data was tallied at the end of each week, team members were always eager to assess their performance for the week. Another strength of Lewin's model is that it is simple and easy to understand. A downside of the model was that the 6-week period of project implementation proved to be rather brief for a model that depicted no urgency. Furthermore, the brevity of the evaluation period (two weeks), did not allow for the model's comprehensive recommendations for a full assessment of sustainability.

Applicability of EBP Framework

"Essential components for creating an EBP environment include vision, engagement, integration, and evaluation" (Hockenberry, Walden, Brown, & Barrera, 2007, p. 222). The Iowa Model of Evidence-Based Practice to Promote Quality Care was used as a framework for this EBP project. The Iowa model, with its problem and knowledge-focused triggers, acted as a catalyst for the DNP student facilitator to think critically about the clinical and operational

efficiency and effectiveness of the project. Use of the model prompted the student facilitator to seek evidence-based knowledge for use in the decision making process. Applicability of the model was achieved by means of the model's seven steps: The problem-focused trigger for the project began when the DNP student facilitator observed low rates of Tdap vaccinations among women attending the health clinic. Discussions with the clinic's APN (step one), revealed that she was equally aware and concerned about the low rates. Further discussions confirmed that the problem was a priority for the organization, and within the second step in the Iowa Model, a team which comprised of the DNP student facilitator, the clinic APN who served as project site facilitator, two MAs, and a receptionist was formed. The third step involved identifying available sources, and assembling the data. With assistance and guidance from the project advisor and the help of the university librarian, a search for best evidence was conducted. Nine studies and one task force recommendation, all of which addressed clinical reminders as a strategy for increase in immunizations, were included in the final analysis. A critical analysis of the evidence was part of the fourth step. The appraised literature evaluated increases in vaccination rates, an enhanced compliance to recommended guidelines, and a decrease in missed opportunities to vaccinate. Strength of each of the studies was rated using the Melnyk and Fineout-Overholt (2011) Rating System for Hierarchy of Evidence. All of the articles were graded of good quality and demonstrated the effectiveness of using a multifaceted approach (including provider and staff education in combination with visual reminders) to increase immunization rates. In step five, it was determined that there was sufficient evidence to guide practice change. The project was guided by the best evidence in support of provider reminder systems which aimed to increase immunization rates and increase provider compliance of recommended guidelines. Implementing the practice change into practice occurred during the sixth step. Following successful IRB approval from both the university and the larger organization, project implementation began on November 2nd 2015. Provider education comprised of interactive educational sessions that were designed to meet the CDC's recommended guidelines for Tdap

immunization. The proposed Tdap policy was instated, including the use of a brightly colored worksheet which served as a clinical reminder. For the seventh and final step, the DNP student facilitator evaluated outcomes of initial implementation by tallying vaccination rate at the end of each week. To evaluate sustainability, data was collected from a two-week post intervention period.

The Iowa model highlights the importance of considering the entire healthcare system; from the provider, to the patient, and to the organization, a characteristic which was of importance to this EBP project as success depended on the cooperation of the entire team. Therefore, the model proved to be a good fit for this project as it provided the ideal framework needed to process the clinical question and implement evidence based change to improve immunization at the clinic. A strength of the framework was the ease with which the DNP student facilitator was able to apply all the steps of the model to the monitoring, analyzing, and evaluation of the EBP project in relation to the clinical environment, the staff, and the patients. Team cooperation was a vital tool for this project's success, and was evident when the student DNP facilitator approached the team with concerns about the numerous number of clinic closures due to the Christmas holidays. The team collectively agreed that the best way to make-up for the lost days was to extend the implementation time beyond the preciously agreed-upon date. The Iowa model is not without its weaknesses, noted particularly in the dearth of detail in the guidance for the implementation process. Fortunately, application of Kurt Lewin's change model compensated for this weakness. A recommendation for replication of this EBP project is to increase the length of time allocated for the implementation and evaluation stages.

Strengths and Limitations of the EBP Project

Support from the clinical site APN was a major strength of the project. Her support also influenced the clinic staff who willingly played very active roles in the successful implementation of the project. According to Doody and Doody (2011), direct interaction between the organization, the providers, and its leadership is necessary to support practice change. The

DNP student facilitator was a strong project leader who's well laid-out education plan motivated the clinic team to implement practice change by actively engaging in the standardization of vaccine policy delivery and subsequently impacting vaccine rates. Throughout the planning and implementation period, the team was encouraged to provide input, and feedback was positively acknowledged. Some of the team's suggestions were incorporated into the EBP project procedure, an action that empowered team members.

The DNP student facilitator's comprehensive knowledge of the subject abetted the ease of role transition for all team members. As a clinical doctorate student completing her final coursework, the student facilitator adeptly used the Iowa model and Kurt Lewin's change theory to systematically gather and critique evidence and ultimately facilitate the transfer of evidence into clinical practice. Drawing on the strengths and personalities of each of the team members, the DNP student facilitator tailored and combined techniques that promoted team cohesiveness.

Despite the explosive growth in technology, the clinical agency was not completely paperless and still used paper charts for the majority of the patients. Hence, the brightly colored paper reminder served as a simple and effective tool. Today most hospitals, clinics, and physician practices have transitioned to electronic health records (EHRs) and would be better served with a clinical reminder which is integrated into the electronic records. A weakness of this EBP project therefore is that the paper reminder would be impractical in a facility that is entirely paperless. It is fair to say that the parent organization of this clinic recognizes the incredible benefits that EHRs brings to the medical practice and has initiated a plan to implement one in the very near future. What is not so clearly understood is when the transition will actually take place.

Another weakness of this EBP project was the fact that only one provider was targeted for the intervention. Due to the small sample size (one provider) it was difficult to draw any inferences related to the influence of knowledge and attitudes on compliance, which can be clinician specific. A limitation of the EBP was the sample size for analysis. Although a power

analysis suggested that sample size of the EHR data that were analyzed was large enough for drawing inferences, with such infrequent immunizations (1.5% immunizations pre-intervention), a larger patient sample is warranted for replicate studies. Disruption in the flow was noted during the intervention period when the clinic remained closed for several days during the Christmas holiday season. Following a one-week closure, it was noted that vaccinations fell drastically as the team tried to re-group and return to the new routine.

Implications for the Future

Practice

Despite the success of this EBP project, with significant increases in vaccination rates compared to the pre-intervention periods, vaccination rates overall were low. An important component of vaccination success is ensuring that all people who need the vaccines can get them. A goal of the CDC (2011) is to move healthcare personnel from a state of unawareness about the problem of low immunization rates, to a state in which they are knowledgeable, concerned, and motivated to change their immunization practices. and capable of sustaining new behaviors. It is a responsibility of APNs to assess vaccination status at every patient encounter and offer vaccines to all those who are eligible.

Advanced practice nurses are well suited to address the problems related to low immunization rates. Promoting health and disease prevention are within the scope of practice of the APN. Practitioners are well prepared to play a vital role in wellness through education and advancement of preventive health by promoting adherence to recommended immunization guidelines. Understanding predictors of adherence may inform quality improvement processes aimed at optimizing disease prevention.

Theory

The Iowa Model of Evidence-Based practice to Promote Quality Care served as an appropriate guide for the implementation of this EBP project because of its focus on organization and collaboration incorporating practice and use of evidence. The model allowed

the DNP student facilitator as well as the clinic team to focus on knowledge and problem-focused triggers, which led team members to question current practices and whether there can be improvement through the use of current research findings. Theory based interventions provide a valuable background vital to formulating effective designs aimed at provider adherence. Use of Kurt Lewin's change theory to guide the implementation of this EBP project helped to promote project acceptance by the provider and the clinic staff by involving them in all aspects of the planning and implementation; suggestions from team members were incorporated into the project plan when deemed fit. This helped to build autonomy and ownership of the project, ultimately leading to success. Advanced practice nurses should consider use of this change model to reduce fear of change through the development of a well thought-out plan that encourages active participation by all players.

Evidence-based practice is an essential part of quality healthcare and nursing practice. Use of theories much like the aforementioned, help to provide the APN with a framework of how best to think about and implement EBP within a particular healthcare system or community. A future consideration is the development of a theory that merges the strengths of each of the two theories into one theory, making it compatible with all stages of project implementation and leading to ultimate success.

Research

In spite of the significant increase in the rate of immunization, there was a noteworthy number of women who declined the vaccine. Unfortunately, this EBP project was not designed to track those who declined immunization, making it difficult to evaluate fully, the reasons for non-acceptance. Evaluation of reasons for vaccine refusal would have possibly shed light on specific reasons for the trend noted at this clinic in which vaccine recipients were 46.6% white, 36.8% black, and 16.5% Hispanic. Additional research is warranted therefore, to investigate reasons for vaccine refusal and further concentrate research efforts on the best approach to overcome barriers of vaccine receipt. This finding however is consistent with current literature

(CDC, 2010; Johnson et al., 2008; Lu et al., 2015). Lu et al. (2015) sought to assess adult vaccination by race/ethnicity in the U.S. Analysis was conducted to assess adult vaccination by race/ethnicity for five vaccines recommended for adults: influenza, tetanus, pneumococcal, human papilloma virus, and zoster vaccines. Study results revealed that vaccination coverage was significantly lower among non-Hispanic blacks, Hispanics, and non-Hispanic Asians compared with non-Hispanic whites. The writers recommended the routine monitoring and reporting of vaccine coverage by race, ethnicity and other sociodemographic factors as a way to help reduce racial and ethnic disparities (Lu et al., 2015).

To assess sustainability within this EBP project, data was collected from a two-week post-intervention period. Although there was a threefold increase in vaccination rate compared to baseline (4.9%), the rate was noted to have fallen significantly compared to the intervention period. Future research should focus not only on strategies to improve vaccination rates, but also on ways of sustaining new behaviors.

This EBP project used a simple paper reminder as the main instrument in the intervention that sought to prompt the provider to assess and administer the Tdap vaccine. A paper reminder was used because the clinical agency is still using paper charts. Results of this EBP project demonstrated that practices that have not adopted electronic health record (EHR) can still improve vaccination rates by conveying the reminder with a brightly colored paper form attached to the front of a patient's chart. The study by Pierson et al (2015) showed that this approach increased rates of influenza vaccination in an urban practice by 12 percentage points. However, many in healthcare today have transitioned or are in the process of transitioning to EHR. As adoption continues to expand, the combination of the EHR with clinical reminders has been recognized as an important strategy. Several studies examined the effectiveness of this strategy (Crosson, Stroebel, Scott, Stello, & Crabtree, 2005; Fiks, Grundmeir, Biggs, Localio, & Alessandrini, 2007; Gandhi et al., 2003; Joos, Chen, Jirjis, & Johnson, 2006; Rolnick, Jackson, & Amundson, 2009). While the EHR has been identified as an effective strategy to improve

provider adherence and vaccination rates, it is not without limitations. Barriers such as too many alerts “alert fatigue”, provider attitude, lack of knowledge on the use, and usefulness of alerts continue to plague this strategy (Hysong et al., 2010; Rolnick et al., 2009; Saleem et al., 2005).

Future research should explore ways to remove barriers and improve the effectiveness of computerized clinical reminders. Meanwhile, in the absence of funding or extensive computerized systems, this EBP project demonstrated that minor changes in standard operating procedures can improve vaccine delivery. Results of this EBP project were presented in a poster presentation at the 2016 Midwest Nursing Research Society (MNRS) conference in Milwaukee, Wisconsin.

Education

Education is an important piece in the success of infectious disease prevention. APNs have an obligation to the public who entrust them with their health, to become knowledgeable about infectious diseases, vaccines, and best practices for disease prevention. Healthcare providers should continue their commitment to assess, identify, prevent, or treat infectious diseases, and also provide much needed education at every patient encounter.

Conclusion

“Based on the evidence, the best method to ensure a reduction of the incidence in pertussis is to promote universal vaccination not only for all children but also for all adolescents and adults” (Rittle, 2010, p. 289). Adherence to recommended preventive services and immunizations in adults is suboptimal and often associated with socioeconomic status, race, and access to care (Shippee et al., 2012). The CDC (2015a) recommends provider reminders on the basis of strong evidence of effectiveness in increasing vaccination rates across a range of intervention characteristics which include simple or computerized reminders, checklists, and flowcharts. This EBP project answered key outcome measures of the initial PICOT question, demonstrating that chart reminders are a simple but effective way to increase immunization rates, plus, they require minimal labor and cost. As evidenced by this EBP project, rates of

adult immunization can be improved when a health care organization supports performance of strategies that promote adherence to clinical guidelines through organizational changes in staffing and clinical procedures. Achieving immunization levels necessary for the greatest effect remains a challenging goal that can only be reached by the combined efforts of healthcare systems and providers. Preventing life-threatening pertussis will require a multi-faceted approach, much like this project, because no single paradigm or vaccination strategy will be effective (Healy & Baker, 2012).

REFERENCES

- American Academy of Pediatrics. (2006). Prevention of pertussis among adolescents: Recommendations for use of tetanus toxoid, reduced diphtheroid toxoid, and acellular pertussis (Tdap) vaccine. *Pediatrics*, 117(3), 965-978.
- American College of Obstetricians and Gynecologists. (2013). Physician script on influenza immunization during pregnancy. Retrieved from <http://immunizationforwomen.org/downloads/Toolkits/Flu/Flu-vaccine-Physicians-Script-2013.pdf>
- Balas, E. A., Weingarten, S., Garb, C. T., Blumenthal, D., Boren, S. A., & Brown, G. D. (2000). Improving preventive care by prompting physicians. *Archives of Internal Medicine*, 160(3), 301-308.
- Bishop, S. (2011). Theories of organizational behavior and leadership. In J. Butts & K. Rich (Eds.), *Philosophies and theories for advanced nursing practice*. Sudbury, MA: Jones & Bartlett Learning.
- Boom, J. A., Nelson, C. S., Laufman, L. E., Kohrt, A. E., & Kozinetz, C. A. (2007). Improvement in provider immunization knowledge and behaviors following a peer education intervention. *Clinical Pediatrics*, 46(8), 706-717.
- Bozak, M. G. (2003). Using Lewin's force field analysis in implementing a nursing information system. *Computers, Informatics, Nursing*, 21(2), 80-85.
- Brouwers, M., Kho, M. E., Browman, G. P., Burgers, J. S., Cluzeau, F., Feder, G.,... Zitzelsberger, L. (2010). AGREE II: Advancing guideline development, reporting and evaluation in healthcare. *Journal of Canadian Medical Association*. Retrieved from <http://www.agreetrust.org/resource-centre/agree-ii/> doi: 10.1503/cmaj.090449
- Burnes, B. (2004). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, 41, 977-1002

- Centers for Disease Control and Prevention. (2008). Prevention of pertussis, tetanus, and diphtheria among pregnant and postpartum women and their infants: Recommendations of the Advisory Committee on Immunization Practices. *MMWR: Morbidity & Mortality Weekly Report*, (57) 4, 1-50.
- Centers for Disease Control and Prevention. (2010). Pertussis (whooping cough): Causes and transmission. Retrieved from <http://www.cdc.gov/pertussis/about/causes-transmission.html>
- Centers for Disease Control and Prevention. (2011). Updated recommendations for use of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine in pregnant women and persons who have or anticipate having close contact with an infant aged <12 months: Advisory Committee on Immunization Practices. *MMWR: Morbidity & Mortality Weekly Report*, 60(41), 1424-1426. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6041a4.htm>
- Centers for Disease Control and Prevention. (2012). Epidemiology and prevention of vaccine-preventable diseases: *Pertussis*. Retrieved from <http://www.cdc.gov/vaccines/pubs/pinkbook/pert.html>
- Centers for Disease Control and Prevention. (2014). Strategies for increasing adult vaccination rates. Retrieved from <http://www.cdc.gov/vaccines/hcp/adults/for-practice/increasing-vacc-rates.html>
- Centers for Disease Control and Prevention. (2015a). Immunization strategies for healthcare practices and providers: The need for strategies to increase immunization levels. *Epidemiology and Prevention of Vaccine-Preventable Diseases (13th ed.)*. Retrieved from: <http://www.cdc.gov/vaccines/pubs/pinkbook/strat.html>

- Centers for Disease Control and Prevention. (2015b). Vaccination coverage among adults excluding influenza vaccine – United States, 2013. *MMWR: Morbidity & Mortality Weekly Report*, 64(04), 95-102. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6404a6.htm>
- Chamberlain, A. (2010, April). Use of IIS by VFC provider sites in Oregon and Louisiana in planning for and managing the 2009-2010 influenza vaccination campaign. Paper presented at the 44th National Immunization Conference, Atlanta, GA.
- Clark, S. J., Adolphe, S., Davis, M. M., Cowan, A. E., & Kretsinger, K. (2006). Attitudes of US obstetricians toward a combined tetanus-diphtheria-acellular vaccine for adults. *Infectious Diseases in Obstetrics and Gynecology*, 2006, 1-5.
doi: 10.1155/IDOG/2006/87040
- Critical Appraisal Skills Programme. (2013). *Making sense of evidence*. Retrieved from <http://www.casp-uk.net>
- Crosson, J. C., Stroebel, C., Scott, J. G., Stello, B., & Crabtree, B. F. (2005). Implementing an electronic medical record in a family medicine practice: Communication decision making and conflict. *Annals of Family Medicine*, 3, 307-311.
- Dardis, M. R., Koharchik, L. S., & Dukes, S. (2015). Using the health belief model to develop educational strategies to improve pertussis vaccination rates among preschool staff. *NASN School Nurse*. doi:10.1177/1942602X14549256
- Dexheimer, J. W., Talbot, T. R., Sanders, D. L., Rosenbloom, S. T., & Aronsky, D. (2008). Prompting clinicians about preventive care measures: A systemic review of randomized controlled trials. *Journal of the American Medical Informatics Association*, 15, 311-320.
- Doody, C. M., & Doody, O. (2011). Introducing evidence into nursing practice using the IOWA model. *British Journal of Nursing*, 20(11), 661-664. Retrieved from <http://dx.doi.org/10.12968/bjo.n.2011.01.11.661>

- Fiks, A. G., Grundmeir, R. W., Biggs, L. M., Localio, A. R., & Alessandrini, E. A. (2007). Impact of clinical alerts within an electronic health record on routine childhood immunization in an urban pediatric population. *Pediatrics, 120*(4), 707-714.
- Frere, J., De Wals, P., Ovetchkine, P., Coic, L., Audibert, F., & Tapiero, B. (2013). Evaluation of several approaches to immunize parents of neonates against B. pertussis. *Vaccine, 31*, 6087-6091. Retrieved from <http://dx.doi.org/10.1016/j.vaccine.2013.09.043>
- Gandhi, T. K., Sequist, T. D., Poon, E. G., Karson, A. S., Murff, H., Fairchild, D. G., ... Bates, D. W. (2003). Primary care clinician attitudes towards electronic clinical reminders and clinical practice guidelines. *American Medical Informatics Association, 8*48-849.
- Goins, W., Schaffner, W., Edwards, K., & Talbot, T. (2007). Healthcare worker's knowledge and attitudes about pertussis and pertussis vaccination. *Infection Control and Hospital Epidemiology, 28*(11). doi: 10.1086/521654
- Gonik, B., Puder, K. S., Gonik, N., & Kruger, M. (2005). Seroprevalence of bordetella pertussis antibodies in mothers and their newborn infants. *Infectious Diseases in Obstetrics and Gynecology, 13*, 59-61.
- Green, J. (2000). The role of theory in evidence-based health promotion practice. *Health Education Research, 15*(2), 125-129. <http://dx.doi.org/10.1093/her/15.2.125>
- Groom, H., Hopkins, D. P., Pabst, L. J., Morgan, J. M., Patel, M., Calonge, N., Coyle, R., Dombkowski, K., Groom, A. V., Kurilo, M. B., Rasulnia, B., Shefer, A., Town, C., Wortley, P. M., & Zucker, J. (2014). Immunization information systems to increase vaccination rates: A community guide systematic review. *Journal of Public Health Management Practice, 0*, 1-22
- Healy, C. M., & Baker, C. J. (2012). Infant pertussis: what to do next. *Clinical Infectious Diseases, 54*, 328-330.

- Hockenberry, M., Walden, M., Brown, T., & Barrera, P. (2007). Creating an evidence-based practice environment: one hospital's journey. *Journal of Nursing Care Quality*, 22(3), 222-31; 232-3.
- Hysong, S. J., Sawhney, M. K., Wilson, L., Sittig, D. F., Espadas, D., Davis, T., & Singh, H. (2010). Provider management strategies of abnormal test results alerts: A cognitive task analysis. *Journal of the American Medical Informatics Association*, 17, 71-77.
- Indiana State Department of Health (2014). *Annual report of infectious diseases. Epidemiology Resource Center*. Retrieved from [in.gov/isdh/files/2013_Communicable_Diseases_Report \(v.1\). pdf](http://www.in.gov/isdh/files/2013_Communicable_Diseases_Report_(v.1).pdf)
- Johnson, D., Nichol, K., & Lipczynski, K. (2008). Barriers to adult immunization. *American Journal of Medicine*, 121, s28-s35.
- Joos, D., Chen, Q., Jirjis, J., & Johnson, K. B. (2006). An electronic medical record in primary care: impact on satisfaction, work efficiency and clinic processes. *Journal of the American Medical Informatics Association*, 394-398.
- Lau, D., Hu, J., Majumdar, S. R., Storie, D. A., Rees, S. E., & Johnson, J. A. (2012). Interventions to improve influenza and pneumococcal vaccination rates among community-dwelling adults: A systematic review and meta-analysis. *Annals of Family Medicine*, 10(6), 538-546.
- Lu, P., O'Halloran, A., Williams, W. W., Lindley, M. C., Farrall, S., & Bridges, C. B. (2015). Racial and ethnic disparities in vaccination coverage among adult populations in the U.S. *American Journal of Preventive Medicine*, 49(6), 412-425.
<http://dx.doi.org/http://dx.doi.org/10.1016/j.amepre.2015.03.005>
- Melnik, B. M., & Fineout-Overholt, E. (2011). *Evidence-based practice in nursing & healthcare: A guide to best practice*. (2nd.ed). Philadelphia, PA: Wolters Kluwer, LWW.

- Minkovitz, C. S., Belote, A. D., Higman, S. M., Serwint, J. R., & Weiner, J. P. (2001). Effectiveness of a practice-based intervention to increase vaccination rates and reduce missed opportunities. *Archives of Pediatrics and Adolescent Medicine*, 155, 382-386.
- Murphy, T. V., Slade, B. A., Tiwarl, T., Joyce, P. M., Kretsinger, K., Iskander, J. K., & Moran, J. S. (2008). Prevention of Pertussis, Tetanus, and Diphtheria among pregnant and postpartum women and their infants. *MMWR Recommendation and Report*, 57(RR-4), 1-50.
- Ndiaye, S. M., Hopkins, D. P., Shefer, A. M., Hinman, A. R., Briss, P. A., Rodewald, L., & Willis, B. (2005). Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults. *American Journal of Preventive Medicine*, 28(5S), 248-279.
- Paisley, R., Blaylock, J., & Hartzell, J. (2012). Whooping cough in adults: An update on a reemerging infection. *The American Journal of Medicine*, 125(2), 141-143.
- Pickering, L. K., Baker, C. J., Freed, G. L., Gall, S. A., Grogg, S. E., Poland, G. A., . . . Orenstein, W. A. (2009). Immunization programs for infants, children, adolescents, and adults: Clinical practice guidelines by the infectious diseases society of America. *Clinical Infectious Diseases*, 49, 817-840.
- Pierson, R. C., Malone, A. M., & Haas, D. M. (2015). Increasing influenza vaccination rates in a busy urban clinic. *Journal of Natural Science*, 1(3), 1-12.
- Riley, M., Galang, S., & Green, L. A. (2011). The impact of clinical reminders on prenatal care. *Family Medicine*, 43(8), 560-565.
- Rittle, C. (2010). Pertussis – The case for universal vaccination. *Journal for Specialists in Pediatric Nursing*, 15(4), 282-291.
- Rolnick, S. J., Jackson, J. M., & Amundson, J. H. (2009). Development, implementation and evaluation of an electronic medical record prompt for bone density testing. *Health Informatics Journal*, 15(4), 296-304.

- Rycroft-Malone, J., Seers, K., Chandler, J., Hawkes, C. A., Crichton, N., Allen, C., ... Strunin, L. (2013). The role of evidence, context, and facilitation in an implementation trial: implications for the development of the PARIHS framework. *Implementation Science, 8*(28). Retrieved from <http://www.implementationscience.com/content/8/1/28>
- Saleem, J. J., Patterson, E. S., Militello, L., Render, M. L., Orshansky, G., & Asch, S. M. (2005). Exploring barriers and facilitators to the use of computerized clinical reminder. *Journal of the American Medical Informatics Association, 12*(4), 438-447.
- Schmidt, N. A., & Brown, J. M. (2015). *Evidence-based practice for nurses: Appraisal and application of research*. Boston, MA: Jones & Bartlett.
- Shippee, N. D., Mullan, R. J., Nabhan, M., Kermott, C. A., Hagen, P. T., Rhodes, D. J., ... Murad, M. H. (2012). Adherence to preventive recommendations: Experience of a cohort presenting for executive health care. *Population Health Management, 15*(2), 65-70. <http://dx.doi.org/10.1089/pop.2011.0029>
- Shugarman, L. R., Mack, K., Sorbero, M. E. S., Tian, H., Jain, A. K., Ashwood, J. S., & Asch, S. M. (2009). Race and sex differences in the receipt of timely and appropriate lung cancer treatment. *Medical Care, 47*(7), 774-781.
- Spratling, R., & Carmon, M. (2010). Pertussis: An overview of the disease, immunization, and trends for nurses. *Pediatric Nursing, 36*(5), 239-244.
- Stedman, T. L. (2006). *Stedman's medical dictionary*. (28th ed.). Baltimore, MD: Lippincott, Williams, & Wilkins.
- Steiner, B., Swamy, G. K., & Walter, E. B. (2014). Engaging expectant parents to receive Tdap vaccination. *American Journal of Perinatology, 31*(5), 407-412.
- Sutherland, K. (2013). Applying Lewin's change management theory to the implementation of bar-coded medication administration. *Canadian Journal of Nursing Informatics, 8*. Retrieved from <http://cjni.net/journal/?p=2888>Title

Titler, M. G., Kleiber, C., Steelman, V. J., Rakel, B. A., Budreau, G., Everett, L. Q., . . .

Goode, C. J. (2001). The Iowa model of evidence-based practice to promote quality care. *Critical Care Nursing Clinics of North America*, 13(4), 497-509.

Vitek, W. S., Akers, A., Meyn, L. A., Switzer, G. E., Lee, B. Y., & Beigi, R. H. (2011).

Vaccine eligibility and acceptance among ambulatory obstetric and gynecologic patients. *Vaccine*, 29, 2024-2028.

Wallis, D. H., Chin, J. L., Sur, D. K. C., Lee, M. Y. (2006). Increasing rates of influenza

vaccination during pregnancy: A multisite interventional study. *Archives of Pediatrics and Adolescent Medicine*, 19(4), 345-349.

Zastrow, R. (2011). Pertussis on the rise: A troubling picture of waning immunity with

unvaccinated children especially vulnerable. *American Journal of Nursing*, 111(6), 51-56.

doi: 10.1097/01.NAJ.0000398542.37036.1b

BIOGRAPHICAL MATERIAL

Soneka S. Wynter

Soneka obtained an associate degree in nursing in her home country of Zambia, southern Africa. She worked in a rural health center for two years and during this time, her professional and personal experiences fostered a deep commitment to serving indigent and underserved populations. Aware of the desperate need for mother and child care in the communities that she served, Soneka returned to school in 1988 and obtained a certificate in midwifery at the Lusaka School of Midwifery, Zambia. With a quest to further her career, Soneka later migrated to the United States, and settled in New York, where she spent 18 years working in the intensive care unit of a Level 2 trauma hospital. Working in a city hospital gave her the opportunity to learn and develop her skills, during which time she also developed a passion for mentoring new nurses. The true "melting pot" that was the backdrop for the New York City hospital also gave her the opportunity to apply her clinical experiences to a diverse multicultural patient population. It was also during this time that she obtained her Bachelor of Science (BSN) from Pace University, New York, in 2000. She later married and relocated to Indiana in 2009, to join her husband. Soneka worked as a staff nurse at a local hospital in South Bend Indiana before returning to college in August of 2012, to pursue a Doctor of Nursing Practice (DNP) at Valparaiso University. She is currently a student member of Coalition of Advanced Practice Nurses of Indiana (CAPNI) and the Midwest Nursing Research Society (MNRS). Her primary interest lies in the provision and delivery of better service to underserved populations, especially maternal and child care, in the context of a multi-cultural background and the trend of globalization. More recently, her interests have shifted towards immunization and prevention of communicable infections. Soneka is confident that the advanced study attained from the DNP program will allow her to broaden her perspectives on healthcare and afford her the opportunity to better serve communities in diverse cultural and economic clinical settings. She hopes to one day return to the place where it all began, and give back to the underserved populations of Zambia.

ACRONYM LIST

AAP: American Academy of Pediatrics

ACIP: Advisory Committee on Immunization Practices

ACOG: American College of Obstetricians and Gynecologists

APN: Advanced Practice Nurse

CDC: Centers for Disease Control and Prevention

CINAHL: Cumulative Index to Nursing and Allied Health Literature

DNP: Doctor of Nursing Practice

DTaP: Diphtheria, Tetanus, and Pertussis

EBP: Evidence-Based-Practice

FDA: Food and Drug Administration

IIS: Immunization Information Systems

IRB: Institutional Review Board

IDSA: Infectious Diseases Society of America

ISDH: Indiana State Department of Health

MA: Medical Assistant

PICOT: Patient population, Intervention or Interest, Comparison intervention, Outcome, & Time

RCT: Randomized Control Trial(s)

TDAP: Tetanus, Diphtheria, and Acellular Pertussis

APPENDIX A**Proposed Tdap Protocol**

TITLE:	Provider Reminders to Improve Tdap Immunization among Women Aged 18 years and older.
DEPARTMENTS:	Healthcare Providers, Support Staff

Purpose: To meet the Advisory Committee on Immunization Practices (ACIP) guidelines for Tdap vaccinations for eligible patients.

- 1.0 In preparation for patient-provider encounter, all charts for patients age 18 years and older will have a yellow colored worksheet (see Appendix C) placed in the front of the chart.
- 2.0 The provider will assess vaccine status on all flagged patients, and if no contraindications exist, the Tdap vaccine will be offered as per standard practice.
- 3.0 Consistent with ACIP guidelines, persons ineligible for immunization include
 - Pregnant patients who have already received the Tdap vaccine during this pregnancy
 - Non-pregnant patients who have previous immunization with the last two years
 - History of allergic reactions to the Tdap vaccine
- 4.0 Women aged < 18 years of age may receive vaccinations as per standard practice during project implementation, but data on this population will not be obtained
- 5.0 Patient teaching about the Tdap vaccine will be given by the provider.
- 6.0 Patients will also be given the CDC's "Tdap (tetanus-diphtheria-pertussis) Vaccine: What You Need to Know" pamphlet (see Appendix F).
- 7.0 Eligible patients will receive the Tdap vaccine after signing consent and vaccine administration will be included within the patient's medical record (standard practice).
- 8.0 Referral will be provided if the patient is unable to receive the vaccine at the clinic site due to insurance purposes.
- 9.0 As part of the patient discharge process, the MA will remove the completed worksheet from the patient's chart and these will be placed in a secure place within the work station during the day.

- 10.0 The MA will place a sticker on the front of each patient's chart (see Appendix D), to mark vaccination status. Blue stickers will be used if vaccination is administered, whereas red stickers will represent those not vaccinated.
- 11.0 At the end of each business day, completed forms will be collected by the APN and locked in a drawer in the APN's office.

APPENDIX B

Participant Information Form

Date _____

Patient Initials _____

Age _____ Ethnicity/Race _____

New Patient Yes No

Appointment Type OB Post-Partum

GYN Well Visit

Date of Last TDAP _____ Up-to-Date: YES NO

TDAP Vaccine: _____

Vaccine Ordered Today Refused Vaccine

Reason for Refusal _____

Referral Given

Vaccine not discussed

Reason Why _____

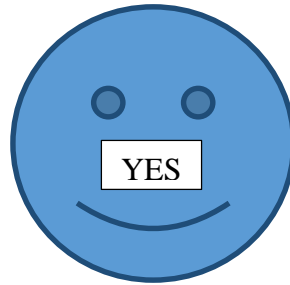
Not Candidate for Vaccine

Provider Signature: _____

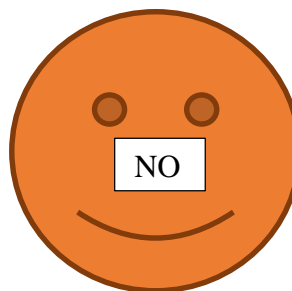
APPENDIX C

Vaccine Status Stickers

TDAP GIVEN: (Blue Sticker)



TDAP NOT GIVEN: (Red Sticker)



APPENDIX D

Patient Information: Page 1 of 2

VACCINE INFORMATION STATEMENT		
<h2 style="margin: 0;">Tdap Vaccine</h2> <h3 style="margin: 0;">What You Need to Know</h3>	(Tetanus, Diphtheria and Pertussis)	Many Vaccine Information Statements are available in Spanish and other languages. See www.imz.nia.nih.gov/via Muchas de información sobre vacunas están disponibles en español y en muchos otros idiomas. Visite www.imz.nia.nih.gov/via

1 Why get vaccinated?

Tetanus, diphtheria and pertussis are very serious diseases. Tdap vaccine can protect us from these diseases. And, Tdap vaccine given to pregnant women can protect newborn babies against pertussis.

TETANUS (Lockjaw) is rare in the United States today. It causes painful muscle tightening and stiffness, usually all over the body.

- It can lead to tightening of muscles in the head and neck so you can't open your mouth, swallow, or sometimes even breathe. Tetanus kills about 1 out of 10 people who are infected even after receiving the best medical care.

DIPHTHERIA is also rare in the United States today. It can cause a thick coating to form in the back of the throat.

- It can lead to breathing problems, heart failure, paralysis, and death.

PERTUSSIS (Whooping Cough) causes severe coughing spells, which can cause difficulty breathing, vomiting and disturbed sleep.

- It can also lead to weight loss, incontinence, and rib fractures. Up to 2 in 100 adolescents and 5 in 100 adults with pertussis are hospitalized or have complications, which could include pneumonia or death.

These diseases are caused by bacteria. Diphtheria and pertussis are spread from person to person through secretions from coughing or sneezing. Tetanus enters the body through cuts, scratches, or wounds.

Before vaccines, as many as 200,000 cases of diphtheria, 200,000 cases of pertussis, and hundreds of cases of tetanus, were reported in the United States each year. Since vaccination began, reports of cases for tetanus and diphtheria have dropped by about 99% and for pertussis by about 80%.

2 Tdap vaccine

Tdap vaccine can protect adolescents and adults from tetanus, diphtheria, and pertussis. One dose of Tdap is routinely given at age 11 or 12. People who did *not* get Tdap at that age should get it as soon as possible.

Tdap is especially important for healthcare professionals and anyone having close contact with a baby younger than 12 months.

Pregnant women should get a dose of Tdap during every pregnancy, to protect the newborn from pertussis. Infants are most at risk for severe, life-threatening complications from pertussis.

Another vaccine, called Td, protects against tetanus and diphtheria, but not pertussis. A Td booster should be given every 10 years. Tdap may be given as one of these boosters if you have never gotten Tdap before. Tdap may also be given after a severe cut or burn to prevent tetanus infection.

Your doctor or the person giving you the vaccine can give you more information.

Tdap may safely be given at the same time as other vaccines.

3 Some people should not get this vaccine

- A person who has ever had a life-threatening allergic reaction after a previous dose of any diphtheria, tetanus or pertussis containing vaccine, OR has a severe allergy to any part of this vaccine, should not get Tdap vaccine. Tell the person giving the vaccine about any severe allergies.
- Anyone who had coma or long repeated seizures within 7 days after a childhood dose of DTP or DTP, or a previous dose of Tdap, should not get Tdap, unless a cause other than the vaccine was found. They can still get Td.
- Talk to your doctor if you:
 - have seizures or another nervous system problem,
 - had severe pain or swelling after any vaccine containing diphtheria, tetanus or pertussis,
 - ever had a condition called Guillain-Barre Syndrome (GBS),
 - aren't feeling well on the day the shot is scheduled.



APPENDIX D

Patient Information: Page 2 of 2

4 Risks

With any medicine, including vaccines, there is a chance of side effects. These are usually mild and go away on their own. Serious reactions are also possible but are rare.

Most people who get Tdap vaccine do not have any problems with it.

Mild problems following Tdap
(*Did not interfere with activities*)

- Pain where the shot was given (about 3 in 4 adolescents or 2 in 3 adults)
- Redness or swelling where the shot was given (about 1 person in 5)
- Mild fever of at least 100.4°F (up to about 1 in 25 adolescents or 1 in 100 adults)
- Headache (about 3 or 4 people in 10)
- Tiredness (about 1 person in 3 or 4)
- Nausea, vomiting, diarrhea, stomach ache (up to 1 in 4 adolescents or 1 in 10 adults)
- Chills, sore joints (about 1 person in 10)
- Body aches (about 1 person in 3 or 4)
- Rash, swollen glands (uncommon)

Moderate problems following Tdap
(*Interfered with activities, but did not require medical attention*)

- Pain where the shot was given (up to 1 in 5 or 6)
- Redness or swelling where the shot was given (up to about 1 in 16 adolescents or 1 in 12 adults)
- Fever over 102°F (about 1 in 100 adolescents or 1 in 250 adults)
- Headache (about 1 in 7 adolescents or 1 in 10 adults)
- Nausea, vomiting, diarrhea, stomach ache (up to 1 or 3 people in 100)
- Swelling of the entire arm where the shot was given (up to about 1 in 500).

Severe problems following Tdap
(*Unable to perform usual activities; required medical attention*)

- Swelling, severe pain, bleeding and redness in the arm where the shot was given (rare).

Problems that could happen after any vaccine:

- People sometimes faint after a medical procedure, including vaccination. Sitting or lying down for about 15 minutes can help prevent fainting, and injuries caused by a fall. Tell your doctor if you feel dizzy, or have vision changes or ringing in the ears.
- Some people get severe pain in the shoulder and have difficulty moving the arm where a shot was given. This happens very rarely.
- Any medication can cause a severe allergic reaction. Such reactions from a vaccine are very rare, estimated at fewer than 1 in a million doses, and would happen within a few minutes to a few hours after the vaccination.

As with any medicine, there is a very remote chance of a vaccine causing a serious injury or death.

The safety of vaccines is always being monitored. For more information, visit: www.cdc.gov/vaccinesafety/

5 What if there is a serious problem?

What should I look for?

- Look for anything that concerns you, such as signs of a severe allergic reaction, very high fever, or unusual behavior.
- Signs of a severe allergic reaction can include hives, swelling of the face and throat, difficulty breathing, a fast heartbeat, dizziness, and weakness. These would usually start a few minutes to a few hours after the vaccination.

What should I do?

- If you think it is a severe allergic reaction or other emergency that can't wait, call 9-1-1 or get the person to the nearest hospital. Otherwise, call your doctor.
- Afterward, the reaction should be reported to the Vaccine Adverse Event Reporting System (VAERS). Your doctor might file this report, or you can do it yourself through the VAERS web site at www.vaers.hhs.gov, or by calling 1-800-822-7967.

VAERS does not give medical advice.

6 The National Vaccine Injury Compensation Program

The National Vaccine Injury Compensation Program (VICP) is a federal program that was created to compensate people who may have been injured by certain vaccines.

Persons who believe they may have been injured by a vaccine can learn about the program and about filing a claim by calling 1-800-338-2382 or visiting the VICP website at www.hrsa.gov/vaccinecompensation. There is a time limit to file a claim for compensation.

7 How can I learn more?

- Ask your doctor. He or she can give you the vaccine package insert or suggest other sources of information.
- Call your local or state health department.
- Contact the Centers for Disease Control and Prevention (CDC):
 - Call 1-800-232-4636 (1-800-CDC-INFO) or
 - Visit CDC's website at www.cdc.gov/vaccines

Vaccine Information Statement
Tdap Vaccine

2/24/2015



42 U.S.C. § 300aa-26

APPENDIX F. 1

Tdap Vaccination: Patient Information Poster

PERTUSSIS (WHOOPING COUGH)
IS SPREADING IN YOUR COMMUNITY




**To protect yourself
 and your baby,
 get vaccinated against
 pertussis.**

Pertussis (whooping cough) is a serious disease for babies. Adults and older children can spread pertussis to babies.


Pertussis is very contagious. It can cause serious illness and even death. About half of infants who get the disease are hospitalized.

Find out about the booster shot (Tdap) that's recommended for yourself, older children, pregnant women and other adults, including grandparents and babysitters.

www.cdc.gov/features/pertussis

National Center for Immunization & Respiratory Diseases
 Office of the Director



0214870

APPENDIX F. 2

Tdap Vaccination: Patient Information Poster

TOSFERINA (PERTUSSIS)

LA TOSFERINA SE ESTÁ PROPAGANDO EN SU COMUNIDAD

Para su protección y la de su bebé, vacúnese contra la tosferina

La tosferina (pertussis) es una enfermedad grave para los bebés. Los adultos y los niños mayores pueden contagiarla a los bebés.

La tosferina es muy contagiosa. Puede causar una enfermedad muy grave e incluso la muerte. Casi la mitad de los bebés que contraen la enfermedad son hospitalizados.

Pregunte sobre la vacuna de refuerzo (Tdap) recomendada para usted, los niños mayores, las mujeres embarazadas y otros adultos, incluidos los abuelos y las personas que cuidan de los bebés.

www.cdc.gov/spanish/especialesCDC/TosFerina

National Center for Immunization & Respiratory Diseases
Office of the Director

