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Determining the Knowledge and Practices of Obstetrics Healthcare Professionals Regarding Maternal Intrapartum Pertussis Vaccination Administration

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DETERMINING THE KNOWLEDGE AND PRACTICES OF
OBSTETRICS HEALTHCARE PROFESSIONALS REGARDING
MATERNAL INTRAPARTUM PERTUSSIS VACCINATION ADMINISTRATION

A Scholarly Project Submitted to the Graduate School
in Partial Fulfillment of the Requirements
for the Degree of
Doctor of Nursing Practice

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April, 2020

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DETERMINING THE KNOWLEDGE AND PRACTICES OF
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An Abstract of the Scholarly Project by
Kristie Mattix, BSN, RN

Pertussis is a contagious respiratory disease that can occur in all age groups. Signs and symptoms of pertussis, however, are worse in infants and young children; likewise, the rates of severe cases, hospitalizations, and deaths are higher in this group as well. Vaccination against pertussis is the most effective way to combat this illness. In the last 15 years, there have been a number of changes in the recommendations regarding vaccination against pertussis. In order for these recommendations to be followed, healthcare professionals must be aware of the guidelines as well as be knowledgeable about the condition they are trying to prevent.

This study evaluated the knowledge and practice of obstetrics healthcare professionals in Bartlesville, Oklahoma, regarding maternal pertussis vaccination strategies and timing. It assessed their perceived knowledge and practice before an educational in-service regarding pertussis prevention strategies specifically related to pertussis vaccination and pregnancy. Immediately following the educational in-service, healthcare professionals were asked to report whether they had an increase in knowledge regarding pertussis and vaccination strategies and whether they plan to change their practice in the future as a result of information received. The participants of this study reported having an increase in knowledge regarding pertussis and vaccination strategies, as well as an intention to use the information in the future for patient education.

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Chapter I

Introduction

Throughout history a major cause of infant morbidity and mortality has been pertussis, also known as “whooping cough.” After the introduction of the pertussis vaccine in the 1940’s, the number of cases declined significantly. Unfortunately, pertussis once again threatens young infants despite vaccination efforts and availability (Forsyth et al., 2015).

Pertussis is a highly contagious acute respiratory illness caused by *Bordetella pertussis*, which is transmitted by aerosolized droplets (Cornia & Lipsky, 2017).

Vaccination is the primary method for preventing pertussis. Despite the availability of vaccination, increased incidence of pertussis continues even in populations with rate of high vaccine coverage. The primary source of pertussis in infants is direct family members, with parents contributing in 50-55% of reported cases (Wiley et al., 2013). Grandparents and adolescent siblings accounted for 8% and 20% transmission rates, respectively (Terranella et al., 2013).

In adults and adolescents, clinical manifestations of pertussis are often less severe than in infants and children. If a person has received immunization previously, a prolonged cough may be the only symptom. Others may include increased sputum

production, sweating episodes, and sore throat. Complications of pertussis can result in pneumonia or otitis media (Cornia & Lipsky, 2017).

Description of the Clinical Problem

Bordetella pertussis can lead to serious manifestations in young infants, who are more susceptible (Walther et al., 2015). Clinical signs include respiratory distress such as rapid breathing, grunting, nasal flaring, and retractions. Other manifestations can include pneumonia, inability to feed, cyanosis, apnea with or without coughing, and seizures. Decreases in fluid or nutrition intake combined with possible vomiting while coughing can lead to ceasing or declining weight gain, resulting in a failure to thrive diagnosis (Yeh, 2017).

Pertussis Vaccination

In the early 1900s, a vaccine was developed using killed whole cell pertussis (wP). Later in the 1970s and 1980s, acellular pertussis (aP) vaccines were developed. The acellular pertussis vaccines had a lower rate of adverse reactions and were shown to also be effective against pertussis. This is the vaccine of choice today because of the lower incidence of side effects, but the whole cell vaccine may offer a higher level of immunity. The aP component is combined with the combination tetanus and diphtheria (Td) components to create the DTaP for children up to six years of age and Tdap vaccine for those over the age of seven (Chiappini, et al., 2013).

Infants are not initially immunized against pertussis until two months of age and depend upon others to not expose them to the illness. Primary immunization is comprised of five doses of the DTaP vaccine. In their first year, infants receive doses of the pertussis vaccine at two months, four months, and six months of age. The fourth dose is

administered at 18 months of age, and fifth dose around 4-6 years of age. Immunizations are specifically timed in order to gradually establish stronger immunity to the pertussis antigen. Between the first and fifth doses, the infant builds antibodies and generally has partial immunity. Young children remain vulnerable before the initial vaccine, but the risk of infection is decreased. After the first dose of DTaP, the vaccine effectiveness is only 55.3%, this increases to approximately 80% after the second dose (Quinn et al., 2014). With this in mind, it is possible to further protect infants and young children with incomplete immunity by having high levels of herd immunity in another group.

Herd Immunity

Herd immunity, also known as community immunity or herd protection, may develop naturally in society as a result of large-scale exposure to and recovery from disease; it may be stimulated artificially by widespread vaccination programs. Immunity is actively or passively acquired. Active immunity is the most common contributor to herd immunity. In active immunity, the individual develops resistance to a disease as a result of antibody production in relation to the exposure to and recovery from an antigen or after immunization (Merrill, 2013). Immunity limits or stops the ability of an individual to acquire and or pass along a specific disease (McCance & Huether, 2014). The easiest and safest way to increase levels of immunity results from vaccination (Fine et al., 2011). An individual's immune system cannot distinguish between a vaccination or natural infection, so it creates antibodies and an immune reaction in response to both; however, vaccines usually have fewer side effects and complications associated with them (Pommerville, 2014).

Infants and young children can be partially protected from pertussis with high levels of immunity in adolescents and young adults. With this concept in mind, in 2005 the Advisory Committee on Immunization Practices (ACIP) introduced the concept of “cocooning,” a form of herd immunity (as cited in Terranella et al., 2013). With herd immunity, an individual is thought to be protected from a disease if those around him are vaccinated against that disease. This decreases the likelihood of the individual coming into contact with an infected person. Family members who have not received a Tdap booster, including fathers and adolescent siblings, are encouraged to receive a booster vaccination of Tdap before the birth of an infant if not previously vaccinated. This allows the ability to shield or “cocoon” the infant with immunity. As a part of the cocooning strategy, mothers were also instructed to receive the vaccine in the immediate postpartum period, referred to as postpartum vaccination.

Issue Significance

Despite the initiatives created in 2005, pertussis cases and rates continued significantly in the infant population. Between 2001 and 2010 there were 27,995 reported cases of pertussis in infants less than one year of age in the United States. In this group there were a resulting 189 deaths. The majority of these deaths occurred among those less than 3 months old (Centers for Disease Control, 2017). In infants less than two months old, pertussis cases accounted for 57% of hospitalizations and 85% of deaths (Terranella et al., 2013).

While pertussis can be prevented by immunization, lifelong protection, however, cannot be achieved by initial immunization or natural disease (Walther et al., 2015). Immunity coverage for pertussis is restricted to five to eight years, after natural infection,

or vaccination; for this reason, regular booster doses are needed (Chiappini et al., 2013). Due to decreasing immunity, adolescents should receive a Tdap booster immunization at 11 to 18 years of age (Cornia & Lipsky, 2017). The ACIP recommends that adolescents, adults, and those over the age of 65 receive a dose of Tdap, especially if they are in close contact with infants (Chiappini et al., 2013). Tdap should be the vaccine of choice over regular tetanus and diphtheria (Td) immunization because it boosts immunity to tetanus and pertussis. It is recommended that a booster of Tdap be administered every 10 years, if not indicated sooner.

Due to continued cases of pertussis, the ACIP introduced new guidelines in 2012, recommending that women should receive a Tdap vaccination during every pregnancy between 27-36 weeks gestation regardless of previous vaccination status. This dose is deemed the prenatal or pregnancy vaccination (as cited in Centers for Disease Control, 2018). It allows the mother to create antibodies which will provide direct immunity to the mother and indirect or passive immunity to the infant. During pregnancy, antibodies from the mother cross the placental barrier to the infant and can remain present in the infant for up to 35-55 days after birth (Abu Raya et al., 2015). This transfer of antibodies is able to offer a small degree of protection to the infant until they are able to start receiving vaccinations of their own.

Specific Purpose

Although steps continue to be made regarding recommendations and current vaccination efforts, pertussis rates continue to increase due to decreases in vaccination uptake and waning immunity of those previously vaccinated against pertussis. Infants are at an extreme disadvantage since they do not receive their first dose of DTaP until 2

months of age. To best combat this, mothers must receive the Tdap vaccination with every pregnancy to transfer a small amount of immunity to the infant. This practice has been lacking in acceptance among patients as well as implementation among healthcare providers.

To establish a greater overall immunity to pertussis, it must be determined how to best implement and educate the public about these strategies. A lack of public knowledge about waning immunity associated with Tdap vaccination was observed as a barrier to individuals obtaining a booster vaccination. A study conducted by Suryadevera et al. (2014) examined reasons for low immunity coverage. Participants took a survey that inquired about factors such as knowledge about pertussis, receipt of booster vaccination, and instruction by a health provider to obtain a booster vaccination. Results determined a significant lack of knowledge concerning the disease as well as a lack of provider recommendation to receive the vaccination.

This scholarly project will evaluate provider knowledge regarding current recommendations concerning maternal prenatal pertussis vaccination before and after a teaching in-service. The in-service will highlight the current ACIP Tdap guidelines and outline specific instances which require Tdap administration to intrapartum and postpartum mothers. The use of a postintervention survey will determine the knowledge gained during the in-service as well as the provider's intention of using it in practice.

Theoretical Framework

The theoretical framework for this project uses the Health Belief Model. This model was developed in the 1950's by Godfrey Hochbaum, Irwin Roenstock, and Steven Kegels to increase disease prevention. It was created in response to a failing free health

screening program for tuberculosis. The Health Belief Model has been utilized to describe and promote safety initiatives such as use of seatbelts, oral contraceptives, safe sex practices, health screenings, as well as vaccination programs (ReCAPP, 2018).

The Health Belief Model outlines two beliefs about a particular negative health outcome outlined as an individual's susceptibility and severity. These outcome beliefs are balanced against two beliefs about the behavior to prevent the negative outcome including perceived benefits and barriers of the individual. These four beliefs drive a person to act or not act to prevent the outcome. To begin, an individual must believe whether or not they are susceptible to a negative outcome and must also believe whether or not they perceive the outcome to be severe. Once a person is convinced of the severity of the illness or outcome and his susceptibility, he will take into consideration the benefits of the proposed behavior. These benefits may be universally inherent to all individuals, may be specific for that individual, or may be a combination. A factor that may stand in the way of a person completing the desired task is perceived barriers. Again, these may also be universal to all individuals, may be specific for that person, or more than likely will be a combination. Barriers can include monetary commitment, time constraint, and perceived pain. Other strong barriers can come from level of education and cultural or familial beliefs (Resource Center for Adolescent Pregnancy Prevention, 2020).

Finally, in order to act, influencing factors must be strong enough to overcome a person's perceived barriers to completing the behavior (Resource Center for Adolescent Pregnancy Prevention, 2020). Factors influencing behavior are also called cues to action. These factors include outside influences such as family advice and tradition as well as

information received from a health care provider. Other cues include national and local health initiatives, and advertisements.

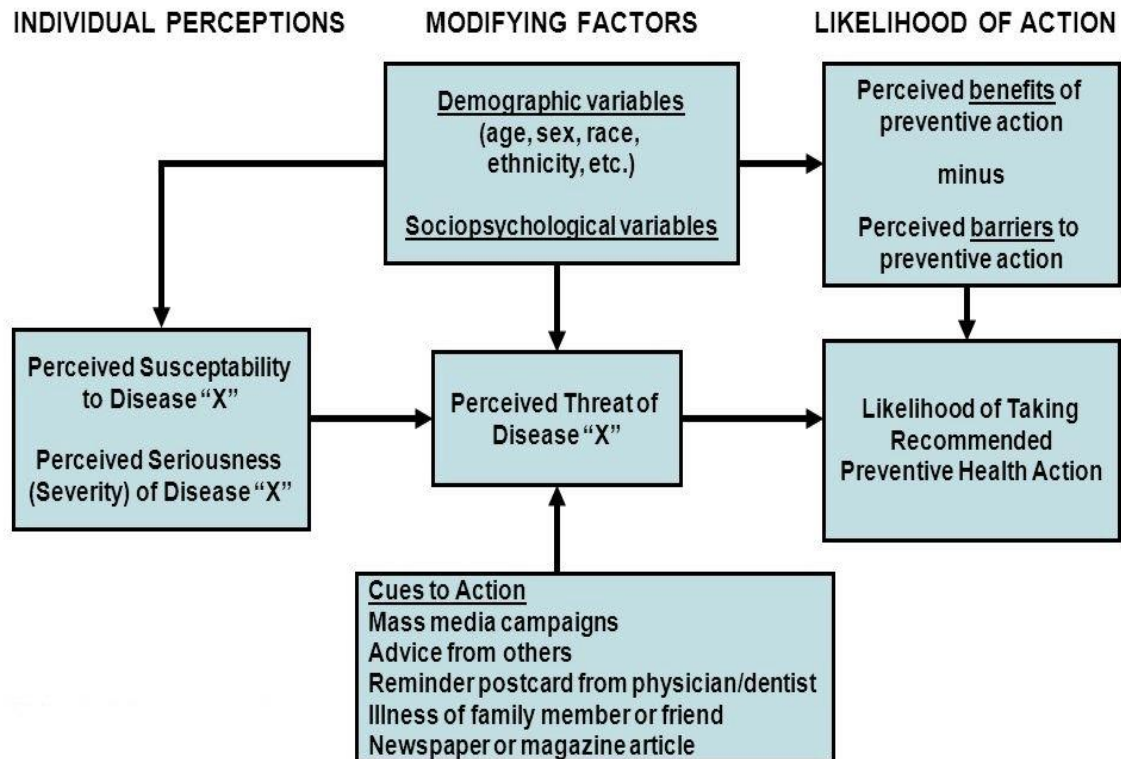
Once all the available factors have been received by the individual, the perceived benefits minus the personal barriers result in the likelihood of a person following through with a desired outcome or behavior. While this model can help explain an individual's behavior, it is not meant to be used as a risk assessment, and factors are not considered indicators for definite action or lack of action.

The basis of this project and overall focus will center around the knowledge of healthcare professionals regarding maternal Tdap recommendations and their current practice discussing recommendations with their patients. Education from health care professionals is an important cue to action that can help patients make better informed decisions regarding healthcare for themselves or family members. This project also worked to determine the current influence from healthcare professionals and whether that influence could be stronger as well as help determine if there is a lack of or error in the information being provided to patients from healthcare workers.

Figure 1:

Health Belief Model

Health Belief Model



Project Questions

1. What is the current knowledge level, attitude, and belief of physicians, advanced practice providers, and support staff of obstetric clinics at St. John Medical Group in Bartlesville, Oklahoma, regarding national maternal Tdap vaccination guidelines?
2. How will the knowledge, attitude, and beliefs of these healthcare professionals change after receiving education regarding Tdap administration guidelines?

Definition of Key Terms

The key terms and definitions below will provide a basis for the important considerations of this project:

- DTaP- diphtheria, tetanus, and acellular pertussis vaccine, which is given to children (CDC, 2019a).
- Tdap- combined tetanus, diphtheria and acellular pertussis vaccine, which is given to adolescents and adults (CDC, 2019a).
- Booster- a dose of an immunizing substance given to maintain or renew the effect of a previous one (Dictionary.com, n.d).
- Barrier- anything that restrains or obstructs progress (Dictionary.com, n.d).
- Herd Immunity- the ability of a community to resist epidemic disease (Taber's, 1997).
- Prenatal- occurring, existing, performed, or used before birth (Merriam-Webster Dictionary, n.d.).
- Intrapartum- occurring or provided during the act of birth (Merriam-Webster Dictionary, n.d.).
- Postpartum- occurring in or being the period following childbirth (Merriam-Webster Dictionary, n.d.).
- Healthcare Professional- a person associated with either a specialty or a discipline and who is qualified and allowed by regulatory bodies to provide a healthcare service to a patient (FreeDictionary.com, n.d.).

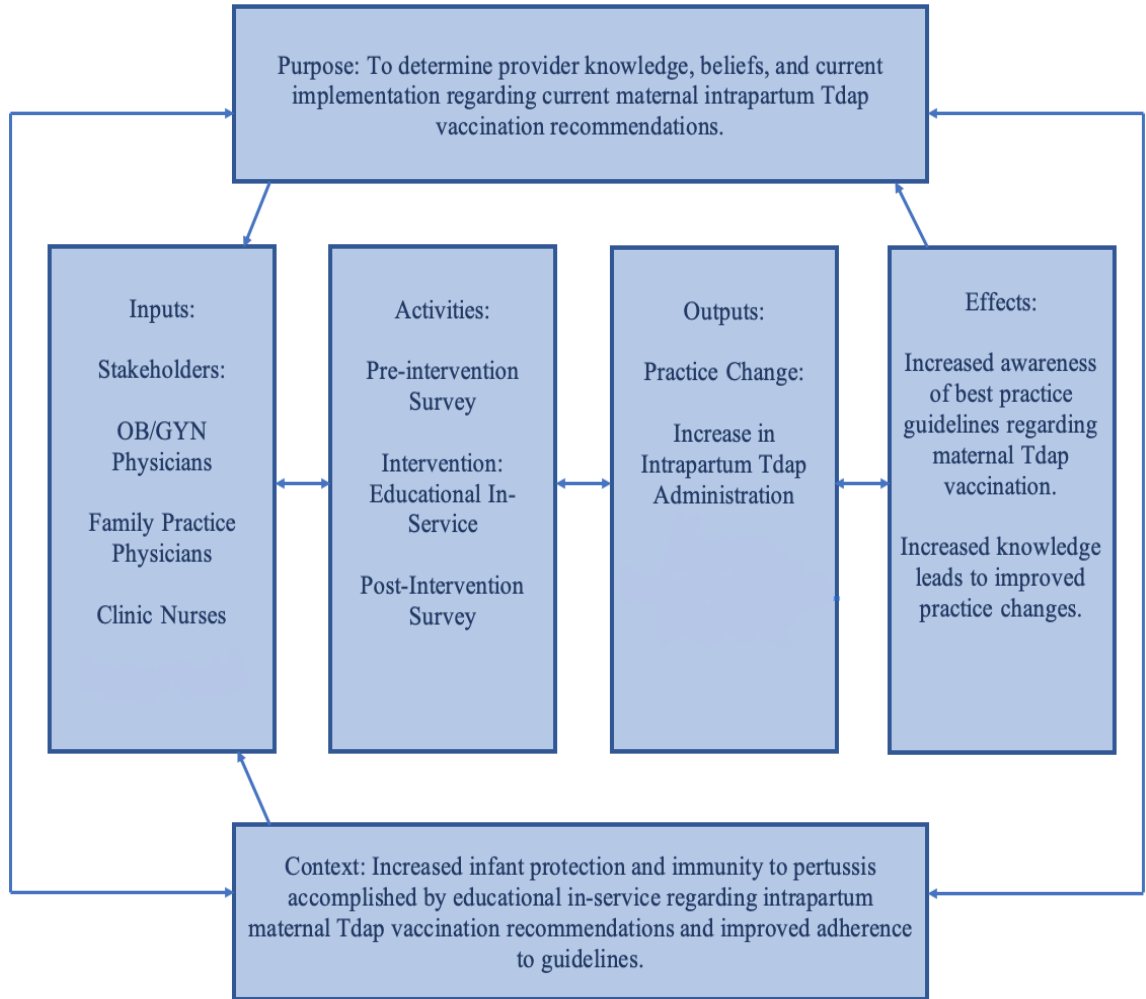
- Primary Care Provider- a health care practitioner who sees people who have common medical problems. This person is usually a doctor but may be a physician assistant or a nurse practitioner (Medline Plus, 2014).
- Family Practice Physician- Doctors who have completed a family practice residency and are board-certified, or board-eligible, for this specialty. The scope of their practice includes children and adults of all ages and may include obstetrics and minor surgery (Medline Plus, 2014).
- Obstetrician/gynecologists (OB/GYN)- Doctors who have completed a residency and are board-certified, or board-eligible, in this specialty. They often serve as a primary care provider for women, particularly those of childbearing age (Medline Plus, 2014).
- Inpatient- a hospital patient who receives lodging and food as well as treatment (Merriam-Webster Dictionary, n.d.).
- Outpatient- a patient who is not hospitalized overnight but who visits a hospital, clinic, or associated facility for diagnosis or treatment (Merriam-Webster Dictionary, n.d.).

Logic Model

A logic model (Figure 2) for this project was created in order to visually represent the process and identify contributing factors to the project. Logic models are able to show relationships between ideas and key components within the proposed work. For the purpose of this project, key stakeholders were identified as well as proposed activities that guide the course of the task. The model is also able to show expected outcomes as well as later identify actual results obtained throughout the process.

Fig. 2

Logic Model



Summary

Vaccines have been an important tool used to eliminate some of the worst disease throughout history. As a society, we have forgotten or become indifferent to the serious consequences of letting these diseases spread uninhibited. Continued diligence and stricter vaccination policies are needed to keep these infections to a minimum or to eliminate them completely; unfortunately, it may take a large-scale outbreak of one of these easily preventable diseases to change society's mind and current practices.

Despite renewed information and availability of best evidence-based practice concerning prevention measures for pertussis transmission, there remains a serious threat to young infants and children. According to the CDC (2012), “Pertussis vaccinations remain the single most effective strategy for prevention of infection.” Many recommendations have been made and adopted regarding timing of booster vaccine administration to mothers and family members, but there still is a large gap in vaccination rates. These gaps allow for infant exposure and susceptibility to a dangerous yet preventable disease. Infants most at risk include those under three months due to severely limited or no immunity to pertussis.

Upon receiving a dose of the Tdap vaccination, the mother starts making antibodies that are transferred through the placenta to the fetus, thereby conferring passive immunity to the fetus. By vaccinating women during every pregnancy, infants are able to start acquiring a small amount of immunity to this disease. Continued education, guideline clarification, and research on this phenomenon will better protect future generations from *Bordetella pertussis*.

Chapter II

Literature Review

A review of literature concerning strategies for protecting infants from acquiring pertussis infections was performed using the electronic databases of PubMed and CINAHL. Search criteria consisted of the following:

- Maternal Immunization
- Tdap Vaccination
- Pregnancy
- Pregnancy Vaccination Rates
- Pregnancy Vaccination Barriers
- Infant Pertussis Transmission
- Infant Pertussis Incidence

These topics were investigated individually as well as in combination in order to identify relevant articles and studies. Additional articles used for the review were found among the reference lists of the initial identified sources. All identified search results related to maternal Tdap vaccination administration during pregnancy were not used for this project. Sources were chosen based on studies or reports generated in the last five years that applied to the framework of this project resultant from scholarly and peer-reviewed

publications. Foreign studies were included in the project if they met the above outlined criteria for the purpose of adding generalizability to the project. The sources were then grouped into subjects:

- Vaccination Strategies
- Immunogenicity
- Vaccine Effectiveness
- Immunization Safety
- Barriers to Immunization Administration

Evidence

Vaccination Strategies

The concepts of cocooning, postnatal maternal administration of Tdap, and prenatal maternal administration of the Tdap vaccine were identified as strategies against pertussis transmission and are outlined below. Further evaluation of each will identify effectiveness of the strategy as a stand-alone method or in combination with other approaches. Each of these concepts play a role in protecting infants from exposure to pertussis and/or providing immunity to infants.

Cocooning. In 2005, the (ACIP) introduced the concept of “cocooning” which is a form of herd immunity (Terranella et al., 2013). The concept of herd immunity postulates an individual is protected from a disease if those around them are vaccinated against that disease. This decreases the likelihood of the individual coming into contact with an infected person. The recommendation stipulated that family members including fathers, grandparents, and adolescent siblings should also receive a booster vaccination, Tdap, before or immediately after the birth of an infant if they had not been previously

vaccinated with the booster, allowing the ability to shield or “cocoon” the infant with immunity.

Postnatal Administration. As a part of the cocooning strategy in 2005, mothers received the Tdap vaccine in the immediate postpartum period, referred to as postpartum or postnatal vaccination. This practice is still used by some providers today. According to Castagnini et al. (2012) maternal vaccination should be included with the family goal of immunization not just as a stand-alone measure. Their cross-sectional study discovered that only immunizing mothers in the postpartum period made no difference in the incidence of pertussis in infants under six months of age. The recommendation from this study was that all family members and those frequently encountered by the infant should receive a pertussis booster.

In an analysis performed of confirmed pertussis cases, it was determined that infant risk was reduced by 51% when both the mother and father received the Tdap booster; protection is further increased by 16% when older siblings and grandparents received the Tdap booster vaccination before delivery (Quinn et al., 2014). This indicates that increasing vaccine use in parents and other family members can help decrease infant risk for the disease.

Prenatal Administration. In 2011, the CDC recommended that women who had not previously received a booster Tdap immunization be immunized during the third or late second trimester of pregnancy. The recommendation was again changed in 2012, and women are now encouraged to receive a dose of Tdap between 27-36 weeks gestation of every pregnancy, regardless of previous vaccination history. This dose is deemed the prenatal or pregnancy vaccination. This allows the mother to create antibodies which will

provide her direct immunity to pertussis. During pregnancy, these antibodies will also be able to cross the placental barrier, to the infant, which remain present in the infant for up to two months after birth (Abu-Raya et al., 2015). This transfer of antibodies from mother to infant is known as indirect or passive immunity.

When compared to pre-pregnancy and postpartum Tdap administration, maternal intrapartum vaccination has been reported to be the most effective strategy to protect infants from contracting pertussis and is “highly protective against infant pertussis, especially in the first two months of life” (Baxter et al., 2017). A case-control study of pregnancy dosing from 2012-2013 in England revealed an adjusted vaccine effectiveness of 93% after comparing incidence of pregnancy Tdap administration to postpartum dosing in pertussis confirmed cases to those in the control group (Dabrera et al., 2015).

Practice Change Guidelines

In order to identify the most effective maternal/infant Tdap administration strategy, a search was performed in regard to current evidence-based practice guidelines and recommendations. A report completed by Liang et al. (2018) provides all recommendations from the ACIP concerning the above-mentioned strategies regarding vaccination of all persons against pertussis, diphtheria, and tetanus. The recommendations utilized for this work were selected on the basis of appropriate age (childbearing years), disease (pertussis), and condition (pregnancy) of the intended population.

Pregnancy Tdap Guidelines. The ACIP recommends the following Tdap immunization strategies for all pregnant women:

- Health care providers should administer a dose of Tdap during every pregnancy, regardless of the patient’s prior Tdap vaccination history (Liang et al., 2018).
- Tdap may be administered at any time during pregnancy; however, for full benefits it should be given between 27 and 36 weeks’ gestation (Liang et al., 2018).
- If a woman did not receive Tdap during the current pregnancy nor has she ever received a prior dose of Tdap, then Tdap should be administered in the immediate postpartum period (Liang et al., 2018).
- If a woman did not receive Tdap during her current pregnancy; however, she did receive a dose of Tdap previously, she does not require Tdap administration in the postpartum period (Liang et al., 2018).

Recommendation Evaluation. Each vaccination recommendation set forth from the ACIP is developed using select criteria to ensure the best and most accurate evidence-based approach. The criteria used for this is the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) criteria. Elements assessed in this evaluation include benefits, harms, quality of evidence, and other socioeconomic considerations (National Center for Immunization and Respiratory Diseases, 2019). The recommendations were further assessed using the AGREE II tool (Appendix D). The AGREE II tool uses specific scored criteria within different domains to rate the strength of evidence to which it is applied. It was determined the ACIP recommendations were high in quality of evidence as well as strong recommendation strength based on amount and level of data provided.

Immunogenicity

To understand the differences in protection conferred to infants by varying the timing of the Tdap vaccination, one must consider immunogenicity. Immunogenicity is the level of protection against an antigen. Serologic pertussis antibody levels are used to determine the amount or level of immunogenicity or protection against this disease.

Infants receive this protection through the transplacental passage from mother to fetus of maternal derived antibodies in response to the administration of the Tdap vaccine to the mother during pregnancy (Gkentzi et al., 2017). Multiple studies identified in the literature review by Gkentzi et al. (2017) measured the immunological effect of prenatal maternal Tdap vaccination in regard to timing of the vaccination with pregnancy. In these studies, pertussis antibody levels were compared in the mother's blood as well as infant's cord blood to determine effectiveness and in some cases optimal timing of vaccine administration.

A previous test conducted by Abu Raya et al. (2014) compared antibody serology of mother-infant pairs. His team analyzed the maternal levels and infant cord blood levels that were immunized at various gestational ages to determine the range for maximum antibody referral. Women were grouped by gestational age at which they received the Tdap vaccination. The groups were divided into those vaccinated at 27-30 weeks, 31-36 weeks, and greater than 36 weeks. Infant antibody concentrations were measured at 36 days, 72 days, and 108 days after birth. It was determined in this study that by immunizing mothers between 27-30 weeks gestation, infants had a higher level of antibodies present than those immunized after 31 weeks (Abu Raya et al., 2014).

In the cohort study conducted by Winter et al. (2017), it was determined that administration of the Tdap vaccine to mothers between the time of 27-36 weeks gestation was more effective than those vaccinated earlier in the second trimester. Although not held as a significant finding in this study, it was revealed that infants of mothers vaccinated at 27-31 weeks gestation had a lower risk of pertussis than those of mothers vaccinated between 32-36 weeks gestation (Winter et al., 2017). A prospective observational study agreed that antibody levels of infants of mothers vaccinated earlier within the recommended time frame had a higher level of anti-pertussis antibodies than those born of women receiving the vaccine later (Eberhardt et al., 2016).

Healy et al. (2013) found that previously immunized women or those who received a Tdap booster before or early in pregnancy would not have the number of antibodies sufficient enough to pass to the infant before delivery. Maternal and infant cord blood pairs were collected and analyzed for two years on mothers who received the Tdap vaccine in different stages of pregnancy including preconception, early during pregnancy, and later in pregnancy. It found no difference in antibody levels between women vaccinated before pregnancy or early in the pregnancy, and it was determined these levels would not be sufficient to protect the infant through two to three months of age. This study determined the optimal time for receiving the Tdap vaccine is between 30-32 weeks (Healy et al., 2013). This protection, however, only benefits the offspring of that particular pregnancy. Future pregnancies would require repeated immunization with each.

According to a cohort study, Abu Raya et al. (2015) and associates confirmed that it is necessary for women to receive the prenatal vaccination with every pregnancy due to

waning antibody levels of the mother in the post-partum period. It was observed that serum antibody levels were significantly reduced 9-15 months postpartum. These levels were, however, found to be higher than their counterparts who were unimmunized during pregnancy. The mother is able to retain immunity for herself during this time but does not have enough available antibodies to pass to a fetus in subsequent pregnancies.

Vaccine Effectiveness

A cohort model study by Teranella et al. (2013) demonstrated the differences in effectiveness of prenatal vaccine administration versus cocooning and infant immunization with DTaP vaccinations after two months of age. Figures showed a decrease in pertussis cases by 20%, hospitalizations by 19%, and deaths by 16% when cocooning strategies were compared to infant vaccination beginning at two months of age. Further evidence revealed an even more significant reduction in pertussis rates in infants whose mothers received the Tdap vaccination in the antepartum period. Antibody transfer as a result of maternal pertussis vaccination during pregnancy was shown to have 33%, 38%, and 49% decreases in pertussis cases, hospitalizations, and deaths respectively (Teranella et al., 2013).

In response to an outbreak of pertussis in England, an observational study was completed comparing pertussis cases in varying coverage groups. Researchers examined the number of infant pertussis cases, hospitalizations, and deaths as a result of pertussis. The study demonstrated an overall vaccine effectiveness of 90% with a 79% decrease in infant mortality related to pertussis. Winters (2017), found antibodies received in utero from maternal vaccination between 27 and 36 weeks' gestation to be 85% more effective

at preventing pertussis than cocooning the infant by postpartum maternal Tdap administration.

In a retrospective cohort study conducted by Winter et al. (2017), it was determined the antibodies received by the infant in-utero have been shown to be 85% more effective at preventing pertussis in infants less than eight weeks old than postpartum maternal vaccine administration. In a case control study by Dabrera et al. (2015), an adjusted vaccine effectiveness of 93% was found by comparing incidence of pregnancy Tdap administration to postpartum dosing.

In the United States from the years 2010 to 2015, Baxter, et al. (2017) completed a retrospective cohort study of infants born at facilities within the health system Kaiser Permanente Northern California (KPNC). The KPNC is a far-reaching organization incorporating hospitals, primary care clinics, and pharmacy and laboratory services. Participants for the cohort study were infants born greater or equal to 37 weeks gestation into the KPNC system to mothers with established care, background, and membership within the Kaiser Permanente healthcare system. This strategy allowed for easier determination of immunization status as well as availability of medical records concerning pregnancy statistics and outcomes, and incidence of infant pertussis cases. Of the 17 infants testing positive for pertussis, only one's mother was vaccinated during pregnancy, resulting in a rate ratio of 0.08 with 95% confidence interval. Pregnancy Tdap vaccination was calculated to have a 91.4% risk reduction of infant pertussis and a calculated vaccine effectiveness of 87.9% from birth to first DTaP dose in first two months of life (Baxter et al., 2017).

Although there is a high-correlated vaccine effectiveness rate, the pertussis vaccination is unable to stop every case of pertussis; however, those infants born of mothers receiving the vaccine in the antepartum period have shown to have added health benefits for combating the disease (Gentile et al., 2018). In order to determine effects of maternal pertussis on disease burden and process, a surveillance study of pertussis cases in a hospital setting before and after implementation of a national maternal intrapartum Tdap vaccination strategy was conducted by Gentile et al. (2018). Active cases of pertussis were identified in the population of patients at a children's hospital between December 1, 2003 and December 31, 2016. The establishment of the intervention was initiated in 2012; therefore, cases in 2012 were not included in the results due to the possibility of overlapping populations. One postintervention result identified an increase in the average age of participants, meaning that those that did contract pertussis on average were older at disease occurrence with a decreased incidence in the younger population. There was also a decrease in severity of cases, resulting in less hospitalizations. One of the most significant results was a complete reduction in mortality from pertussis within the study period. Before the intervention, 14 cases of death from pertussis occurred within the study period resulting in a 5.9% mortality rate. After the intervention, there were no reported mortalities (Gentile et al., 2018).

Barriers to Immunization Administration

Despite recommendations and nationwide efforts to increase pertussis vaccination rates among pregnant women actual vaccine coverage remains low (Gkentzi et al., 2017). A binary logistic regression method study was conducted by Suryadevera et al. (2014) which examined the reason for low immunity coverage. Participants were given a survey

that inquired about factors such as knowledge about pertussis, receipt of booster vaccination, and instruction by a health provider to obtain a booster vaccination. It was determined there was a significant lack of knowledge concerning the disease as well as a lack of provider recommendation to receive the vaccination (Suryadevara et al., 2014).

A study conducted by Gauld et al. (2016) identified barriers or reasons for not getting the vaccination. Identified barriers included lack of knowledge about the pertussis disease and the available vaccine. In some cases, women didn't remember the topic even coming up during prenatal visits, others identified concern about the safety of the vaccine while pregnant. Family and anecdotal tradition was another given reason for not receiving the vaccination. Those that did receive the Tdap vaccine recalled hearing about it from multiple sources including their healthcare providers or settings such as health fairs. Other participants noted receiving the vaccine due to the ease of availability from their physician's office or local pharmacy (Gauld et al., 2016).

A literature review conducted by Gkentzi et al. (2017) concerning vaccination uptake strategies identified provider recommendation as being the single most effective strategy to increase pertussis acceptance. The review also identified studies originating in Mexico, the United Kingdom, and Australia indicating health care provider recommendation and education regarding pertussis and the Tdap vaccination as the strongest factors affecting maternal receipt of the vaccine. The literature review also identified fear of vaccination safety as being the most common reason for refusing the vaccine (Gkentzi et al., 2017).

Vaccination Safety

To test the safety of administering vaccines to pregnant women a phase I, randomized, double-masked, placebo-controlled clinical trial was conducted by Munoz et al. (2014). The study found no adverse outcomes for mothers or infants who received the prenatal Tdap vaccine. It was noted that all had healthy newborns at and following delivery. The most common adverse effect noted with this study was injection site pain for the mother.

Researchers in New Zealand completed a prospective observational study regarding the safety of women receiving the Tdap vaccination during pregnancy. The study consisted of 739 participants that were followed for four weeks after receiving the Tdap vaccination at various times during the intrapartum period. While 31 different serious adverse events (SAEs) occurred during this time, none of the SAEs were able to be linked or attributed to the mother receiving the pertussis vaccination. They concluded that the maternal Tdap vaccination was generally well tolerated by mothers and led to no adverse fetal or pregnancy outcomes (Petousis-Harris et al., 2016).

Lastly, the above-mentioned review of literature by Gkentki et al. (2017) consisted of a systematic review of 47 studies evaluating maternal Tdap vaccination safety, effectiveness, immunogenicity, and coverage. In regard to safety, a combined 138,277 pregnancies were identified as receiving the Tdap vaccination among the 47 studies. The identified studies individually looked at SAEs such as preterm birth, stillbirth, low birth weight, duration of hospitalization, obstetric complications, and overall neonatal or maternal outcomes. None of the studies identified a difference in

maternal or neonatal outcome related to the mother receiving the Tdap vaccination when compared to unvaccinated counterparts (Gkentzi et al., 2017).

Summary

Despite renewed information and availability of best evidence-based practice concerning prevention measures for pertussis transmission, pertussis remains a serious threat to young infants and children. Many recommendations have been made and adopted regarding timing of booster vaccine administration to mothers, family members and other contacts; still, there is a large gap in vaccination rates. These gaps allow for infants to be exposed and susceptible to a dangerous yet preventable disease. Many do not realize there is a large gap in protection; others rely on the vaccination of others within the community in order to not take steps at vaccination for themselves and their family.

Antibody referral from the mother to the fetus has shown the most significant effectiveness limiting the transmission of pertussis to infants. Demonstrated vaccine effectiveness of maternal intrapartum vaccination ranges from 85-93% in limiting pertussis related illness. Of those contracting the illness, maternal receipt of the vaccine in the prenatal period has been effectively shown to reduce the severity of the disease process. Combining strategies such as prenatal administration of the Tdap vaccination with cocooning has been shown to further increase an infant's protection. These techniques should be used together to allow for maximum effectiveness against this disease. Vaccination safety had been proven time and again. The next step is to address the most common reason for nonacceptance--lack of provider recommendation. Going forward it is important to further educate the public as well as healthcare professionals on

the importance of these strategies in order to allow them to make their own best-informed decisions. Healthcare professionals must be knowledgeable of the best practice guidelines and communicate this knowledge with their patients. In light of the information revealed with this literature review, assessing the healthcare professionals' knowledge and practice recommendation regarding maternal intrapartum Tdap vaccination administration was the focus of this project in order to decrease the pertussis disease burden in our most vulnerable population.

Chapter III

Methodology

Immunizing pregnant mothers with Tdap has been shown to be the most effective way in preventing acquisition of and/or limiting the severity of pertussis in young infants. Despite numerous recommendations and efforts to increase Tdap administration to this population, a large number of mothers remain unimmunized during pregnancy (Gkentzi et al., 2017). Research has also shown that lack of provider recommendation and education regarding Tdap as a main contributing factor of those not receiving the vaccine (Suryadevara et al., 2014).

Project Design

This chapter details the design of the completed research project. The intended purpose of this project was to (1) evaluate Tdap administration knowledge and practice of obstetric health care providers as well as clinical and supportive staff, i.e. nurses, medical aides, and others; (2) provide an educational in-service regarding the importance of Tdap administration and current recommendations to providers and supportive staff, and (3) evaluate knowledge gained and/or intent to change current practice by physicians and supportive staff as a result of the educational in-service.

The study obtained data in the form of a pretest regarding the pre-intervention knowledge of the participants regarding pertussis, strategies to limit pertussis

transmission to infants, as well as whether they discuss pertussis with their patients. Further data was obtained by the posttest comparing the participants' perceived increase in knowledge regarding pertussis and evaluated the participants' plan to incorporate that knowledge in their future practice.

Setting

The Ascension Medical Group St. John Clinic employs multiple physicians and offers the only obstetrics coverage in the city of Bartlesville, Oklahoma. The clinic has two divisions in obstetrics care: the first is a group of three obstetrician/gynecologists and the other is a group of four family practice physicians providing obstetrics care and services. Each of the practices employ a number of other healthcare professionals including nurse practitioners, nurses, and other support staff. Each office cares for a diverse range of patients, both racially/ethnically and socioeconomically.

Target Population

The target participants for the study consisted of providers and supportive staff working in the St. John Clinics' family practice and obstetrician/gynecological offices in Bartlesville, Oklahoma. Providers include family practice and obstetric/gynecologic physicians. Supportive staff included nurses (registered nurses and licensed practical nurses) and aides (certified medical aide, certified nurse aide). Projected estimate of the number of participants for data collection was 30 to 40 staff members in various positions.

Recruitment and Inclusion/Exclusion Criteria

Those participating in the study included healthcare professionals and support staff attending an educational in-service offered once on a specific day for each office

group. The group gathers multiple times per month during the lunch hour to discuss current medical topics and treatments. Permission was obtained from the physicians and office managers to present information regarding pertussis and current Tdap administration guidelines for pregnant patients. Other participants were welcome to join the educational in-service; however, data collected from them was excluded from the data pool if their position did not apply to those educating patients on Tdap and pertussis or giving the Tdap vaccination.

Protection of Human Subjects

An application for approval of investigations involving the use of human subjects was completed and submitted to the Pittsburg State University Institution Review Board (IRB) for approval to complete the study. According to the Pittsburg State University human subjects' guidelines, this study qualifies for exempt status. Subjects included in the study were of age to consent for themselves (over eighteen years of age) and did not include any vulnerable or protected individuals or groups such as minors, prisoners, or pregnant patients themselves. The study was presented to the human subjects committee in order to be reviewed and approved.

Participation in the study was on a voluntary basis. Verbal disclosure was given before beginning the presentation that a participant's answers would not be revealed to their employer or other coworkers in order to prevent retribution. In order to maintain confidentiality, pre-tests were previously numbered. Participants were instructed to number their post-test with the same number that was on their pre-test. Providing corresponding numbers on the tests ensured accuracy and continuity of results while maintaining privacy of the individuals. Individual results were maintained as confidential

and were not and will not be revealed to persons outside of the conductor of the study and those completing computations of the data if applicable.

Ethical Considerations

Ethical considerations for the study included anonymity of participants and their answers obtained from the questionnaires. Demographics on the questionnaires were evaluated to determine education levels of the participants in regard to position and years of practice. Care was taken to ensure these demographics were not able to identify a participant.

Instruments

An instrument specific for this study was unable to be found. For this reason, a questionnaire instrument was developed in order to assess current knowledge and practice for each of the participants regarding patient pertussis and Tdap education and administration. Demographics included on the questionnaire assess the position or role of the participant, the type of practice in which they worked, and length of time in that position. The pre and posttests contain Likert-type, dichotomous, and multiple choice/multiple mark questions. The questions evaluated the current knowledge and practice of the participant and practice of the office setting in which they work. Three questions were select all that apply to assess office practice, barriers to patient Tdap education, and barriers to Tdap administration.

Procedure

After receiving approval from the IRB for the project, physicians and office managers from each of the prospective offices were contacted to gain consent for the educational in-service. Data for the study was obtained from pre-test and post-test

questionnaires with an educational in-service completed between the tests. The participants were given a packet containing both a numbered pretest, a posttest (which the participant numbered to match the pre-test), a pregnancy Tdap informational handout (appendix C), and a paper copy of the PowerPoint presentation. Participants completed the pretest before the educational portion of the presentation. The posttests were removed from the packet and completed after the presentation. Both surveys were returned to the original packet then collected by the presenter and placed in a locked case. The participants were able to keep the other printed information and any notes they had taken.

Questions on the pretest aimed to determine participants' knowledge and practice regarding pertussis and Tdap vaccination information and guidelines. The first question identified the participant's job status as provider, supportive staff, or other. An additional question on the pretest regarding perceived patient barriers or reasons for refusal to accept Tdap administration was included to gauge possible future interventions.

The presentation consisted of a PowerPoint presentation on a screen and participants were given a paper form of the presentation in order for participants to review information at a later time. Information presented consisted of pertussis definition and severity, strategies aimed at combating pertussis, as well as current guidelines and recommendations regarding proper maternal Tdap administration and timeline regarding pregnancy. A question and answer period followed. Once the question and discussion time was completed, the participants were instructed to complete the posttest before leaving. The posttest consisted of a number of the same questions from the pretest reworded in order to gauge information learned and the participants intention of practice change in the future.

Additional information was given in the form of a paper handout from the CDC. The handout, titled “You Can Start Protecting Your Infant from Whooping Cough Before Birth,” is an information sheet produced by the CDC. This article details the risks and harms associated with pertussis, steps pregnant women can take in order to protect their infant from whooping cough, and also the safety of the Tdap vaccine. It is endorsed by the American Academy of Pediatrics, the American Academy of Family Physicians, American College of Obstetricians and Gynecologists, and the American College of Nurse-Midwives (CDC, 2019b). This sheet was provided in order to demonstrate the information that should be given to and discussed with all mothers regarding pertussis and the Tdap vaccine. Evaluation of this information sheet was done using the Patient Medical Educational Tool (PMET). This tool evaluates patient education material for ease of understanding by patients and those without high health literacy. It rates 26 individual aspects of the education material on clarity, simplification of verbiage, layout, and design. These aspects are scored as disagree, agree, or not applicable. The agree responses receive a point, disagree responses receive no point, and not applicable responses are not counted in the total possible. The points are calculated then divided by the number of points possible which gives a percentage on the strength of the material. The CDC’s handout received a score of 93.7% on understandability, and a score of 83% for actionability. Points reduced for scoring this material was due to lack of visual aids on the handout. Despite the limited visual aids, the material is easy to read and understand and has clear instructions to the reader on how to combat pertussis.

Outcomes

Evaluation Measures. Evaluation of the data collected determined the provider's and support staff's current knowledge of the pertussis disease as well as current practice prior to receiving the educational presentation. These values were then compared to those obtained after the in-service to determine if knowledge levels increased. It also evaluated the intention of the participant to improve future practice in regard to discussing Tdap vaccination with patients and their families. These measures are discussed further in the next chapter.

Instrument Linked to Measures. The measurement tool used for this study was a pretest and posttest format. These tools were developed specifically for this project. In order to test the validity and significance of the tools, they were distributed to health care professionals in the field of obstetrics to determine ease of understandability and significance of application to the project. To score the tools, a rubric was used on each of the questions except the demographics. Items were scored on a 1-4 scale regarding the significance to the study. A score of 1 indicates the question is not relevant to the study, 2 indicates the study is somewhat relevant, 3 indicates quite relevant, while 4 indicates very relevant. The average score for validity of the tool was 37/40. Additional comments and input from evaluators were considered and implemented on some items to improve understandability and ease of use of the tools.

Methods of Analysis. Excel spreadsheets were utilized in order to complete statistical analysis of the data. Statistics gathered evaluated the knowledge of pertussis and Tdap in all participants combined. Further evaluation will examine the differences in practice among types of healthcare professionals including comparing family practice and

OB/GYN physicians as well as supportive staff to evaluate the population most in need of the intervention and possible continued efforts in the future. Likewise, comparing and contrasting of individual responses was completed on additional topics, such as current practice discussing these topics with patients. Data collected from the survey following the educational presentation evaluated the individuals' change in knowledge regarding pertussis and Tdap as well as their intention to implement it in their future practice. Visual aids used for demonstration of acquired data included bar graphs and pie charts.

Plan for Sustainability

Sustainability is described by the Institute for Healthcare Improvement as “locking in the progress made by an improvement initiative” (Moran et al., 2017). Sustainability of the study will rely on continued evaluation of knowledge and implementation of educational training regarding current Tdap vaccination strategies in the future. As strategies and recommendations regarding Tdap administration during pregnancy have changed throughout the years, it will be the responsibility of the providers and supportive staff to stay current with recommendations that affect their patient population. The Tdap handout provided in this presentation can serve as a guide to help healthcare professionals and patients with information regarding Tdap. Current guidelines regarding Tdap administration should be intermittently evaluated by a specified person within each clinic setting in order to assess for recommendation changes.

The pregnancy Tdap handout distributed during the presentation is available as a free download and is available on the CDC website (CDC, 2019b). Expected incurred cost of sustaining this project would be low. Costs would be the result of ink and paper in

order to produce the information sheet to distribute to patients. These costs are expected to be low relative to the current use of a printing service for the healthcare system.

Summary

Lack of maternal Tdap vaccination represents a great potential for severe health disparities in infants. In order to address these gaps in coverage, all healthcare professionals must be able to educate patients on the importance of Tdap vaccination and proper timing of the vaccine during every pregnancy. Adherence to the ACIP Tdap administration guidelines has been shown to decrease the incidence as well as severity of pertussis in young infants (Gentile et al., 2018). The goal of this project was to increase provider awareness of pertussis vaccination administration practices and evaluate the adherence to those guidelines. Educating all healthcare professionals including nurses and other staff further increases the ability to confer knowledge to pregnant patients and their families the dangers of pertussis and the importance of receiving the vaccine. Furthermore, infants will receive passive immunity by way of antibodies from their mother while in utero and mothers will receive a boosted immunity from pertussis.

Chapter IV

Results Evaluation

The data collected with the surveys were descriptive in nature. The intended purpose of this project and data collection was to (1) evaluate current Tdap administration knowledge and practice of obstetric health care providers as well as clinical and supportive staff, i.e. nurses, medical aides, and others; (2) provide educational in-service regarding the importance of Tdap administration and current recommendations to providers and supportive staff, and (3) evaluate knowledge gained and/or intent to change current practice by physicians and supportive staff as a result of the educational in-service. The long-term goals of this study are to improve maternal intrapartum Tdap vaccination acceptance rates, thereby leading to increased rates of immunity against pertussis in newborns up to two months of age.

Results

An educational in-service was provided to each of the two types of Ascension Medical Group St. John clinics offering obstetrics care in Bartlesville, Oklahoma. Immediately prior to the presentation, participants were provided with and completed a pre-numbered pre-test. Pre-test results that were compiled included information such as participant demographics (position, type of clinic, and time at current position), as well as current individual perceived knowledge regarding pertussis and Tdap. Further

information obtained in the survey related to participants' personal and healthcare facility practice regarding Tdap education and vaccine administration. Participants were then shown a PowerPoint regarding pertussis as well as current CDC recommendations regarding maternal intrapartum Tdap vaccination strategies. Immediately following the presentation, a short question and answer period was completed. Participants were then given a post-test and instructed to write the number on the pretest number on this survey. The post-test included participants' perceived increase in knowledge regarding pertussis and Tdap recommendations. Other information obtained included their intention to discuss this information more with their patients and to improve Tdap administration rates.

Demographics

Pre and posttest surveys were distributed among those present for the in-service in each office setting. The presentation was offered one time to each of the OB/GYN and family practice settings at Ascension Medical Group St. John Clinic in Bartlesville, Oklahoma. Information obtained about the participants consisted of; type of office setting, position, and years at position. Demographic data was included only on the pretests. This information was used to contrast and compare knowledge regarding Tdap vaccine administration knowledge and practice among participants' positions, office type, and number of years of experience.

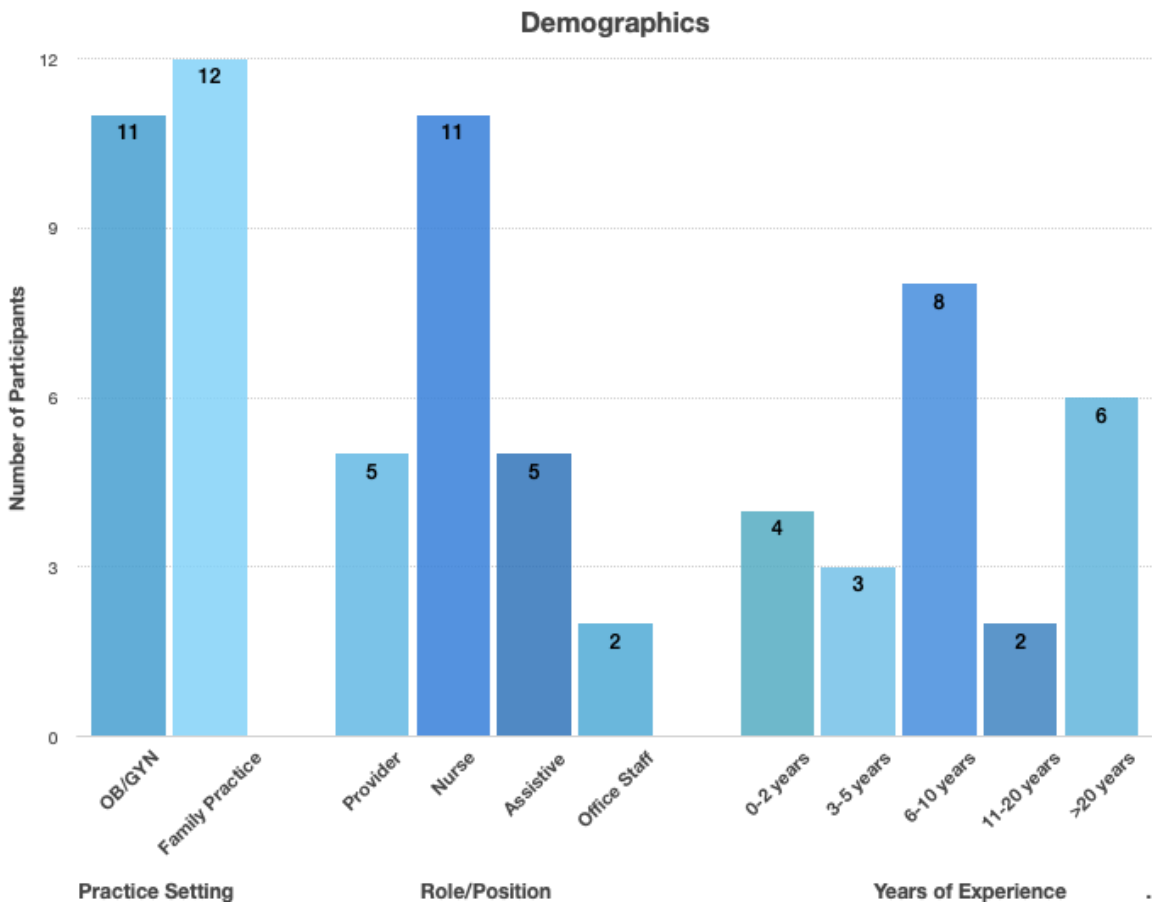
Practice Setting. A total number of 23 respondents (N=23) participated in the surveys and in-services. Participants were asked to differentiate if they worked in the obstetrician/gynecologist office setting or the family practice office. The ratio of

respondents from each type of office consisted of 52% (n=12) from the family practice office and 48% (n=11) from the obstetrics/gynecology office (Figure 3).

Participant Role. Participants were next asked to identify their position or role (Figure 4). Possible choices included providers (physician, nurse practitioner, or physician’s assistant), nurses (registered nurse or licensed practical nurse), assistive staff (certified medical assistant or medical technician), and other office staff (Figure 3). Responses included five (22%) providers, eleven (48%) nurses, four (17%) assistive staff members, and three (13%) office staff members.

Figure 3

Demographics

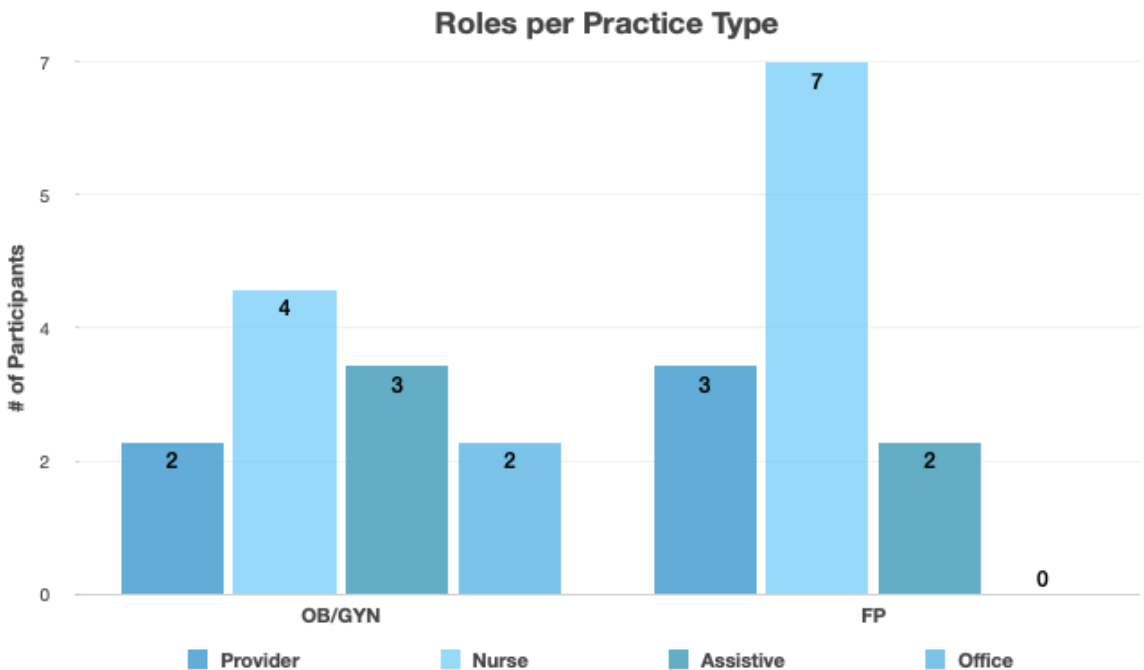


Participant’s Years of Experience. The largest group of participants, 35% (n=8), have been in their current position or role for 6-10 years (Figure 3). The second largest group, 20% (n=6), reported greater than 20 years of experience. The remainder of respondents reported experience among 0-2 years for 17% (n=4), 3-5 year 13% (n=3), and 11-20 years 9% (n=2).

Roles per Practice Type. Roles were further evaluated according to office or practice type (Figure 4). Of the respondent providers, two were obstetrician/gynecologists while three were physicians providing family practice care with obstetrical services. The largest group represented in the data consisted of seven nurses from the family practice office setting. Four nurses were representative of the OB/GYN group. Three assistive personnel were representative of the OB/GYN group and two were representative of the FP group. Two office staff were representative of the OB/GYN group and zero were representative of the FP group.

Figure 4

Roles per Practice Type



Background

The background section of the survey was only included on the pretest surveys. Information gathered in this section included the current practice aspects of the different clinics. Participants were asked if the clinic in which they worked provided patients with informational handouts regarding the Tdap vaccination. They were also asked if their offices administered the Tdap vaccination within the clinic, as well as the reason if they did not administer the vaccine within the clinic. Finally, it asked about patient provided reasons for not receiving the vaccination.

Office Tdap Practices. Of the two types of offices surveyed, OB/GYN and family practice, all respondents from both offices reported that each of the clinics offered and administered maternal Tdap vaccinations to their intrapartum patients. One provider indicated in the survey, as well as in the discussion following the presentation that they did not administer the vaccination in the office setting to Medicaid patients due to lack of reimbursement for the vaccine by Medicaid. In this particular office, patients with Medicaid coverage were instructed to go to the health department to receive the vaccination.

It was reported that both office types did give informational handouts to patients regarding pertussis and Tdap vaccination. Upon further discussion, the informational handouts provided by both offices were for pertussis and Tdap in general and not specific for pertussis and Tdap during pregnancy. Discussion regarding the specific nature of the maternal intrapartum Tdap vaccine was discussed among participants. It was considered important by participants to obtain more information for patients regarding the role of the Tdap vaccination during pregnancy.

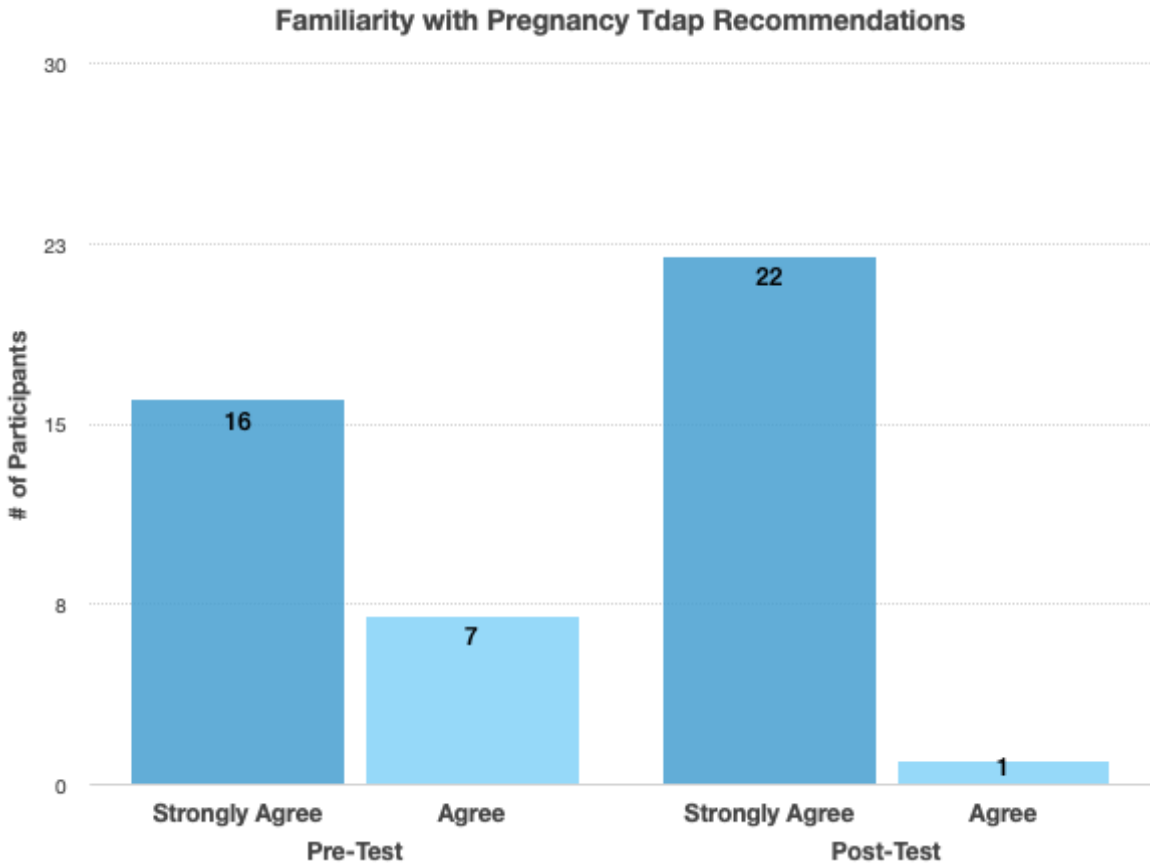
Questionnaire

The questionnaire portion of the survey included in both the pretest and post-test. Question topics remained the same; however, the manner of asking the question was changed. Questions presented on the pretest sought to identify individuals' current practice and their perceived knowledge regarding pertussis prevention and Tdap vaccination strategies. Posttest questions were worded to determine participants' perceived increase in knowledge regarding the topics as well as their intention to change their practice in the future.

Familiarity with Current Pregnancy Tdap Recommendations. All participants indicated that they were familiar with recommendations for vaccinating against pertussis during pregnancy (Figure 5). Of these, 70% (n=16) reported they were strongly aware of recommendations while 30% (n=7) reported they were aware. Following the in-service participants were asked to answer the statement "I am more familiar with recommendations for vaccinating against pertussis during pregnancy." Again, all participants indicated that they were more familiar with Tdap recommendations during the post-test, with 95% of participants (n=22) reporting that they "strongly agreed with the statement of being more familiar with recommendations.

Figure 5

Familiarity with Pregnancy Tdap Recommendations

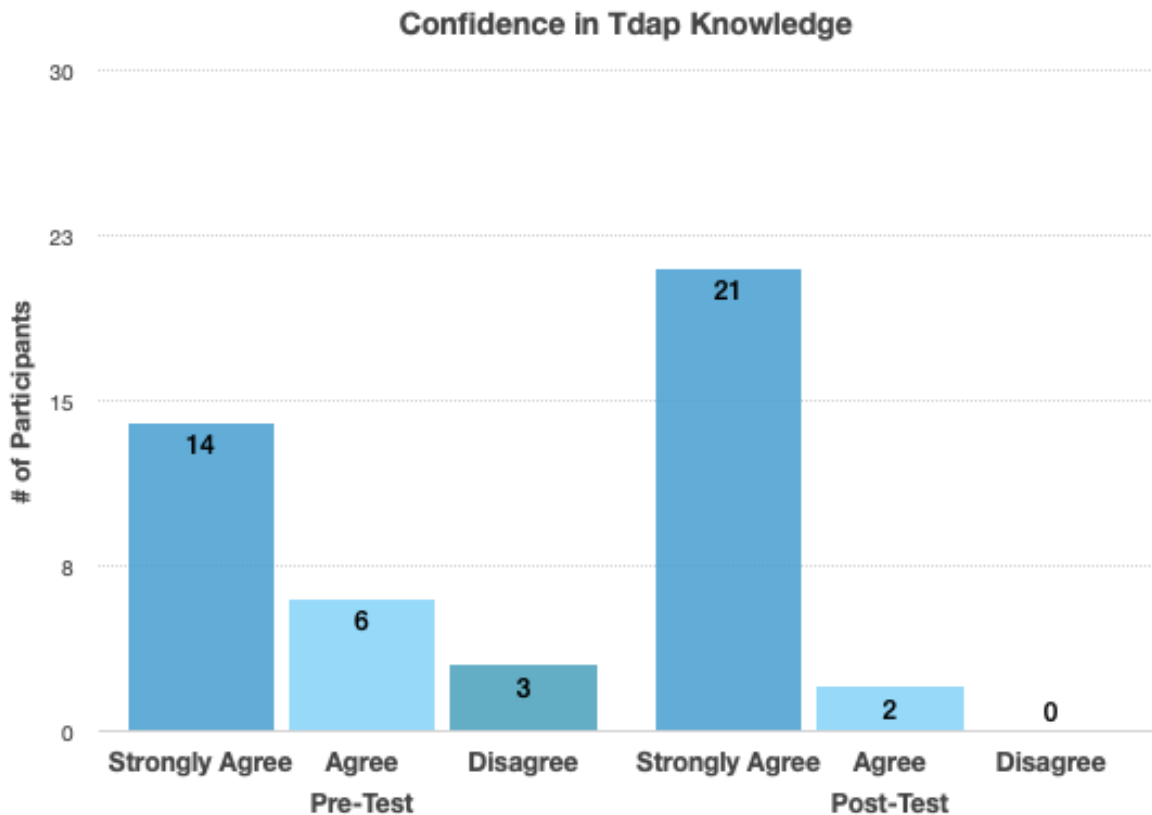


Confident of Pertussis/Tdap Knowledge. Participants were next asked about their confidence regarding their knowledge of pertussis and the Tdap vaccine when discussing those vaccines with their patients/families (Figure 6). Of the participants (N=23), 61% (n=14), “strongly agreed” prior to the in-service that they felt confident in their knowledge of the pertussis disease as well as maternal Tdap recommendations. Of the remaining participants, 26% (n=6) “agreed” while 13% (n=3) “disagreed” that they felt confident regarding their knowledge in order to pertussis and Tdap with their patients prior to the educational presentation. Following the presentation, all participants either “agreed” or “strongly agreed” that they had an increase in knowledge regarding Tdap

vaccination following the presentation. Furthermore, 91% (n=21) of participants reported that they “strongly agreed” that they felt an increase in confidence in their knowledge regarding Tdap vaccination strategies following the presentation.

Figure 6

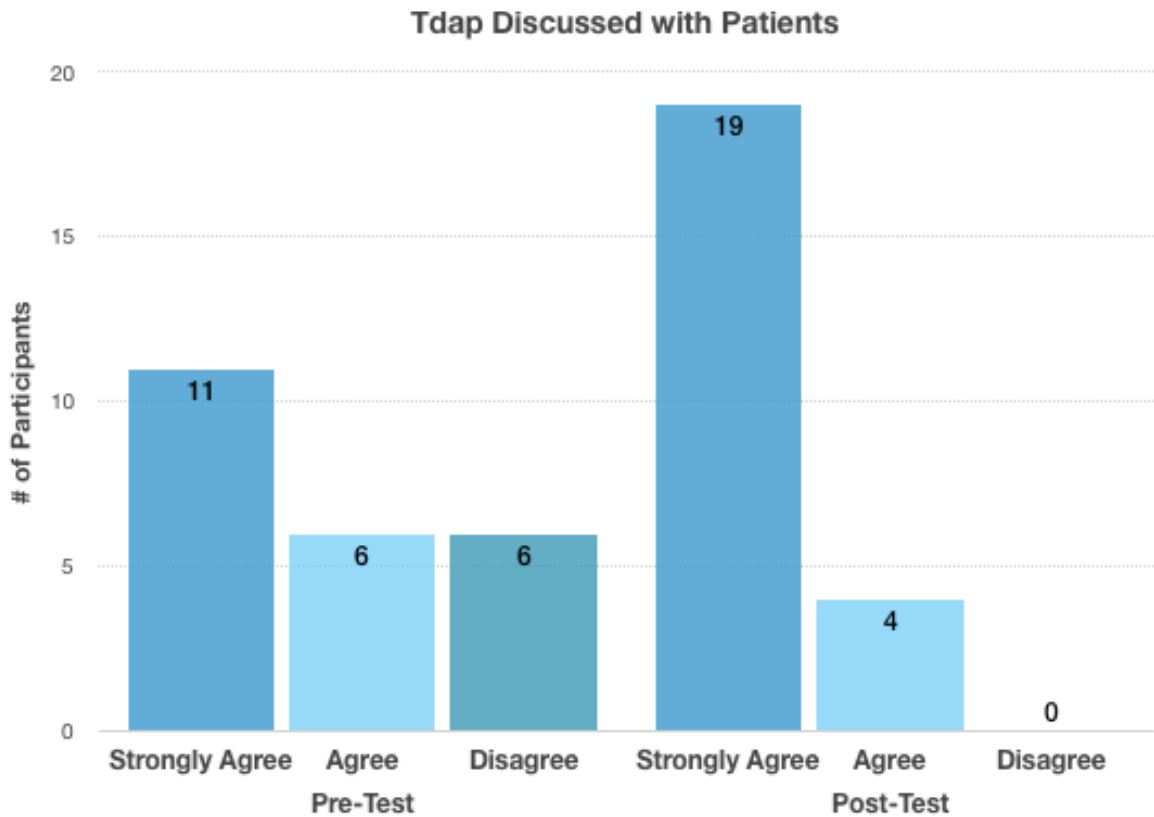
Confidence in Tdap Knowledge



Tdap Discussed with Patients. The next question sought to determine the individual practices of participants (Figure 7). They were asked in the pretest if they currently discussed pertussis and the Tdap vaccine with patients. Of those surveyed, (n=6) reported they did not discuss Tdap with patients at that time. In the posttest, all participants responded that they intend to discuss pertussis and the Tdap vaccine with their patients in the future.

Figure 7

Tdap Discussed with Patients

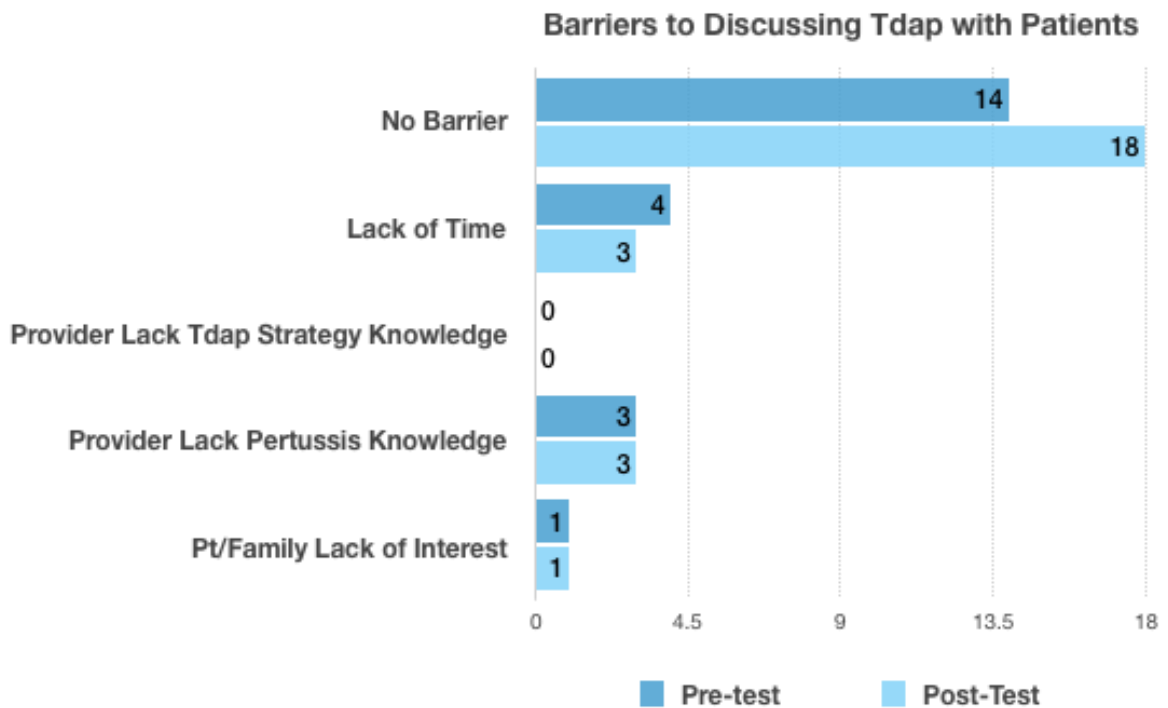


Barriers to Discussing Tdap with Patients. As a follow-up to the previous question, participants were asked to identify their perceived barriers to discussing pertussis and the Tdap vaccine with their patients (Figure 8). This was a multiple-choice question as participants may have several barriers affecting their ability to talk with patients. A majority of participants (60%) reported no barrier to discussing pertussis and Tdap vaccinations with patients. Others did report, however, that time constraint and lack of knowledge prevented them from talking with patients. Following the educational presentation, an increased number of participants, 78% (n=18), reported that they will have no perceived barrier in discussing these subjects with patients in the future. Some participants still identified lack of time and lack of knowledge of pertussis as barriers to

discussing pertussis and Tdap strategies with patients. Time constraints are an increasingly large factor in healthcare. Improved use of time, time management strategies, delegation of tasks, and strong informational handouts could be important strategies to address this problem. In regard to continued lack of individuals' knowledge, further individualized research into this subject could be beneficial.

Figure 8

Barriers to Discussing Tdap with Patients

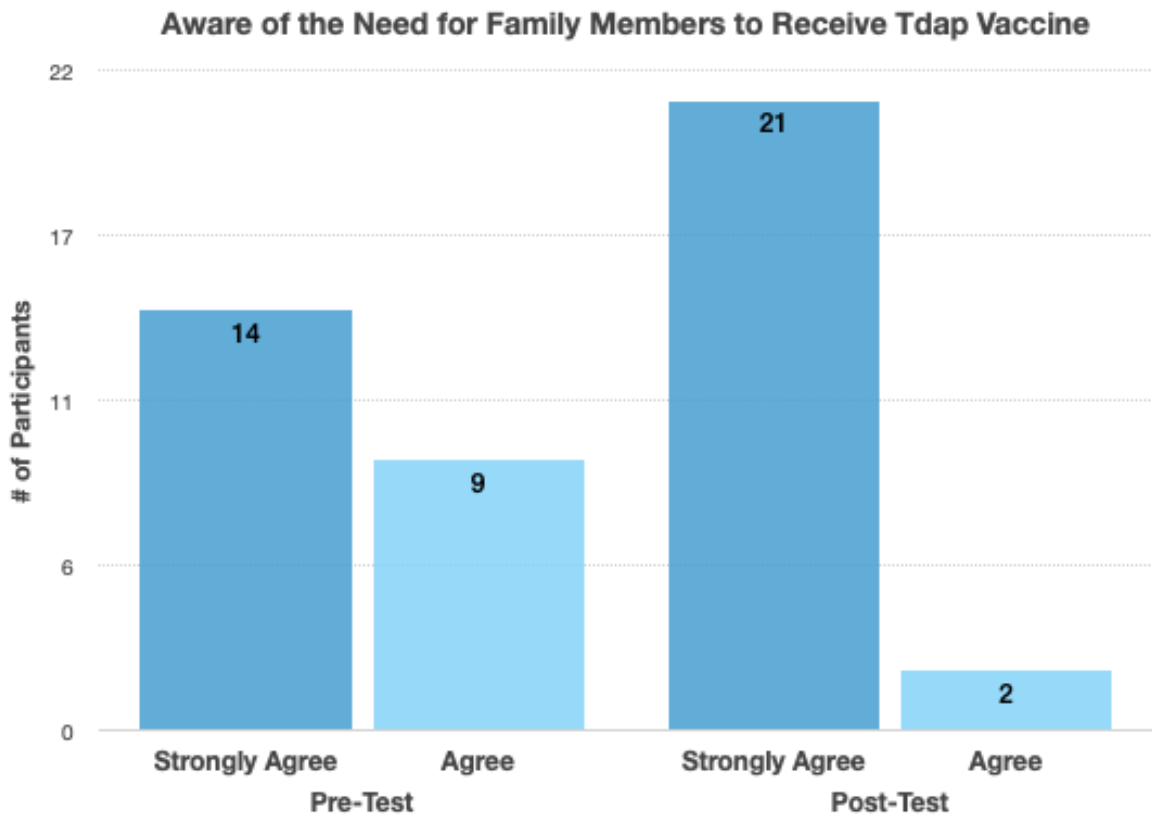


Tdap Vaccine to Family Members. As a part of the herd immunity strategy of cocooning, family members including fathers, adolescent siblings, grandparents, and other close contacts are encouraged to receive the Tdap vaccination before the birth of the infant. This allows the family member to build immunity before the infant is born in order to keep from passing pertussis to the infant in the first few months (Castagnini et al. 2012). After receiving this information during the in-service, a larger percentage of

respondents strongly agreed to being aware of the need for family members to receive the Tdap vaccination (Figure 9).

Figure 9

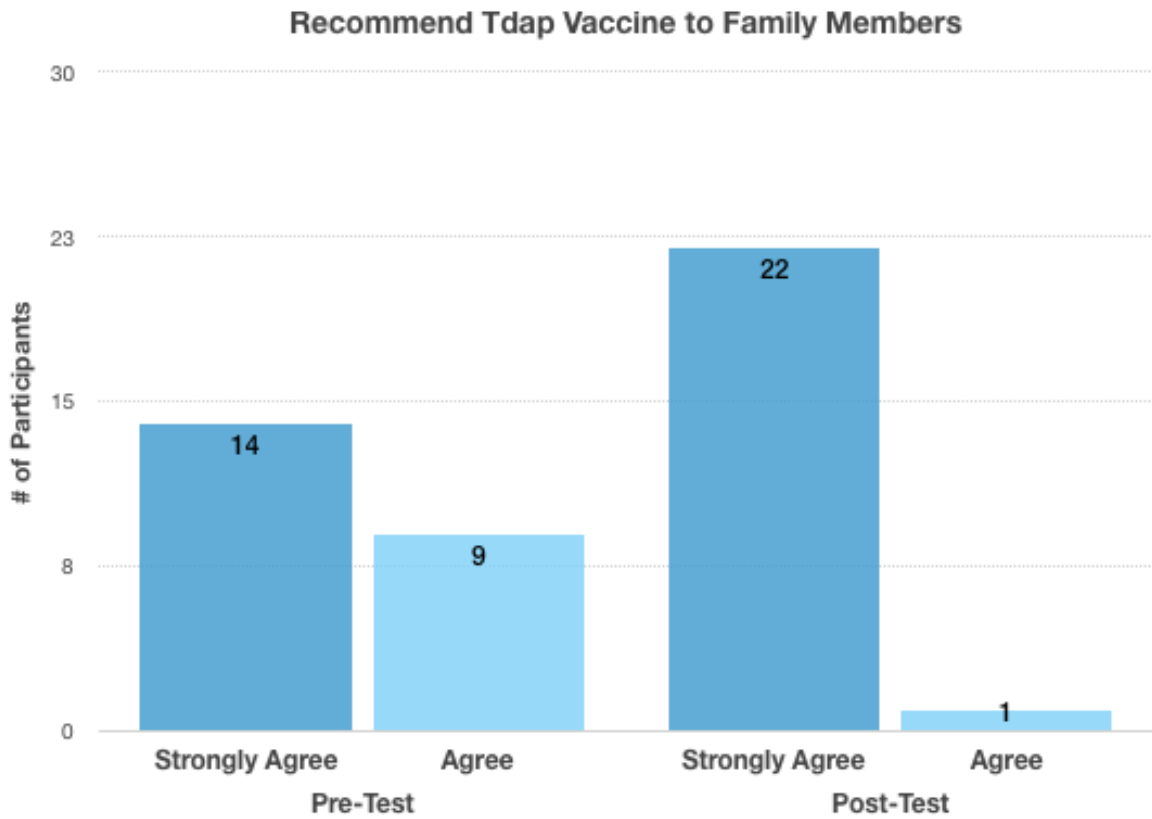
Aware of the Need for Family Members to Receive Tdap Vaccine



When asked about current practice of recommending to patients that family members receive the Tdap vaccination, all participants reported that they do this (Figure 10). After discussion of the importance family members receiving the vaccine, 95% (n=22) of respondents reported they “strongly agree” while the remaining respondent “agrees” to plan to encourage family members to receive the vaccine in the future.

Figure 10

Recommend Tdap Vaccine to Family Members



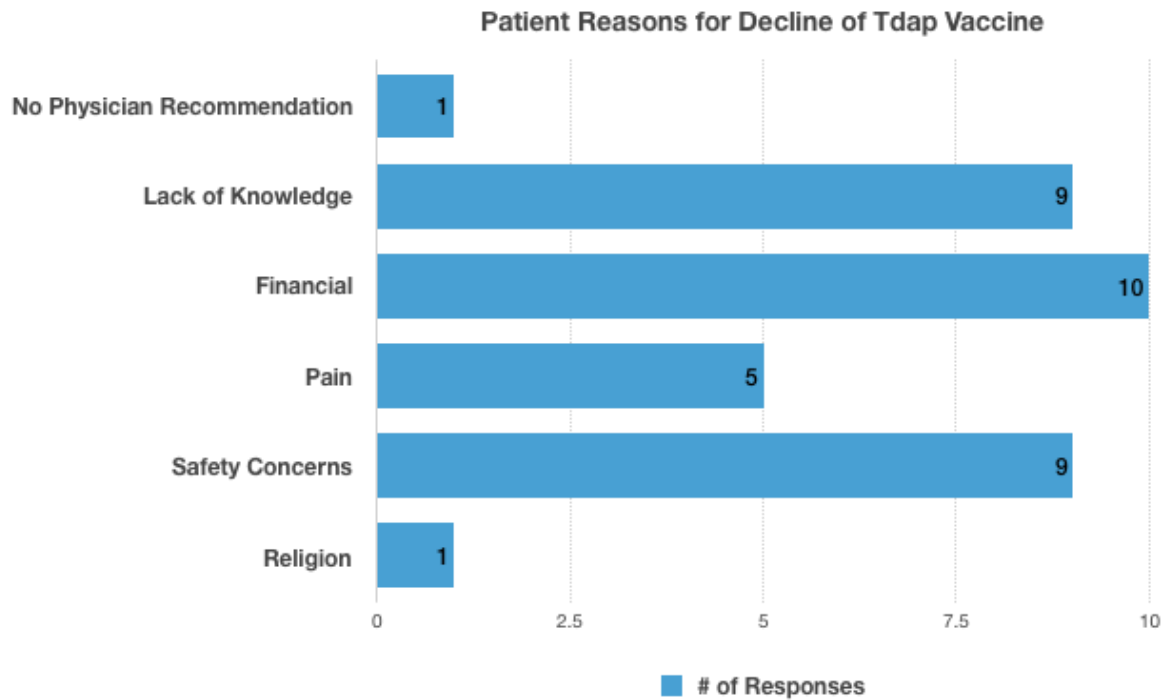
Additional Statistical Analyses

In addition to the questions posed for the purpose of this study, an extra question was included on the pre-test about the most frequently given reasons that patients failed to receive the maternal Tdap vaccination. Participants were able to select from a number of reasons patients have given for declining the Tdap vaccination (Figure 11). According to the surveyed healthcare professionals, financial concern (10 responses) was the most common reason for patients to decline the vaccination. Safety concerns and lack of patient knowledge regarding pertussis and the vaccine tied (9 responses each) as the next most common reasons for patients to decline the vaccination. Five respondents reported pain from the vaccine as the primary reason given by patients who decline the

vaccination. Lastly, one respondent reported religion was another stated barrier for patients.

Figure 11

Patient Reason for Declining Tdap Vaccine



Summary

This chapter discussed the results of the project to identify healthcare professionals' current knowledge level, attitude, and belief regarding national maternal Tdap vaccination guidelines. It also described how these beliefs changed as a result of provided education regarding pertussis and vaccination strategies. The study revealed that a majority of those participating in the in-service believed they already knew about current maternal intrapartum Tdap vaccination strategies. However, following an educational in-service, the respondents reported that they learned new information from the presentation.

Chapter V

Discussion

The purpose of this study was to evaluate the current knowledge level, attitude, and belief of physicians, advanced practice providers, and support staff of obstetric providing clinics at Ascension Medical Group St. John Clinic in Bartlesville, Oklahoma, regarding national maternal Tdap vaccination guidelines. The second aspect of the study sought to determine if and/or how the knowledge, attitude, and beliefs of these healthcare professionals would change after receiving education regarding Tdap administration guidelines. The study provided an educational presentation to inform participants on the current maternal intrapartum Tdap vaccination strategies to improve healthcare professionals' knowledge regarding the vaccination strategy. The overall goal of this study was to improve healthcare professionals' awareness of the current guidelines regarding maternal intrapartum Tdap vaccination.

Relationship of Outcomes to Research

Identified barriers in the literature to maternal intrapartum Tdap vaccination included patient lack of knowledge about the pertussis disease and the available vaccine. In some cases, women did not remember the topic being mentioned during prenatal visits. Those receiving the Tdap vaccine recalled hearing about it from multiple sources including their healthcare providers (Gauld et al., 2016). It has been shown that when

information is offered by a reliable and trusted source such as a healthcare professional, a patient is more inclined to follow guidelines.

As results of this study indicate, some healthcare professionals were not confident in their knowledge regarding pertussis prevention and maternal intrapartum Tdap vaccination strategies for this population. They also reported they were not likely to discuss this topic with patients. After completion of the in-service, all participants surveyed either “agreed” to “strongly agreed” that they would discuss these subjects with their patients.

Statistically, patients have reported receiving the vaccine due to the ease of availability from their physician’s office or local pharmacy (Gauld et al., 2016). Patients who are offered vaccination in the clinic setting are more likely to be vaccinated than those being instructed to go elsewhere (New et al., 2016). One provider in the survey and discussion following the presentation noted they did not administer the vaccination in the office setting to Medicaid patients due to lack of reimbursement for the vaccine by Medicaid. In this particular office, patients with Medicaid coverage were instructed to go to the health department to receive the vaccination. Directing a patient to another location to receive the vaccination decreases the likelihood of the patient receiving the vaccine. Upon further review of reimbursement regarding the intrapartum Tdap vaccine, other offices within the same St. John groups reported full reimbursement of the vaccine and administration costs from Medicaid when the vaccine is coded under pregnancy. It was determined that reimbursement did exist for patients under Medicaid for the Tdap vaccination. Since this determination, the provider has started vaccinating every willing patient in their office regardless of insurance status.

Evaluation of Theoretical Framework

The Health Belief Model (Figure 1.1) was the theoretical framework used for illustration purposes of this project. The major assumptions of the Health Belief Model postulate that a person will take a desired action if they believe the benefits and calls to action outweigh the risks and barriers of such action. In the case of maternal intrapartum Tdap vaccine administration, information and advice given by healthcare professionals has been identified as a large influencing factor on whether or not someone accepts the vaccination. By increasing healthcare professionals' knowledge regarding pertussis and interventions to prevent pertussis one can strengthen the likelihood that they will be able to pass this knowledge to their patients increasing the call to action.

According to the results of this study, a majority of healthcare professionals surveyed expressed confidence regarding their knowledge about pertussis as well as the recommendations regarding maternal intrapartum Tdap administration; however, all participants reported that the educational in-service increased their knowledge regarding the subject. Likewise, all participants in the study reported the likelihood that they will discuss this topic with their patients in the future. This suggests that all who participated in the in-service learned some new information that will enable them to educate their patients on the importance of pertussis prevention during pregnancy.

Evaluation of Logic Model

The logic model (Figure 1.2) created for this study incorporated the intended audience or study participants (physicians/providers, nurses, support staff) as well as the intervention (pretest, in-service, posttest). Expected immediate effects or results of the activity included increased awareness and knowledge of current maternal intrapartum

Tdap vaccination guidelines. According to results of the surveys, all participants indicated an increase in knowledge. The next expected effect was practice changes regarding recommendations. All participants expressed an intention to discuss pertussis and maternal Tdap vaccine administration with patients.

Other expected results of the project listed in the logic model have yet to be determined. These outcomes include increased rates of maternal intrapartum Tdap vaccination which, as evidenced by literature, will lead to a decrease in incidence, severity, and/or infant death rates in relation to pertussis cases. Further study will be required to determine the effect of this study on these outcomes. One proposed evaluation of expected results would be to complete a chart review of rates of Tdap administration retroactive to the offering of the educational in-service and compare those rates to those occurring after the intervention.

Limitations

One observed limitation of the study included participant survey size. During the time of the in-services, it was noted that one OB/GYN physician as well as one of the family practice group's physicians were out on medical leave. Two nurse practitioners were also out of the office on the day of the presentation. These absences further decreased the size of the study as those nurses and/or supportive staff were not available to attend the in-service.

This project focused on the obstetrics providers' offices within a single health system, Ascension Medical Group St. John, in one community, Bartlesville, Oklahoma. If participants had been included from a number of health systems and a greater number of communities, it is anticipated the results would have been more diverse and varied in

response to healthcare professionals' knowledge, recommendation, as well as practice regarding maternal Tdap administration.

Finally, limitations introduced by way of the instrument include the ability to accurately determine provider knowledge regarding Tdap recommendations. Participants were instructed to consider their own knowledge regarding current Tdap recommendations before the in-service was given. This perceived knowledge of the individual may have been greater than what it actually was. Since the study revealed that 91% of the participants responded with a "strongly agree" response to a question evaluating that participants knowledge increased regarding Tdap administration, it could be possible that some participants did not know as much as they initially thought.

Implications for Future Research

Effects of the educational in-service on overall Tdap vaccine administration rates and thus decreases in rates and/or severity of pertussis cases was unable to be determined due to the expedited nature of the study. An extended time period that would allow for evaluation of vaccine rates retroactively in comparison to those after the intervention would provide a better example of the results of the in-service. This would be completed by a comprehensive chart review of patients in the inpatient labor and delivery setting regarding the acceptance of the maternal Tdap vaccination. A retroactive review of administration rates would have been compared to the vaccination rates after the in-service was conducted. This comparison would be able to demonstrate an actual improvement of vaccination rates as a result of healthcare professional education if one occurred.

Based on the limited number of participants provided by the selected setting for this study, a larger scale intervention could be the basis for another study. This study would be proposed to incorporate multiple settings and/or communities that may identify even larger gaps in knowledge regarding pertussis prevention as well as Tdap vaccination strategies. Likewise, informing other healthcare professionals, such as inpatient obstetrical nurses may serve to improve the overall knowledge of all healthcare professionals providing care to this population.

Participants in this study were asked to identify the reasons patients frequently give for declining the maternal intrapartum Tdap vaccination. Future research or consideration should go into evaluating these barriers in the current system. Patient education from providers should be tailored to address these concerns. It would also be helpful to poll patients directly on their concerns regarding the vaccination or barriers to receiving the vaccination. These results may prove to be similar or different than those previously identified. Regardless of the result, these factors should be addressed with patients and information should be identified and shared. The results to this question were provided to the office managers and providers in order to further identify needs that may be addressed in the future.

The complete project will be given to and/or discussed with the department manager of the hospital's inpatient obstetrics unit at Jane Phillips Medical Center in Bartlesville, Oklahoma. The same educational in-service that was provided for the outpatient clinics will be provided for the inpatient nurses. At that time, current pertussis recommendations will be presented and discussed with this group. Current practices and

procedures regarding maternal Tdap vaccination strategies in the inpatient setting will be reviewed to determine if they are in line with national recommendations.

Implications for Practice

Healthcare professionals are one of the biggest contributing factors for influencing health behaviors in their patient populations. It is important for healthcare professionals to be knowledgeable of diseases and other health disparities. It is also imperative for them to stay up to date with current guidelines regarding strategies to eliminate or limit these health disparities in order to improve the health of their patients.

It was reported that both office types provide patients with informational handouts to patients regarding pertussis and Tdap vaccination. Upon further discussion, the informational handouts were for pertussis and Tdap in general and not specifically about pertussis and Tdap during pregnancy. Discussion regarding the specific nature of the maternal intrapartum Tdap vaccine was discussed among study participants. It was considered important by participants to obtain more information for patients regarding the role of the Tdap vaccination during pregnancy.

The handout provided by the CDC (Appendix C) was discussed as a good piece of information to provide obstetric patients. As discussed in the handout provided to participants, mothers have the unique ability to start protecting their babies from pertussis before a child is even born. There is a short time period in which this protection can be maximized in order to offer infants the best protection available to them. Discussion of this important topic with mothers needs to be well timed and effective in order to rely the importance of the situation to mothers. Once an infant is born, it is too late to confer this immunity to them.

Conclusion

Pertussis continues to be a prevalent threat to children. This threat has been shown to be even greater among infants under two months due to them not yet being immunized. In the past, herd immunity was used as the sole strategy to offer protection from pertussis to infants. More recently, it was discovered that administering a Tdap vaccination to mothers during the intrapartum period offers this vulnerable population the greatest chance of protection against pertussis. This protection offers infants, at best, the ability to avoid contracting pertussis or, at least, decreases the severity and/or death rates for those infants who do contract the illness. Historically, lack of instruction by healthcare providers was one of the major reasons cited by patients for not receiving the Tdap vaccine (Gauld et al, 2016). By keeping healthcare professionals up to date regarding pertussis prevention as well as current Tdap vaccination recommendations, they will be better prepared and informed about the subject in order to improve and facilitate discussion with patients.

Participants of this study were provided with verbal as well as paper copies of information regarding pertussis and Tdap vaccination strategies. It is the intention of this survey was to improve healthcare professionals' knowledge of this disease and prevention in order to address this subject more fully with their patients. Improved dialog with patients has been shown to increase vaccination rates, leading to a decrease in pertussis cases and/or the severity of the illness. It is important that all healthcare professionals share in this knowledge and responsibility as patient safety relies upon it.

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APPENDIX

Appendix A:

Tdap Administration Survey

Number_____

Pre-Test

Demographics:

1. What is your position or role?
 Provider (doctor, nurse practitioner, physician's assistant)
 Nurse (RN, LPN)
 Assistive Personnel (CMA, Tech, Aide)
 Other (office staff, etc.)

2. # of years in position/role
 0-2 years
 3-5 years
 6-10 years
 11-20 years
 >20 years

3. Type of Practice you work in:
 Family Practice
 OB/GYN
 Other: _____

Background:

4. Does your office give patients informational handouts regarding the Tdap vaccine?
 Yes
 No
 Unsure

5. Are Tdap (tetanus/diphtheria/pertussis) vaccinations administered in your office?
 Yes (skip to #7)
 No (if no, answer #6)
 Unsure

6. Please list reason the Tdap vaccine is not given in the office. (Select all that apply)
 Cost
 Time constraint
 Unsure
 Other: _____

7. What reasons do patients give for declining the Tdap vaccine? (Select all that apply)
 Lack of recommendation by physician
 Lack of knowledge of necessity

- Financial burden
- Unsure of where to get it
- Fear of pain from shot
- Safety concerns (side effects)
- Religion
- Other: specify _____
- N/A

Questionnaire:

1. I am familiar with recommendations for vaccinating against pertussis during pregnancy?
 - Strongly Agree
 - Agree
 - Disagree
 - Strongly Disagree

2. I feel confident in my knowledge of pertussis and the tetanus/diphtheria/pertussis (Tdap) vaccine to talk with my patients/families?
 - Strongly Agree
 - Agree
 - Disagree
 - Strongly Disagree

3. I currently discuss pertussis (whooping cough) and the Tdap vaccine with patients?
 - Strongly Agree
 - Agree
 - Disagree
 - Strongly Disagree
 - N/A

4. What barriers do you have to informing patients about the need for Tdap? (select all)
 - None, I talk with all my patients and their families
 - Lack of time
 - Lack of knowledge about current pertussis vaccination strategies and guidelines
 - Perceived lack of interest from patients and families
 - Lack of knowledge of waning (decreasing) immunity to pertussis
 - Other (please list): _____

5. I am aware of the need for family members of obstetric patients to get Tdap booster vaccinations due to declining immunity?
 - Strongly Agree
 - Agree
 - Disagree
 - Strongly Disagree

6. I encourage my obstetric patients' family members to receive the Tdap vaccine?

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

Post-Test

Questionnaire:

1. I am more familiar with recommendations for vaccinating against pertussis during pregnancy.
 Strongly Agree
 Agree
 Disagree
 Strongly Disagree

2. I have increased confidence in my knowledge of pertussis and the tetanus/diphtheria/pertussis (Tdap) vaccine to talk with my patients/families?
 Strongly Agree
 Agree
 Disagree
 Strongly Disagree

3. I plan to discuss pertussis (whooping cough) and the Tdap vaccine with patients in the future?
 Strongly Agree
 Agree
 Disagree
 Strongly Disagree

4. Barriers that continue to exist in regard to informing patients about the need for Tdap in the future include: (select all that apply)
 None, I will talk with all my patients and their families
 Lack of time
 Lack of knowledge about current vaccination strategies and guidelines
 Perceived lack of interest from patients and families
 Lack of knowledge of waning (decreasing) immunity to pertussis
 Other (please list): _____

5. I am more aware of the need for family members of obstetric patients to get Tdap booster vaccinations due to declining immunity?
 Strongly Agree
 Agree
 Disagree
 Strongly Disagree

6. I plan to make recommendations to my obstetric patients' family members to receive the Tdap vaccine?
 Strongly Agree

- Agree
- Neutral
- Disagree
- Strongly Disagree

You can start protecting your baby from whooping cough before birth



Information for pregnant woman



When you get Tdap vaccine during your 3rd trimester, your baby will be born with protection against whooping cough.

Why do I need to get Tdap vaccine while I am pregnant?

CDC recommends Tdap vaccine during your third trimester so that your body can create antibodies and pass them to your baby before birth. These antibodies will help protect your newborn right after birth and until your baby gets his own first whooping cough vaccine at 2 months of age. During the first few months of life, your baby is most vulnerable to serious complications from this disease.

Is this vaccine safe for me and my baby?

Yes, Tdap vaccine is very safe for you and your baby. The most common side effects are mild, like redness, swelling or pain where the shot is given in the arm. This should go away within a few days. You cannot get whooping cough from the vaccine. The vaccine does not contain any live bacteria.

Doctors and midwives who specialize in caring for pregnant women agree that Tdap vaccine is safe and important to get during the third trimester of each pregnancy. Getting the vaccine during pregnancy does not put you at increased risk for pregnancy complications like low birth weight or preterm delivery.

If I recently got this vaccine, why do I need to get it again?

The amount of antibodies in your body is highest about 2 weeks after getting the vaccine, but then starts to decrease over time. That is why the vaccine is recommended during every pregnancy—so that each of your babies gets the greatest number of protective antibodies from you and the best protection possible against this disease.

Are babies even getting whooping cough anymore in the United States?

Yes. In fact, babies are at greatest risk for getting whooping cough. We used to think of this as a disease of the past, but it's still common in the United States. Recently, we saw the most cases we had seen in 60 years. Cases, which include people of all ages, are reported in every state. Typically more than 1,000 babies younger than 2 months old are diagnosed with whooping cough each year in the United States.

Whooping cough (sometimes called pertussis) is a serious disease that can cause babies to stop breathing. Unfortunately, babies must be 2 months old before they can start getting their whooping cough vaccine. The good news is you can avoid this gap in protection by getting a whooping cough vaccine called Tdap during your pregnancy. The recommended time to get the shot is your 27th through 36th week of pregnancy, preferably during the earlier part of this time period. By getting vaccinated, you will pass antibodies to your baby so she is born with protection against whooping cough.



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Appendix C (cont.): (posterior)

Mom, only you can provide your newborn baby with the best protection possible against whooping cough.

You may have heard that your baby's father, grandparents, and others who will be in contact with your baby will need to get their whooping cough vaccine as well. This strategy of surrounding babies with protection against whooping cough is called "cocooning." However, cocooning might not be enough to prevent whooping cough illness and death. This is because cocooning does not provide any direct protection (antibodies) to your baby, and it can be difficult to make sure everyone who is around your baby has gotten their whooping cough vaccine. Since cocooning does not completely protect babies from whooping cough, it is even more important that you get the vaccine while you are pregnant.

How dangerous is whooping cough for babies?

Whooping cough is very serious for babies. Many babies with whooping cough don't cough at all. Instead it can cause them to stop breathing. In the United States, about half of babies younger than 1 year old who get whooping cough are hospitalized. About 7 in 10 deaths from whooping cough are among babies younger than 2 months old. These babies are too young to be protected by their own vaccination.

How could my baby be exposed to whooping cough?

Whooping cough spreads from person to person when coughing or sneezing. It also spreads when people spend a lot of time together or share breathing space, like when you hold your newborn on your chest. Some people with whooping cough may just have a mild cough or what seems like a common cold. Since symptoms can vary, children and adults may not know they have whooping cough and can end up spreading it to babies they are in close contact with.

Why is the vaccine recommended during pregnancy instead of in the hospital after my baby is born?

When you get Tdap vaccine during pregnancy, you will pass protective antibodies to your baby before birth, so both you and your baby have protection. Tdap vaccine used to be recommended for women to get in the hospital after giving birth. This helped protect moms from getting whooping cough, but did not directly protect babies.

Is it safe to breastfeed after getting Tdap vaccine?

Yes, in fact you can pass some whooping cough protection to your baby by breastfeeding. When you get Tdap vaccine during pregnancy, you will have protective antibodies in your breast milk that you can share with your baby as soon as your milk comes in. However, your baby will not get protective antibodies immediately if you wait to get Tdap until after you give birth. This is because it takes about 2 weeks after getting vaccinated before your body develops antibodies.

Where can I go for more information?

Pregnancy and Whooping Cough website:
www.cdc.gov/pertussis/pregnant

Immunization for Women website:
www.immunizationforwomen.org/patients/diseases-vaccines/tetanus-diphtheria-pertussis/faqs.php

Vaccines and Pregnancy Quiz:
www.cdc.gov/vaccines/pregnancy/vaccine-quiz.html

American Academy of Family Physicians website:
www.aafp.org/patient-care/immunizations/disease-population.html

Tdap Vaccine Information Statement (VIS):
www.cdc.gov/vaccines/hcp/vis/vis-statements/tdap.html

Ask your doctor or midwife about getting Tdap vaccine during your 3rd trimester.

To learn more about vaccines recommended during pregnancy, visit www.cdc.gov/vaccines/pregnancy

Appendix D: AGREE II

Item	Content	Domain
1	The overall objective(s) of the guideline is (are) specifically described.	Scope and Purpose
2	The health question(s) covered by the guideline is (are) specifically described.	
3	The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.	
4	The guideline development group includes individuals from all relevant professional groups.	Stakeholder Involvement
5	The views and preferences of the target population (patients, public, etc.) have been sought.	
6	The target users of the guideline are clearly defined.	
7	Systematic methods were used to search for evidence.	Rigour of Development
8	The criteria for selecting the evidence are clearly described.	
9	The strengths and limitations of the body of evidence are clearly described.	
10	The methods for formulating the recommendations are clearly described.	
11	The health benefits, side effects, and risks have been considered in formulating the recommendations.	
12	There is an explicit link between the recommendations and the supporting evidence.	
13	The guideline has been externally reviewed by experts prior to its publication.	
14	A procedure for updating the guideline is provided.	Clarity of Presentation
15	The recommendations are specific and unambiguous.	
16	The different options for management of the condition or health issue are clearly presented.	
17	Key recommendations are easily identifiable.	Applicability
18	The guideline describes facilitators and barriers to its application.	
19	The guideline provides advice and/or tools on how the recommendations can be put into practice.	
20	The potential resource implications of applying the recommendations have been considered.	
21	The guideline presents monitoring and/or auditing criteria.	Editorial Independence
22	The views of the funding body have not influenced the content of the guideline.	
23	Competing interests of guideline development group members have been recorded and addressed.	
^a : Extracted from the AGREE II instrument		