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Guiding patients to appropriate vaccination during pregnancy

Abstract: This article focuses on the two universally recommended vaccines during pregnancy—Tdap and influenza—and how NPs can advocate for the appropriate vaccination of this patient population.

By Elizabeth Heavey, PhD, RN, CNM

NPs, nurse-midwives, and other OB/GYN providers play a key role in assessing the vaccination status of patients, ensuring they are up to date with current vaccination recommendations.[1] Patients should be extra cautious about exposures to harmful substances during pregnancy, including some medications and live vaccinations. Many do not realize that not all vaccines are contraindicated in pregnancy. In fact, two vaccines have significant benefit to both the mother and infant and are highly recommended for all women during pregnancy: tetanus toxoid, reduced diphtheria toxoid, acellular pertussis vaccine (Tdap), and influenza vaccine.[2] Unfortunately, one study found that 65% of pregnant women do not receive both of these two important vaccines, leaving themselves and their infants at risk for serious and sometimes deadly infections.[3] It is critically important that all obstetric providers discuss the risks associated with infection from vaccine-preventable diseases during pregnancy and allay any patient concerns about these recommended vaccines in pregnancy.

Keywords: infectious diseases, influenza, pregnancy, Tdap, vaccines

In addition to the two universally recommended vaccines, several other vaccines are safe if warranted during pregnancy.[2] A summary of maternal immunization recommendations is available on the CDC's website at https://www.cdc.gov/vaccines/pregnancy/hcp-toolkit/resources.html. Discussing patient risks and exposures and familiarity with the current prevalence of vaccine-preventable diseases allow obstetric providers and patients to determine if these vaccinations are appropriate. Providers should also be aware that live bacterial and live attenuated viral vaccines pose a theoretical risk to the fetus and are generally contraindicated during pregnancy.[2] This article focuses on the two universally recommended vaccines during pregnancy and how obstetric providers can help advocate for the appropriate vaccination of patients who are pregnant.

Tdap vaccine

Pertussis is a highly communicable illness caused by the *Bordetella pertussis* bacteria and spread through respiratory secretions. The bacteria produce a toxin that immobilizes the cilia of the respiratory epithelial cells and produce inflammation that interferes with the clearance of pulmonary secretions.[4] Pertussis infection typically progresses through three stages. After a 7- to 10-day incubation period, the first stage of symptoms begins. This involves the typical signs of a mild upper respiratory infection. Within 1 to 2 weeks, the second stage begins as the cough becomes markedly worse with periods of rapid bursts of coughing followed by a high-pitched inspiratory whoop and sometimes vomiting.[4] The intense coughing can lead to insomnia, urinary incontinence, syncope, and rib fracture.[5] The paroxysmal coughing stage usually lasts about 1 to 6 weeks with more frequent coughing bursts at night.[4] When the coughing begins to improve, the third stage commences, during which, patients have less persistent coughing for an additional 2 to 3 weeks. Patients may experience the return of paroxysmal coughing with future respiratory infections.[6]

In infants infected with pertussis, the primary symptom is usually apnea, which may be accompanied by exhaustion, low-grade fever, and minimal coughing with no whooping sound.[6] Newborns who develop pertussis are at a high risk for hospitalization and frequently develop pneumonia (23%) and multiple episodes of apnea (61%).[5] Almost all deaths from pertussis are seen in children under age 1 year (88%). Those most at risk are infants under age 2 months who are too young to be vaccinated; this population accounts for the majority of deaths from pertussis.[3,7]

The pertussis vaccine has decreased the incidence of pertussis by 80%.[4] However, cases are again rising in the US, in part due to waning immunity associated with the current vaccine.[5,8] Women who have already had a pertussis vaccine as an adult are likely to have humoral immunity, which provides them with some protection from infection. However, antibody levels are frequently not high enough to provide adequate passive immunity to their infants after birth, leaving infants vulnerable to infection during this high-risk time frame.[8]

Vaccinating women between the 27th and 36th week of each pregnancy maximizes maternal antibody response and facilitates passive IgG antibody transfer from the mother through the placenta to the fetus.[2,9,10] It also increases the avidity of the pertussis-specific antibodies transferred to the infant, making them more effective in binding to the infecting bacteria.[9] In addition, administering the vaccine closer to the 27th week provides better coverage for those who go on to deliver prematurely as long as the vaccine is given at least 2 weeks before delivery.[7] Either formulation of the vaccine (Boostrix and Adacel) is appropriate to administer to pregnant women.[11] The American College of Obstetricians and Gynecologists (ACOG) recommends administering the Tdap vaccine when screening for gestational diabetes or alternatively when administering the Rho(D) immune globulin to Rh-negative women, to facilitate administration closer to the 27th week of pregnancy.[10] By age 2 months, most infants are able to begin the Tdap vaccine series, which provides additional protection. The only contraindications to Tdap vaccination are a prior severe allergic reaction to the vaccine or to any component and encephalopathy within 7 days of receiving a previous pertussis-containing vaccination.[11] Precautions should be taken for patients with progressive neurologic disorders and those who developed Guillain-Barré syndrome within 6 weeks of receiving a previous tetanus vaccine. Patients with an Arthus reaction to a previous tetanus and/or diphtheria vaccine should wait at least 10 years until receiving another vaccine with Td components.[4] Appropriate Tdap vaccination during the third trimester of pregnancy is approximately 78% effective in preventing pertussis cases and 91% effective in preventing hospitalizations from the infection in those under age 2 months.[3]

Pregnant women living in locations with active outbreaks of pertussis should be immunized as soon as possible regardless of the stage of their pregnancy.[10] If this is before the recommended window of 27 to 36 weeks, the woman should not be vaccinated again later in the pregnancy.[10] All household members should also be appropriately vaccinated to ensure protection for the newborn during an outbreak or epidemic.[10]

Milder forms of the disease may occur even in those who are vaccinated and can still be transmitted to those who are susceptible.[4] All close contacts with known exposures should be treated with appropriate antibiotic therapy regardless of vaccination status.[4] For pregnant adolescents and adults, postexposure prophylaxis and treatment of active infection are the same: oral administration of azithromycin or erythromycin.[11] Treatment is recommended within 6 weeks of cough onset for pregnant women; though treatment that occurs 3 weeks after cough onset is unlikely to impact the course of the disease, it does help prevent transmission to infants.[11] It is associated with fewer secondary infections and may be appropriate in certain circumstances.[11,12]

Special circumstances: Wound management and Td booster in pregnancy. If it has been 5 years or more since their last tetanus and diphtheria (Td) vaccination, and a pregnant patient needs a tetanus toxoid-containing vaccine as part of standard wound management, a Tdap vaccine should be administered instead, regardless of the stage of pregnancy.[10] Once given in pregnancy, the Tdap does not need to be repeated during that pregnancy regardless of the timing of administration.[10] Also, if a pregnant woman is due for a Td booster during pregnancy (every 10 years without injury), she should receive a Tdap vaccine in the 27- to 36-week window instead.[10] In the event that a pregnant woman has not had the three-part tetanus vaccination series, she should begin the series during the pregnancy (0 weeks, 4 weeks, and 6-12 months). Ideally, providers should plan for one of the injections to be due between 27 and 36 weeks and administer a Tdap vaccine instead of the Td vaccine for that dose.[10]

Influenza vaccine

Influenza is another highly communicable disease spread by respiratory droplets. It is caused by infection with an influenza virus and produces symptoms starting about 2 days after exposure. Symptoms include fatigue, congestion, headache, fever, cough, sore throat, and body aches. Gastrointestinal symptoms may also develop, particularly in children.[13] Individuals infected with influenza become contagious even before symptom onset and remain contagious for up to 7 days after developing symptoms. Over the course of each flu season, 3% to 11% of the population will experience symptomatic influenza infection.[13] The risk of infection is substantial for both a pregnant woman and her infant. Pregnant women are at increased risk for developing pneumonia and are twice as likely to be hospitalized due to influenza than nonpregnant patients.[3,14] In fact, between 2010 and 2018, 24% to 34% of women hospitalized with influenza were pregnant even though less than 10% of women ages 15 to 44 are pregnant each year.[3] Pregnant women hospitalized with influenza are more likely to require admission to ICUs and experience poor perinatal and neonatal outcomes including preterm labor, and are at high risk for death.[14] Infants under age 6 months are not eligible for influenza vaccination and are the children with the highest incidence of influenza-associated hospitalizations and death.[3] The best protection available for infants is passive immunity from placental antibody transfer from their mother and high levels of annual influenza vaccination in their community.

The CDC and ACOG recommend that all women who are pregnant during influenza season (October to May) receive an inactivated influenza vaccine during pregnancy, preferably before the end of October to maximize the risk reduction.[2,14,15] The inactivated influenza vaccine should be administered I.M., preferably in the deltoid muscle.[1] Pregnant women should not receive the live attenuated virus influenza vaccine.[1] Providers should not administer the influenza vaccine to individuals with a previous severe allergic reaction to the vaccine or any of its components, excluding eggs.[1] If patients are scheduled to receive the influenza vaccine and are moderately ill, with or without fever, the NP should discuss and consider influenza risk factors and the patient's ability to reschedule the vaccination for a later point in time after the patient is feeling better. Also, patients who are not at risk for severe complications from influenza and who have a history of developing Guillain-Barré syndrome within 6 weeks of a previous influenza vaccine, generally should not be vaccinated.[1] Appropriate vaccination for influenza during pregnancy decreases the woman's risk of hospitalization by 40% and decreases the risk

of an infant under 6 months old requiring hospitalization by 72%.[3]

If pregnant women and those up to 2 weeks postpartum are exposed to someone with influenza, they should be given postexposure antiviral chemoprophylaxis (75 mg of oseltamivir daily for 10 days) to minimize the risk of infection.[14] All pregnant women are advised to call immediately with influenza-like symptoms (fever greater than 100° F, shortness of breath, syncope, or chest pain) and should be treated presumptively with antiviral medications (75 mg of oseltamivir twice daily for 5 days) based on clinical presentation.[14] Pregnant women with an abrupt onset of flu symptoms and any of the following, should be sent to the ED for immediate evaluation: shortness of breath, difficulty breathing, chest pain, inability to keep down liquids, dehydration, decreased responsiveness or confusion, and improvement followed by worsening symptoms.[16]

Special circumstances: Egg allergies and the influenza vaccine. Most influenza vaccines contain trace levels of egg components from the manufacturing process. Pregnant patients with an egg allergy, who only experience hives after ingesting eggs, may receive the influenza vaccine that is appropriate for their age and health.[1,14] Individuals with an egg allergy who experience additional symptoms including angioedema, respiratory distress, lightheadedness or recurrent emesis, or have required epinephrine, may also be vaccinated for influenza, but should do so in a medical setting while supervised by a healthcare provider who is prepared to respond appropriately to a severe allergic reaction.[1,14]

Education

It is important for obstetric providers and pregnant patients to discuss the serious consequences for themselves and their infants if they contract either of these diseases during pregnancy or during the immediate postpartum period.[3] Providers should also explain that it is safe to administer the Tdap and influenza vaccines at the same visit, which may improve vaccination adherence rates.[10] Of note, one study found that women who accept the influenza vaccine during pregnancy have higher rates of Tdap vaccination as well.[7]

Providers should address patients' safety concerns and use CDC and professional organizations' educational resources on the topic.[3] Vaccine refusal during pregnancy may be rooted in safety concerns, a lack of understanding about the importance of the vaccine for infant well-being, financial reasons, and negative, ineffective, or nonexistent interactions with healthcare providers.[7] Tdap vaccines do not contain thimerosal, a preservative with traces of mercury that is a source of concern for some patients despite a lack of evidence showing any association with harm.[10] Multidose vials of influenza vaccine do contain traces of thimerosal, and though there is a thimerosal-free formulation of the vaccine available, the CDC has approved either formulation for pregnant women.[14] Evidence shows no increased risk for autism spectrum disorder or adverse reactions associated with these vaccines while the risks of not being vaccinated during pregnancy are substantial.[10] If patients refuse vaccination, the provider should document the discussion and readdress the recommendation during future visits.[10]

When to discuss vaccinations

In some studies, Tdap vaccinations occurred later in pregnancy than recommended because of patient reluctance when initially presented with the information. Administering the Tdap vaccine after 36 weeks increases the chance of inadequate transfer of antibodies before the delivery of the infant.[7] Patients who are initially reluctant may opt for vaccination after multiple conversations over several visits.[7] For this reason, it is advisable to discuss the vaccination recommendation before the time of administration to provide patients with the opportunity to voice concerns and address them in earlier visits to avoid delays in the appropriate administration window.[7] Administering the Tdap vaccine earlier than 27 weeks gestation is not recommended, unless indicated for another reason, since it is sometimes associated with insufficient transfer of maternal antibodies.[8]

Who else needs to be vaccinated to protect newborns?

The CDC recommends all children age 6 months or older and all adults receive an annual influenza vaccine unless contraindicated.[1] Children younger than 9 years old require two doses of the influenza vaccine at least 4 weeks apart, unless they have previously received at least two doses of trivalent or quadrivalent influenza vaccine more than 4 weeks apart in previous influenza seasons, in which case only one dose is required. Beginning the vaccination process early in the influenza season is particularly important for this group.[1]

Unfortunately, more than half of infants who develop pertussis are infected by close contacts, most often their mothers.[8] When an individual in a household is infected with pertussis, 80% of susceptible household contacts will become infected as well.[4,8] Providers should encourage the appropriate vaccination of pregnant women as well as all of those who are close contacts with the infant under the age of 1 year. Close contacts should have had at least one dose of Tdap after age 11 years, at least 2 weeks before interacting with the infant.[10]

Women who have never received a Tdap vaccination before or during pregnancy should be vaccinated appropriately in the immediate postpartum period.[10] In addition, ensuring infants begin and follow the recommended childhood vaccination schedule in a timely manner is important to guarantee coverage for infants.[5] Last, it is important for providers and healthcare staff to be appropriately vaccinated to protect vulnerable patients seeking their care.[14]

The CDC currently recommends all healthcare workers have an annual influenza vaccine and a single Tdap vaccination (after age 11 years) followed by a repeat vaccination with Td or Tdap every 10 years.[17] In October of 2019, the Advisory Committee on Immunization Practices indicated that the decennial booster may be with the Td or Tdap vaccine.[17] Because infants are at the greatest risk of contracting pertussis from healthcare personnel, if revaccination with a Tdap booster is going to occur, those who work with infants or pregnant women should be prioritized recipients of the vaccine.[18] Of interest, in many European countries, a Tdap booster is recommended every 10 years because of waning immunity associated with the vaccine.[11]

Location of vaccination services

Recommending and administering vaccines at the obstetric provider's clinical site is the best practice supported in the literature and produces the highest vaccination rates.[10] If the vaccine is not available in the obstetric care site, providers should still recommend and refer pregnant women for vaccination at an available location.[3,10] The Tdap and influenza vaccines are available at many major pharmacies as well as through primary care practices, community vaccination sites, or local health department clinics. If obtained elsewhere, documentation should be given to the obstetric care providers as well.[10] In addition to focusing on the importance of providers consistently recommending the vaccines, coordinated efforts should be made to educate the obstetric office and administrative staff about the importance of these vaccines.[7] Uncertain or unknowledgeable office personnel negatively impact patients' acceptance of these vaccines. Educating and involving office personnel is key to the success of a vaccine administration initiative including the provision of standing orders, with an approved protocol, to allow nonprovider personnel to administer the vaccine appropriately.[7]

Addressing disparities

Particular attention should be focused on ensuring vaccinations are offered to and concerns are discussed with African-American women, who are less likely to report having a provider recommend or refer for vaccination.[3] African-American women are significantly less likely to be vaccinated during pregnancy; in fact, one study reports African-American women are 60% less likely to receive the Tdap vaccine during pregnancy.[7] Even with provider recommendation, during pregnancy, less than half of African-American women accepted the influenza vaccine as compared with close to 70% acceptance rates for white women.[3] Rates were only minimally higher when Tdap vaccines were offered by healthcare providers to pregnant women. Fifty-three percent of African-American women accepted Tdap vaccination during pregnancy compared with more than 77% of white women.[3] If offered, reasons associated with declining the vaccine include doubting the vaccine effectiveness, fear of contracting the illness from the vaccine, and general mistrust of the provider or healthcare system.[7] Culturally appropriate educational material, trusted healthcare providers from similar backgrounds, and more patient-centered provider communication may help overcome these barriers.[3]

In addition, financial resources impact vaccine acceptance. When the state Medicaid system does not cover the cost of vaccines, significant disparities exist. In a recent study, in a state without vaccination coverage, only 13.4% of women enrolled in Medicaid received the Tdap vaccine in pregnancy, while 68.6% of privately insured women did.[19] When the Tdap vaccine was offered free of charge to these same women in the immediate postpartum period, Tdap vaccination rates for Medicaid enrollees increased to 51.7%. Similar effects were seen with the influenza vaccine. Addressing cost and access barriers is strongly associated with increased acceptance and use of vaccines.[19]

NPs and nurse-midwives treat the whole patient, which means listening to and addressing the concerns of patients who are pregnant. As trusted health advisors, NPs must ensure that their knowledge of vaccination recommendations is current and that they share this information with pregnant patients. Increasing the Tdap and influenza vaccination rates in pregnant women helps protect patients and their newborns from potentially life-threatening complications associated with these diseases. NP

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