

Best Practices to Improve Maternal Immunization



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Our recommended software and hardware configuration is the following:

Windows



Processor: 850MHz or faster processor (or above)
Operating System: Windows XP/2000/98
Memory: 512MB of RAM (or above)
Screen Resolution: 1024 x 768 (or above)
Microsoft Internet Explorer 5.5 (or higher) or Mozilla Firefox 1.5
Adobe Flash Player 8 (or higher)
Adobe Acrobat 6 (or higher)

Macintosh



Processor: G3 500MHz or faster processor (or above)
Operating System: OS 10.3 (or above)
Memory: 512MB of RAM (or above)
Screen Resolution: 1024 x 768 (or above)
Mozilla Firefox 1.5 or Safari 1.2.2 browser supported for Mac OS X 10.3 or higher
Adobe Flash Player 8 (or higher)
Adobe Acrobat 6 (or higher)

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PROVIDING HEALTH CARE FOR WOMEN

Learning Objectives

- Emphasize the importance of maternal immunizations
- Update on current recommendations for maternal immunization and the future of maternal immunization
- Discuss practical tips to incorporate immunizations into your practice
- Identify and locate resources for providers and patients regarding immunizations



Vaccines are not just for children...

- Maternal vaccination saves lives!
- Routine adult vaccine recommendations are based on recommendations from the [Advisory Committee on Immunization Practices \(ACIP\)](#)
- Visit ACOG's <http://immunizationforwomen.org/> for Adult, Maternal, and Childhood/Adolescent Immunization Schedules

Advancing Maternal Vaccination

- Maternal vaccination is an important strategy to protect against diseases that disproportionately threaten newborns and young infants, as well as the mother
 - Tetanus
 - Influenza
 - Pertussis
- New vaccines are in development for administration during pregnancy to protect mothers and infants
 - Group B Streptococcus (GBS)
 - Respiratory Syncytial Virus (RSV)

Benefits of Vaccinating Mothers During Pregnancy

- Maternal vaccination enhances immunity for both mother and baby
- Maternal antibodies will protect the mother from infection
- Maternal antibodies will cross the placenta and also protect newborns and young infants
- Transplacental antibodies provide protection during a vulnerable period before a baby's immune system matures and can adequately respond to a vaccine
- Breast milk antibodies could also contribute to infant protection

Recommended Vaccines in Pregnancy: Influenza

Influenza and Pregnancy

- **1918:** Mortality associated with infection during latter part of pregnancy ~50-61% (pneumonia)
- **1957:** 50% of women of childbearing age who died of influenza were pregnant; 10% of all influenza deaths that season were in pregnant women (most in latter half of pregnancy)
- **Since 2005 – H5N1:**
 - Six affected pregnant women, 4 did not survive, 2 survivors had spontaneous abortions
 - Post-mortem studies suggest possible mother to fetus transmission via placenta
- Interpandemic case reports of complications since 1950's – mostly healthy women in later stages of pregnancy

Harris. JAMA 1918;14:979 / 2. Freeman and Barro. Am J Ob Gyn 1959;78:1172 / 3. Abdel-Ghafer et al., NEJM 2008;358: 261 / 4. Gu et al., Lancet 2007;370:1137/ 5. Ng and To, Lancet 2007; 370:1106 / 6. Neuzil et al Inf Dis Clin N Am 2003;115:123

2009 Influenza A H1N1 and Pregnancy

- Pregnant women were at high risk to be hospitalized, admitted to the ICU (4x), require mechanical ventilation, and die* from influenza, particularly if in 2nd-3rd trimester of gestation or with underlying conditions (asthma)
- 5% of all reported 2009 H1N1 influenza deaths in the U.S. were pregnant women, while only approximately 1% of the population was estimated to be pregnant
- The median age of mothers who died: 25 years (14-43 years old)
- Severe illness in the postpartum period and increased rate of premature birth (30.2%) also documented
- Delayed diagnosis and treatment increased risk of death

Louie, JK, et al. NEJM 2010, 362:27-35; Newsome K, et al. MMWR, 2011;60(35):1193-96
 *All cause maternal mortality California 19.3/100,000; USA 13.3/100,000 – most related to obstetrical factors influenza associated mortality 4.3/100,000

Newborn/Infant Benefits of Maternal Influenza Vaccination

- Decreased risk of acquiring influenza in the first 6 months of life (up to 70%, various prospective and obstetric studies)
- Decreased risk of influenza related hospitalizations in the first 6 months of life (up to 60%)
- Improved pregnancy outcomes also reported, including decrease in preterm birth (OR 0.87) and low birth weight (OR 0.88) (variable effect on SGA)

Steinhoff, Antenatal Influenza Immunization Am J Obstet Gynecol 2012

Influenza Vaccination Recommendations: Pregnant Women

[ACOG Committee Opinion 608](#)

- Influenza vaccination is an **essential** part of prenatal and prepregnancy care
 - Pregnant women have increased morbidity and mortality from influenza
 - Neonates also have increased morbidity and mortality from influenza and cannot be vaccinated until 6 months
 - Keeping mom healthy during pregnancy protects fetus from early delivery



Influenza Vaccination Recommendations: Pregnant Women

Influenza vaccination is recommended for all pregnant women regardless of trimester

- Pregnant women should receive the inactivated vaccine and **NOT** the nasal spray, which is a live vaccine
- Pregnant women can receive the trivalent or the quadrivalent vaccine
- The Flu shot is OK to get while breastfeeding
- The Flu shot has been shown to protect both the mother and her baby (up to 6 months old) from flu

Influenza Vaccination Recommendations: Pregnant Women

Children younger than 6 months old cannot receive the flu vaccine – protecting mom helps protect baby:

- Maternal antibodies cross the placenta and protect newborns
- Vulnerable newborns/young infants are protected by vaccinating family members and caretakers
- Everyone (e.g. siblings, grandparents and babysitters) who will be around the baby should be vaccinated, ideally, before the baby is born
- Encourage extended family members and friends to get vaccinated
- Ensure anyone holding the baby washes their hands first

Inactivated Influenza Vaccine: Effectiveness in Mother and Child

Infants

- Maternal influenza vaccine reduced proven influenza illness in **infants** by 65%
- 29% reduction in any respiratory illness
- 42% reduction in clinic visits

Mothers

- Maternal influenza vaccine reduced respiratory illness with fever by 36%
- Fewer clinic visits

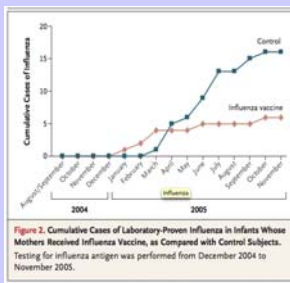
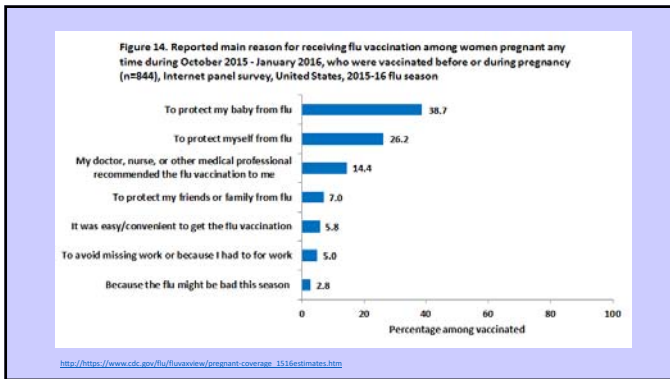


Figure 2. Cumulative Cases of Laboratory-Proven Influenza in Infants Whose Mothers Received influenza Vaccine, as Compared with Control Subjects. Testing for influenza antigen was performed from December 2004 to November 2005.

Zaman, NEJM, 2008



Health Care Personnel: Be the Example

- Make sure all staff members are vaccinated
 - 79% coverage rate for Health Care Personnel for 2015-16 season
 - Coverage was highest among Health Care Personnel working in settings with flu vaccination requirements 96.5%
- Make sure you and your family are vaccinated
- Educate entire staff

Safety of influenza vaccine

How is it monitored ?

- **Vaccine Adverse Event Report System (VAERS)** is a national program, jointly managed by CDC and FDA, which monitors the safety of all vaccines licensed in the United States. Anyone can file a VAERS report.
- **Vaccine Safety Datalink (VSD)** is a vaccine safety system used to both monitor and assess adverse events following vaccination
- **Vaccines and Medications in Pregnancy Surveillance System (VAMPSS)** study

Influenza Vaccine Safety in Recent Studies

Observational studies:

- VAERS ~ 2 million pregnant women vaccinated 2000-03¹
- VAERS ~11.8 million vaccinated from 1990 to 2009²
- VAERS H1N1 vaccinations 2009-10²

ALL: No increased risk of adverse events or pregnancy outcomes vs. background rates

Pool V and Iskander J. Am J Obstet Gynecol 2006;194:1200; 2. Moro et al. Am J Obstet Gynecol 2010; 203:1.e1-e7 3. Moro et al. Am J Obstet Gynecol 2011; 205:43e1-7

Vaccination is Safer than Influenza During Pregnancy

- Norwegian National Registries study
- 113,331 pregnancies in 2009-2010
- 54% of women were vaccinated (2nd-3rd trimester Pandemrix ASO3)
- 492 Fetal deaths – 4.3 per 1000 births (outside pandemic 4.1)
- Vaccination during pregnancy **substantially reduced (70%) the risk of an influenza diagnosis in pregnant women** (Adjusted hazard ratio 0.30; 95% CI, 0.25-0.34)
- Among **pregnant women with influenza, the risk of fetal death was increased** (Adjusted hazard ratio, 1.91; 95% CI 1.07-3.41)
- The risk of fetal death was reduced with vaccination during pregnancy (not significant: Adjusted hazard ratio, 0.88; 95% CI 0.66-1.17)
- Among live births: no association with preterm delivery, low birth weight, low Apgar

Hiberg et al NEJM (2013)

Recommended Vaccines in Pregnancy: Tetanus/Pertussis

What is Tdap?

Tetanus, Diphtheria, and Pertussis

There are four combination vaccines used:

DTaP, **Tdap**, DT, Td

- DTaP and DT are given to children younger than 7 years of age
- **Tdap** and Td are given to older children and adults
 - Upper-case letters in abbreviations = pediatric strength doses of Diphtheria (D), Tetanus (T) toxoids and Pertussis (P) vaccine
 - Lower-case letters in abbreviations = adult strength doses of Diphtheria (d) and Pertussis (p) used in the adolescent/adult-formulations

For Maternal Immunization use **Tdap**

Pertussis (aka whooping cough)

- **Causative organism:**
 - *Bordetella pertussis*, a gram-negative bacterium
 - Uniquely human pathogen
- Incubation 7-10 days, catarrhal stage followed by paroxysm of coughing that can continue for 4-6 weeks
- **Clinical case definition:** Cough illness lasting at least 2 weeks with one of the following: paroxysms of coughing, inspiratory "whoop," or post-tussive vomiting, apnea, without other apparent cause (as reported by a health professional)
- **Can lead to:** rib fractures, weight loss, pneumonia, seizures, brain damage, incontinence and death

Burden of Disease: Pertussis

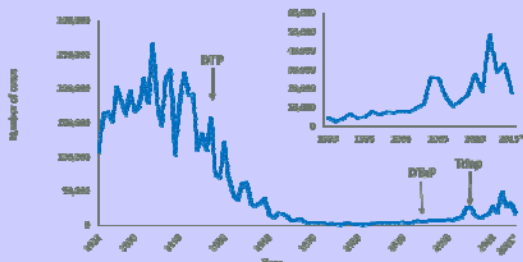
- One of the leading causes of vaccine preventable deaths world-wide
- Up to 2 in 100 adolescents and 5 in 100 adults are hospitalized or have complications such as pneumonia or death
- Pertussis remains a serious infection in young infants. Most deaths occur in the first 3 months of life, before the infant can be protected by their own vaccine series

Newborn/Infant Benefits of Maternal Tdap Vaccination

- Significant impact on maternal-neonatal tetanus
- Decreased risk of acquiring neonatal pertussis (protection up to 90% reported in UK)
- Efficacy in decreasing severity of pertussis
- Efficacy in decreasing pertussis associated hospitalization and deaths

Amirthalingam G et al. The Lancet. 2014
 Baxter R et al. Pediatrics 2017:e20164091
 Winter K, et al. Clin Infect Dis. 2016

Reported NNDSS pertussis cases: 1922-2015*



*2015 data are provisional
 SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System and 1922-1949, passive reports to the Public Health Service

Notice to Readers:
Final 2015 Reports of Notifiable Diseases
 November 25, 2016 / 65(46)
https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6504a.htm?s_cid=mm6504a

Reported Cases: 2014 and 2015
 Weeks 1-53, 2014: 32,971 Weeks 1-52, 2015: 20,762

Reported Case Profiles, By Age

Age	No. of Cases	%	Age Inc. /100,000
< 6 mos	1,970	(6.3)	99.0
6-11 mos	739	(2.3)	37.2
1-4 yrs	3,739	(11.3)	18.6
5-10 yrs	2,892	(8.8)	14.5
11-19 yrs	6,734	(20.4)	17.9
20+ yrs	4,650	(14.2)	1.9
Unknown	38	(0.1)	N/A
Total	20,762	(100.0)	6.5*

Reported Pertussis Deaths

Age	Deaths*
Infants, aged < 1 yr	3
Persons, aged ≥ 1 yr	3
Total	6

*Total age incidence per 100,000 population from 2014
 based on age-specific rates

Mother-Fetus Antibody Response, Every Pregnancy, Every Infant

- Transplacental transfer of antibodies from mother to infant provides some protection against pertussis in early life
- Immune response to vaccine peaks about 2 weeks after administration, hence:
 - Tdap vaccine is recommended preferably between 27 and 36 weeks gestation, to optimize antibody transfer and protection at birth**
- The level of pertussis antibodies decreases over time, hence:
 - Tdap vaccine should be administered during every pregnancy so that each infant receives high levels of protective antibodies**

Immunizing Pregnant Women DOES Protect Infants

- Pertussis outbreak in England in 2011-2012, with deaths in newborns less than three months
- Program initiated to immunize all pregnant women at 28-37 weeks of gestation
- 92% effective in preventing infant pertussis if mother received the vaccine at least seven days before birth
- No safety issues for the 23,000 infants whose mothers received Tdap in the 3rd trimester

Amirthalingam et al. www.thelancet.com Published online July 16, 2014 [http://dx.doi.org/10.1016/S0140-6736\(14\)60686-3](http://dx.doi.org/10.1016/S0140-6736(14)60686-3)
 Donegan et al. BMJ 2014;349:g4219 doi: 10.1136/bmj.g4219 (Published 11 July 2014)

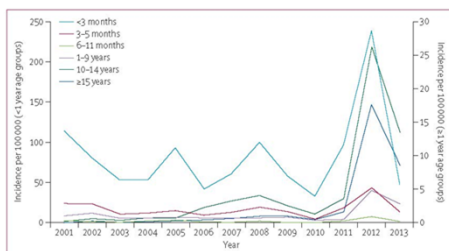


Figure 2: Annual incidence of laboratory-confirmed cases of pertussis by age group. Figure shows incidence from 2001 to 2013 in England only.

Amirthalingam et al. www.thelancet.com Published online July 16, 2014 [http://dx.doi.org/10.1016/S0140-6736\(14\)60686-3](http://dx.doi.org/10.1016/S0140-6736(14)60686-3)

Tdap Vaccine Safety Data

New Study Finds Tdap Vaccine During Pregnancy Not Associated With Increased Risk of Preterm Delivery or Small Birth Size

- Safety of Tdap vaccine during pregnancy
- Analyzed administrative and electronic health record data from two California Vaccine Safety Datalink sites to assess risk of maternal Tdap vaccination during pregnancy for mother or baby
- **The study found that Tdap vaccination during pregnancy was not associated with increased risk for hypertensive disorders of pregnancy, preterm birth, or having a baby who is small for his or her gestational age.**

Kharbanda EO, Vazquez-Benitez G, Lippold HS, et al. Evaluation of the Association of Maternal Pertussis Vaccination With Obstetric Events and Birth Outcomes. JAMA. 2014;312(18):1897-1904. doi:10.1093/jama.2014.14825. <http://jama.jamanetwork.com/article.aspx?articleid=1310817>

Maternal pertussis vaccination -- safety data collected in the United States continue to be reassuring

- Pattern of adverse events observed in VAERS in pregnant women receiving Tdap and their infants is consistent with expectations
- Studies of >50,000 women receiving Tdap during pregnancy in the VSD show no increased risk for adverse maternal or infant health outcomes*
- Clinical study in the CISA Project shows Tdap was well tolerated in both pregnant and non-pregnant women, including pregnant women receiving a repeated Tdap dose

*Kharbanda EO et al. JAMA. 2014;312(18):1897-904.; Sukumaran L, et al. JAMA. 2015;314(15):1583-7; Sukumaran L, et al. ObstetGyn. 2015;126(5): 1069-1074; Kharbanda EO et al. Vaccine 2016; 34: 968-73.

Courtesy of the CDC Immunization Safety Office

Tdap Vaccine Safety Monitoring: We are looking...

- **Vaccine Adverse Event Report System (VAERS)**
 - National program
 - Jointly managed by CDC and FDA
 - Monitors the safety of all vaccines licensed in the United States.
- **Vaccine Safety Datalink (VSD)**
 - Vaccine safety system
 - Monitors and assesses adverse events following vaccination

Effectiveness of maternal Tdap on pertussis severity in infants

Infants born to vaccinated mothers

- Older when developed pertussis
 - Median: 45 days vs. 35 days; $p=0.03$
- Less likely have classic pertussis symptoms
- Significantly lower risk of hospitalization and ICU admission
 - Hospitalization: RR 0.5; $p<0.001$
 - ICU: RR 0.8; $p=0.012$
- No deaths due to pertussis

Winter K, et al. Effectiveness of prenatal Tdap vaccination on pertussis severity in infants. Clin Infect Dis. 2016 Sep 13. [Epub ahead of print]

The Ob-Gyn's Role

Studies show the provider recommendation is the **MOST** influential factor in a patient's decision to receive an immunization.

- Ob-Gyns:
 - long-standing role of providing primary and preventive care to women
 - major source of ambulatory care for women
 - account for 44% of preventive care visits for women over age 18 years
- Pregnant women see their ob-gyn regularly throughout the course of their prenatal and postpartum care allowing for multiple opportunities to vaccinate

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a3.htm?_cid=mm6337a3_eftg
Skinner AR, Saraiya M, Hing E, Henderson JT, Sawaya GF. Women's Clinical Preventive Services in the United States: Who Is Doing What?. JAMA Intern Med. Published online July 07, 2014. doi:10.1001/jamaintern.2014.3003.

Cocooning (*protecting infants by vaccinating those in close contact with them*)

- 2005 ACIP recommendation: cocooning with Tdap vaccine for all those with expected close contact with infants younger than 1 year of age
- Cocooning + maternal Tdap vaccination + childhood DTaP series on schedule → best protection to the infant
- Providers should educate pregnant women about encouraging others (dads, grandparents and other caregivers) to be up-to-date with pertussis vaccination
- Family members & caregivers who aren't current with Tdap vaccine: get vaccinated at least two weeks before coming into contact with the infant

Tips for Incorporating Immunizations Into Ob-Gyn Practice

- Offer an **educational seminar** on value of vaccines to cultural case workers and clinic staff
- Every August/September Dr. Eckert gives an **in-service to nursing and clinic staff** over lunch highlighting the importance of flu vaccines
- Identify a "vaccine champion" in your office
- Staff have to "opt out" of flu vaccine and Tdap vaccine. Those who opt out have to watch an educational video and sign a paper
- Using **standing orders** for flu vaccine

Tips for Incorporating Immunizations Into Ob-Gyn Practice

- Post a **sign on the front desk** when people check in that reads: "Flu vaccine available and strongly recommended"
- Educate patients
- Hanging **signs in bathroom**: "Help prevent your baby from getting the flu or whooping cough"
- Send out EHR reminder through patient portal such as MyChart, early October to all users reminding the patient to receive their flu vaccine.
 - Link this reminder to your flu clinics webpage

Questions?

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Immunization Information for OB-GYNs and Their Patients
