2016
Immunization Update

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Disclosures

- Andrew Kroger is a federal government employee with no financial interest or conflict with the manufacturer of any product named in this presentation.
- I will discuss the off-label use of serogroup meningococcal B vaccine, human papillomavirus (HPV) vaccine, and pneumococcal conjugate vaccine (PCV13)
- I will not discuss a vaccine not currently licensed by the FDA.

What's New?

- 2016 Immunization Schedules
- Serogroup B meningococcal vaccine
- HPV9
- Pertussis vaccine (Tdap)
- Pneumococcal vaccine recommendations
- Immunization Resources

Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2016.

(FOR THOSE WHO FALL BEHIND OR START LATE, SEE THE CATCH-UP SCHEDULE [FIGURE 2]).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16–18 yrs
Hepatitis B[1] (HepB)	1st dose	2nd dose			3rd dose											
Rotavirus[2] (RV) RV1 (2-dose series); RV5 (3-dose series)			1st dose	2nd dose	See footnote 2											
Diphtheria, tetanus, & acellular pertussis[3] (DTaP: <7 yrs)			1st dose	2nd dose	3rd dose			4th dose				5th dose				
Haemophilus influenzae type b[4] (Hib)			1st dose	2nd dose	See footnote 4		3rd or 4th dose, See footnote 4									
Pneumococcal conjugate[5] (PCV13)			1st dose	2nd dose	3rd dose		4th dose									
Inactivated poliovirus[6] (IPV: <18 yrs)			1st dose	2nd dose	3rd dose							4th dose				
Influenza[7] (IIV; LAIV)					Annual vaccination (IIV only) 1 or 2 doses						Annual vaccination (LAIV or IIV) 1 or 2 doses			Annual vaccination (LAIV or IIV) 1 dose only		
Measles, mumps, rubella[8] (MMR)					See footnote 8		1st dose					2nd dose				
Varicella[9] (VAR)							1st dose					2nd dose				
Hepatitis A[10] (HepA)							2-dose series, See footnote 10									
Meningococcal[11] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)			See footnote 11											1st dose		Booster
Tetanus, diphtheria, & acellular pertussis[12] (Tdap: ≥ 7 yrs)														(Tdap)		
Human papillomavirus[13] (2vHPV: females only; 4vHPV, 9vHPV: males and females)														(3-dose series)		
Meningococcal B[11]													See footnote 11			
Pneumococcal polysaccharide[5] (PPSV23)											See footnote 5					

Range of recommended ages for all children

Range of recommended ages for catch-up immunization

Range of recommended ages for certain high-risk groups

Range of recommended ages for non-high-risk groups that may receive vaccine, subject to individual clinical decision making

No recommendation

This schedule includes recommendations in effect as of January 1, 2016. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/hcp/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines/recs/vac-admin/contraindications.htm) or by telephone (800-CDC-INFO [800-232-4636]).

This schedule is approved by the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/acip), the American Academy of Pediatrics (http://www.aap.org), the American Academy of Family Physicians (http://www.aafp.org), and the American College of Obstetricians and Gynecologists (http://www.acog.org).

NOTE: The above recommendations must be read along with the footnotes of this schedule.

FIGURE 2. Catch-up immunization schedule for persons aged 4 months through 18 years who start late or who are more than 1 month behind — United States, 2016.

The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. Always use this table in conjunction with Figure 1 and the footnotes that follow.

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
Children age 4 months through 6 years					
Hepatitis B[7]	Birth	4 weeks	8 weeks *and* at least 16 weeks after first dose. Minimum age for the final dose is 24 weeks.		
Rotavirus[2]	6 weeks	4 weeks	4 weeks[2]		
Diphtheria, tetanus, and acellular pertussis[3]	6 weeks	4 weeks	4 weeks	6 months	6 months[3]
Haemophilus influenzae type b[4]	6 weeks	4 weeks if first dose was administered before the 1st birthday. 8 weeks (as final dose) if first dose was administered at age 12 through 14 months. No further doses needed if first dose was administered at age 15 months or older.	4 weeks[4] if current age is younger than 12 months **and** first dose was administered at younger than age 7 months, **and** at least 1 previous dose was PRP-T (ActHib, Pentacel) or unknown. 8 weeks *and* age 12 through 59 months (as final dose)[4] • if current age is younger than 12 months **and** first dose was administered at age 7 through 11 months (wait until at least 12 months old); OR • if current age is 12 through 59 months **and** first dose was administered before the 1st birthday, **and** second dose administered at younger than 15 months; OR • if both doses were PRP-OMP (PedvaxHIB; Comvax) **and** were administered before the 1st birthday (wait until at least 12 months old). No further doses needed if previous dose was administered at age 15 months or older.	8 weeks (as final dose) This dose only necessary for children age 12 through 59 months who received 3 doses before the 1st birthday.	
Pneumococcal[5]	6 weeks	4 weeks if first dose administered before the 1st birthday. 8 weeks (as final dose for healthy children) if first dose was administered at the 1st birthday or after. No further doses needed for healthy children if first dose administered at age 24 months or older.	4 weeks if current age is younger than 12 months and previous dose given at <7months old. 8 weeks (as final dose for healthy children) if previous dose given between 7-11 months (wait until at least 12 months old); OR if current age is 12 months or older and at least 1 dose was given before age 12 months. No further doses needed for healthy children if previous dose administered at age 24 months or older.	8 weeks (as final dose) This dose only necessary for children aged 12 through 59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age.	
Inactivated poliovirus[6]	6 weeks	4 weeks[6]	4 weeks[6]	6 months[6] (minimum age 4 years for final dose).	
Measles, mumps, rubella[8]	12 months	4 weeks			
Varicella[8]	12 months	3 months			
Hepatitis A[10]	12 months	6 months			
Meningococcal[11] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)	6 weeks	8 weeks[11]	See footnote 11	See footnote 11	
Children and adolescents age 7 through 18 years					
Meningococcal[11] (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)	Not Applicable (N/A)	8 weeks[11]			
Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis[12]	7 years[12]	4 weeks	4 weeks if first dose of DTaP/DT was administered before the 1st birthday. 6 months (as final dose) if first dose of DTaP/DT or Tdap/Td was administered at or after the 1st birthday.	6 months if first dose of DTaP/DT was administered before the 1st birthday.	
Human papillomavirus[13]	9 years	Routine dosing intervals are recommended.[13]			
Hepatitis A[10]	N/A	6 months			
Hepatitis B[7]	N/A	4 weeks	8 weeks **and** at least 16 weeks after first dose.		
Inactivated poliovirus[6]	N/A	4 weeks	4 weeks[6]	6 months[6]	
Measles, mumps, rubella[8]	N/A	4 weeks			
Varicella[8]	N/A	3 months if younger than age 13 years. 4 weeks if age 13 years or older.			

NOTE: The above recommendations must be read along with the footnotes of this schedule.

Recommended Adult Immunization Schedule—United States - 2016

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended immunization schedule for adults aged 19 years or older, by vaccine and age group[1]

VACCINE ▼ / AGE GROUP ▶	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
Influenza*[,2]	1 dose annually					
Tetanus, diphtheria, pertussis (Td/Tdap)*[,3]	Substitute Tdap for Td once, then Td booster every 10 yrs					
Varicella*[,4]	2 doses					
Human papillomavirus (HPV) Female*[,5]	3 doses					
Human papillomavirus (HPV) Male*[,5]	3 doses					
Zoster[6]					1 dose	
Measles, mumps, rubella (MMR)*[,7]	1 or 2 doses depending on indication					
Pneumococcal 13-valent conjugate (PCV13)*[,8]	1 dose					
Pneumococcal 23-valent polysaccharide (PPSV23)[8]	1 or 2 doses depending on indication					1 dose
Hepatitis A*[,9]	2 or 3 doses depending on vaccine					
Hepatitis B*[,10]	3 doses					
Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)*[,11]	1 or more doses depending on indication					
Meningococcal B (MenB)[11]	2 or 3 doses depending on vaccine					
Haemophilus influenzae type b (Hib)*[,12]	1 or 3 doses depending on indication					

*Covered by the Vaccine Injury Compensation Program

Recommended for all persons who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection; zoster vaccine is recommended regardless of past episode of zoster

Recommended for persons with a risk factor (medical, occupational, lifestyle, or other indication)

No recommendation

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at www.cdc.gov/vaccines or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m. - 8:00 p.m. Eastern Time, Monday - Friday, excluding holidays.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the America College of Physicians (ACP), the American College of Obstetricians and Gynecologists (ACOG) and the American College of Nurse-Midwives (ACNM).

Figure 2. Vaccines that might be indicated for adults aged 19 years or older based on medical and other indications[1]

VACCINE ▼ / INDICATION ▶	Pregnancy	Immuno-compromising conditions (excluding HIV infection)[4,6,7,8,13]	HIV infection CD4+ count (cells/μL)[4,6,7,8,13] < 200	HIV infection CD4+ count (cells/μL)[4,6,7,8,13] ≥ 200	Men who have sex with men (MSM)	Kidney failure, end-stage renal disease, on hemodialysis	Heart disease, chronic lung disease, chronic alcoholism	Asplenia and persistent complement component deficiencies[8,11,12]	Chronic liver disease	Diabetes	Healthcare personnel
Influenza*[2]	1 dose annually										
Tetanus, diphtheria, pertussis (Td/Tdap)*[3]	1 dose Tdap each pregnancy	Substitute Tdap for Td once, then Td booster every 10 yrs									
Varicella*[4]	Contraindicated			2 doses							
Human papillomavirus (HPV) Female*[5]		3 doses through age 26 yrs				3 doses through age 26 yrs					
Human papillomavirus (HPV) Male*[5]		3 doses through age 26 yrs				3 doses through age 21 yrs					
Zoster[6]	Contraindicated				1 dose						
Measles, mumps, rubella (MMR)*[7]	Contraindicated			1 or 2 doses depending on indication							
Pneumococcal 13-valent conjugate (PCV13)*[8]		1 dose									
Pneumococcal polysaccharide (PPSV23)[8]	1, 2, or 3 doses depending on indication										
Hepatitis A*[9]	2 or 3 doses depending on vaccine										
Hepatitis B*[10]	3 doses										
Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)*[11]	1 or more doses depending on indication										
Meningococcal B (MenB)[11]	2 or 3 doses depending on vaccine										
Haemophilus influenzae type b (Hib)*[12]		3 doses post-HSCT recipients only	1 dose								

*Covered by the Vaccine Injury Compensation Program

Recommended for all persons who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection; zoster vaccine is recommended regardless of past episode of zoster

Recommended for persons with a risk factor (medical, occupational, lifestyle, or other indication)

No recommendation

Contraindicated

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These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly recommended for adults aged ≥19 years, as of February 2016. For all vaccines being recommended on the Adult Immunization Schedule: a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/hcp/acip-recs/index.html). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

TABLE. Contraindications and precautions to commonly used vaccines in adults [1,*]

Vaccine	Contraindications	Precautions
Influenza, inactivated (IIV)[2]	• Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine; or to a vaccine component, including egg protein	• Moderate or severe acute illness with or without fever • History of Guillain-Barré Syndrome within 6 weeks of previous influenza vaccination • Adults with egg allergy of any severity may receive RIV; adults with hives-only allergy to eggs may receive IIV with additional safety measures[2]
Influenza, recombinant (RIV)	• Severe allergic reaction (e.g., anaphylaxis) after previous dose of RIV or to a vaccine component. RIV does not contain any egg protein[2]	• Moderate or severe acute illness with or without fever • History of Guillain-Barré Syndrome within 6 weeks of previous influenza vaccination
Influenza, live attenuated (LAIV)[2,3]	• Severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine, or to a previous dose of any influenza vaccine • In addition, ACIP recommends that LAIV not be used in the following populations: — pregnant women — immunosuppressed adults — adults with egg allergy of any severity — adults who have taken influenza antiviral medications (amantadine, rimantadine, zanamivir, or oseltamivir) within the previous 48 hours; avoid use of these antiviral drugs for 14 days after vaccination	• Moderate or severe acute illness with or without fever • History of Guillain-Barré Syndrome within 6 weeks of previous influenza vaccination • Asthma in persons aged 5 years and older • Other chronic medical conditions, e.g., other chronic lung diseases, chronic cardiovascular disease (excluding isolated hypertension), diabetes, chronic renal or hepatic disease, hematologic disease, neurologic disease, and metabolic disorders
Tetanus, diphtheria, pertussis (Tdap); tetanus, diphtheria (Td)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component • For pertussis-containing vaccines: encephalopathy (e.g., coma, decreased level of consciousness, or prolonged seizures) not attributable to another identifiable cause within 7 days of administration of a previous dose of Tdap, diphtheria and tetanus toxoids and pertussis (DTP), or diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine	• Moderate or severe acute illness with or without fever • Guillain-Barré Syndrome within 6 weeks after a previous dose of tetanus toxoid-containing vaccine • History of Arthus-type hypersensitivity reactions after a previous dose of tetanus or diphtheria toxoid-containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus toxoid-containing vaccine • For pertussis-containing vaccines: progressive or unstable neurologic disorder, uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized
Varicella[4]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component • Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,[4] or patients with human immunodeficiency virus [HIV] infection who are severely immunocompromised) • Pregnancy	• Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)[5] • Moderate or severe acute illness with or without fever • Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; avoid use of these antiviral drugs for 14 days after vaccination
Human papillomavirus (HPV)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever • Pregnancy
Zoster[4]	• Severe allergic reaction (e.g., anaphylaxis) to a vaccine component • Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, or long-term immunosuppressive therapy,4 or patients with HIV infection who are severely immunocompromised) • Pregnancy	• Moderate or severe acute illness with or without fever • Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; avoid use of these antiviral drugs for 14 days after vaccination
Measles, mumps, rubella (MMR)[3]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component • Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,[4] or patients with HIV infection who are severely immunocompromised) • Pregnancy	• Moderate or severe acute illness with or without fever • Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)[5] • History of thrombocytopenia or thrombocytopenic purpura • Need for tuberculin skin testing[6]
Pneumococcal conjugate (PCV13)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component, including to any vaccine containing diphtheria toxoid	• Moderate or severe acute illness with or without fever
Pneumococcal polysaccharide (PPSV23)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever
Hepatitis A	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever
Hepatitis B	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever
Meningococcal, conjugate (MenACWY); meningococcal, polysaccharide (MPSV4)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever
Meningococcal serogroup B (MenB)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever
Haemophilus influenzae Type b (Hib)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	• Moderate or severe acute illness with or without fever

1. Vaccine package inserts and the full ACIP recommendations for these vaccines should be consulted for additional information on vaccine-related contraindications and precautions and for more information on vaccine excipients. Events or conditions listed as precautions should be reviewed carefully. Benefits of and risks for administering a specific vaccine to a person under these circumstances should be considered. If the risk from the vaccine is believed to outweigh the benefit, the vaccine should not be administered. If the benefit of vaccination is believed to outweigh the risk, the vaccine should be administered. A contraindication is a condition in a recipient that increases the chance of a serious adverse reaction. Therefore, a vaccine should not be administered when a contraindication is present.
2. For more information on use of influenza vaccines among persons with egg allergies and a complete list of conditions that CDC considers to be reasons to avoid receiving LAIV, see CDC. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP) — United States, 2015–16 Influenza Season. *MMWR* 2015;64(30):818-25.
3. LAIV, MMR, varicella, or zoster vaccines can be administered on the same day. If not administered on the same day, live vaccines should be separated by at least 28 days.
4. Immunosuppressive steroid dose is considered to be ≥2 weeks of daily receipt of 20 mg of prednisone or the equivalent. Vaccination should be deferred for at least 1 month after discontinuation of such therapy. Providers should consult ACIP recommendations for complete information on the use of specific live vaccines among persons on immune-suppressing medications or with immune suppression because of other reasons.
5. Vaccine should be deferred for the appropriate interval if replacement immune globulin products are being administered. See CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2011;60(No. RR-2). Available at www.cdc.gov/vaccines/pubs/pinkbook/index.html.
6. Measles vaccination might suppress tuberculin reactivity temporarily. Measles-containing vaccine may be administered on the same day as tuberculin skin testing. If testing cannot be performed until after the day of MMR vaccination, the test should be postponed for at least 4 weeks after the vaccination. If an urgent need exists to skin test, do so with the understanding that reactivity might be reduced by the vaccine.

* Adapted from CDC. Table 6. Contraindications and precautions to commonly used vaccines. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices. MMWR 2011;60(No. RR-2):40–41 and from Hamborsky J, Kroger A, Wolfe C, eds. Appendix A. Epidemiology and prevention of vaccine preventable diseases. 13th ed. Washington, DC: Public Health Foundation, 2015. Available at www.cdc.gov/vaccines/pubs/pinkbook/index.html.

† Regarding latex allergy, consult the package insert for any vaccine administered.

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Meningococcal Disease

Meningococcal Vaccines

TABLE 1. Licensed meningococcal vaccines — United States, 1981–2012

Formulation	Type	Trade name	Manufacturer	Licensed (yr)	Age group	Dose(s)	Serogroups
MPSV4*	Polysaccharide	Menomune	Sanofi Pasteur	1981	≥2 yrs	Single dose	A, C, W, and Y
MenACWY-D†	Conjugate	Menactra	Sanofi Pasteur	2005	11–55 yrs	Single dose	A, C, W, and Y
MenACWY-D†	Conjugate	Menactra	Sanofi Pasteur	2007	2–10 yrs	Single dose	A, C, W, and Y
MenACWY-D†	Conjugate	Menactra	Sanofi Pasteur	2011	9–23 mos	2-dose series	A, C, W, and Y
MenACWY-CRM§	Conjugate	Menveo	Novartis	2010	11–55 yrs	Single dose	A, C, W, and Y
MenACWY-CRM§	Conjugate	Menveo	Novartis	2011	2–10 yrs	Single dose	A, C, W, and Y
Hib-MenCY-TT¶	Conjugate	MenHibrix	GlaxoSmithKline	2012	6 wks–18 mos	4-dose series	C and Y

* Package insert available at http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM308370.pdf.
† Package insert available at http://www.fda.gov/downloads/BiologicBloodVaccines/Vaccines/ApprovedProducts/UCM131170.pdf.
§ Package insert available at http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM201349.pdf.
¶ Package insert available at http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM308577.pdf.

Meningococcal Conjugate Vaccines

- Meningococcal polysaccharide conjugated to protein carrier
- Elicit both T- and B-cell immunity (T-cell dependent immunity)
- 3 brands currently licensed in the United States (2 brands for adults, both quadrivalent MenACWY)

Traveler to High-risk Area, Present During Outbreak Caused by Vaccine Serogroup, Microbiologists Working with *Neisseria meningitidis*

Age Group	Primary Dose(s)	Booster Dose(s)
2 – 18 mos.	MenACWY-CRM at ages 2, 4, 6, and 12–15 mos. May use Hib-MenCY if an outbreak caused by serogroup C or Y	If risk continues, give initial booster after 3 yrs. followed by boosters every 5 yrs.
7-23 mos. if no prior MenACWY-CRM or Hib-MenCY	Give 2 doses MenACWY-CRM 3 mos. apart* (if age 7–23 mos.)** or MenACWY-D (if age 9–23 mos.)	

*Minimum interval 2 mos. If needed for travel

**If using MenACWY-CRM, do not give dose 2 before 12 mos. of age

Traveler to High-risk Area, Present During Outbreak Caused by Vaccine Serogroup, Microbiologists Working with *Neisseria meningitidis*

Age Group	Primary Dose(s)	Booster Dose(s)
2 – 55 yrs.	1 dose of MenACWY*	Boost every 5 yrs. with MenACWY (1st booster after 3 yrs. If primary dose(s) <7rs., then every 5 yrs. if risk remains)
56 yrs. and older	If no previous MenACWY dose and either short-term travel or outbreak-related, 1 dose of MPSV; all others, 1 dose of MenACWY	Boost every 5 yrs. with MenACWY if risk remains

*2-dose primary series 2 mos. apart if HIV+

People with Persistent Complement Component Deficiencies

Age Group	Primary Dose(s)	Booster Dose(s)
2 – 18 mos.	Give MenACWY-CRM or Hib-MenCY at ages 2, 4, 6 and 12–15 mos.	Give MenACWY booster after 3 yrs. followed by boosters every 5 yrs. thereafter
7-23 mos. if no prior MenACWY-CRM or Hib-MenCY	Give 2 doses MenACWY-CRM 3 mos. apart (if age 7–23 mos.)* or MenACWY-D (if age 9–23 mos.)	

*If using MenACWY-CRM, do not give dose 2 before 12 mos. of age

People with Persistent Complement Component Deficiencies

Age Group	Primary Dose(s)	Booster Dose(s)
2 – 55 yrs.	2 doses of MenACWY, 2 mos. apart	Boost every 5 yrs. with MenACWY* (1st boost after 3 yrs. If primary dose(s) <7rs., then every 5 yrs.) if risk remains)
56 yrs. and older	2 doses of MenACWY, 2 mos. apart	Boost every 5 yrs. with MenACWY*

*If person received a 1-dose primary series, give booster at earliest opportunity, then boost every 5 years

People with Functional or Anatomic Asplenia, Including Sickle Cell Disease

Age Group	Primary Dose(s)	Booster Dose(s)
2 – 18 mos.	Give MenACWY-CRM or Hib-MenCY at ages 2, 4, 6 and 12–15 mos.	Give MenACWY booster after 3 yrs. followed by boosters every 5 yrs. thereafter
19-23 mos. if no prior MenACWY-CRM or Hib-MenCY	2 doses of MenACWY-CRM, 3 mos. apart	

People with Functional or Anatomic Asplenia, Including Sickle Cell Disease

Age Group	Primary Dose(s)	Booster Dose(s)
2 – 55 yrs.	2 doses of MenACWY, 2 mos. apart	Boost every 5 yrs. with MenACWY* (1st boost after 3 yrs. If primary dose(s) <7rs., then every 5 yrs.) if risk remains)
56 yrs. and older	2 doses of MenACWY, 2 mos. apart	Boost every 5 yrs. with MenACWY*

*Children should complete their PCV13 series before vaccination with MenACWY-D; MenACWY-D should be given at least 4 wks. after last dose of PCV13. MenACWY-CRM or Hib-MenCY may be given at any time before or after PCV13

MenACWY Recommendations and HIV

- HIV infection alone is **not** an indication for MenACWY vaccination
- Persons with HIV infection show evidence of suboptimal response to vaccination
- Some persons with HIV infection should receive MenACWY (adolescents, some international travelers, microbiologists, etc.)
- Persons with HIV infection who are vaccinated with MenACWY should receive 2 doses at least 8 weeks apart

MMWR 2013;62(RR-2):1-28

The “Meningitis Belt”

wwwnc.cdc.gov/travel/yellowbook/

Routine Adolescent Recommendations Meningococcal Conjugate Vaccine (MCV4) (Menactra or Menveo)

Preteens 11-12 yrs*	Dose #1
Catch-up for teens 13-15 yrs.	Dose #1
Teens 16-18 yrs.**	Dose #2
Catch-up 16-18 yrs.	Dose #1
First year college students, 19-21 yrs., living in residence halls	Dose #1

*2-dose primary series 2 mos. apart if HIV+
**Minimum interval between doses is 8 wks.

Meningococcal Vaccination Recommendations for College Students

- **First-year college students living in residence halls**
  - At least 1 dose of MenACWY before college entry, preferably on or after their 16th birthday
- **If only 1 dose of vaccine was administered before the 16th birthday, a booster dose should be administered before enrollment.**
- **For ease of program implementation, persons aged ≤21 years should have documentation of receipt of meningococcal conjugate vaccine not more than 5 years before enrollment**

MenACWY Revaccination Recommendations

- **Other high-risk persons recommended for boosters:**
  - Microbiologists with prolonged exposure to *Neisseria meningitidis*
  - Frequent travelers to or persons living in areas with high rates of meningococcal disease (see next slide)
- **Revaccinate every 5 years as long as the person remains at increased risk**
  - MenACWY for persons 2 through 55 years of age
  - MenACWY for persons 56 years and older also (off-label recommendation) if repeated vaccination anticipated

*Off-label recommendation. *MMWR* 2013;62(RR-2):10-11

International Travelers and Revaccination*

- **International travelers should receive a booster dose of MenACWY if the last dose was administered 5 or more years previously**
  - Vaccination in the 3 years before the date of travel is required by the government of Saudi Arabia for all travelers to Mecca during the annual Hajj

*CDC Travelers Health website at http://www.cdc.gov/travel

Meningococcal B Vaccines

Product Name/ACIP Abbreviation	FDA Age Indications	Dosage/Route/Schedule
Trumenba ® MenB-FHbp	10 through 25 years of age	• 3 doses – 0.5 mL each • IM injection • 0-, 2-, and 6-month
Bexsero® MenB-4C	10 through 25 years of age	• 2 doses – 0.5 mL each • IM injection • 0, 1–6 month

ACIP MenB Recommendations

- **Certain persons 10 years of age and older* who are at increased risk for meningococcal disease should receive MenB vaccine. These include:**
  - Persons with persistent complement component deficiencies.
  - Persons with anatomic or functional asplenia.**
  - Microbiologists routinely exposed to isolates of *Neisseria meningitidis.*
  - Persons identified as at increased risk because of a serogroup B meningococcal disease outbreak.

*ACIP off-label recommendation

**Including sickle cell disease

www.cdc.gov/mmwr/preview/mmwrhtml/mm6422a3.htm?s_cid=mm6422a3_w

ACIP MenB Recommendations

- **MenB vaccine is NOT recommended for:**
  - High-risk children younger 2 months – 9 years.
  - Persons who travel to or reside in countries where meningococcal disease is hyperendemic or epidemic because risk is generally not caused by serogroup B.
  - Routine use in first-year college students living in residence halls, military recruits, and all adolescents.

Note: MenACWY is recommended

www.cdc.gov/mmwr/preview/mmwrhtml/mm6422a3.htm?s_cid=mm6422a3_w

ACIP MenB Recommendations

MenB vaccine series <u>may be</u> administered to adolescents and young adults 16 through 23 years of age to provide short-term protection against most strains of serogroup B meningococcal disease. The preferred age for MenB vaccination is 16 through 18 years of age.*

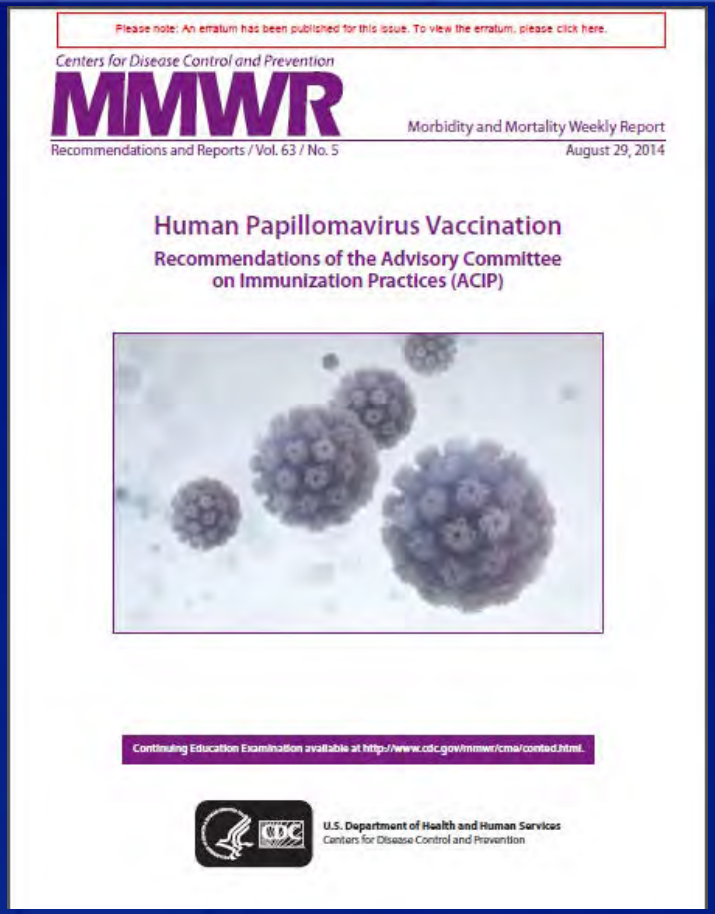
* Permissive recommendation (Category B)

Meningococcal Serogroup B Vaccine Recommendations

- Brands are NOT interchangeable in the same vaccinee
- If two different brands administered to one vaccine – pick which brand is invalid
- Continue with the other brand
- Must use a 4 week interval after the invalid brand, plus remember minimum interval rules between doses in the series of the same brand

Meningococcal Serogroup B Vaccine Recommendations

- **Minimum intervals should be observed between doses of the same vaccine**
  - Bexsero (time zero, time 1 month)
  - Trumenba (time zero, time 1-2 months, time 6 months)
  - If the minimum interval is violated, no need to repeat



Please note: An erratum has been published for this issue. To view the erratum, please click here.

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Recommendations and Reports / Vol. 63 / No. 5

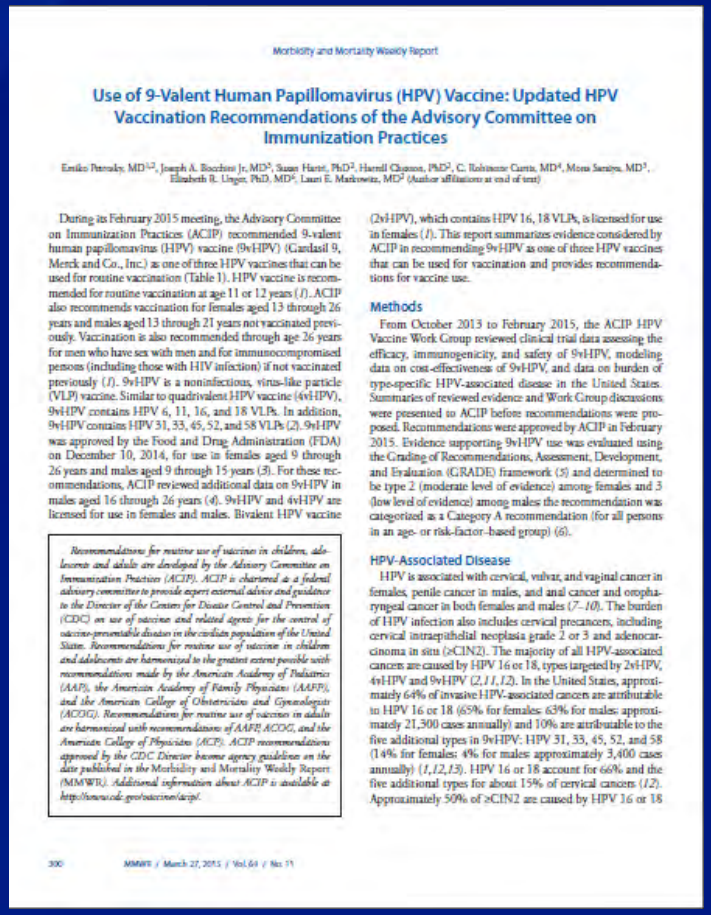
August 29, 2014

Human Papillomavirus Vaccination

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Continuing Education Examination available at http://www.cdc.gov/mmwr/cme/conted.html.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention



Morbidity and Mortality Weekly Report

Use of 9-Valent Human Papillomavirus (HPV) Vaccine: Updated HPV Vaccination Recommendations of the Advisory Committee on Immunization Practices

Emiko Petrosky, MD[1,2], Joseph A. Bocchini Jr, MD[3], Susan Hariri, PhD[2], Harrell Chesson, PhD[2], C. Robinsonne Curtis, MD[4], Mona Saraiya, MD[5], Elizabeth R. Unger, PhD, MD[6], Lauri E. Markowitz, MD[2] (Author affiliations at end of text)

During its February 2015 meeting, the Advisory Committee on Immunization Practices (ACIP) recommended 9-valent human papillomavirus (HPV) vaccine (9vHPV) (Gardasil 9, Merck and Co., Inc.) as one of three HPV vaccines that can be used for routine vaccination (Table 1). HPV vaccine is recommended for routine vaccination at age 11 or 12 years (*1*). ACIP also recommends vaccination for females aged 13 through 26 years and males aged 13 through 21 years not vaccinated previously. Vaccination is also recommended through age 26 years for men who have sex with men and for immunocompromised persons (including those with HIV infection) if not vaccinated previously (*1*). 9vHPV is a noninfectious, virus-like particle (VLP) vaccine. Similar to quadrivalent HPV vaccine (4vHPV), 9vHPV contains HPV 6, 11, 16, and 18 VLPs. In addition, 9vHPV contains HPV 31, 33, 45, 52, and 58 VLPs (*2*). 9vHPV was approved by the Food and Drug Administration (FDA) on December 10, 2014, for use in females aged 9 through 26 years and males aged 9 through 15 years (*3*). For these recommendations, ACIP reviewed additional data on 9vHPV in males aged 16 through 26 years (*4*). 9vHPV and 4vHPV are licensed for use in females and males. Bivalent HPV vaccine (2vHPV), which contains HPV 16, 18 VLPs, is licensed for use in females (*1*). This report summarizes evidence considered by ACIP in recommending 9vHPV as one of three HPV vaccines that can be used for vaccination and provides recommendations for vaccine use.

Recommendations for routine use of vaccines in children, adolescents and adults are developed by the Advisory Committee on Immunization Practices (ACIP). ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the Director of the Centers for Disease Control and Prevention (CDC) on use of vaccines and related agents for the control of vaccine-preventable disease in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), and the American College of Obstetricians and Gynecologists (ACOG). Recommendations for routine use of vaccines in adults are harmonized with recommendations of AAFP, ACOG, and the American College of Physicians (ACP). ACIP recommendations approved by the CDC Director become agency guidelines on the date published in the Morbidity and Mortality Weekly Report (MMWR). Additional information about ACIP is available at http://www.cdc.gov/vaccines/acip/.

Methods

From October 2013 to February 2015, the ACIP HPV Vaccine Work Group reviewed clinical trial data assessing the efficacy, immunogenicity, and safety of 9vHPV, modeling data on cost-effectiveness of 9vHPV, and data on burden of type-specific HPV-associated disease in the United States. Summaries of reviewed evidence and Work Group discussions were presented to ACIP before recommendations were proposed. Recommendations were approved by ACIP in February 2015. Evidence supporting 9vHPV use was evaluated using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework (*5*) and determined to be type 2 (moderate level of evidence) among females and 3 (low level of evidence) among males; the recommendation was categorized as a Category A recommendation (for all persons in an age- or risk-factor–based group) (*6*).

HPV-Associated Disease

HPV is associated with cervical, vulvar, and vaginal cancer in females, penile cancer in males, and anal cancer and oropharyngeal cancer in both females and males (*7–10*). The burden of HPV infection also includes cervical precancers, including cervical intraepithelial neoplasia grade 2 or 3 and adenocarcinoma in situ (≥CIN2). The majority of all HPV-associated cancers are caused by HPV 16 or 18, types targeted by 2vHPV, 4vHPV and 9vHPV (*2,11,12*). In the United States, approximately 64% of invasive HPV-associated cancers are attributable to HPV 16 or 18 (65% for females; 63% for males; approximately 21,300 cases annually) and 10% are attributable to the five additional types in 9vHPV: HPV 31, 33, 45, 52, and 58 (14% for females; 4% for males; approximately 3,400 cases annually) (*1,12,13*). HPV 16 or 18 account for 66% and the five additional types for about 15% of cervical cancers (*12*). Approximately 50% of ≥CIN2 are caused by HPV 16 or 18

300 MMWR / March 27, 2015 / Vol. 64 / No. 11

HUMAN PAPILLOMAVIRUS (HPV) VACCINATION

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html

Updated ACIP Recommendations

- **Vaccinate males and females at 11-12 years.***
- **Catch up those previously unvaccinated or missing doses:**
  - Females age 13 through 26 years.
  - Males age 13 though 21 years.**
  - High-risk males age 21 through 26 years.**
  - Men who have sex with men and immunocompromised men (including HIV-infected men).
- **Use:**
  - 2vHPV, 4vHPV, or 9vHPV for females.
  - 4vHPV or 9vHPV** for males.

*Vaccination series can be started at 9 years of age

**ACIP off-label recommendation. MMWR 2015;64:300-4

Updated ACIP Recommendations Administration

- **Administer in a 3-dose schedule*:**
  - Dose 2: Administer at least 1 to 2 months after the first dose.
  - Dose 3: Administer at least:
    - 12 weeks after dose 2 AND:
    - 6 months (24 weeks) after dose 1.
  - If the vaccination schedule is interrupted, the series does not need to be restarted.
- **IM injection.**

*ACIP off-label recommendation

MMWR 2015;64(29):300-4

9vHPV vaccination for persons who completed a HPV vaccination series

- The manufacturer did not seek an indication for 9vHPV vaccination for persons who previously completed a HPV vaccination series
- No studies of 9vHPV in prior 1 or 2 dose 4vHPV vaccinees
- A study of 9vHPV in prior (3 dose) 4vHPV vaccinees was conducted

Updated ACIP Recommendations Interchangeability*

- **If vaccination providers do not know or do not have available the HPV vaccine product previously administered, or are in settings transitioning to 9vHPV, for protection against HPV 16 and 18:**
  - Females: Any HPV vaccine product may be used to continue or complete the series.
  - Males: 4vHPV or 9vHPV* may be used to continue or complete the series for males.

*ACIP off-label recommendation. MMWR 2015;64(29):300-4

Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap) Vaccine in Adults Aged 65 Years and Older — Advisory Committee on Immunization Practices (ACIP), 2012

Since 2005, the Advisory Committee on Immunization Practices (ACIP) has recommended a tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine booster dose for all adolescents aged 11 through 18 years (preferred at 11 through 12 years) and for those adults aged 19 through 64 years who have not yet received a dose (*1,2*). In October 2010, despite the lack of an approved Tdap vaccine for adults aged 65 years and older, ACIP recommended that unvaccinated adults aged 65 years and older be vaccinated with Tdap if in close contact with an infant, and that other adults aged 65 years and older may receive Tdap (*3*). In July 2011, the Food and Drug Administration (FDA) approved expanding the age indication for Boostrix (GlaxoSmithKline Biologicals, Rixensart, Belgium) to aged 65 years and older (*4*). In February 2012, ACIP recommended Tdap for all adults aged 65 years and older. This recommendation supersedes previous Tdap recommendations regarding adults aged 65 years and older.

The Pertussis Vaccines Work Group of ACIP reviewed the epidemiology of pertussis in adults aged 65 years and older and two cost-effectiveness models to assess the epidemiologic and economic impact of pertussis vaccination in this population. The Work Group also considered safety and immunogenicity data from clinical trials and observational studies on the use of Tdap in adults aged 65 years and older (*3*).

The two Tdap vaccines available in the United States, Boostrix and Adacel (Sanofi Pasteur, Toronto, Canada), differ in composition and approved age for use (Table). Only Boostrix is approved for adults aged 65 years and older; however, ACIP discussed the use of Adacel in this age group. On February 22, 2012, ACIP approved use of Tdap for all adults aged 65 years and older. This report summarizes data considered and conclusions made by ACIP and provides guidance for implementing the recommendation.

The Pertussis Vaccines Work Group of ACIP reviewed the epidemiology of pertussis in adults aged 65 years and older and two cost-effectiveness models to assess the epidemiologic and economic impact of pertussis vaccination in this population. The Work Group also considered safety and immunogenicity data from clinical trials and observational studies on the use of Tdap in adults aged 65 years and older (*3*). The Work Group then presented policy options for consideration to the full ACIP.

Epidemiology of Pertussis in Older Adults

Because pertussis is underdiagnosed and underreported substantially in all age groups, the actual burden of disease in adults aged 65 years and older is unknown (*5*). During 2000–2010, an annual average of 318 pertussis cases (range: 71–719 cases) in adults aged 65 years and older were reported each year through the National Notifiable Diseases Surveillance System (CDC, unpublished data, 2011). Challenges to diagnosing and reporting pertussis in all adults include 1) underrecognition of pertussis as a cause for cough illness, 2) atypical presentation of symptoms in adults, and 3) a low index of suspicion among providers (*6,7*). Few studies are focused on the burden of pertussis in adults aged 65 years and older. Among reported prospective studies, the calculated pertussis incidence ranged from 66 to 500 cases per 100,000 persons per year (*8–11*). Reported pertussis incidence ranges from one to five cases per 100,000 in adults of similar age ranges (CDC, unpublished data, 2011); this 70-fold to 100-fold difference suggests that actual pertussis incidence in older adults is much higher than reported (CDC, unpublished data, 2011). ACIP supported the conclusion that the actual burden of pertussis in adults aged 65 years and older likely is at least 100 times greater than that reported.

Cost Effectiveness Analysis

ACIP reviewed two unpublished cost-effectiveness models, developed independently by GlaxoSmithKline and CDC (*12,13*). Both models were developed to assess the epidemiologic and economic impact of Tdap vaccination in adults aged 65 years and older and demonstrated that a dose of Tdap for older adults resulted in a moderate decrease in the number of cases and outcomes (e.g., outpatient visits, hospitalizations, and deaths), which might represent a cost-effective intervention. Model results were most sensitive to incidence of pertussis; however, sensitivity analyses showed that even with a range of underreporting of incidence, Tdap vaccination might be cost-effective in this population. Reassured by the concordance between the two cost-effectiveness models, ACIP's interpretations were that the cost per case averted and cost per quality-adjusted life-year saved were modest, and pertussis incidence estimates accounting for underreporting were reasonable based on limited data and expert opinion.

Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine (Tdap) in Pregnant Women — Advisory Committee on Immunization Practices (ACIP), 2012

In October 2011, in an effort to reduce the burden of pertussis in infants, the Advisory Committee on Immunization Practices (ACIP) recommended that unvaccinated pregnant women receive a dose of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) (*1*). Vaccination of women with Tdap during pregnancy is expected to provide some protection to infants from pertussis until they are old enough to be vaccinated themselves. Tdap given to pregnant women will stimulate the development of maternal antipertussis antibodies, which will pass through the placenta, likely providing the newborn with protection against pertussis in early life, and will protect the mother from pertussis around the time of delivery, making her less likely to become infected and transmit pertussis to her infant (*1*). The 2011 Tdap recommendation did not call for vaccinating pregnant women previously vaccinated with Tdap. On October 24, 2012, ACIP voted to recommend use of Tdap during every pregnancy. This report summarizes data considered and conclusions made by ACIP and provides guidance for implementing its recommendations. These updated recommendations on use of Tdap in pregnant women aim to optimize strategies for preventing pertussis morbidity and mortality in infants.

ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the Director of the Centers for Disease Control and Prevention (CDC) on use of vaccines and related agents for the control of vaccine-preventable diseases in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics, the American Academy of Family Physicians (AAFP), and the American College of Obstetricians and Gynecologists. Recommendations for routine use of vaccines in adults are reviewed and approved by the American College of Physicians, AAFP, the American College of Obstetricians and Gynecologists, and the American College of Nurse-Midwives. ACIP recommendations adopted by the CDC Director become agency guidelines on the date published in the *Morbidity and Mortality Weekly Report* (*MMWR*).

The United States has experienced substantial increases in reported pertussis cases over the past several years. Provisional case counts for 2012 have surpassed the last peak year, 2010, with 41,880 pertussis cases and 14 deaths in infants aged <12 months (*2*) (CDC, unpublished data, 2012). To reduce this burden, optimizing the current vaccination program and protecting infants who are at highest risk for death are immediate priorities. Since the 2011 ACIP vaccination recommendation, uptake of Tdap among pregnant women has been low: one survey of 1,231 women (August 2011 to April 2012) estimated that only 2.6% of women received Tdap during their recent pregnancy (*3*). New data indicate that maternal antipertussis antibodies are short-lived; therefore, Tdap vaccination in one pregnancy will not provide high levels of antibodies to protect newborns during subsequent pregnancies (*4*).

Methods

In monthly teleconferences during 2012, the ACIP Pertussis Vaccines Work Group considered published, peer-reviewed literature and unpublished data relevant to vaccinating pregnant women with Tdap. When data were not available, expert opinion was considered. Summaries of the data reviewed and work group discussions were presented to ACIP before recommendations were proposed. The proposed Tdap recommendation for pregnant women was presented at the October 2012 ACIP meeting and approved by ACIP.

Summary of ACIP Deliberations and Rationale

A dose of Tdap during each pregnancy

Very young infants are dependent solely on maternal antibodies and lack the ability to mount a cell-mediated response (*4*). The effectiveness and optimal concentration of maternal antipertussis antibodies in newborns are not yet known, but high levels of antibodies in the first weeks after birth likely confer protection and might prevent pertussis or modify disease severity (*5–7*). Studies on the persistence of antipertussis antibodies following a dose of Tdap show antibody levels in healthy, nonpregnant adults peak during the first month after vaccination, with substantial antibody decay after 1 year (*8–10*). Antibody kinetics in pregnant women likely would be similar. One study evaluated persistence of maternal

PERTUSSIS VACCINATION OF PREGNANT WOMEN

www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/tdap-td.html

ACIP Conclusions: Tdap and Pregnancy

- **Maternal antibodies from women immunized before pregnancy waned quickly (Healy 2012)**
  - Concentration of maternal antibodies unlikely high enough to provide passive protection to infants
- **A single dose of Tdap during one pregnancy is insufficient to provide protection for subsequent pregnancies**

Bottom Line

An infant's first dose of pertussis vaccine is the one you administer to his/her mom!

ACIP Recommendations: Tdap and Pregnancy

- **Administer Tdap to pregnant women during each pregnancy, regardless of previous Tdap vaccination history**
- **Ideally vaccinate between 27 through 36 weeks gestation although Tdap may be given at any time during pregnancy**
  - 27 through 36 weeks gestation is optimal timing to maximize the maternal antibody response AND passive antibody transfer to the infant

*ACIP off-label recommendation; *MMWR*. Vol. 62 No. 7; Feb, 22, 2013

Special Situations and Pregnant Women

- **Unknown or incomplete tetanus vaccination: should complete the 3-dose primary series**
  - Recommended schedule is 0, 4 weeks, and 6 through 12 months
  - Tdap should replace 1 dose of Td, preferably between 27- 36 weeks gestation
- **Wound care: previously unvaccinated pregnant woman should be given Tdap if Td is indicated for wound management**

*ACIP off-label recommendation;
MMWR. Vol. 62 No. 7; February 22, 2013 and *MMWR* 2011:60 (No.41): 11424-1426

Tdap and Postpartum Women

- **Postpartum women *not previously vaccinated* should be vaccinated immediately**
  - Including women who are breastfeeding
- **Do not administer Tdap to postpartum women who have already been vaccinated with Tdap**
  - Regardless of the length of time since Tdap vaccination

Pneumococcal Vaccines

Characteristic	23-valent Pneumococcal Polysaccharide Vaccine (PPV23)	13-Valent Pneumococcal Conjugate Vaccines (PCV13)
Components	Purified polysaccharide	Purified polysaccharide covalently bound to carrier protein
Ages	2 years and older	6 weeks and older *
Number of serotypes	23	13
Effect against bacteremia	Substantial	Substantial
Effect against carriage	None	Substantial
Effect against non-bacteremic pneumonia	No consensus	Moderate
Route	Subcut or IM injection	IM Injection

*ACIP Off-label recommendation

Administering PCV13 and PPSV23 Vaccines General Rules

- **PCV13 and PPSV23 should not be administered during the same clinic visit**
  - Either vaccine may be administered with other vaccines
- **Administer PCV13 before PPSV23 whenever possible**

Invasive Pneumococcal Disease

- **High-risk immunocompromising conditions**
  - Functional or anatomic asplenia
  - Immunocompromising condition
  - Renal disease
  - Cerebrospinal fluid leak
  - Cochlear implant

Invasive Pneumococcal Disease

- **High-risk immunocompetent condition**
  - Chronic heart disease
  - Chronic lung disease
  - Metabolic disease
  - Alcoholism
  - Chronic liver disease
  - Cigarette smoking (19 years of age or older)
  - Asthma (19 years of age or older)

Administering PCV13 and PPSV23: General Rules

- **If PCV13 is administered first**
  - Generally administer PPSV23 1 year later
  - If high-risk immunosuppressive: 8 weeks later
- **If PPSV23 is administered first**
  - Must administer PCV13 1 year later
  - Optimal antibody response

ACIP Recommendations for PCV13 and PPSV23 for Adults 19 Years and Older

- Immunocompromised, Asplenic (sickle cell, hemoglobinopathy), CSF leaks, Cochlear Implants who are Pneumococcal-naive

PCV13 + PPSV23 + PPSV23* + PPSV23 (@ ≥65 years)

≥8 weeks

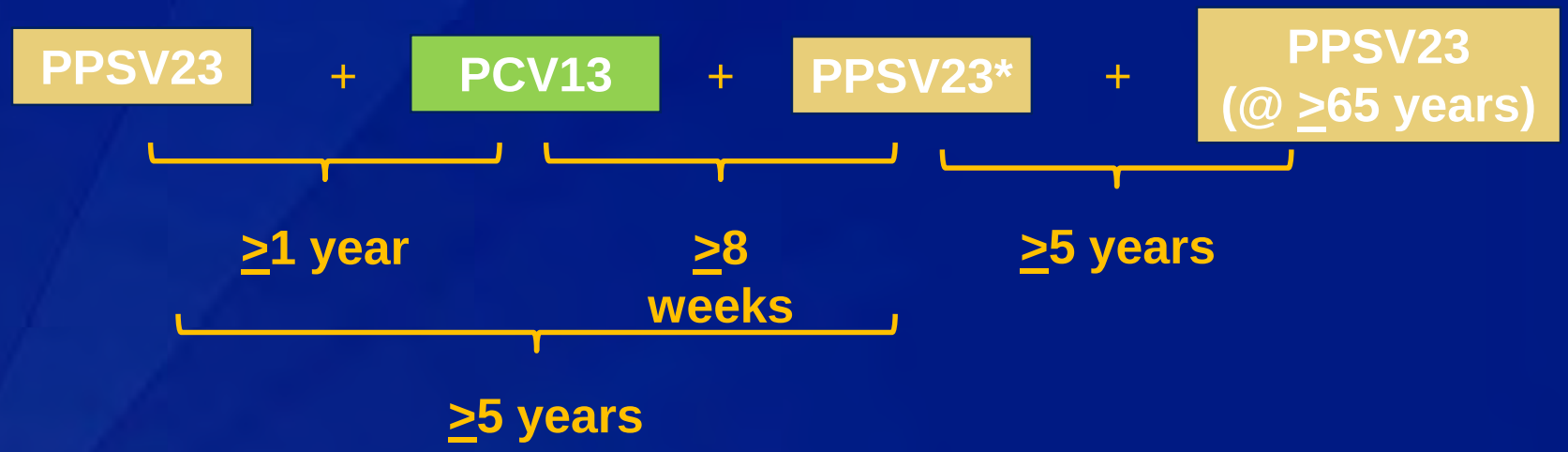
≥5 years

≥5 years

*Second PPSV23 dose before age 65 years NOT recommended for adults with CSF leaks or those with cochlear implants

ACIP Recommendations for PCV13 and PPSV23 for Adults 19 Years and Older

- **Immunocompromised, Asplenic (sickle cell, hemoglobinopathy), CSF leaks, Cochlear Implants who have previously received PPSV23**



***Second PPSV23 dose before age 65 years NOT recommended for adults with CSF leaks or those with cochlear implants**

ACIP Recommendations for PCV13 and PPSV23 for Adults 65 Years and Older

- Pneumococcal-naïve or unknown vaccination history
- Healthy or high-risk immunocompetent adult

PCV13 (@ ≥65 years) + PPSV23

12 months

- If PPSV23 cannot be given at 12 months later, it should be given during the next visit
- Minimum interval = 8 weeks

ACIP Recommendations for PCV13 and PPSV23 for Adults 65 Years and Older

- Pneumococcal-naïve or unknown vaccination history
- High-risk immunocompromised adult

PCV13 (@ ≥65 years) + PPSV23

8 weeks

- Minimum interval = 8 weeks

ACIP Recommendations for PCV13 and PPSV23 for Adults 65 Years and Older

- Previously received one or more doses of PPSV23
- Healthy or high-risk immunocompetent adult

PPSV23* (@ ≥ 65 years) + PCV13

≥ 1 year

PPSV23* (@ < 65 years) + PCV13 (@ ≥ 65 years) + PPSV23* (@ ≥ 65 years)

≥ 1 year

≥ 12 months

≥ 5 years

*Doses already administered

ACIP Recommendations for PCV13 and PPSV23 for Adults 65 Years and Older

- Previously received one or more doses of PPSV23
- High-risk immunosuppressive adult

PPSV23* (@ ≥ 65 years) + PCV13

≥ 1 year

PPSV23* (@ < 65 years) + PCV13 (@ ≥ 65 years) + PPSV23* (@ ≥ 65 years)

≥ 1 year

≥ 8 weeks

≥ 5 years

*Doses already administered

http://www.cdc.gov/vaccines/vpd-vac/pneumo/downloads/adult-vax-clinician-aid.pdf

Pneumococcal Vaccine Timing for Adults

Make sure your patients are up to date with pneumococcal vaccination.

Two pneumococcal vaccines are recommended for adults:
- 13-valent pneumococcal conjugate vaccine (PCV13, Prevnar13®)
- 23-valent pneumococcal polysaccharide vaccine (PPSV23, Pneumovax®23)

PCV13 and PPSV23 should not be administered during the same office visit.

When both are indicated, PCV13 should be given before PPSV23 whenever possible.

If either vaccine is inadvertently given earlier than the recommended window, do not repeat the dose.

One dose of PCV13 is recommended for adults:
- 65 years or older who have not previously received PCV13.
- 19 years or older with certain medical conditions and who have not previously received PCV13. *See Table 1 for specific guidance.*

One dose of PPSV23 is recommended for adults:
- 65 years or older, regardless of previous history of vaccination with pneumococcal vaccines.
  - Once a dose of PPSV23 is given at age 65 years or older, no additional doses of PPSV23 should be administered.
- 19 through 64 years with certain medical conditions.
  - A second dose may be indicated depending on the medical condition. *See Table 1 for specific guidance.*

Pneumococcal vaccine timing for adults 65 years or older

For those who have not received any pneumococcal vaccines, or those with unknown vaccination history

PCV13 (at ≥ 65 years) → At least 1 year apart for most immunocompetent adults → PPSV23 (at ≥ 65 years)

PCV13 (at ≥ 65 years) → At least 8 weeks apart for adults with certain medical conditions → PPSV23 (at ≥ 65 years)

- Administer 1 dose of PCV13.
- Administer 1 dose of PPSV23 **at least 1 year** later for most immuno*competent* adults or **at least 8 weeks** later for adults with immuno*compromising* conditions, cerebrospinal fluid leaks, or cochlear implants. *See Table 1 for specific guidance.*

For those who have previously received 1 dose of PPSV23 at ≥ 65 years and no doses of PCV13

PPSV23 (at ≥ 65 years) → At least 1 year apart for all adults → PCV13 (at ≥ 65 years)

- Administer 1 dose of PCV13 **at least 1 year** after the dose of PPSV23 for all adults, regardless of medical conditions.

NCIRDig410 | 11.30.2015

www.cdc.gov/pneumococcal/vaccination.html

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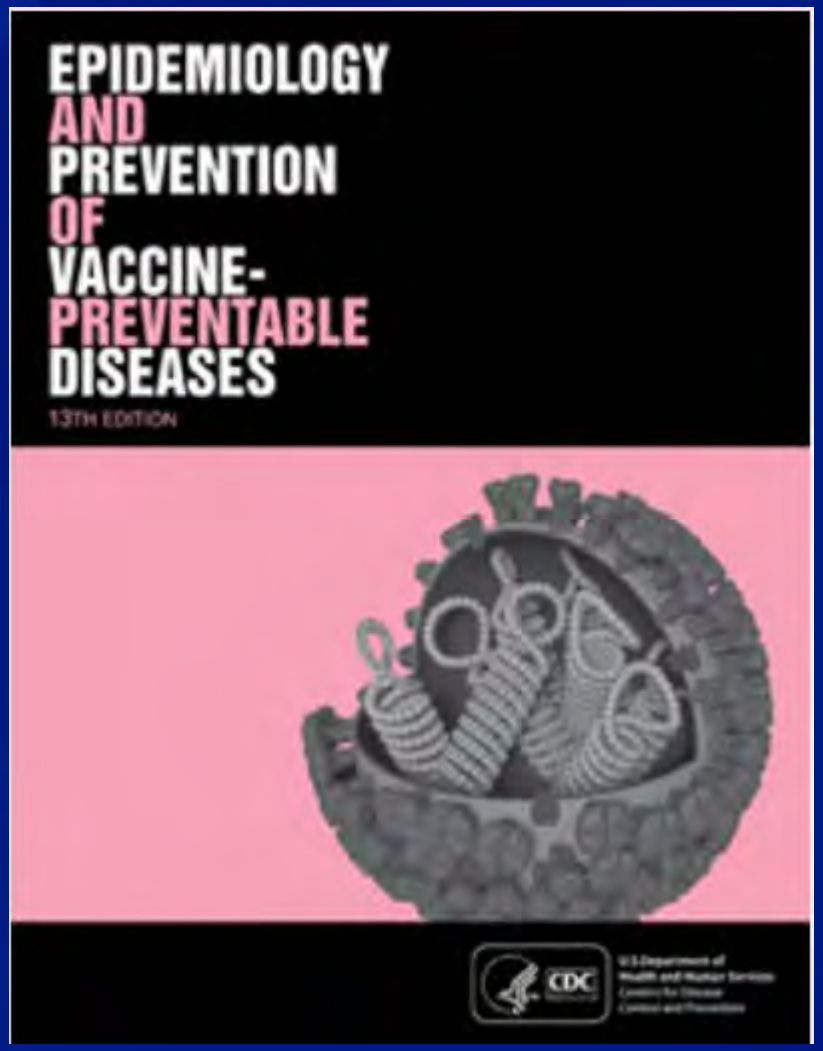

www.cdc.gov/vaccines/pubs/pinkbook/index.html
www.cdc.gov/vaccines/ed/webinar-epv/index.html

CDC Vaccines and Immunization Resources

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