

# Advisory Committee on Immunization Practices Recommended Immunization Schedule for Adults Aged 19 Years or Older: United States, 2016\*

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In October 2015, the Advisory Committee on Immunization Practices (ACIP) approved the Recommended Adult Immunization Schedule: United States, 2016. This schedule summarizes ACIP recommendations for the use of vaccines routinely recommended for adults in 2 figures (Figures 1 and 2), footnotes for each vaccine (Figure 3), and a table that describes primary contraindications and precautions for commonly used vaccines for adults (Table). Details on these updates and information on other vaccines recommended for adults can be found at [www.cdc.gov/vaccines/schedules](http://www.cdc.gov/vaccines/schedules). The full ACIP recommendations for each vaccine are not included in the schedule owing to space limitations but can be found at [www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html). The 2016 adult immunization schedule was reviewed and approved by the American College of Physicians, American Academy of Family Physicians, American College of Obstetricians and Gynecologists, and American College of Nurse-Midwives.

Changes in the 2016 adult immunization schedule from the 2015 schedule include the following new ACIP recommendations:

- Interval change for 13-valent pneumococcal conjugate vaccine (PCV13) followed by 23-valent pneumococcal polysaccharide vaccine (PPSV23) from “6 to 12 months” to “at least 1 year” for immunocompetent adults aged  $\geq 65$  years (1). Adults aged  $\geq 19$  years with anatomical or functional asplenia, cerebrospinal fluid leak, or cochlear implant or who are immunocompromised should receive PPSV23 at least 8 weeks after PCV13.

- Serogroup B meningococcal (MenB) vaccine series should be administered to persons aged  $\geq 10$  years who are at increased risk for serogroup B meningococcal disease (2). Those at increased risk include persons with anatomical or functional asplenia or persistent complement component deficiencies, microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*, and persons identified at increased risk because of a serogroup B meningococcal disease outbreak. MenB vaccine series may be administered to

adolescents and young adults aged 16 through 23 years (preferred age is 16 through 18 years) to provide short-term protection against most strains of serogroup B meningococcal disease (3).

- Nine-valent human papillomavirus (HPV) vaccine (9vHPV) was added to the 2016 adult immunization schedule. This vaccine can be used for routine vaccination against HPV as 1 of 3 HPV vaccines (bivalent HPV vaccine [2vHPV], quadrivalent HPV vaccine [4vHPV], and 9vHPV) recommended for females and 1 of 2 HPV vaccines (4vHPV and 9vHPV) recommended for males (4).

Notable changes in Figures 1 and 2 are as follows:

- The row for “Meningococcal” was retitled to “Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)” to indicate that there are 2 types of serogroup A, C, W, and Y meningococcal vaccines available for adults.

- A new row for “Meningococcal B (MenB)” was added.

- Additional text was added in several indication bars to describe reasons for alternate dosing schedules for vaccines where such designations were appropriate; for example, in the “Measles, mumps, and rubella (MMR)” indication bar that states “1 or 2 doses,” the clause “depending on indication” was added.

- The text in the “Hepatitis A” indication bar was revised from “2 doses” to “2 or 3 doses depending on vaccine” to account for the hepatitis A and hepatitis B combination vaccine that is administered in a 3-dose series.

Additional clarifying changes in Figure 2 include:

- The text in the consolidated “Influenza” indication bar was simplified to “one dose annually”; readers should refer to the footnotes for additional information regarding which influenza vaccine types are recommended for different age and risk groups.

- The text in the “Pneumococcal polysaccharide (PPSV23)” indication bar was revised from “1 or 2 doses” to “1, 2, or 3 doses depending on indication” to account for the recommendation that adults aged  $\geq 19$

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\* The 2016 ACIP Adult Immunization Schedule appears in *Annals of Internal Medicine* and on the Centers for Disease Control and Prevention Web site at [www.cdc.gov/vaccines/schedules](http://www.cdc.gov/vaccines/schedules). An announcement summarizing changes in the 2016 adult immunization schedule is published concurrently in the *Morbidity and Mortality Weekly Report*. Readers can cite the 2016 adult immunization schedule as follows: Kim DK, Bridges CB, Harriman KH; Advisory Committee on Immunization Practices. Advisory Committee on Immunization Practice recommended immunization schedule for adults aged 19 years or older: United States, 2016. *Ann Intern Med.* 2016;164:184-94. doi:10.7326/M15-3005

† The 2016 adult immunization schedule was prepared by the Advisory Committee on Immunization Practices (ACIP); ACIP Adult Immunization Work Group; David K. Kim, MD, Carolyn B. Bridges, MD, LaDora Woods (Immunization Services Division, National Center for Immunization and Respiratory Disease, Centers for Disease Control and Prevention, Atlanta, Georgia), and Kathleen H. Harriman, PhD, MPH, RN (California Department of Public Health, Richmond, California). Drs. Kim, Bridges, and Harriman authored this work. For a list of members of the ACIP and the ACIP Adult Immunization Work Group, see the Appendix (available at [www.annals.org](http://www.annals.org)).

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

**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<sup>1</sup>

VACCINE ▼	AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥65 years
Influenza <sup>1,2</sup>		1 dose annually					
Tetanus, diphtheria, pertussis (Td/Tdap) <sup>3</sup>		Substitute Tdap for Td once, then Td booster every 10 yrs					
Varicella <sup>4</sup>		2 doses					
Human papillomavirus (HPV) Female <sup>5</sup>		3 doses					
Human papillomavirus (HPV) Male <sup>5</sup>		3 doses					
Zoster <sup>6</sup>						1 dose	
Measles, mumps, rubella (MMR) <sup>7</sup>		1 or 2 doses depending on indication					
Pneumococcal 13-valent conjugate (PCV13) <sup>8</sup>						1 dose	
Pneumococcal 23-valent polysaccharide (PPSV23) <sup>9</sup>		1 or 2 doses depending on indication					1 dose
Hepatitis A <sup>9</sup>		2 or 3 doses depending on vaccine					
Hepatitis B <sup>10</sup>		3 doses					
Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4) <sup>11</sup>		1 or more doses depending on indication					
Meningococcal B (MenB) <sup>11</sup>		2 or 3 doses depending on vaccine					
<i>Haemophilus influenzae</i> type b (Hib) <sup>9,12</sup>		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](http://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](http://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, NW, Washington, DC 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](http://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 American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG), and American College of Nurse-Midwives (ACNM).



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years with immunocompromising conditions or anatomical or functional asplenia can receive up to 3 doses of PPSV23.

- The text in the “*Haemophilus influenzae* type b (Hib)” indication bar was revised from “1 or 3 doses” to “3 doses, post-HSCT [hematopoietic stem cell transplant] recipients only” as these adults are the only group for whom a 3-dose series of Hib vaccination is recommended; for adults in other groups for whom Hib vaccination is recommended, the text in the indication bar was revised to “1 dose.”

The influenza, pneumococcal, meningococcal, and HPV vaccination sections are revised in the footnotes. The 2016 ACIP recommendations on influenza vaccination reiterate that all persons aged ≥6 months are recommended to receive annual vaccination against influenza (5). Persons aged ≥18 years with egg allergy of any severity may receive the recombinant influenza vaccine (RIV) because it does not contain any egg protein. Persons with hives-only allergy to eggs may receive the inactivated influenza vaccine (IIV) with additional safety measures.

The 2016 schedule footnotes correct 2 errata on pneumococcal vaccination that were in the 2015 schedule footnotes:

- “Adults aged ≥19 years” replaced “adults aged 19 through 64 years” as the age group for pneumococcal vaccination recommendations for persons with immunocompromising conditions, anatomical or functional asplenia, cerebrospinal fluid leak, or cochlear implant (6). The interval from PCV13 vaccination to PPSV23 vaccination is at least 8 weeks for adults aged ≥19 years with these conditions. For adults aged ≥65 years without these conditions, the interval from PCV13 vaccination to PPSV23 vaccination is at least 1 year.

- “Adults aged 19 through 64 years who are residents of nursing homes and other long-term care facilities” was removed from those for whom PPSV23 is recommended. These adults should be assessed for pneumococcal vaccination status and receive pneumococcal vaccines recommended based on their health condition(s) or age (6).

The footnotes in the 2016 schedule for meningococcal vaccination include new recommendations on

**Figure 2.** Vaccines that might be indicated for adults based on medical and other indications.

**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 2.** Vaccines that might be indicated for adults based on medical and other indications<sup>1</sup>

VACCINE ▼	INDICATION ▶	Pregnancy	Immuno-compromising conditions (excluding HIV infection) <sup>4,5,7,8,12</sup>	HIV infection CD4+count (cells/μL) <sup>4,6,7,8,13</sup>		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 <sup>11,12</sup>	Chronic liver disease	Diabetes	Health care personnel	
				<200	≥200								
Influenza <sup>1,2</sup>													1 dose annually
Tetanus, diphtheria, pertussis (Td/Tdap) <sup>1,3</sup>		1 dose Tdap each pregnancy											Substitute Tdap for Td once, then Td booster every 10 yrs
Varicella <sup>4</sup>			Contraindicated										2 doses
Human papillomavirus (HPV) Female <sup>1,5</sup>													3 doses through age 26 yrs
Human papillomavirus (HPV) Male <sup>1,5</sup>													3 doses through age 21 yrs
Zoster <sup>6</sup>			Contraindicated										1 dose
Measles, mumps, rubella (MMR) <sup>1,7</sup>			Contraindicated										1 or 2 doses depending on indication
Pneumococcal 13-valent conjugate (PCV13) <sup>8</sup>													1 dose
Pneumococcal polysaccharide (PPSV23) <sup>8</sup>													1, 2, or 3 doses depending on indication
Hepatitis A <sup>9</sup>													2 or 3 doses depending on vaccine
Hepatitis B <sup>10</sup>													3 doses
Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4) <sup>11</sup>													1 or more doses depending on indication
Meningococcal B (MenB) <sup>11</sup>													2 or 3 doses depending on vaccine
<i>Haemophilus influenzae</i> type b (Hib) <sup>12</sup>													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](http://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.

the use of MenB vaccine, in addition to the information on the use of MenACWY and MPSV4 vaccines. Certain groups of persons known to be at increased risk for meningococcal disease are recommended to be routinely vaccinated with a MenACWY vaccine, which protects against meningococcal serogroups A, C, W, and Y (7). Although the epidemiology for meningococcal serogroup B is different from serogroups A, C, W, and Y, persons who are at increased risk for serogroup A, C, W, and Y meningococcal disease may also be at increased risk for serogroup B meningococcal disease. The footnotes for meningococcal vaccination in the 2016 schedule include the following general information:

- MenACWY vaccine is preferred over MPSV4 vaccine for adults with meningococcal vaccine indications who are aged ≤55 years, and for adults aged ≥56 years who were vaccinated previously with MenACWY vaccine and are recommended for revaccination or for whom multiple doses of vaccine are anticipated; MPSV4 vaccine is preferred for adults aged ≥56 years who have not received MenACWY vaccine previously

and who require a single dose only (for example, persons at risk because of an outbreak).

- Revaccination with MenACWY vaccine every 5 years is recommended for adults previously vaccinated with MenACWY or MPSV4 vaccine who remain at increased risk for infection (for example, adults with anatomical or functional asplenia or persistent complement component deficiencies and microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*).
- MenB vaccine is available as a 2-dose series of MenB-4C or a 3-dose series of MenB-FHbp vaccine; the 2 MenB vaccines are not interchangeable, that is, the same MenB vaccine product must be used for all doses.
- There is no recommendation for MenB revaccination at this time.
- MenB vaccine may be administered concomitantly with MenACWY vaccine, but at a different anatomical site, if feasible.
- HIV infection is not an indication for routine vaccination with MenACWY or MenB vaccine; if an HIV-

**Figure 3.** Footnotes to the Recommended Immunization Schedule for Adults Aged 19 Years and Older: United States, 2016.**1. Additional information**

Additional guidance for the use of the vaccines described in this supplement is available at [www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html). Information on vaccination recommendations when vaccination status is unknown and other general immunization information can be found in the General Recommendations on Immunization at [www.cdc.gov/mwr/preview/mmwrhtml/rr6002a1.htm](http://www.cdc.gov/mwr/preview/mmwrhtml/rr6002a1.htm). Information on travel vaccine requirements and recommendations (e.g., for hepatitis A and B, meningococcal, and other vaccines) is available at [wwwnc.cdc.gov/travel/destinations/list](http://wwwnc.cdc.gov/travel/destinations/list). Additional information and resources regarding vaccination of pregnant women can be found at [www.cdc.gov/vaccines/adults/rec-vac/pregnant.html](http://www.cdc.gov/vaccines/adults/rec-vac/pregnant.html).

**2. Influenza vaccination**

Annual vaccination against influenza is recommended for all persons aged  $\geq 6$  months. A list of currently available influenza vaccines can be found at [www.cdc.gov/flu/protect/vaccine/vaccines.htm](http://www.cdc.gov/flu/protect/vaccine/vaccines.htm). Persons aged  $\geq 6$  months, including pregnant women, can receive the inactivated influenza vaccine (IIV). An age-appropriate IIV formulation should be used. Intradermal IIV is an option for persons aged 18 through 64 years. High-dose IIV is an option for persons aged  $\geq 65$  years. Live attenuated influenza vaccine (LAIV [FluMist]) is an option for healthy, nonpregnant persons aged 2 through 49 years. Recombinant influenza vaccine (RIV [Flublok]) is approved for persons aged  $\geq 18$  years. RIV, which does not contain any egg protein, may be administered to persons aged  $\geq 18$  years with egg allergy of any severity; IIV may be used with additional safety measures for persons with hives-only allergy to eggs. Health care personnel who care for severely immunocompromised persons who require care in a protected environment should receive IIV or RIV; health care personnel who receive LAIV should avoid providing care for severely immunosuppressed persons for 7 days after vaccination.

**3. Tetanus, diphtheria, and acellular pertussis (Td/Tdap) vaccination**

Administer 1 dose of Tdap vaccine to pregnant women during each pregnancy (preferably during 27–36 weeks' gestation) regardless of interval since prior Td or Tdap vaccination. Persons aged  $\geq 11$  years who have not received Tdap vaccine or for whom vaccine status is unknown should receive a dose of Tdap followed by tetanus and diphtheria toxoids (Td) booster doses every 10 years thereafter. Tdap can be administered regardless of interval since the most recent tetanus or diphtheria toxoid-containing vaccine. Adults with an unknown or incomplete history of completing a 3-dose primary vaccination series with Td-containing vaccines should begin or complete a primary vaccination series including a Tdap dose. For unvaccinated adults, administer the first 2 doses at least 4 weeks apart and the third dose 6–12 months after the second. For incompletely vaccinated (i.e., less than 3 doses) adults, administer remaining doses. Refer to the ACIP statement for recommendations for administering Td/Tdap as prophylaxis in wound management (see footnote 1).

**4. Varicella vaccination**

All adults without evidence of immunity to varicella (as defined below) should receive 2 doses of single-antigen varicella vaccine or a second dose if they have received only 1 dose. Vaccination should be emphasized for those who have close contact with persons at high risk for severe disease (e.g., health care personnel and family contacts of persons with immunocompromising conditions) or are at high risk for exposure or transmission (e.g., teachers; child care employees; residents and staff members of institutional settings, including correctional institutions; college students; military personnel; adolescents and adults living in households with children; nonpregnant women of childbearing age; and international travelers). Pregnant women should be assessed for evidence of varicella immunity. Women who do not have evidence of immunity should receive the first dose of varicella vaccine upon completion or termination of pregnancy and before discharge from the health care facility. The second dose should be administered 4–8 weeks after the first dose. Evidence of immunity to varicella in adults includes any of the following:

- documentation of 2 doses of varicella vaccine at least 4 weeks apart;
- U.S.-born before 1980, except health care personnel and pregnant women;
- history of varicella based on diagnosis or verification of varicella disease by a health care provider;
- history of herpes zoster based on diagnosis or verification of herpes zoster disease by a health care provider; or
- laboratory evidence of immunity or laboratory confirmation of disease.

**5. Human papillomavirus (HPV) vaccination**

Three HPV vaccines are licensed for use in females (bivalent HPV vaccine [2vHPV], quadrivalent HPV vaccine [4vHPV], and 9-valent HPV vaccine [9vHPV]) and two HPV vaccines are licensed for use in males (4vHPV and 9vHPV). For females, 2vHPV, 4vHPV, or 9vHPV is recommended in a 3-dose series for routine vaccination at age 11 or 12 years and for those aged 13 through 26 years, if not previously vaccinated. For males, 4vHPV or 9vHPV is recommended in a 3-dose series for routine vaccination at age 11 or 12 years and for those aged 13 through 21 years, if not previously vaccinated. Males aged 22 through 26 years may be vaccinated. HPV vaccination is recommended for men who have sex with men through age 26 years who did not get any or all doses when they were younger. Vaccination is recommended for immunocompromised persons (including those with HIV infection) through age 26 years who did not get any or all doses when they were younger. A complete HPV vaccination series consists of 3 doses. The second dose should be administered 4–8 weeks (minimum interval of 4 weeks) after the first dose; the third dose should be administered 24 weeks after the first dose and 16 weeks after the second dose (minimum interval of 12 weeks). HPV vaccines are not recommended for use in pregnant women. However, pregnancy testing is not needed before vaccination. If a woman is found to be pregnant after initiating the vaccination series, no intervention is needed; the remainder of the 3-dose series should be delayed until completion or termination of pregnancy.

**6. Zoster vaccination**

A single dose of zoster vaccine is recommended for adults aged  $\geq 60$  years regardless of whether they report a prior episode of herpes zoster. Although the vaccine is licensed by the U.S. Food and Drug Administration for use among and can be administered to persons aged  $\geq 50$  years, ACIP recommends that vaccination begin at age 60 years. Persons aged  $\geq 60$  years with chronic medical conditions may be vaccinated unless their condition constitutes a contraindication, such as pregnancy or severe immunodeficiency.

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Figure 3—Continued

## 7. Measles, mumps, rubella (MMR) vaccination

Adults born before 1957 are generally considered immune to measles and mumps. All adults born in 1957 or later should have documentation of 1 or more doses of MMR vaccine unless they have a medical contraindication to the vaccine or laboratory evidence of immunity to each of the 3 diseases.

Documentation of provider-diagnosed disease is not considered acceptable evidence of immunity for measles, mumps, or rubella.

**Measles component:**

A routine second dose of MMR vaccine, administered a minimum of 28 days after the first dose, is recommended for adults who:

- are students in postsecondary educational institutions,
- work in a health care facility, or
- plan to travel internationally.

Persons who received inactivated (killed) measles vaccine or measles vaccine of unknown type during 1963–1967 should be revaccinated with 2 doses of MMR vaccine.

**Mumps component:**

A routine second dose of MMR vaccine, administered a minimum of 28 days after the first dose, is recommended for adults who:

- are students in a postsecondary educational institution,
- work in a health care facility, or
- plan to travel internationally.

Persons vaccinated before 1979 with either killed mumps vaccine or mumps vaccine of unknown type who are at high risk for mumps infection (e.g., persons who are working in a health care facility) should be considered for revaccination with 2 doses of MMR vaccine.

**Rubella component:**

For women of childbearing age, regardless of birth year, rubella immunity should be determined. If there is no evidence of immunity, women who are not pregnant should be vaccinated. Pregnant women who do not have evidence of immunity should receive MMR vaccine upon completion or termination of pregnancy and before discharge from the health care facility.

**Health care personnel born before 1957:**

For unvaccinated health care personnel born before 1957 who lack laboratory evidence of measles, mumps, and/or rubella immunity or laboratory confirmation of disease, health care facilities should consider vaccinating personnel with 2 doses of MMR vaccine at the appropriate interval for measles and mumps or 1 dose of MMR vaccine for rubella.

## 8. Pneumococcal vaccination

**General information**

- Adults are recommended to receive 1 dose of 13-valent pneumococcal conjugate vaccine (PCV13) and 1, 2, or 3 doses (depending on indication) of 23-valent pneumococcal polysaccharide vaccine (PPSV23).
- PCV13 should be administered at least 1 year after PPSV23.
- PPSV23 should be administered at least 1 year after PCV13, except among adults with immunocompromising conditions, anatomical or functional asplenia, cerebrospinal fluid leak, or cochlear implant, for whom the interval should be at least 8 weeks; the interval between PPSV23 doses should be at least 5 years.
- No additional dose of PPSV23 is indicated for adults vaccinated with PPSV23 at age  $\geq 65$  years.
- When both PCV13 and PPSV23 are indicated, PCV13 should be administered first; PCV13 and PPSV23 should not be administered during the same visit.
- When indicated, PCV13 and PPSV23 should be administered to adults whose pneumococcal vaccination history is incomplete or unknown.

Adults aged  $\geq 65$  years (immunocompetent) who:

- have not received PCV13 or PPSV23: administer PCV13 followed by PPSV23 at least 1 year after PCV13.
- have not received PCV13 but have received a dose of PPSV23 at age  $\geq 65$  years: administer PCV13 at least 1 year after PPSV23.
- have not received PCV13 but have received 1 or more doses of PPSV23 at age  $< 65$  years: administer PCV13 at least 1 year after the most recent dose of PPSV23. Administer a dose of PPSV23 at least 1 year after PCV13 and at least 5 years after the most recent dose of PPSV23.
- have received PCV13 but not PPSV23 at age  $< 65$  years: administer PPSV23 at least 1 year after PCV13.
- have received PCV13 and 1 or more doses of PPSV23 at age  $< 65$  years: administer PPSV23 at least 1 year after PCV13 and at least 5 years after the most recent dose of PPSV23.

Adults aged  $\geq 19$  years with immunocompromising conditions or anatomical or functional asplenia (defined below) who:

- have not received PCV13 or PPSV23: administer PCV13 followed by PPSV23 at least 8 weeks after PCV13. Administer a second dose of PPSV23 at least 5 years after the first dose of PPSV23.
- have not received PCV13 but have received 1 dose of PPSV23: administer PCV13 at least 1 year after the PPSV23. Administer a second dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the first dose of PPSV23.
- have not received PCV13 but have received 2 doses of PPSV23: administer PCV13 at least 1 year after the most recent dose of PPSV23.
- have received PCV13 but not PPSV23: administer PPSV23 at least 8 weeks after PCV13. Administer a second dose of PPSV23 at least 5 years after the first dose of PPSV23.
- have received PCV13 and 1 dose of PPSV23: administer a second dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the first dose of PPSV23.
- If the most recent dose of PPSV23 was administered at age  $< 65$  years, at age  $\geq 65$  years, administer a dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the last dose of PPSV23.
- Immunocompromising conditions that are indications for pneumococcal vaccination are: congenital or acquired immunodeficiency (including B- or T-lymphocyte deficiency, complement deficiencies, and phagocytic disorders excluding chronic granulomatous disease), HIV infection, chronic renal failure, nephrotic syndrome, leukemia, lymphoma, Hodgkin disease, generalized malignancy, multiple myeloma, solid organ transplant, and term systemic corticosteroids and iatrogenic immunosuppression (including long-term systemic corticosteroids and radiation therapy).
- Anatomical or functional asplenia that are indications for pneumococcal vaccination are: sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, splenic dysfunction, and splenectomy. Administer pneumococcal vaccines at least 2 weeks before immunosuppressive therapy or an elective splenectomy, and as soon as possible to adults who are newly diagnosed with asymptomatic or symptomatic HIV infection.

Adults aged  $\geq 19$  years with cerebrospinal fluid leaks or cochlear implants: administer PCV13 followed by PPSV23 at least 8 weeks after PCV13; no additional dose of PPSV23 is indicated if aged  $< 65$  years. If PPSV23 was administered at age  $< 65$  years, at age  $\geq 65$  years, administer another dose of PPSV23 at least 5 years after the last dose of PPSV23.

Adults aged 19 through 64 years with chronic heart disease (including congestive heart failure and cardiomyopathies, excluding hypertension), chronic lung disease (including chronic obstructive lung disease, emphysema, and asthma), chronic liver disease (including cirrhosis), alcoholism, or diabetes mellitus, or who smoke cigarettes: administer PPSV23. At age  $\geq 65$  years, administer PCV13 at least 1 year after PPSV23, followed by another dose of PPSV23 at least 1 year after PCV13 and at least 5 years after the last dose of PPSV23.

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Figure 3—Continued

Routine pneumococcal vaccination is not recommended for American Indian/Alaska Native or other adults unless they have an indication as above; however, public health authorities may consider recommending the use of pneumococcal vaccines for American Indians/Alaska Natives or other adults who live in areas with increased risk for invasive pneumococcal disease.

#### 9. Hepatitis A vaccination

Vaccinate any person seeking protection from hepatitis A virus (HAV) infection and persons with any of the following indications:

- men who have sex with men;
- persons who use injection or noninjection illicit drugs;
- persons working with HAV-infected primates or with HAV in a research laboratory setting;
- persons with chronic liver disease and persons who receive clotting factor concentrates;
- persons traveling to or working in countries that have high or intermediate endemicity of hepatitis A (see footnote 1); and
- unvaccinated persons who anticipate close personal contact (e.g., household or regular babysitting) with an international adoptee during the first 60 days after arrival in the United States from a country with high or intermediate endemicity. The first dose of the 2-dose hepatitis A vaccine series should be administered as soon as adoption is planned, ideally 2 or more weeks before the arrival of the adoptee.

Single-antigen vaccine formulations should be administered in a 2-dose schedule at either 0 and 6–12 months (Havrix), or 0 and 6–18 months (Vaqta). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, administer 3 doses at 0, 1, and 6 months; alternatively, a 4-dose schedule may be used, administered on days 0, 7, and 21–30, followed by a booster dose at 12 months.

#### 10. Hepatitis B vaccination

Vaccinate persons seeking protection from hepatitis B virus (HBV) infection and persons with any of the following indications:

- sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than 1 sex partner during the previous 6 months); persons seeking evaluation or treatment for a sexually transmitted disease (STD); current or recent injection drug users; and men who have sex with men;
- health care personnel and public safety workers who are potentially exposed to blood or other infectious body fluids;
- persons who are aged <60 years with diabetes as soon as feasible after diagnosis; persons with diabetes who are aged ≥60 years at the discretion of the treating clinician based on the likelihood of acquiring HBV infection, including the risk posed by an increased need for assisted blood glucose monitoring in long-term care facilities, the likelihood of experiencing chronic sequelae if infected with HBV, and the likelihood of immune response to vaccination;
- persons with end-stage renal disease (including patients receiving hemodialysis), persons with HIV infection, and persons with chronic liver disease;
- household contacts and sex partners of hepatitis B surface antigen–positive persons, clients and staff members of institutions for persons with developmental disabilities, and international travelers to regions with high or intermediate levels of endemic HBV infection (see footnote 1); and
- all adults in the following settings: STD treatment facilities, HIV testing and treatment facilities, facilities providing drug abuse treatment and prevention services, health care settings targeting services to injection drug users or men who have sex with men, correctional facilities, end-stage renal disease programs and facilities for chronic hemodialysis patients, and institutions and nonresidential day care facilities for persons with developmental disabilities.

Administer missing doses to complete a 3-dose series of hepatitis B vaccine to those persons not vaccinated or not completely vaccinated. The second dose should be administered at least 1 month after the first dose; the third dose should be administered at least 2 months after the second dose (and at least 4 months after the first dose). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, give 3 doses at 0, 1, and 6 months; alternatively, a 4-dose Twinrix schedule may be used, administered on days 0, 7, and 21–30, followed by a booster dose at 12 months.

Adult patients receiving hemodialysis or with other immunocompromising conditions should receive 1 dose of 40 mcg/mL (Recombivax HB) administered on a 3-dose schedule at 0, 1, and 6 months or 2 doses of 20 mcg/mL (Engerix-B) administered simultaneously on a 4-dose schedule at 0, 1, 2, and 6 months.

#### 11. Meningococcal vaccination

##### General information

- Serogroup A, C, W, and Y meningococcal vaccine is available as a conjugate (MenACWY [Menactra, Menveo]) or a polysaccharide (MPSV4 [Menomune]) vaccine.
- Serogroup B meningococcal (MenB) vaccine is available as a 2-dose series of MenB-4C vaccine (Bexsero) administered at least 1 month apart or a 3-dose series of MenB-FHbp (Trumenba) vaccine administered at 0, 2, and 6 months; the 2 MenB vaccines are not interchangeable, i.e., the same MenB vaccine product must be used for all doses.
- MenACWY vaccine is preferred for adults with serogroup A, C, W, and Y meningococcal vaccine indications who are aged ≤55 years, and for adults aged ≥56 years 1) who were vaccinated previously with MenACWY vaccine and are recommended for revaccination or 2) for whom multiple doses of vaccine are anticipated; MPSV4 vaccine is preferred for adults aged ≥56 years who have not received MenACWY vaccine previously and who require a single dose only (e.g., persons at risk because of an outbreak).
- Revaccination with MenACWY vaccine every 5 years is recommended for adults previously vaccinated with MenACWY or MPSV4 vaccine who remain at increased risk for infection (e.g., adults with anatomical or functional asplenia or persistent complement component deficiencies, or microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*).
- MenB vaccine is approved for use in persons aged 10 through 25 years; however, because there is no theoretical difference in safety for persons aged >25 years compared with those aged 10 through 25 years, MenB vaccine is recommended for routine use in persons aged ≥10 years who are at increased risk for serogroup B meningococcal disease.
- There is no recommendation for MenB revaccination at this time.
- MenB vaccine may be administered concomitantly with MenACWY vaccine but at a different anatomical site, if feasible.
- HIV infection is not an indication for routine vaccination with MenACWY or MenB vaccine; if an HIV-infected person of any age is to be vaccinated, administer 2 doses of MenACWY vaccine at least 2 months apart.

Adults with anatomical or functional asplenia or persistent complement component deficiencies: administer 2 doses of MenACWY vaccine at least 2 months apart and revaccinate every 5 years. Also administer a series of MenB vaccine.

Microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*: administer a single dose of MenACWY vaccine; revaccinate with MenACWY vaccine every 5 years if they remain at increased risk for infection. Also administer a series of MenB vaccine.

Persons at risk because of a meningococcal disease outbreak: if the outbreak is attributable to serogroup A, C, W, or Y, administer a single dose of MenACWY vaccine; if the outbreak is attributable to serogroup B, administer a series of MenB vaccine.

Persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic: administer a single dose of MenACWY vaccine and revaccinate with MenACWY vaccine every 5 years if an increased risk for infection remains (see footnote 1); MenB vaccine is not recommended because meningococcal disease in these countries is generally not caused by serogroup B.

Military recruits: administer a single dose of MenACWY vaccine.

Continued on following page

**Figure 3—Continued**

First-year college students aged  $\leq 21$  years who live in residence halls: administer a single dose of MenACWY vaccine if they have not received a dose on or after their 16th birthday.

Young adults aged 16 through 23 years (preferred age range is 16 through 18 years): may be vaccinated with a series of MenB vaccine to provide short-term protection against most strains of serogroup B meningococcal disease.

**12. *Haemophilus influenzae* type b (Hib) vaccination**

One dose of Hib vaccine should be administered to persons who have anatomical or functional asplenia or sickle cell disease or are undergoing elective splenectomy if they have not previously received Hib vaccine. Hib vaccination 14 or more days before splenectomy is suggested.

Recipients of a hematopoietic stem cell transplant (HSCT) should be vaccinated with a 3-dose regimen 6–12 months after a successful transplant, regardless of vaccination history; at least 4 weeks should separate doses.

Hib vaccine is not recommended for adults with HIV infection since their risk for Hib infection is low.

**13. Immunocompromising conditions**

Inactivated vaccines (e.g., pneumococcal, meningococcal, and inactivated influenza vaccines) generally are acceptable and live vaccines generally should be avoided in persons with immune deficiencies or immunocompromising conditions. Information on specific conditions is available at [www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html).

infected person of any age is to be vaccinated, administer 2 doses of MenACWY vaccine at least 2 months apart.

- MenB vaccines are approved by the U.S. Food and Drug Administration for use in persons aged 10 through 25 years; however, because there is no theoretical difference in safety for persons aged  $>25$  years compared with those aged 10 through 25 years, MenB vaccine is recommended by the ACIP for routine use in persons aged  $\geq 10$  years who are at increased risk for serogroup B meningococcal disease.

The meningococcal vaccination footnotes provide an algorithm for groups of persons known to be at increased risk for meningococcal disease:

- Adults with anatomical or functional asplenia or persistent complement component deficiencies: administer 2 doses of MenACWY vaccine at least 2 months apart and revaccinate every 5 years; in addition, administer either a 2-dose series of MenB-4C or a 3-dose series of MenB-FHbp vaccine.

- Microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*: administer a single dose of MenACWY vaccine; revaccinate with MenACWY vaccine every 5 years if they remain at increased risk for infection; in addition, administer either a 2-dose series of MenB-4C or a 3-dose series of MenB-FHbp vaccine.

- Persons at risk because of a meningococcal disease outbreak: administer a single dose of MenACWY vaccine if the outbreak is attributable to serogroup A, C, W, or Y; if the outbreak is attributable to serogroup B, administer either a 2-dose series of MenB-4C or a 3-dose series of MenB-FHbp vaccine.

- Persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic: administer a single dose of MenACWY vaccine and revaccinate with MenACWY vaccine every 5 years if they remain at increased risk for infection; MenB vaccine is not recommended because meningococcal disease in these countries is generally not caused by serogroup B.

- Military recruits: administer a single dose of MenACWY vaccine.

- First-year college students aged  $\leq 21$  years who live in residence halls: administer a single dose of MenACWY vaccine if they have not received a dose on or after their 16th birthday.

- Young adults aged 16 through 23 years (preferred age range is 16 through 18 years) may be vaccinated with either a 2-dose series of MenB-4C or a 3-dose series of MenB-FHbp vaccine to provide short-term protection against most strains of serogroup B meningococcal disease.

The footnotes in the 2016 adult immunization schedule for HPV vaccination include the following:

- Three HPV vaccines are licensed for use in females (2vHPV, 4vHPV, and 9vHPV) and two are licensed for use in males (4vHPV and 9vHPV).

- For females, 2vHPV, 4vHPV, or 9vHPV is recommended in a 3-dose series for routine vaccination at age 11 or 12 years and for those aged 13 through 26 years if not previously vaccinated.

- For males, 4vHPV or 9vHPV is recommended in a 3-dose series for routine vaccination at age 11 or 12 years and for those aged 13 through 21 years, if not previously vaccinated. Males aged 22 through 26 years may be vaccinated.

- HPV vaccination is recommended for men who have sex with men through age 26 years who did not get any or all doses when they were younger.

- Vaccination is recommended for immunocompromised persons (including those with HIV infection) through age 26 years who did not get any or all doses when they were younger.

- A complete HPV vaccination series consists of 3 doses. The second dose should be administered 4 to 8 weeks (minimum interval of 4 weeks) after the first dose; the third dose should be administered 24 weeks after the first dose and 16 weeks after the second dose (minimum interval of 12 weeks).

- HPV vaccines are not recommended for use in pregnant women. However, pregnancy testing is not needed before vaccination. If a woman is found to be pregnant after initiating the HPV vaccination series, no intervention is needed; the remainder of the 3-dose

**Table.** Contraindications and Precautions to Commonly Used Vaccines in Adults\*†‡

Vaccine	Contraindications	Precautions
Influenza, inactivated (IIV)§	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§
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§	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)§	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, acellular 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	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¶), or patients with HIV infection who are severely immunocompromised) Pregnancy	Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)** 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), 9-valent (9vHPV), quadrivalent (4vHPV), bivalent (2vHPV)	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	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¶), 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)	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¶), 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)** History of thrombocytopenia or thrombocytopenic purpura Need for tuberculin skin testing††
Pneumococcal, 13-valent 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, 23-valent 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
Meningococcal serogroup ACWY, conjugate (MenACWY); meningococcal serogroup ACWY, 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

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Table—Continued

Vaccine	Contraindications	Precautions
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
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
<i>Haemophilus influenzae</i> 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

\* Adapted from "Table 6. Contraindications and precautions to commonly used vaccines," in CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices. MMWR Recomm Rep. 2011;60:40-1; and from Appendix A in Hamborsky J, Kroger A, Wolfe C, eds. *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](http://www.cdc.gov/vaccines/pubs/pinkbook/index.html)).

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

‡ 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 and risks of 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 that increases the chance of a serious adverse reaction. Therefore, a vaccine should not be administered when a contraindication is present.

§ For more information on use of influenza vaccines among persons with egg allergies and a complete list of conditions that the 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.

|| 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.

¶ Immunosuppressive steroid dose is considered to be  $\geq 2$  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.

\*\* 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 Recomm Rep. 2011; 60:1-64 (available at [www.cdc.gov/vaccines/pubs/pinkbook/index.html](http://www.cdc.gov/vaccines/pubs/pinkbook/index.html)).

†† 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.

series should be delayed until completion or termination of pregnancy.

Lastly, a row for MenACWY/MPSV4 vaccine and a separate row for MenB vaccine replace the single row for meningococcal vaccine in the 2015 schedule table of contraindications and precautions to commonly used vaccines in adults. The text "Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component" was added as a contraindication and "Moderate or severe acute illness with or without fever" was added as a precaution for both MenACWY/MPSV4 and MenB rows.

The adult immunization schedule describes certain conditions that might cause altered immunocompetence, such as anatomical or functional asplenia and the use of immunosuppressive drugs, as indications or contraindications for specific vaccines. It also describes certain high-risk conditions for which specific vaccines are recommended. For example, before all adults were recommended to receive yearly influenza vaccine—a recommendation since the 2010–2011 influenza season—the ACIP recommended that adults who are at increased risk for severe complications from influenza or at higher risk for influenza-related outpatient, emergency department, or hospital visits receive annual influenza vaccine, including those with chronic pulmonary (including asthma) or cardiovascular (except isolated hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus), and HIV infection (8). The ACIP also recom-

mends that women who are or will be pregnant during the influenza season be vaccinated to protect themselves and their newborns (5, 8). In addition, tetanus-diphtheria-acellular pertussis (Tdap) vaccination is recommended for pregnant women during each pregnancy, preferably during 27 to 36 weeks' gestation, regardless of her history of receiving tetanus-diphtheria (Td) or Tdap vaccines (9). Thus, obstetrician-gynecologists, pulmonologists, nephrologists, cardiologists, and other clinical specialists who provide care for these at-risk adult populations have the responsibility, as do their primary care colleagues, to assess for and recommend vaccines their patients need, and either administer the needed vaccines or refer them to a place where they can get the recommended vaccines. Recently, the authors of 2 published meta-analyses described an association between influenza vaccination and lower risk for cardiovascular events among patients with existing cardiovascular disease. They concluded that physicians should be aware of the need to offer influenza vaccination to patients with cardiovascular disease and that cardiologists should offer vaccination to their patients as "a simple once-annual protective therapy to reduce cardiovascular events" (10, 11).

Despite the long-standing ACIP recommendations and continued emphasis on vaccinating adults who are at increased risk for complications from influenza, influenza vaccination coverage rates among high-risk adults have remained low (12, 13). The overall influenza vaccination coverage for the 2012–2013 season among

adults 18 through 64 years of age with at least 1 high-risk condition was only 49.5% and those with at least 2 high-risk conditions was only 59.5% (13). Influenza vaccination rates were low among those with lung disease (46.2%), heart disease (50.5%), diabetes (58.0%), renal disease (62.5%), and cancer (56.4%). In 2012–2013, out of an estimated 40 million adults 18 through 64 years of age with medical conditions that increase the risk for severe illness from influenza, approximately 90% of those who were unvaccinated may have missed at least 1 potential opportunity to receive the influenza vaccine through their health care provider (13). Coverage rates for other vaccines indicated for adults 18 through 64 years of age who have high-risk conditions are likewise low (14). For adults  $\geq 19$  years of age with chronic liver conditions, only 13.3% reported that they received hepatitis A vaccinations and 34.0% reported that they received hepatitis B vaccinations. Hepatitis B vaccination coverage among adults aged 19 through 59 years and  $\geq 60$  years with diabetes was 26.3% and 13.9%, respectively.

Although vaccination coverage estimates for adults with high-risk conditions are low, almost all general internists and family physicians feel responsible to ensure that patients receive recommended vaccines (15). But only 29% of general internists and 32% of family physicians assess their adult patients' vaccination status at every visit (15). In addition, some adult patients may rely on the specialists they see for primary care, including vaccination. A recommendation by an adult patient's health care provider for needed vaccines is a strong predictor of the patient receiving recommended vaccines (16). The health care provider is clearly the central figure in promoting vaccination among adults with high-risk conditions and adults in general.

Several tools are available to assist primary care and specialty health care providers in assessing for and recommending needed vaccines for their adult patients (17–19). Health care providers also have at their disposal proven methods for improving vaccination rates, such as the use of standing orders, patient reminder and recall notices, provider feedback, and immunization information systems (commonly known as vaccine registries, which are available in most states) (20). In addition, electronic health record management systems can include adult immunization and clinical decision-support systems to prompt providers to assess their patients' immunization needs and recommend appropriate vaccinations. Because only 31% of family physicians and 20% of general internists reported stocking all vaccines routinely recommended for adults (15), many providers will need to refer some of their patients to other providers for vaccination. Online tools, such as Vaccine Finder ([www.vaccines.gov/more\\_info/features/healthmapvaccinefinder.html](http://www.vaccines.gov/more_info/features/healthmapvaccinefinder.html)), can be useful for providers to identify vaccination service providers in their area.

Primary care providers and specialty providers, such as obstetrician-gynecologists, cardiologists, and other clinical specialists, have the responsibility to help

ensure that their patients are protected from vaccine-preventable diseases and their sequelae. The use of proven, existing strategies can lead to improvements in immunization coverage rates and reduced illness and disability from vaccine-preventable diseases among adults in the United States.

From the Centers for Disease Control and Prevention, Atlanta, Georgia.

**Disclosures:** To assure the integrity of the ACIP, the U.S. Department of Health and Human Services has taken steps to assure that there is technical adherence to ethics statutes and regulations regarding financial conflicts of interest. Concerns regarding the potential for the appearance of a conflict are addressed, or avoided altogether, through pre- and postappointment considerations. Individuals with particular vaccine-related interests will not be considered for appointment to the committee. Potential nominees are screened for conflicts of interest, and if any are found, they are asked to divest or forgo certain vaccine-related activities. In addition, at the beginning of each ACIP meeting, each member is asked to declare his or her conflicts. Members with conflicts are not permitted to vote if the conflict involves the vaccine or biological being voted on. Details can be found at [www.cdc.gov/vaccines/acip/committee/structure-role.html](http://www.cdc.gov/vaccines/acip/committee/structure-role.html). Drs. Kim, Bridges, and Harri-man authored this work. Authors have disclosed no conflicts of interest. Forms can be viewed at [www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M15-3005](http://www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M15-3005).

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## APPENDIX

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 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 (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 adopted by the CDC Director become agency guidelines on the date published in the *Morbidity and Mortality Weekly Report (MMWR)*. Additional information on ACIP is available at [www.cdc.gov/vaccines/acip](http://www.cdc.gov/vaccines/acip).

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