ACIP Releases 2012 Immunization Schedules

JAMIE LOEHR, MD, University of Rochester School of Medicine and Dentistry, Ithaca, New York

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This issue of American Family Physician introduces the 2012 immunization schedules for young children (birth through six years of age), older children and adolescents (seven through 18 years of age), and adults, as well as the catch-up immunization schedule for persons who have not received a recommended vaccination on time or at the appropriate intervals. A few changes this year are especially pertinent to family physicians.

With regard to pertussis, the Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention now recommends that health care professionals and pregnant women receive a single dose of the tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine—regardless of the time since the previous tetanus and diphtheria vaccine—if they have not received a dose of Tdap previously. In pregnant women, the preferred time for Tdap administration is during the late second or early third trimester.

Based on studies that have shown an increased incidence of hepatitis B infection in persons with diabetes mellitus, the ACIP now recommends routine hepatitis B vaccination for all adults younger than 60 years who have diabetes. For older adults with diabetes, the ACIP agreed to a Category B recommendation (formerly known as a permissive recommendation) for hepatitis B vaccination, which allows for individualized decision-making by the physician and patient about the appropriateness of the vaccine.

The most complicated recommendations from the ACIP this year involve the administration of quadrivalent human papillomavirus (HPV4) vaccine (Gardasil) for boys and young men. These recommendations are specific to the quadrivalent vaccine, and do not apply to the bivalent vaccine (Cervarix). The ACIP now recommends routine HPV4 vaccination in boys 11 to 12 years of age, with catch-up vaccinations at 13 to 21 years of age. It is acceptable to begin HPV4 vaccination as young as nine years of age. HPV4 vaccination is also recommended at 22 to 26 years of age in men who have human immunodeficiency virus infection and in men who have sex with men. For other men 22 to 26 years of age, the ACIP makes a Category B recommendation for HPV4 vaccination.

Finally, the ACIP recommends that children six months to eight years of age receive two doses of influenza vaccine during the current season if they did not receive at least one dose of the vaccine during the 2010-2011 season. This is a departure from past recommendations, which stated that two doses in any previous season meant the child needed only one dose for the current season.

EDITOR’S NOTE: The author serves as liaison to the ACIP for the AAFP.

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Author disclosure: No relevant financial affiliations to disclose.

Answers to This Issue’s CME Quiz

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<td>Q1.</td>
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<td>Q2.</td>
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<td>Q3.</td>
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<td>Q6.</td>
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<td>Q7.</td>
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**FIGURE 1.** Recommended adult immunization schedule, by vaccine and age group

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–49 years</th>
<th>50–59 years</th>
<th>60–64 years</th>
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<tbody>
<tr>
<td>Influenza*</td>
<td>1 dose annually</td>
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<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)*</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 years</td>
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<tr>
<td>Varicella*</td>
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<tr>
<td>Human papillomavirus (HPV)* Female</td>
<td>3 doses</td>
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<tr>
<td>Human papillomavirus (HPV)* Male</td>
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<tr>
<td>Zoster*</td>
<td>1 dose</td>
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<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)*</td>
<td>1 or 2 doses</td>
<td>1 or 2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pneumococcal ( polysaccharide)</td>
<td>1 or 2 doses</td>
<td>1 or more doses</td>
<td>1 dose</td>
<td></td>
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<tr>
<td>Meningococcal (including meningococcal B)</td>
<td>2 doses</td>
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<tr>
<td>Hepatitis B*</td>
<td>3 doses</td>
<td></td>
<td></td>
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</tbody>
</table>

* Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

Tdap recommended for ≥65 if contact with <12 month old child. Either Td or Tdap can be used if no infant contact

No recommendation

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

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>VACCINE</th>
<th>IMMUNOCOMPROMISING CONDITIONS (INCLUDING HUMAN IMMUNODEFICIENCY VIRUS [HIV]/[AIDS], INFECTIOUS DISEASES, IMMUNE DISORDERS, DRUGS, RADIATION, PERSONNEL, OTHER CONDITIONS)</th>
<th>HIV INFECTION</th>
<th>CD4+ TLYMPHOCYTE COUNT</th>
<th>MEN WHO HAVE SEX WITH MEN (MSM)</th>
<th>HEART DISEASE, CHRONIC LUNG DISEASE, CHRONIC ALCOHOLISM</th>
<th>ASLEPIAS (INCLUDING ELECTIVE SPLENECTOMY AND PERSISTENT COMPONENT DEFICIENCIES)</th>
<th>CHRONIC LIVER DISEASE</th>
<th>DIABETES, KIDNEY FAILURE, END-STAGE RENAL DISEASE, RECEPNT OF HEMODIALYSIS</th>
<th>HEALTH CARE PERSONNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza*</td>
<td>1 dose TIV annually</td>
<td></td>
<td>≤200 cells/µL</td>
<td>≥200 cells/µL</td>
<td>Men who have sex with men (MSM)</td>
<td>Heart disease, chronic lung disease, chronic alcoholism</td>
<td>Aslepias (including elective splenectomy and persistent component deficiencies)</td>
<td>Chronic liver disease</td>
<td>Diabetes, kidney failure, end-stage renal disease, recipient of hemodialysis</td>
<td>Health care personnel</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)*</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 years</td>
<td></td>
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<tr>
<td>Varicella*</td>
<td>Contraindicated</td>
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<tr>
<td>Human papillomavirus (HPV)* Female</td>
<td>3 doses through age 26 years</td>
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<tr>
<td>Human papillomavirus (HPV)* Male</td>
<td>3 doses through age 26 years</td>
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<td>Zoster*</td>
<td>Contraindicated</td>
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<tr>
<td>Measles, mumps, rubella*</td>
<td>Contraindicated</td>
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<td>Pneumococcal (polysaccharide)*</td>
<td>1 or 2 doses</td>
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<tr>
<td>Meningococcal*</td>
<td>1 or more doses</td>
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<td>Hepatitis A*</td>
<td>2 doses</td>
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</tbody>
</table>

* Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

Contraindicated

No recommendation

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly indicated for adults ages 19 years and older, as of January 1, 2012. 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 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 (http://www.cdc.gov/vaccines/pubs/acip-list.htm).

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 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 http://www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. Information about filing a claim for vaccine injury is available through 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 also is available at http://www.cdc.gov/vaccines.

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.
1. Additional information
   • Advisory Committee on Immunization Practices (ACIP) vaccine recommendations and additional information are available at: http://www.cdc.gov/vaccines/pubs/acip-list.htm.
   • Information on travel vaccine requirements and recommendations (e.g., for hepatitis A and B, meningococcal, and other vaccines) available at http://wwwn.cdc.gov/travel/page/vaccinations.htm.

2. Influenza vaccination
   • Annual vaccination against influenza is recommended for all persons 6 months of age and older.
   • Persons 6 months of age and older, including pregnant women, can receive the trivalent inactivated vaccine (TIV).
   • Healthy, nonpregnant adults younger than age 50 years without high-risk medical conditions can receive either intranasally administered live, attenuated influenza vaccine (LAIV) (FluMist), or TIV.
   • Health-care personnel who care for severely immunocompromised persons (i.e., those who require care in a protected environment) should receive TIV rather than LAIV. Other persons should receive TIV.
   • The intramuscular or intradermal administered TIV are options for adults aged 18–64 years.
   • Adults aged 65 years and older can receive the standard dose TIV or the high-dose TIV (Fluzone High-Dose).

3. Tetanus, diphtheria, and acellular pertussis (Td/Tdap) vaccination
   • Administer a one-time dose of Tdap to adults younger than age 65 years who have not received Tdap previously or for whom vaccine status is unknown to replace one of the 10-year Td boosters.
   • Tdap is specifically recommended for the following persons:
     — pregnant women more than 20 weeks’ gestation;
     — adults, regardless of age, who are close contacts of infants younger than age 12 months (e.g., parents, grandparents, or child care providers), and
     — health-care personnel.
   • Tdap can be administered regardless of interval since the most recent tetanus or diphtheria-containing vaccine.
   • Pregnant women not vaccinated during pregnancy should receive Tdap immediately postpartum.
   • Adults 65 years and older may receive Tdap.
   • Adults with unknown or incomplete history of completing a 3-dose primary vaccination series with Td-containing vaccines should begin or complete a primary vaccination series. Tdap should be substituted for a single dose of Td in the vaccination series with Tdap preferred as the first dose.
   • For unvaccinated adults, administer the first 2 doses at least 4 weeks apart and the third dose 6–12 months after the second.
   • If incompletely vaccinated (i.e., less than 3 doses), 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.
   • Special consideration for vaccination should be given to 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 (although for health-care personnel and pregnant women, birth before 1980 should not be considered evidence of immunity);
     — history of varicella based on diagnosis or verification of varicella by a health-care provider (for a patient reporting a history of or having an atypical case, a mild case, or both, health-care providers should seek either an epidemiologic link to a typical varicella case or to a laboratory-confirmed case or evidence of laboratory confirmation, if it was performed at the time of acute disease);
     — history of herpes zoster based on diagnosis or verification of herpes zoster by a health-care provider; or
     — laboratory evidence of immunity or laboratory confirmation of disease.

5. Human papillomavirus (HPV) vaccination
   • Two vaccines are licensed for use in females, bivalent HPV vaccine (HPV2) and quadrivalent HPV vaccine (HPV4), and one HPV vaccine for use in males (HPV4).
   • For females, either HPV4 or HPV2 is recommended in a 3-dose series for routine vaccination at 11 or 12 years of age, and for those 13 through 26 years of age, if not previously vaccinated.
   • For males, HPV4 is recommended in a 3-dose series for routine vaccination at 11 or 12 years of age, and for those 13 through 21 years of age, if not previously vaccinated. Males 22 through 26 years of age may be vaccinated.
   • HPV vaccines are not live vaccines and can be administered to persons who are immunocompromised as a result of infection (including HIV infection), disease, or medications. Vaccine is recommended for immunocompromised persons through age 26 years who did not get any or all doses when they were younger. The immune response and vaccine efficacy might be less than that in immunocompetent persons.
   • Men who have sex with men (MSM) might especially benefit from vaccination to prevent condyloma and anal cancer. HPV4 is recommended for MSM through age 26 years who did not get any or all doses when they were younger.
   • Ideally, vaccine should be administered before potential exposure to HPV through sexual activity; however, persons who are sexually active should still be vaccinated consistent with age-based recommendations. HPV vaccine can be administered to persons with a history of genital warts, abnormal Papanicolaou test, or positive HPV DNA test.
   • A complete series for either HPV4 or HPV2 consists of 3 doses. The second dose should be administered 1–2 months after the first dose; the third dose should be administered 6 months after the first dose (at least 24 weeks after the first dose).
   • Although HPV vaccination is not specifically recommended for health-care personnel (HCP) based on their occupation, HCP should receive the HPV vaccine if they are in the recommended age group.

6. Zoster vaccination
   • A single dose of zoster vaccine is recommended for adults 60 years of age and older regardless of whether they report a prior episode of herpes zoster. Although the vaccine is licensed by the Food and Drug Administration (FDA) for use among and can be administered to persons 50 years and older, ACIP recommends that vaccination begins at 60 years of age.
• Persons with chronic medical conditions may be vaccinated unless their condition constitutes a contraindication, such as pregnancy or severe immunodeficiency.
• Although zoster vaccination is not specifically recommended for health-care personnel (HCP), HCP should receive the vaccine if they are in the recommended age group.

7. Measles, mumps, rubella (MMR) vaccination
• Adults born before 1957 generally are 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, laboratory evidence of immunity to each of the three diseases, or documentation of provider-diagnosed measles or mumps disease. For rubella, documentation of provider-diagnosed disease is not considered acceptable evidence of immunity.

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 from 1963 to 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 postsecondary educational institutions;— 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 routinely 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 polysaccharide (PPSV) vaccination
• Vaccinate all persons with the following indications:
  — age 65 years and older without a history of PPSV vaccination;
  — adults younger than 65 years with chronic lung disease (including chronic obstructive pulmonary disease, emphysema, and asthma); chronic cardiovascular diseases; diabetes mellitus; chronic liver disease (including cirrhosis); alcoholism; cochlear implants; cerebrospinal fluid leaks; immunocompromising conditions; and functional or anatomic asplenia (e.g., sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, splenic dysfunction, or splenectomy [if elective splenectomy is planned, vaccinate at least 2 weeks before surgery]); — residents of nursing homes or long-term care facilities; and— adults who smoke cigarettes.
• Persons with asymptomatic or symptomatic HIV infection should be vaccinated as soon as possible after their diagnosis.

• When cancer chemotherapy or other immunosuppressive therapy is being considered, the interval between vaccination and initiation of immunosuppressive therapy should be at least 2 weeks. Vaccination during chemotherapy or radiation therapy should be avoided.
• Routine use of PPSV is not recommended for American Indians/Alaska Natives or other persons younger than 65 years of age unless they have underlying medical conditions that are PPSV indications. However, public health authorities may consider recommending PPSV for American Indians/Alaska Natives who are living in areas where the risk for invasive pneumococcal disease is increased.

9. Revaccination with PPSV
• One-time revaccination 5 years after the first dose is recommended for persons 19 through 64 years of age with chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (e.g., sickle cell disease or splenectomy); and for persons with immunocompromising conditions.
• Persons who received PPSV before age 65 years for any indication should receive another dose of the vaccine at age 65 years or later if at least 5 years have passed since their previous dose.
• No further doses are needed for persons vaccinated with PPSV at or after age 65 years.

10. Meningococcal vaccination
• Administer 2 doses of meningococcal conjugate vaccine quadrivalent (MCV4) at least 2 months apart to adults with functional asplenia or persistent complement component deficiencies.
• HIV-infected persons who are vaccinated should also receive 2 doses.
• Administer a single dose of meningococcal vaccine to microbiologists routinely exposed to isolates of Neisseria meningitidis, military recruits, and persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic.
• First-year college students up through age 21 years who are living in residence halls should be vaccinated if they have not received a dose on or after their 16th birthday.
• MCV4 is preferred for adults with any of the preceding indications who are 55 years old and younger; meningococcal polysaccharide vaccine (MPSV4) is preferred for adults 56 years and older.
• Revaccination with MCV4 every 5 years is recommended for adults previously vaccinated with MCV4 or MPSV4 who remain at increased risk for infection (e.g., adults with anatomic or functional asplenia or persistent complement component deficiencies).

11. 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 and persons who use injection 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; 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. (See footnote 1 for more information on travel recommendations). 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; alterna-
12. Hepatitis B vaccination  
- Vaccinate persons with any of the following indications and any person seeking protection from hepatitis B virus (HBV) infection:
  - Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than one 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 exposed to blood or other potentially infectious body fluids;
  - Persons with diabetes younger than 60 years as soon as feasible after diagnosis; persons with diabetes who are 60 years or older at the discretion of the treating clinician based on increased need for assisted glucose monitoring in long-term care facilities, likelihood of acquiring hepatitis B infection, its complications or chronic sequelae, and 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 persons with chronic HBV infection; clients and staff members of institutions for persons with developmental disabilities; and international travelers to countries with high or intermediate prevalence of chronic HBV infection; 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 daycare 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 1 month after the first dose; the third dose should be given 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, administered on days 0, 7, and 21–30 followed by a booster dose at month 12 may be used.
- Adult patients receiving hemodialysis or with other immunocompromising conditions should receive 1 dose of 40 μg/mL (Recombivax HB) administered on a 3-dose schedule or 2 doses of 20 μg/mL (Engerix-B) administered simultaneously on a 4-dose schedule at 0, 1, 2, and 6 months.

13. Selected conditions for which Haemophilus influenzae type b (Hib) vaccine may be used  
- One dose of Hib vaccine should be considered for persons who have sickle cell disease, leukemia, or HIV infection, or who have anatomic or functional asplenia if they have not previously received Hib vaccine.

14. Immunocompromising conditions  
- Inactivated vaccines generally are acceptable (e.g., pneumococcal, meningococcal, and influenza [inactivated influenza vaccine]), and live vaccines generally are avoided in persons with immune deficiencies or immunocompromising conditions. Information on specific conditions is available at http://www.cdc.gov/vaccines/pubs/acip-list.htm.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Contraindications</th>
<th>Precautions</th>
</tr>
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<tbody>
<tr>
<td>Influenza, injectable trivalent (TIV)</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine or to a vaccine component, including egg protein.</td>
<td>Moderate or severe acute illness with or without fever. History of Guillain-Barré syndrome (GBS) within 6 weeks of previous influenza vaccination.</td>
</tr>
<tr>
<td>Influenza, live attenuated (LAN)</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine or to a vaccine component, including egg protein. Immune suppression. Certain chronic medical conditions such as asthma, diabetes, heart or kidney disease. Pregnancy.</td>
<td>Moderate or severe acute illness with or without fever. History of GBS within 6 weeks of previous influenza vaccination. Receipt of specific antivirals (i.e., amantadine, rimantadine, zanamivir, or oseltamivir) 48 hours before vaccination. Avoid use of these antiviral drugs for 14 days after vaccination.</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Tdap); tetanus, diphtheria (Td)</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.</td>
<td>Moderate or severe acute illness with or without fever. GBS 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 Tdap only: Progressive or unstable neurologic disorder, uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized.</td>
</tr>
</tbody>
</table>
TABLE. Contraindications and precautions to commonly used vaccines in adults*†

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Contraindications</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicella,²</td>
<td>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 human immunodeficiency virus (HIV) infection who are severely immunocompromised). Pregnancy.</td>
<td>Recent (≤11 months) receipt of antibody-containing blood product (specific interval depends on product).³ Moderate or severe acute illness with or without fever. Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; if possible, delay resumption of these antiviral drugs for 14 days after vaccination.</td>
</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td>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, or long-term immunosuppressive therapy) or patients with HIV infection who are severely immunocompromised). Pregnancy.</td>
<td>Moderate or severe acute illness with or without fever. Pregnancy.</td>
</tr>
<tr>
<td>Zoster</td>
<td>Severe allergic reaction (e.g., anaphylaxis) 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.</td>
<td>Moderate or severe acute illness with or without fever. Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; if possible, avoid use of these antiviral drugs for 14 days after vaccination.</td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)²</td>
<td>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.</td>
<td>Moderate or severe acute illness with or without fever. Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product).⁶ History of thrombocytopenia or thrombocytopenic purpura. Need for tuberculin skin testing.²</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV)</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. Moderate or severe acute illness with or without fever.</td>
<td></td>
</tr>
<tr>
<td>Meningococcal conjugate, (MCV4); meningococcal, polysaccharide (MPV4)</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. Moderate or severe acute illness with or without fever.</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B (HepB)</td>
<td>Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. Moderate or severe acute illness with or without fever.</td>
<td></td>
</tr>
</tbody>
</table>

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.

2. LAIV, MMR, and varicella vaccines can be administered on the same day. If not administered on the same day, these live vaccines should be separated by at least 28 days.


4. Substantially immunosuppressive steroid dose is considered to be ≥2 weeks of daily receipt of 20 mg or 2 mg/kg body weight of prednisone or equivalent.

5. Vaccine should be deferred for the appropriate interval if replacement immune globulin products are being administered.


7. Measles vaccination may 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 ≥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.


FIGURE 1: Recommended immunization schedule for persons aged 0 through 6 years—United States, 2012 (for those who fall behind or start late, see the catch-up schedule [Figure 3])

<table>
<thead>
<tr>
<th>Vaccine ▼</th>
<th>Age ▲</th>
<th>Birth</th>
<th>1 month</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
<th>9 months</th>
<th>12 months</th>
<th>15 months</th>
<th>18 months</th>
<th>19–23 years</th>
<th>2–3 years</th>
<th>4–6 years</th>
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<tbody>
<tr>
<td>HepB</td>
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<td>HepB</td>
<td>HepB</td>
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<td>Rotavirus</td>
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<td>RV</td>
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<tr>
<td>Measles, mumps, rubella</td>
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<td>DTPa</td>
<td>DTaP</td>
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<td>Haemophilus influenzae type b</td>
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<td>Hib</td>
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<td>Haemophilus influenzae type b</td>
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<td>Poliovirus</td>
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<td>IPV</td>
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<tr>
<td>Influenza</td>
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<td>MMRa</td>
<td>MMRc</td>
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<tr>
<td>Meningococcalb</td>
<td></td>
<td>MenB</td>
<td>MenB</td>
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<tr>
<td>Varicella</td>
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<td>VZV</td>
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<tr>
<td>Hepatitis A</td>
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<td>HepA</td>
<td>HepB</td>
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<tr>
<td>MCV4 — see footnote33</td>
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<td>MCV4</td>
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</table>

This schedule includes recommendations in effect as of December 23, 2011. Any dose not administered at the recommended age should be administered at a subsequent visit, as 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/recs/acip-list.htm. 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).

1. Hepatitis B (HepB) vaccine. (Minimum age: birth)
   - At birth:
     - Administer monovalent HepB vaccine to all newborns before hospital discharge.
     - For infants born to hepatitis B surface antigen (HBsAg)-positive mothers, administer HepB vaccine and 0.5 mL of hepatitis B immune globulin (HIBG) within 12 hours of birth. These infants should be tested for HBsAg and antibody to HBsAg (anti-HBs) 1 to 2 months after completion of at least 3 doses of the HepB series. The second dose should be administered at age 1 to 2 months (generally at the next well-child visit).
     - If mother’s HBsAg status is unknown, within 12 hours of birth administer HepB vaccine for infants weighing ≥2,000 grams, and HepB vaccine plus HIBG for infants weighing <2,000 grams. Determine mother’s HBsAg status as soon as possible and, if she is HBsAg-positive, administer HIBG for infants weighing ≥2,000 grams (no later than 1 week).
   - Doses after the birth dose:
     - The second dose should be administered at age 1 to 2 months. Monovalent HepB vaccine should be used for doses administered before age 6 weeks.
     - Administration of a total of 4 doses of HepB vaccine is permissible when a combination vaccine containing HepB is administered after the birth dose.
     - Infants who did not receive a birth dose should receive 3 doses of a HepB-containing vaccine starting as soon as feasible (Figure 3).
     - The minimum interval between dose 1 and dose 2 is 4 weeks, and between dose 2 and 3 is 8 weeks. The final (third or fourth) dose in the HepB vaccine series should be administered no earlier than age 24 weeks and at least 16 weeks after the first dose.
   - 2. Rotavirus (RV) vaccines. (Minimum age: 6 weeks for both RV-1 [Rotarix] and RV-5 [RotaTeq])
     - The minimum age for the first dose in the series is 14 weeks, 6 days; and
     - 8 months, 0 days for the final dose in the series. Vaccination should not be initiated for infants aged 15 weeks, 0 days or older.
     - If RV-1 (Rotarix) is administered at ages 2 and 4 months, a dose at 6 months is not indicated.
   - 3. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine. (Minimum age: 6 weeks)
     - The fourth dose may be administered as early as age 12 months, provided at least 6 months have elapsed since the third dose.
   - 4. Haemophilus influenzae type b (Hib) conjugate vaccine. (Minimum age: 6 weeks)
     - If PRP-OMP (PedvaxHIB or Comvax [HepB-Hib]) is administered at ages 2 and 4 months, a dose at age 6 months is not indicated.
     - Hiberox should only be used for the booster (final) dose in children aged 12 months through 4 years.
   - 5. Pneumococcal vaccines. (Minimum age: 6 weeks for pneumococcal conjugate vaccine [PCV], 1 year for pneumococcal polysaccharide vaccine [PPSV])
     - Administer 1 dose of PCV to all healthy children aged 24 through 59 months who are not completely vaccinated for their age.
     - For children who have received an age-appropriate series of 7-valent PCV (PCV7), a single supplemental dose of 13-valent PCV (PCV13) is recommended for:
       - All children aged 14 through 59 months
       - Children aged 60 through 71 months with underlying medical conditions.
     - Administer PPSV at least 8 weeks after last dose of PCV to children aged 2 years or older with certain underlying medical conditions, including a cochlear implant.
   - 6. Inactivated poliovirus vaccine (IPV). (Minimum age: 6 weeks)
     - If 4 or more doses are administered before age 4 years, an additional dose should be administered at age 4 through 6 years.
   - 7. Influenza vaccines. (Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 2 years for live, attenuated influenza vaccine [LAIV])
     - For most healthy children aged 2 years and older, either LAIV or TIV may be used. However, LAIV should not be administered to some children, including 1) children with asthma, 2) children 2 through 4 years who had wheezing in the past 12 months, or 3) children who have any other underlying medical conditions that predispose them to influenza complications. For all other indications for use of LAIV, see MMWR 2010;59(No. RR-9), available at http://www.cdc.gov/mmwr/pdf/rr/rr5908.pdf.
     - For children aged 6 months through 8 years:
       - For the 2011–12 season, administer 2 doses (separated by at least 4 weeks) to those who did not receive at least 1 dose of the 2010–11 vaccine. Those who received at least 1 dose of the 2010–11 vaccine require 1 dose for the 2011–12 season.
       - For the 2012–13 season, follow dosing guidelines in the 2012 ACIP influenza vaccine recommendations.
     - 8. Measles, mumps, and rubella (MMR) vaccine. (Minimum age: 12 months)
     - The second dose may be administered before age 4 years, provided at least 3 months have elapsed since the first dose.
     - Administer MMR vaccine to infants aged 6 through 11 months who are traveling internationally. These children should be revaccinated with 2 doses of MMR vaccine, the first at ages 12 through 15 months and at least 4 weeks after the previous dose, and the second at ages 4 through 6 years.
     - The second dose may be administered before age 4 years, provided at least 3 months have elapsed since the first dose.
     - For children aged 12 months through 12 years, the recommended minimum interval between doses is 3 months. However, if the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.
     - 10. Hepatitis A (HepA) vaccine. (Minimum age: 12 months)
     - Administer the second (final) dose 6 to18 months after the first.
     - A 2-dose HepA vaccine series is recommended for anyone aged 24 months and older, previously unvaccinated, for whom immunity against hepatitis A virus infection is desired.
     - 11. Meningococcal conjugate vaccines, quadrivalent (MCV4). (Minimum age: 9 months for Menactra [MCV4-D], 2 years for Menveo [MCV4-CRM])
     - For children aged 9 through 23 months 1) with persistent complement component deficiency; 2) who are residents of or travelers to countries with hyperendemic or epidemic disease; or 3) who are present during outbreaks caused by a vaccine type 3 doses. Administer 2 primary doses of MCV4-D, ideally at ages 9 months and 12 months and at least 8 weeks apart.
     - For children aged 24 months and older with 1) persistent complement component deficiency who have not been previously vaccinated; or 2) anatomic/functional asplenia, administer 2 primary doses of either MCV4 at least 8 weeks apart.
     - For children with anatomic/functional asplenia, if MCV4-D (Menactra) is used, administer at a minimum age of 2 years and at least 4 weeks after completion of all PCV doses.
This schedule includes recommendations in effect as of December 23, 2011. 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/pubs/acip-list.htm. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://vaers.hhs.gov) or by telephone (800-822-7967).
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 the accompanying childhood and adolescent immunization schedules (Figures 1 and 2) and their respective footnotes.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age for Dose 1</th>
<th>Minimum Interval Between Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose 1 to dose 2</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Birth</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>
| Rota
tivirus1                           | 6 weeks                | 4 weeks                       | 4 weeks1                      |                 |                 |
| Diphtheria, tetanus, pertussis2        | 6 weeks                | 4 weeks                       | 4 weeks                       |                 |                 |
| Haemophilus influenzae type b2         | 6 weeks                | 4 weeks                       | 8 weeks                       | 6 weeks         | 6 months2       |
| Pneumococcal3                          | 6 weeks                | 8 weeks                       | 6 weeks (as final dose)       |                 |                 |
| Inactivated poliovirus3                | 6 weeks                | 4 weeks                       | 4 weeks                       |                 | 6 months#       |
| Meningococcal4                         | 9 months               | 8 weeks*                      |                               |                 |                 |
| Measles, mumps, rubella4               | 12 months              | 8 weeks                       |                               |                 |                 |
| Varicella5                             | 12 months              | 3 months                      |                               |                 |                 |
| Hepatitis A                            | 12 months              | 6 months                      |                               |                 |                 |
| Tetanus, diphtheria, tetanus, pertussis5| 7 years*               | 4 weeks                       |                               |                 |                 |
| Human papillomavirus10                 | 9 years                | Routine dosing intervals are recommended11 |                   |                 |                 |
| Hepatitis A                            | 12 months              | 6 months                      |                               |                 |                 |
| Hepatitis B                            | Birth                  | 4 weeks                       | 8 weeks                       |                 |                 |
| Inactivated poliovirus2                | 8 weeks                | 4 weeks                       | 4 weeks#                      | 6 months#       |
| Meningococcal5                         | 9 months               | 8 weeks*                      |                               |                 |                 |
| Measles, mumps, rubella5               | 12 months              | 4 weeks                       |                               |                 |                 |
| Varicella6                             | 12 months              | 4 weeks                       |                               |                 |                 |
| 1. Rotavirus (RV) vaccines (RV-1 [Rotarix] and RV-5 [RotaTeq]). • The maximum age for the first dose in the series is 14 weeks, 6 days; and 8 months, 0 days for the final dose in the series. Vaccination should not be initiated for infants aged 15 weeks, 0 days or older. • If RV-1 was administered for the first and second doses, a third dose is not indicated. 2. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine. • The fifth dose is not necessary if the fourth dose was administered at age 4 years or older. 3. Haemophilus influenzae type b (Hib) conjugate vaccine. • Hib vaccine should be considered for unvaccinated persons aged 5 years or older who have sickle cell disease, leukemia, human immunodeficiency virus (HIV) infection, or anatomic/functional asplenia. • If the 2 doses were PRP-OMP (PedvaxHIB or Comvax) and were administered at age 11 months or younger, the third (and final) dose should be administered at age 12 through 15 months and at least 8 weeks after the second dose. • If the first dose was administered at age 7 through 11 months, administer the second dose at least 4 weeks later and a final dose at age 12 through 15 months. 4. Pneumococcal vaccines. (Minimum age: 6 weeks for pneumococcal conjugate vaccine [PCV]: 2 years for pneumococcal polysaccharide vaccine [PPSV]). • For children aged 24 through 71 months with underlying medical conditions, administer 1 dose of PCV if 3 doses of PCV were received previously, or administer 2 doses of PCV at least 8 weeks apart if fewer than 3 doses of PCV were received previously. • A single dose of PCV may be administered to certain children aged 6 through 18 years with underlying medical conditions. See age-specific schedules for details. • Administer PPSV to children aged 2 years or older with certain underlying medical conditions. See MMWR 2010:59(No. RR-11), available at http://www.cdc.gov/mmwr/pdf/rr/rr5911.pdf. 5. Inactivated poliovirus vaccine (IPV). • A fourth dose is not necessary if the third dose was administered at age 4 years or older and at least 6 months after the previous dose. • In the first 6 months of life, minimum age and minimum intervals are only recommended if the person is at risk for imminent exposure to circulating poliovirus (i.e., travel to a polio-endemic region or during an outbreak). • IPV is not routinely recommended for U.S. residents aged 18 years or older. Meningococcal conjugate vaccines, quadrivalent (MCV4). (Minimum age: 9 months for Menactra [MCV4-D]; 2 years for Menveo [MCV4-CRM]). • See Figure 1 (“Recommended immunization schedule for persons aged 0 through 8 years of age”) and Figure 2 (“Recommended immunization schedule for persons aged 7 through 18 years”) for further guidance. 6. Measles, mumps, and rubella (MMR) vaccine. • Administer the second dose routinely at age 4 through 6 years. 7. Varicella (VAR) vaccine. • Administer the second dose routinely at age 4 through 6 years. If the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid. 8. Tetanus and diphtheria toxoids (Td) and tetanus and diphtheria toxoids and acellular pertussis (TdAP) vaccines. • For children aged 7 through 18 years who are not fully immunized with the childhood DTaP vaccine series, Tdap vaccine should be substituted for a single dose of Td vaccine in the catch-up series; if additional doses are needed, use Td vaccine. For these children, an adolescent Tdap vaccine dose should not be given. • An inadvertent dose of DTaP vaccine administered to children aged 7 through 10 years can count as part of the catch-up series; this dose can count as the adolescent Tdap dose, or the child can later receive a Tdap booster dose at age 11–12 years. 9. Human papillomavirus (HPV) vaccines (HPV4 [Gardasil] and HPV2 [Cervarix]). • Administer the vaccine series to females (either HPV2 or HPV4) and males (HPV4) at age 13 through 18 years if patient is not previously vaccinated. • Use recommended routine dosing intervals for vaccine series catch-up; see Figure 2 (“Recommended immunization schedule for persons aged 7 through 18 years”).朋。