

Recommended Adult Immunization Schedule, United States, 2019*

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In October 2018, the Advisory Committee on Immunization Practices (ACIP) voted to approve the Recommended Adult Immunization Schedule, United States, 2019, for adults aged 19 years or older. The 2019 adult immunization schedule, available at www.cdc.gov/vaccines/schedules, summarizes ACIP recommendations in 2 tables and accompanying notes (Figure). The full ACIP recommendations for each vaccine are available at www.cdc.gov/vaccines/hcp/acip-recs/index.html. The 2019 schedule has also been approved by the Director of the Centers for Disease Control and Prevention (CDC) and by the American College of Physicians, the American Academy of Family Physicians, the American College of Obstetricians and Gynecologists, and the American College of Nurse-Midwives.

The ACIP's recommendations on use of each vaccine are developed after in-depth review of vaccine-related data, including disease epidemiology and burden of disease, vaccine efficacy and effectiveness, vaccine safety, the quality of evidence, feasibility of program implementation, and economic analyses of immunization policy (1). ACIP recommendations can be complex and challenging to implement. The purpose of the annually published schedule is to consolidate and summarize updates to ACIP recommendations on vaccination of adults and assist providers in implementing current ACIP recommendations. The use of trade names of vaccines in this article and in the schedule is for identification purposes only and does not imply endorsement by the ACIP or the CDC.

CHANGES TO THE 2019 ADULT IMMUNIZATION SCHEDULE

Updated ACIP Recommendations

Influenza vaccination (2). In June 2018, the ACIP updated recommendations on the use of live attenuated influenza vaccine (LAIV) (FluMist Quadrivalent, AstraZeneca) after 2 influenza seasons (2016–2017 and 2017–2018) during which use of LAIV was not recommended in the United States. For the 2018–2019 season, any licensed influenza vaccine that is appropriate for the age and health status of the patient may be used. LAIV is an option for adults through age 49 years, except for those who have immunocompromising conditions, including HIV infection; have anatomical or functional asplenia; are pregnant; have close contact with or are caregivers of severely immunocompromised persons in a protected environment; have re-

ceived influenza antiviral medications in the previous 48 hours; or have cerebrospinal fluid leak or a cochlear implant. Those with a history of Guillain-Barré syndrome within 6 weeks of a previous dose of influenza vaccine generally should not be vaccinated.

Hepatitis B vaccination (3). In February 2018, the ACIP recommended use of the new single-antigen recombinant hepatitis B vaccine with a novel cytosine-phosphate-guanine 1018 oligodeoxynucleotide adjuvant (Heplisav-B, Dynavax) for prevention of hepatitis B virus infection in adults aged 18 years or older. Approved by the U.S. Food and Drug Administration in November 2017, Heplisav-B is routinely administered in 2 doses at least 4 weeks apart. It can be used as a substitute in a 3-dose series with a different hepatitis B vaccine, but a valid 2-dose series requires 2 doses of Heplisav-B with at least 4 weeks between them. When feasible, a vaccine from the same manufacturer should be used to complete the vaccination series. However, vaccination should not be deferred if the previously administered hepatitis B vaccine is unknown or if a vaccine from the same manufacturer is not available. A pregnant woman with an indication for hepatitis B vaccination should not receive Heplisav-B because no safety data are available on its use during pregnancy.

Hepatitis A vaccination (4). In October 2018, the ACIP recommended adding homelessness as an indication for routine hepatitis A vaccination with a 2-dose series of single-antigen hepatitis A vaccine (Havrix, GlaxoSmithKline; Vaqta, Merck) or a 3-dose series of combination hepatitis A and B vaccine (Twinrix, GlaxoSmithKline). Other populations that are at increased risk for hepatitis A virus infection or severe hepatitis A disease and are recommended to receive routine vaccination include persons with chronic liver disease or clotting factor disorders, travelers in countries with high or intermediate endemic hepatitis A, persons with close personal contact with an international adoptee in the first 60 days after arrival from a country with high or intermediate endemic hepatitis A, men who have sex with men, persons who use injection or noninjection drugs, and persons who work with hepatitis A virus in a laboratory or nonhuman primates infected with the virus (5–7). In addition, any person who is not at risk for hepatitis A virus infection but wants protection against it may be vaccinated.

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* The 2019 adult immunization schedule appeared in *Annals of Internal Medicine* and on the Centers for Disease Control and Prevention Web site at www.cdc.gov/vaccines/schedules. An announcement summarizing changes to the 2019 adult immunization schedule is published concurrently in the *Morbidity and Mortality Weekly Report*. Readers can cite the 2019 adult immunization schedule as follows: Kim DK, Hunter P; Advisory Committee on Immunization Practices. Recommended adult immunization schedule, United States, 2019. *Ann Intern Med.* 2019;170:182–92. doi:10.7326/M18-3600

† The 2019 adult immunization schedule was prepared by the Advisory Committee on Immunization Practices (ACIP); the ACIP Adult Immunization Work Group; David K. Kim, LaDora Woods, and Joseph Alcobar (Centers for Disease Control and Prevention, Atlanta, Georgia); and Paul Hunter (University of Wisconsin, Madison, Wisconsin). For a list of members of the ACIP and the ACIP Adult Immunization Work Group, see the Appendix (available at [Annals.org](https://annals.org)).

Figure. Recommended Adult Immunization Schedule, United States, 2019.

Recommended Adult Immunization Schedule for ages 19 years or older

UNITED STATES
2019

1 Determine recommended vaccinations by age (Table 1)

2 Assess need for additional recommended vaccinations by medical condition and other indications (Table 2)

3 Review vaccine types, frequencies, and intervals and considerations for special situations (Notes)

Recommended by the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/acip) and approved by the Centers for Disease Control and Prevention (www.cdc.gov), American College of Physicians (www.acponline.org), American Academy of Family Physicians (www.aafp.org), American College of Obstetricians and Gynecologists (www.acog.org), and American College of Nurse-Midwives (www.midwife.org).

Vaccines in the Adult Immunization Schedule*

Vaccines	Abbreviations	Trade names
<i>Haemophilus influenzae</i> type b vaccine	Hib	AchHB Hiberix
Hepatitis A vaccine	HepA	Havrix Vaqta
Hepatitis A and hepatitis B vaccine	HepA-HepB	Twinrix
Hepatitis B vaccine	HepB	Engerix-B Recombivax HB Heplisav-B
Human papillomavirus vaccine	HPV vaccine	Gardasil 9
Influenza vaccine, inactivated	IV	Many brands
Influenza vaccine, live attenuated	LAIV	FluMist Quadrivalent
Influenza vaccine, recombinant	RIV	Flublok Quadrivalent
Measles, mumps, and rubella vaccine	MMR	M-M-R II
Meningococcal serogroups A, C, W, Y vaccine	MenACWY	Menactra Menveo
Meningococcal serogroup B vaccine	MenB-4C MenB-FHbp	Bexsero Trumenba
Pneumococcal 13-valent conjugate vaccine	PCV13	Prevnar 13
Pneumococcal 23-valent polysaccharide vaccine	PPSV23	Pneumovax
Tetanus and diphtheria toxoids	Td	Tenivac Td vaccine
Tetanus and diphtheria toxoids and acellular pertussis vaccine	Tdap	Adacel Boostrix
Varicella vaccine	VAR	Varivax
Zoster vaccine, recombinant	RZV	Shingrix
Zoster vaccine live	ZVL	Zostavax

* Administer recommended vaccines if vaccination history is incomplete or unknown. Do not restart or add doses to vaccine series for extended intervals between doses. The use of trade names is for identification purposes only and does not imply endorsement by the ACIP or CDC.

Report

- Suspected cases of reportable vaccine-preventable diseases or outbreaks to the local or state health department
- Clinically significant post-vaccination reactions to the Vaccine Adverse Event Reporting System at www.vaers.hhs.gov or 800-822-7967

Injury claims

All vaccines included in the adult immunization schedule except pneumococcal 23-valent polysaccharide and zoster vaccines are covered by the Vaccine Injury Compensation Program. Information on how to file a vaccine injury claim is available at www.hrsa.gov/vaccinecompensation or 800-338-2382.

Questions or comments

Contact CDC at www.cdc.gov/cdc-info or 800-CDC-INFO (800-232-4636), in English or Spanish, 8 a.m.–8 p.m. ET, Monday through Friday, excluding holidays.

Download the CDC Vaccine Schedules App for providers at www.cdc.gov/vaccines/schedules/hcp/schedule-app.html

Helpful information

- Complete ACIP recommendations: www.cdc.gov/vaccines/hcp/acip-recs/index.html
- General Best Practice Guidelines for Immunization: www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html
- Vaccine Information Statements: www.cdc.gov/vaccines/hcp/vis/index.html
- Manual for the Surveillance of Vaccine-Preventable Diseases (including case identification and outbreak response): www.cdc.gov/vaccines/pubs/surv-manual
- Travel vaccine recommendations: www.cdc.gov/travel
- Recommended Child and Adolescent Immunization Schedule, United States, 2019: www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html



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

Table 1 Recommended Adult Immunization Schedule by Age Group United States, 2019

Vaccine	19–21 years	22–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV) or Influenza recombinant (RIV)			1 dose annually		
Influenza live attenuated (LAIV)			1 dose annually		
Tetanus, diphtheria, pertussis (Tdap or Td)		1 dose Tdap, then Td booster every 10 yrs			
Measles, mumps, rubella (MMIR)		1 or 2 doses depending on indication (if born in 1957 or later)			
Varicella (VAR)		2 doses (if born in 1980 or later)			
Zoster recombinant (RZV) (preferred)				2 doses	
Zoster live (ZVL)				1 dose	
Human papillomavirus (HPV) Female		2 or 3 doses depending on age at initial vaccination			
Human papillomavirus (HPV) Male		2 or 3 doses depending on age at initial vaccination			
Pneumococcal conjugate (PCV13)				1 dose	
Pneumococcal polysaccharide (PPSV23)			1 or 2 doses depending on indication		1 dose
Hepatitis A (HepA)		2 or 3 doses depending on vaccine			
Hepatitis B (HepB)		2 or 3 doses depending on vaccine			
Meningococcal A, C, W, Y (MenACWY)		1 or 2 doses depending on indication, then booster every 5 yrs if risk remains			
Meningococcal B (MenB)		2 or 3 doses depending on vaccine and indication			
<i>Haemophilus influenzae</i> type b (Hib)		1 or 3 doses depending on indication			

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
 Recommended vaccination for adults with an additional risk factor or another indication
 No recommendation

Table 2 Recommended Adult Immunization Schedule by Medical Condition and Other Indications United States, 2019

Vaccine	Pregnancy	Immuno-compromised (excluding HIV infection)	HIV infection CD4 count	Asplenia, complement deficiencies	End-stage renal disease, on hemodialysis	Heart or lung disease, alcoholism ¹	Chronic liver disease	Diabetes	Health care personnel ²	Men who have sex with men
IIV or RIV or LAIV		CONTRAINDICATED	<200	CONTRAINDICATED	1 dose annually	PRECAUTION	PRECAUTION	1 dose annually or 1 dose annually		
Tdap or Td	1 dose Tdap each pregnancy		≥200		1 dose Tdap, then Td booster every 10 yrs					
MMR		CONTRAINDICATED			1 or 2 doses depending on indication					
VAR		CONTRAINDICATED			2 doses					
RZV (<i>preferred</i>) or ZVL	DELAY				2 doses at age ≥50 yrs or 1 dose at age ≥60 yrs					
HPV Female	DELAY				2 or 3 doses through age 26 yrs					
HPV Male					2 or 3 doses through age 21 yrs					2 or 3 doses through age 26 yrs
PCV13					1 dose					
PPSV23					1, 2, or 3 doses depending on age and indication					
HepA					2 or 3 doses depending on vaccine					
HepB					2 or 3 doses depending on vaccine					
MenACWY					1 or 2 doses depending on indication, then booster every 5 yrs if risk remains					
MenB	PRECAUTION				2 or 3 doses depending on vaccine and indication					
Hib			3 doses HSCT ³ recipients only		1 dose					

 Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
 Recommended vaccination for adults with an additional risk factor or another indication
 Precaution—vaccine might be indicated if benefit of protection outweighs risk of adverse reaction
 Delay vaccination until after pregnancy if vaccine is indicated because of risk for serious adverse reaction
 Contraindicated—vaccine should not be administered because of risk for serious adverse reaction
 No recommendation

1. Precaution for LAIV does not apply to alcoholism. 2. See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. 3. Hematopoietic stem cell transplant.

Recommended Adult Immunization Schedule United States, 2019

Notes

Haemophilus influenzae type b vaccination

Special situations

- **Anatomical or functional asplenia (including sickle cell disease):** 1 dose Hib if previously did not receive Hib; if elective splenectomy, 1 dose Hib, preferably at least 14 days before splenectomy
- **Hematopoietic stem cell transplant (HSCT):** 3-dose series Hib 4 weeks apart starting 6–12 months after successful transplant, regardless of Hib vaccination history

Hepatitis A vaccination

Routine vaccination

- **Not at risk but want protection from hepatitis A** (identification of risk factor not required): 2-dose series HepA (Havrix 6–12 months apart or Vaqta 6–18 months apart [minimum interval: 6 months]) or 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 5 months between doses 2 and 3])

Special situations

- **At risk for hepatitis A virus infection:** 2-dose series HepA or 3-dose series HepA-HepB as above
- **Chronic liver disease**
- **Clotting factor disorders**
- **Men who have sex with men**
- **Injection or non-injection drug use**
- **Homelessness**
- **Work with hepatitis A virus** in research laboratory or nonhuman primates with hepatitis A virus infection
- **Travel in countries with high or intermediate endemic hepatitis A**
- **Close personal contact with international adoptee** (e.g., household, regular babysitting) in first 60 days after arrival from country with high or intermediate endemic hepatitis A (administer dose 1 as soon as adoption is planned, at least 2 weeks before adoptee's arrival)

Hepatitis B vaccination

Routine vaccination

- **Not at risk but want protection from hepatitis B** (identification of risk factor not required): 2- or 3-dose series HepB (2-dose series HepB (Twinrix at least 4 weeks apart [2-dose series HepB only applies when 2 doses of HepB are used at least 4 weeks apart]) or 3-dose series Engerix-B or Recombivax HB at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 8 weeks between doses 2 and 3, 16 weeks between doses 1 and 3]) or 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: 4 weeks between doses 1 and 2, 5 months between doses 2 and 3])

Special situations

- **At risk for hepatitis B virus infection:** 2-dose (HepB, B) or 3-dose (Engerix-B, Recombivax HB) series HepB, or 3-dose series HepA-HepB as above
- **Hepatitis C virus infection**
- **Chronic liver disease** (e.g., cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice upper limit of normal)
- **HIV infection**
- **Sexual exposure risk** (e.g., sex partners of hepatitis B surface antigen [HBsAg]-positive persons; sexually active persons not in mutually monogamous relationships, persons seeking evaluation or treatment for a sexually transmitted infection, men who have sex with men)
- **Current or recent injection drug use**
- **Percutaneous or mucosal risk for exposure to blood** (e.g., household contacts of HBsAg-positive persons; residents and staff of facilities for developmentally disabled persons; health care and public safety personnel with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids; hemodialysis, peritoneal dialysis, home dialysis, and predialysis patients; persons with diabetes mellitus aged younger than 60 years and, at discretion of treating clinician, those aged 60 years or older)
- **Incarcerated persons**
- **Travel in countries with high or intermediate endemic hepatitis B**

Human papillomavirus vaccination

Routine vaccination

- **Females through age 26 years and males through age 21 years:** 2- or 3-dose series HPV vaccine depending on age at initial vaccination; males aged 22 through 26 years may be vaccinated on basis of individual clinical decision (HPV vaccination routinely recommended at age 11–12 years)
- **Age 15 years or older at initial vaccination:** 3-dose series HPV vaccine at 0, 1–2, 6 months (minimum intervals: 4 weeks between doses 1 and 2, 12 weeks between doses 2 and 3, 5 months between doses 1 and 3; repeat dose if administered too soon)
- **Age 9 through 14 years at initial vaccination and received 1 dose, or 2 doses less than 5 months apart:** 1 dose HPV vaccine
- **Age 9 through 14 years at initial vaccination and received 2 doses at least 5 months apart:** HPV vaccination complete, no additional dose needed
- **If completed valid vaccination series with any HPV vaccine,** no additional doses needed

Special situations

- **Immunocompromising conditions (including HIV infection) through age 26 years:** 3-dose series HPV vaccine at 0, 1–2, 6 months as above
- **Men who have sex with men and transgender persons through age 26 years:** 2- or 3-dose series HPV vaccine depending on age at initial vaccination as above
- **Pregnancy through age 26 years:** HPV vaccination not recommended until after pregnancy; no intervention needed if vaccinated while pregnant; pregnancy testing not needed before vaccination

Notes

Recommended Adult Immunization Schedule United States, 2019

Influenza vaccination

Routine vaccination

- **Persons aged 6 months or older:** 1 dose IV, RIV, or LAIV appropriate for age and health status annually
- For additional guidance, see www.cdc.gov/flu/professionals/index.htm

Special situations

- **Egg allergy, hives only:** 1 dose IV, RIV, or LAIV appropriate for age and health status annually
- **Egg allergy more severe than hives** (e.g., angioedema, respiratory distress): 1 dose IV, RIV, or LAIV appropriate for age and health status annually in medical setting under supervision of health care provider who can recognize and manage severe allergic conditions
- **Immunocompromising conditions (including HIV infection), anatomical or functional asplenia, pregnant women, close contacts and caregivers of severely immunocompromised persons in protected environment, use of influenza antiviral medications in previous 48 hours, cerebrospinal fluid leak or cochlear implant:** 1 dose IV or RIV annually (LAIV not recommended)
- **History of Guillain-Barré syndrome within 6 weeks of previous dose of influenza vaccine:** Generally should not be vaccinated

Measles, mumps, and rubella vaccination

Routine vaccination

- **No evidence of immunity to measles, mumps, or rubella:** 1 dose MMR
 - Evidence of immunity: Born before 1957 (except health care personnel [see below]), documentation of receipt of MMR, laboratory evidence of immunity or disease (diagnosis of disease without laboratory confirmation is not evidence of immunity)

Special situations

- **Pregnancy with no evidence of immunity to rubella:** MMR contraindicated during pregnancy; after pregnancy (before discharge from health care facility), 1 dose MMR
- **Non-pregnant women of childbearing age with no evidence of immunity to rubella:** 1 dose MMR
- **HIV infection with CD4 count ≥ 200 cells/ μ L for at least 6 months and no evidence of immunity to measles, mumps, or rubella:** 2-dose series MMR at least 4 weeks apart; MMR contraindicated in HIV infection with CD4 count < 200 cells/ μ L
- **Severe immunodeficiency:** MMR contraindicated
- **Students in postsecondary educational institutions, international travelers, and household or close personal contacts of immunocompromised persons with no evidence of immunity to measles, mumps, or rubella:** 1 dose MMR if previously received 1 dose MMR, or 2-dose series MMR at least 4 weeks apart; if previously did not receive any MMR
- **Health care personnel born in 1957 or later with no evidence of immunity to measles, mumps, or rubella:** 2-dose series MMR at least 4 weeks apart for measles or mumps, or at least 1 dose MMR for rubella; if born before 1957, consider 2-dose series MMR at least 4 weeks apart for measles or mumps, or 1 dose MMR for rubella

Meningococcal vaccination

Special situations for MenACWY

- **Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, eculizumab use:** 2-dose series MenACWY (Menactra, Menveo) at least 8 weeks apart and revaccinate every 5 years if risk remains
 - **Travel in countries with hyperendemic or epidemic meningococcal disease, microbiologists routinely exposed to *Neisseria meningitidis*:** 1 dose MenACWY and revaccinate every 5 years if risk remains
 - **First-year college students who live in residential housing (if not previously vaccinated at age 16 years or older) and military recruits:** 1 dose MenACWY
- ##### Special situations for MenB
- **Anatomical or functional asplenia (including sickle cell disease), persistent complement component deficiency, eculizumab use, microbiologists routinely exposed to *Neisseria meningitidis*:** 2-dose series MenB-4C (Bexsero) at least 1 month apart, or 3-dose series MenB-FHbp (Trumenba) at 0, 1–2, 6 months (if dose 2 was administered at least 6 months after dose 1, dose 3 not needed); MenB-4C and MenB-FHbp are not interchangeable (use same product for all doses in series)
 - **Pregnancy:** Delay MenB until after pregnancy unless at increased risk and vaccination benefit outweighs potential risks
 - **Healthy adolescents and young adults aged 16 through 23 years (age 16 through 18 years preferred) not at increased risk for meningococcal disease:** Based on individual clinical decision, may receive 2-dose series MenB-4C at least 1 month apart, or 2-dose series MenB-FHbp at 0, 6 months (if dose 2 was administered less than 6 months after dose 1, administer dose 3 at least 4 months after dose 2); MenB-4C and MenB-FHbp are not interchangeable (use same product for all doses in series)

Notes Recommended Adult Immunization Schedule United States, 2019

Pneumococcal vaccination

Routine vaccination

- **Age 65 years or older** (immunocompetent): 1 dose PCV13 if previously did not receive PCV13, followed by 1 dose PPSV23 at least 1 year after PCV13 and at least 5 years after last dose PPSV23
- Previously received PPSV23 but not PCV13 at age 65 years or older: 1 dose PCV13 at least 1 year after PPSV23
- When both PCV13 and PPSV23 are indicated, administer PCV13 first (PCV13 and PPSV23 should not be administered during same visit)

Special situations

- **Age 19 through 64 years with chronic medical conditions (chronic heart [excluding hypertension], lung, or liver disease; diabetes), alcoholism, or cigarette smoking:** 1 dose PPSV23
- **Age 19 years or older with immunocompromising conditions (congenital or acquired immunodeficiency [including B- and T-lymphocyte deficiency, complement deficiencies, and phagocytic disorders, HIV infection], chronic renal failure, nephrotic syndrome, leukemia, lymphoma, Hodgkin disease, generalized malignancy, iatrogenic immunosuppression [e.g., drug or radiation therapy], solid organ transplant, multiple myeloma) or anatomical or functional asplenia (including sickle cell disease and other hemoglobinopathies):** 1 dose PCV13 followed by 1 dose PPSV23 at least 8 weeks later, then another dose PPSV23 at least 5 years after previous PPSV23; at age 65 years or older, administer 1 dose PPSV23 at least 5 years after most recent PPSV23 (note: only 1 dose PPSV23 recommended at age 65 years or older)
- **Age 19 years or older with cerebrospinal fluid leak or cochlear implant:** 1 dose PCV13 followed by 1 dose PPSV23 at least 8 weeks later; at age 65 years or older, administer another dose PPSV23 at least 5 years after PPSV23 (note: only 1 dose PPSV23 recommended at age 65 years or older)

Tetanus, diphtheria, and pertussis vaccination

Routine vaccination

- **Previously did not receive Tdap at or after age 11 years:** 1 dose Tdap, then Td booster every 10 years

Special situations

- **Previously did not receive primary vaccination series for tetanus, diphtheria, and pertussis:** 1 dose Tdap followed by 1 dose Td at least 4 weeks after Tdap, and another dose Td 6–12 months after last Td (Tdap can be substituted for any Td dose, but preferred as first dose); Td booster every 10 years thereafter
- **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27–36
- For information on use of Tdap or Td as tetanus prophylaxis in wound management, see www.cdc.gov/mmwr/volumes/67/rr/r6702a1.htm

Varicella vaccination

Routine vaccination

- **No evidence of immunity to varicella:** 2-dose series VAR 4–8 weeks apart if previously did not receive varicella-containing vaccine (VAR or MMRV [measles-mumps-rubella-varicella vaccine] for children); if previously received 1 dose varicella-containing vaccine: 1 dose VAR at least 4 weeks after first dose
- Evidence of immunity: U.S.-born before 1980 (except for pregnant women and health care personnel [see below]), documentation of 2 doses varicella-containing vaccine at least 4 weeks apart, diagnosis or verification of history of varicella or herpes zoster by a health care provider, laboratory evidence of immunity or disease

Special situations

- **Pregnancy with no evidence of immunity to varicella:** VAR contraindicated during pregnancy; after pregnancy (before discharge from health care facility), 1 dose VAR if previously received 1 dose varicella-containing vaccine, or dose 1 of 2-dose series VAR (dose 2: 4–8 weeks later) if previously did not receive any varicella-containing vaccine, regardless of whether U.S.-born before 1980

- **Health care personnel with no evidence of immunity to varicella:** 1 dose VAR if previously received 1 dose varicella-containing vaccine, or 2-dose series VAR 4–8 weeks apart if previously did not receive any varicella-containing vaccine, regardless of whether U.S.-born before 1980
- **HIV infection with CD4 count ≥ 200 cells/ μ L with no evidence of immunity:** Consider 2-dose series VAR 3 months apart based on individual clinical decision; VAR contraindicated in HIV infection with CD4 count < 200 cells/ μ L
- **Severe immunocompromising conditions:** VAR contraindicated

Zoster vaccination

Routine vaccination

- **Age 50 years or older:** 2-dose series RZV 2–6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon) regardless of previous herpes zoster or previously received ZVL (administer RZV at least 2 months after ZVL)
- **Age 60 years or older:** 2-dose series RZV 2–6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon) or 1 dose ZVL if not previously vaccinated (if previously received ZVL, administer RZV at least 2 months after ZVL); RZV preferred over ZVL

Special situations

- **Pregnancy:** ZVL contraindicated; consider delaying RZV until after pregnancy if RZV is otherwise indicated
- **Severe immunocompromising conditions (including HIV infection with CD4 count < 200 cells/ μ L):** ZVL contraindicated; recommended use of RZV under review

Revised Content, Format, and Graphics

Cover. Recommended Adult Immunization Schedule. The cover page of the 2019 schedule has been simplified and features a shorter title, provides basic instructions on how to use the schedule to systematically identify vaccination needs of adults, and lists routinely recommended vaccines and their standardized abbreviations and trade names. Web links have been added where providers can download the CDC Vaccine Schedules app and access reference materials on surveillance of vaccine-preventable diseases, including case identification and disease outbreak response. The cover page also has instructions on reporting suspected cases of reportable vaccine-preventable diseases to local or state health departments and significant postvaccination adverse events to the Vaccine Adverse Event Reporting System; information on the Vaccine Injury Compensation Program; and Web links to other resources, such as Vaccine Information Statements and recommended vaccines for travelers.

Table 1. Recommended Adult Immunization Schedule by Age Group. **Table 1** (previously known as Figure 1) describes routine and catch-up vaccination recommendations for adults by age. **Table 1** contains 1 notable change from 2018: LAIV has been listed separately from inactivated influenza vaccine (IIV) (many branded products) and recombinant influenza vaccine (RIV) (Flublok Quadrivalent, Sanofi Pasteur) for adults through age 49 years. The ACIP recommends routine annual influenza vaccination for all persons aged 6 months or older who do not have contraindications; 1 annual dose of IIV, RIV, or LAIV that is appropriate for the age and health status of the patient is recommended.

Table 2. Recommended Adult Immunization Schedule by Medical Condition and Other Indications. **Table 2** (previously known as Figure 2) also lists LAIV separately from IIV and RIV. **Table 2** contains 2 new recommendation displays designated by new colors: "Precaution—vaccine might be indicated if benefit of protection outweighs risk of adverse reaction" (orange) and "Delay vaccination until after pregnancy if vaccine is indicated" (pink). LAIV is contraindicated in pregnant women and immunocompromised adults, including those with HIV infection, because it is a live vaccine. The risk of associated adverse effects from the use of LAIV in adults with functional or anatomical asplenia or complement deficiencies is not clear; however, for display purposes, the use of LAIV in this population has been designated as "contraindicated" (red). For adults with end-stage renal disease, heart or lung disease, chronic liver disease, or diabetes, LAIV has been given the "precaution" (orange) designation. This designation has also been applied to serogroup B meningococcal vaccine (MenB) (Bexsero, GlaxoSmithKline; Trumenba, Pfizer) for pregnant women; MenB should be deferred in pregnant women unless they are at increased risk for serogroup B meningococcal disease and the benefits of vaccination outweigh potential risks (8). In pregnant women, the recommended use of MenB differs from that of serogroups A, C, W, and Y meningococcal vaccine (MenACWY) (Menactra, Sanofi Pasteur; Menveo, Glaxo-

SmithKline). Pregnancy should not preclude use of MenACWY if it is otherwise indicated (9). Therefore, MenACWY in pregnancy remains displayed as "Recommended vaccination for adults with an additional risk factor or another indication" (purple). The designation "Delay until after pregnancy" (pink) was applied to the use of human papillomavirus (HPV) vaccine (Gardasil 9, Merck) and recombinant zoster vaccine (RZV) (Shingrix, GlaxoSmithKline). The use of HPV vaccine is not recommended for pregnant women (10, 11), and pregnant women should consider delaying receipt of RZV (if it is indicated) until after pregnancy (12). Zoster vaccine live (ZVL) (Zostavax, Merck) is contraindicated in pregnancy (13).

Notes. Recommended Adult Immunization Schedule. Each recommended vaccine for adults in **Tables 1** and **2** is accompanied by notes (previously known as footnotes), which are designed to provide additional information on routine vaccination and recommendations in special situations. The notes have been reordered alphabetically by vaccination, and superscript footnote numbers in the former figures (now tables) have been removed. Each section contains concise information on vaccine indications, dosing frequencies and intervals, and other published ACIP recommendations. New recommendations on influenza, hepatitis B, and hepatitis A vaccinations have been added to their respective sections in the notes. Recommendations on vaccination in outbreak settings in the measles, mumps, and rubella vaccination and meningococcal vaccination sections have been removed. All vaccines identified in **Tables 1** and **2** (except zoster vaccines) also appear in the *Recommended Immunization Schedule for Children and Adolescents, United States, 2019* (14). The notes for vaccines that appear in both the adult immunization schedule and the child and adolescent immunization schedule have been harmonized to the extent possible.

ADULT VACCINATION COVERAGE RATES

Adults are at risk for illness, hospitalization, disability, and death from vaccine-preventable diseases. The schedule is updated annually to assist providers in implementing up-to-date ACIP recommendations for adults. The overarching goal is to improve adult vaccination coverage rates in the United States.

Although modest increases in vaccination coverage rates were observed in several sectors of the adult population in 2016, the overall rates for adults in the United States have remained low (15). Among adults aged 19 years or older, the influenza vaccination coverage rate for the 2015–2016 influenza season remained similar to that for the 2014–2015 season, at 43.5%. For adults aged 65 years or older, there was a decrease of 3.1 percentage points, to 70.4%. The rate among black (39.5%) and Hispanic (33.1%) adults continued to lag behind that among white adults (46.3%).

Among pregnant women, the influenza vaccination coverage rate in the 2017–2018 influenza season was 49.1% (16) compared with 53.6% in the 2016–2017 season and 49.9% in the 2015–2016 season (17). The

coverage for tetanus, diphtheria, and acellular pertussis vaccine (Tdap) among pregnant women was 54.4% (16). The ACIP has recommended Tdap for every pregnancy since 2012 (18).

The 2016 pneumococcal vaccination coverage rate among adults aged 65 years or older was 66.9%, an increase of 3.3 percentage points from 2015 (15). These rates do not distinguish between 13-valent conjugate (Pneumovax 13, Pfizer) or 23-valent polysaccharide (Pneumovax 23, Merck) pneumococcal vaccines. For adults aged 19 through 64 years who are at increased risk for pneumococcal disease, such as those with heart or lung disease or diabetes, pneumococcal vaccination coverage remained unchanged, at 24.0%. Among adults for whom Tdap vaccination could be assessed, 26.6% were estimated to be current, an increase of 3.4 percentage points from 2015. Among adults aged 60 years or older, zoster vaccination coverage was 33.4%, an increase of 2.8 percentage points from 2015. Rates of HPV vaccination coverage for females and males aged 19 through 21 years were 51.6% and 21.2%, respectively, representing increases of 9.6 and 5.5 percentage points from 2015.

STANDARDS OF ADULT IMMUNIZATION PRACTICE

In response to the persistently low vaccination coverage rates among adults, the National Vaccine Advisory Committee updated the standards for adult immunization practice in 2014 to promote integration of vaccinations as part of routine clinical care for adults (19). The standards for adult immunization practice is a call to action for providers to assess the vaccination status of adult patients at every clinical encounter, strongly recommend needed vaccines, offer vaccines or refer patients to another provider if they do not stock vaccines, and document administered vaccines in state or local immunization information systems. The schedule is an important clinical resource that providers can use to stay current on ACIP-recommended immunizations for adults and to implement the standards for adult immunization practice.

ADULT IMMUNIZATION SCHEDULE USABILITY TESTING

The adult immunization schedule was first published in 2002 with the goal of enabling providers to easily identify vaccination needs of their adult patients and administer appropriate vaccines (20). In addition, providers can use the schedule to help implement use of standing orders, patient reminder and recall systems, and other strategies to vaccinate their adult patients and minimize missed opportunities. The 2002 schedule contained information on 8 vaccines and 6 special-indication categories for which vaccines were routinely recommended, such as pregnancy and HIV infection. In contrast, the 2019 schedule contains information on routinely recommended uses for 17 types of vaccines in 11 antigen groups and 10 special-indication

categories. As ACIP recommendations for adults became more complex, a need arose to translate the recommendations more effectively and improve messaging to busy providers.

In 2016–2017, the ACIP and the CDC conducted an ad hoc review of the 2016 schedule in collaboration with the Georgia Institute of Technology chapter of the Human Factors and Ergonomics Society (21). The goal was to apply user-centered visual design principles to improve the messaging efficiency of the schedule while maintaining a form that did not deviate from established user expectations. This initial review yielded many recommendations that were based on cognitive ergonomics and design principles. Several of these recommendations, such as using blocks instead of bars in figures for simplicity and clarity, were adopted in the 2017 and 2018 schedules.

In 2017, the ACIP and the CDC began formal usability testing of the schedule that included in-depth interviews with primary care physicians, nurse practitioners and physician assistants, pharmacists, nurses, and medical assistants who reported being familiar with the schedule (22). In 2018, several versions of adult immunization schedule redesigns based on these interviews were prepared, and an Internet survey of internal medicine and family medicine physicians was conducted to assess their impressions of and preferences for redesigned drafts.

The qualitative evaluation of the 2017 schedule, which featured in-depth interviews with 48 providers, revealed that most were familiar with Figure 1 (recommended adult immunization schedule by age group) but fewer were familiar with Figure 2 (recommended adult immunization schedule by medical condition and other indications). Interviewees were generally aware of the footnotes, but few accessed the information routinely and few were aware that the schedule included a table of contraindications and precautions for vaccines routinely recommended for adults. When given scenarios that required careful clinical assessments for vaccination needs in adult patients with more complex medical histories, providers generally did not know how to systematically use the schedule to assist them with decision making.

Based on the results of these interviews, several drafts of the schedule with different layouts and color combinations were developed for usability testing. A survey was then administered to an Internet panel of 251 internal medicine and family medicine physicians comparing the characteristics of the published 2017 schedule and a redesigned draft of it to assess their impressions and preferences. The results indicated that the respondents preferred the color scheme of the published schedule and the simplicity of the redesigned draft schedule. Many respondents requested that a larger font be used. The 2019 schedule thus features a simplified cover page that contains a 3-step instruction on how to use the schedule, new versions of Tables 1 and 2 that use the same colors as previous iterations but with changes for improved cognition, and notes pages with a larger font that became possible with removal of the table of contraindications and pre-

cautions for vaccines recommended for adults. The cover page refers readers to www.cdc.gov/vaccines/hcp/acip-recs/general-recs to access the information on vaccine contraindications and precautions.

Besides incorporating new ACIP recommendations on influenza, hepatitis B, and hepatitis A vaccinations, the notes in the 2019 schedule were revised for clarity, brevity, and consistency. Where appropriate, recommendations differentiated between routine and special situations. Populations and special situations for which vaccines are routinely recommended or are associated with important considerations were highlighted in boldface text so that they can be identified more easily.

Along with routine use of the adult immunization schedule, health care providers can implement such proven strategies as incorporating vaccination assessments as part of routine patient flow and using patient reminders and recalls to improve vaccination of their adult patients (23). These and other activities associated with implementation of the standards for adult immunization practice can be used to develop quality improvement projects that readily meet maintenance of certification requirements. In addition, providers who participate in the Medicare Quality Payment Program's Merit-based Incentive Payment System can use their patients' immunization data, such as pneumococcal vaccination records for adults aged 65 years or older, as a quality measure (24). By consistently using the Recommended Adult Immunization Schedule, United States, 2019, and implementing the standards for adult immunization practice, providers can reduce the burden of illnesses, hospitalizations, and mortality associated with vaccine-preventable diseases among their adult patients.

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Disclosures: To ensure the integrity of the ACIP, the U.S. Department of Health and Human Services has taken steps to ensure 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 preappointment 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, 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 biologic being voted on. Details can be found at www.cdc.gov/vaccines/acip/committee/structure-role.html. Dr. Kim has nothing to disclose. Dr. Hunter reports travel expenses to ACIP meetings paid by the Centers for Disease Control and Prevention; grants from the Wisconsin Department of Health Services for speaking to clinicians in Milwaukee about adult vaccinations; and board membership in Immunize Milwaukee!, an ad hoc, nonincorporated, unfunded community coalition seeking to increase vaccination rates in metro Milwaukee. Disclosures can

also be viewed at www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M18-3600.

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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 the use of vaccines and related agents to control 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 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, the American College of Physicians (ACP), and the American College of Nurse-Midwives (ACNM). ACIP recommendations adopted by the CDC Director become agency guidelines on the date they are published in the *Morbidity and Mortality Weekly Report* (MMWR). Additional information on ACIP is available at www.cdc.gov/vaccines/acip.

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