REVIEW ARTICLE

2022 ADULT IMMUNIZATION SCHEDULE UPDATES

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Abstract

Each year, the U.S. Centers for Disease Control and Prevention (CDC) releases the adult vaccine schedule. The 2022 adult vaccine schedule has several changes which will be discussed in the following manuscript. The Advisory Committee on Immunization Practices reviews the preliminary schedules usually at their October or November meetings. The following professional societies also approve the adult schedules prior to the 2022 publications: American College of Physicians (ACP), American Academy of Family Physicians (AAFP), American College of Obstetricians and Gynecologists (ACOG), American College of Nurse-Midwives (ACNM), American Academy of Physician Assistants (AAPA) and the Society for Healthcare Epidemiology of America (SHEA). Once the final draft is approved by the CDC, it is published in the *Morbidity and Mortality Weekly* Report (MMWR) and released to healthcare providers and the general public with a cover page, tables, notes and—new for the 2022 schedule—an appendix with contraindications and precautions for the different approved vaccines.

INTRODUCTION

The 2022 adult vaccine schedue has several updates. The adult vaccines discussed in this article are listed in Figure 1, taken from the draft cover page of the 2022 immunization schedule shown in slide [53].1 In addition, the latest recommendations for COVID-19 immunization will be reviewed. Vaccines listed can be given at the same time including with the COVID-19 immunization, if indicated.[2]

A free app provided by the U.S. Centers for Disease Control and Prevention can be downloaded on smart phones to make finding recommended vaccines for specific ages and medical conditions quickly.[3] Adverse events to vaccines should be reported to Vaccine Adverse Event Reporting System (VAERS).[4]

FIGURE 1:

Adult Vaccines

VACCINE	ABBREVIATION(S)	TRADE NAME(S)
Haemophilus influenzae type B vaccine	Hib	ActHIB® Hiberix® PedvaxHIB®®
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)	IIV4	Many brands
Influenza vaccine (live, attenuated)	LAIV4	FluMist® Quadrivalent
Influenza vaccine (recombinant)	RIV4	Flublok® Quadrivalent

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FIGURE 1 CONT'D:

Adult Vaccines

VACCINE	ABBREVIATION(S)	TRADE NAME(S)
Influenza vaccine (recombinant)	RIV4	Flublok® Quadrivalent
Measles, mumps, and rubella vaccine	MMR	M-M-R® II
Meningococcal serogroups A, C, W, Y vaccine	MenACWY-D MenACWY-CRM MenACWY-TT	Menactra® Menveo® MenQuadfi®
Meningococcal serogroup B vaccine	MenB-4C MenB-FHbp	Bexsero® Trumenba®
Pneumococcal 15-valent conjugate vaccine	PCV15	Vaxneuvance™
Pneumococcal 20-valent conjugate vaccine	PCV20	Prevnar 20™
Pneumococcal 23-valent polysaccharide vaccine	PPSV23	Pneumovax 23®
Tetanus and diphtheria toxoids	Td	Tenivac® Tdvax™
Tetanus and diphtheria toxoids and acellular pertussis vaccine	Tdap	Adacel® Boostrix®
Varicella vaccine	VAR	Varivax®
Zoster vaccine, recombinant	RZV	Shingrix

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COVID-19

COVID-19 vaccines are recommended within the scope of the emergency use authorization (EUA) or biologics license application for a particular vaccine, or as recommended by the Advisory Committee on Immunization Practices (ACIP) and reviewed by the U.S. Center for Disease Control and Prevention's (CDC) Director and, if adopted, are published as official CDC and US. Department of Health and Human services (HHS) recommendations in the *Morbidity and Mortality Weekly* Report (MMWR).[5] The ACIP and CDC have issued interim recommendations for the use of following three COVID-19 vaccines: the Pfizer-BioNTech, now being marketed as Comirnaty,[6] vaccine for those aged 16 years and older, the Moderna vaccine for those aged 18 years and older and the Johnson & Johnson (J&J)/Janssen COVID-19 vaccines for those aged 18 years and older.[7] Booster vaccines are recommended for those 18 and older.[7] In most situations, Pfizer-BioNTech or Moderna vaccines are preferred over the J&J/Janssen vaccine for due to the rare event of thrombosis with thrombocytopenia syndrome (TTS) after J&J/Janssen COVID-19 vaccination;[8] however, the J&J/Janssen COVID-19 vaccine may be considered for persons who:

- Had a severe reaction after an mRNA vaccine dose or who have a severe allergy to an ingredient of Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines).
- Would otherwise remain unvaccinated for COVID-19 due to limited access to Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines).
- Wants to get the J&J/Janssen COVID-19 vaccine despite the safety concerns.

In general, the primary series and additional primary doses should be with the same vaccine product (ie, the same manufacturer). For people at least 18 years old, in situations in which the mRNA vaccine product given for the first dose of the primary series cannot be determined or is not available, any available mRNA COVID-19 vaccine product may be administered at a minimum interval of 28 days between doses to complete the mRNA COVID-19 vaccination series. If an individual received the first dose of an mRNA COVID-19 vaccine but is unable to complete the series with either the same or different mRNA COVID-19 vaccine (eg, due to contraindication), a single dose of J&J/Janssen COVID-19 vaccine may be considered at a minimum interval of 28 days from the previous mRNA COVID-19 vaccine dose if the person is at least 18 years old. People who receive the J&J/Janssen COVID-19 vaccine after a dose of an mRNA COVID-19 vaccine should be considered fully vaccinated against COVID-19 at least 2 weeks after receipt of the single dose of the Janssen vaccine.[9]

The ACIP/CDC also changed the interval for booster shots of Pfizer's vaccine in all individuals 12 and up to at least 5 months after the second dose (was previously 6 months). For the Pfizer-BioNTech or Moderna vaccines, those 18 years and older may recieve a booster dose if given at least 5 months after completing the primary series for the Pfizer-BioNTech or Moderna vaccines. If the one dose of the J&J/Janssen vaccine is given, and if 18 years of age and older, a booster at least 2 months after the initial immunization may be given. Any of the COVID-19 vaccines authorized in the US can be used for the booster.[10]

HAEMOPHILUS INFLUENZAE TYPE B

The *Haemophilus influenzae* type b (Hib) vaccine is not routinely recommended for healthy adults aged 19 years and older, even if the person did not receive Hib vaccine as a child. However,

the ACIP recommends that 1 dose of the Hib vaccine should be administered to persons who have anatomical or functional asplenia or sickle cell disease or are undergoing elective splenectomy if they have not previously received Hib vaccine. The Hib vaccine should be administered 14 or more days before splenectomy if possible. Recipients of a hematopoietic stem cell transplant should be vaccinated with a 3-dose series of Hib vaccine 6–12 months after a successful transplant, regardless of vaccination history, at least 4 weeks should separate doses. The Hib vaccine is not recommended for adults with HIV infection because their risk for Hib disease is low.[11]

HEPATITIS A

The hepatitis A vaccine (HEPA) is a 2-dose series. All high-risk patients with no documentation of HEPA should be given the immunization. Examples of persons who should have the HEPA include those with chronic liver disease or HIV; men who have sex with men (MSM); individuals who use injection or non-injection drug use; laboratory personnel working the hepatitis A virus; those traveling to countries with endemic hepatitis A; and those with close contact to international adoptees.[12] A special emphasis recently has been to vaccinate the homeless.[13]

HEPATITIS B

The hepatitis B virus (HBV) vaccine is recommended for all persons aged 19–59 years old if they have not received the series in the past. Those aged 60 and older should receive HBV series with any risk factors for HBV infections, including MSM; people who inject drugs; household contacts or sexual partners of known people with chronic HBV infection; health care and public safety workers at-risk for occupational exposure to blood or blood-contaminated body fluids; diabetics; and hemodialysis patients.[14] The World Health Organization and the CDC plan to eliminate HBV infections by 2030.[15] There are 2-, 3- and 4-dose series of HBV vaccines available for use.[16] A 2-dose series applies to the Heplisav-B vaccine by Dynavax, given at least 4 weeks apart. The 3-dose series includes Engerix-B by GSK; Recombivax HB by Merck; and the recently approved PreHevbrio by VBI Vaccines,[17] given at birth, 1 month and 6 months. Twinrix by GSK, a combination of Hep A and HBV, is a three-dose series at birth, 1 month and 6 months (regular dosing) or a four-dose series given at birth, 7 days and 21–30 days, with a booster dose at 12 months (accelerated dosing).[18]

HUMAN PAPILLOMAVIRUS

The human papillomavirus (HPV) vaccine is recommended for all adults aged 18–26 years if not adequately vaccinated in the past. Vaccination is not recommended for everyone older than 26. However, some adults aged 27–45 years may choose to receive the HPV vaccine based on a discussion with their clinician, if they did not get adequately vaccinated when younger.[19] For immunocompromising conditions—such as HIV infection—a 3-dose series is recommended when initiating vaccination at age 9–45 years.[20] Pregnancy testing is not needed before HPV vaccination but is not recommended during pregnancy, and no intervention needed if inadvertently vaccinated while pregnant.[21]

INFLUENZA

Routine influenza vaccination is indicated for those aged 19 years and older as an annual dose of any influenza vaccine appropriate for age and health status.[22] Recommendations for flu vaccination of persons with an egg allergy have not changed since the 2018–19 flu season. If a person only experiences hives after exposure to egg, they can receive any licensed flu vaccine. Persons who report having had more significant reactions to egg—such as angioedema, respiratory distress, lightheadedness or recurrent emesis—or who required epinephrine or another emergency medical intervention may similarly receive any licensed and recommended flu vaccine that is otherwise appropriate for the recipient's age and health status. The selected vaccine should be given in an inpatient or outpatient medical setting. The vaccine administration should be supervised by a healthcare provider who is able to recognize and manage severe allergic conditions. If a patient had a severe allergic reaction to a flu vaccine, regardless of the component suspected of being responsible for the reaction, is a contraindication to future receipt of the vaccine.[23] If a patient had a history of Guillain-Barré syndrome within 6 weeks after a previous dose of influenza vaccine, the vaccine should not be administered unless vaccination benefits outweigh risks for those at higher risk for severe complication from influenza.[24]

MEASLES, MUMPS AND RUBELLA

The measles, mumps and rubella (MMR) vaccine should be given to adults who are not up to date on their MMR vaccination.[25] Acceptable presumptive evidence of immunity against measles includes at least 1 of the following:

- Written documentation of adequate vaccination, including
    - o 1 or more doses of a measles-containing vaccine administered on or after the first birthday for preschool-age children and adults not at high risk
    - o 2 doses of measles-containing vaccine for school-age children and adults at high risk, including college students, healthcare personnel and international travelers
- Laboratory evidence of immunity
- Laboratory confirmation of measles
- Birth before 1957[26]

People born during or after 1957 who do not have evidence of immunity against measles should get at least 1 dose of the MMR vaccine. Healthcare personnel should have documented evidence of immunity against measles. People aged 6 months or older who will be traveling internationally should be protected against measles. Teenagers and adults born during or after 1957 without evidence of immunity against measles should have documentation of 2 doses of the MMR vaccine, with the second dose administered no earlier than 28 days after the first dose.[26]

Because MMR does not give 100% protection against mumps, public health authorities—a group at increased risk for acquiring mumps—should receive a third dose of MMR vaccine during

a mumps epidemic. The purpose of the recommendation is to improve protection of people in outbreak settings against mumps disease and mumps-related complications.[27]

MENINGOCOCCAL DISEASE

The MenACWY vaccines and MenB vaccines can help prevent meningococcal disease, which is any type of illness caused by *Neisseria meningitidis* bacteria. There are 2 types of meningococcal vaccines available in the United States:

- Meningococcal conjugate or MenACWY vaccines (Menactra®, Menveo® and MenQuadfi®)
- Serogroup B meningococcal or MenB vaccines (Bexsero® and Trumenba®)

All 11- to 12-year-olds should get a MenACWY vaccine, with a booster dose at 16 years old. Teens and young adults (16–23 years old) also may get a MenB vaccine.[28] Both vaccines may be administered simultaneously if indicated but at a different anatomic site.[29] In certain situations, adults should receive MenACWY vaccines. Some people are at increased risk for serogroup A, C, W or Y meningococcal disease due to:

- Having certain medical conditions, such as
    - o Complement component deficiency (eg, C5-C9, properdin, factor H, factor D)
    - o Functional or anatomic asplenia (including sickle cell disease)
    - o HIV
- Taking specific medications, such as a complement inhibitor (eg, Soliris® or Ultomiris®)
- Traveling or residing in countries in which serogroup A, C, W or Y meningococcal disease is common
- Working in specific professions or living in specific settings, including
    - o Microbiologists who are routinely exposed to *Neisseria meningitidis*
    - o Military recruits
    - o First-year college students living in a residence hall and are not up to date with this vaccine
- Being a part of a community experiencing a serogroup A, C, W or Y meningococcal disease outbreak [30]

Phase 3 studies are being completed by GSK, combining MenACWY with MenB, so that the vaccines can be given as an injection.[31]

PNEUMOCOCCAL DISEASE

Pneumococcal vaccines now include the new pneumococcal conjugated vaccine 15 (PCV15)—VAXNEUVANCE™ by Merck—and the pneumococcal conjugated vaccine 20 (PCV20)—Prevnar by Pfizer. At age 65 years or older, those who have not previously received a pneumococcal conjugate vaccine or whose previous vaccination history is unknown should be given 1 dose of PCV15 or 1 dose of PCV20; if PCV15 is used, this should be followed by a dose of pneumococcal polysaccharide 23 valent (PPSV23) vaccine pneumovax by Merck. The dosing interval between PCV15 and PPSV23 should be at least 8 weeks to 12 months. For those aged 19–64 years with certain underlying medical conditions and who have not previously received a pneumococcal conjugate vaccine or those whose previous vaccination history is unknown, 1 dose of PCV15 or 1 dose of PCV20 should be given. If PCV15 is used, this should be followed by a dose of PPSV23 at least 8 weeks to 12 months apart.[32] Conditions that increase the risk of invasive pneumococcal disease include:

- Decreased immune function from disease or drugs
- Functional or anatomic asplenia
- Chronic heart, lung (including asthma), liver or renal disease
- Cigarette smoking
- Alcoholism
- Cerebrospinal fluid leak
- Cochlear implant[33]

VARICELLA VIRUS

Varicella (VAR) vaccination is recommended for all adults who have never had chickenpox or received the vaccination. Two doses of the vaccine should be given at least 4 weeks apart. On the other hand, because varicella is a live virus, the VAR vaccine should not be given to individuals who:

- Are moderately to severely ill at the time of vaccination
- Are pregnant (women should not become pregnant for 1 month after receiving the chickenpox vaccine)
- Have ever had an allergic reaction to gelatin, the antibiotic neomycin or a previous dose of chickenpox vaccine
- Are an organ donor recipient

People with the following conditions should be cautious and evaluated and receive shared clinical decision making with the healthcare provider and the patient before receiving the VAR vaccine:

- Patients undergoing chemotherapy or radiation for cancer
- People taking steroid drugs or other immunosuppressants
- People with HIV or another disease that compromises the immune system
- Patients who recently had a blood transfusion or received other blood products[34]

HERPES ZOSTER VIRUS

Recombinant zoster vaccine (RZV)—Shingrix by GSK—is the only herpes zoster vaccine available in the United States, now that Zostavax by Merck is no longer available. RZV is recommended to prevent shingles in adults aged 50 and older 35 as a 2-dose series, separated by 2–6 months.[35]

RZV is recommended for use in certain immunocompromised persons. Those conditions include but are not limited to:

- Hematopoietic stem cell transplant (HSCT) recipients
- Hematologic malignancies
- Renal or other solid organ transplants
- Solid tumor malignancies
- HIV
- Primary immunodeficiencies, autoimmune conditions and use of immunosuppressive medications/therapies[36]

Healthcare professionals should consider delaying RZV until after pregnancy. There is no recommendation for pregnancy testing before vaccination.[37]

CONCLUSIONS:

The slides from the November ACIP meeting when the 2022 immunization schedule was discussed can be accessed on the ACIP website.[38] A quick response bar code will be displayed on the cover page to afford easy access to immunization schedules,[39] along with an appendix to make it easier for clinicians and patients to detect contraindications and precautions for the commonly used vaccines. The revised 2022 immunization schedules were announced in the MMWR and posted on the CDC's vaccine website in late February 2022.

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REFERENCES:

1. Cover page draft of 2022 vaccine schedule, slide 53: https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-11-2-3/002-Immunization-Schedule-wodi-508.pdf
2. Centers for Disease Control and Prevention. 2021. Use of COVID-19 Vaccines in the United States. [online] Available at: https://www.cdc.gov/vaccines/covid-19/clinical- considerations/covid-19-vaccines-us.html#Coadministration
3. Centers for Disease Control and Prevention. 2021. CDC Vaccine Schedule app. [online] Available at: https://www.cdc.gov/vaccines/schedules/hcp/schedule-app.html
4. Centers for Disease Control and Prevention. Vaccine Adverse Event Reporting System (VAERS). Available at: https://www.cdc.gov/vaccinesafety/ensuringsafety/monitoring/vaers/access-VAERS-data.html
5. Centers for Disease Control and Prevention. 2021. COVID-19 ACIP Vaccine Recommendations. Available at: https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/covid-19.html
6. U.S. Food and Drug Administration. Comirnaty and Pfizer-BioNTech COVID-19 Vaccine. Available at: https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/comirnaty-and-pfizer-biontech-covid-19-vaccine
7. U.S. Food and Drug Administration. COVID-19 Vaccines. Available at: https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines
8. Centers for Disease Control and Prevention. Johnson & Johnson's Janssen COVID-19 Vaccine: Overview and Safety. Available at: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/janssen.html
9. Centers for Disease Control and Prevention. Use of COVID-19 Vaccines in the United States. Available at: https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html#Interchangeability
10. Centers for Disease Control and Prevention. COVID-19 Vaccine Boosters. Available at: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/booster-shot.html?s_cid=11706:cdc%20covid%20booster%20dose:sem.ga:p:RG:GM:gen:PTN:FY22
11. Immunize.org. Ask the Experts: *Haemophilus influenzae* type b (Hib). Available at: https://www.immunize.org/askexperts/experts_hib.asp
12. Centers for Disease Control and Prevention. Hepatitis A Questions and Answers for Health Professionals. Available at: https://www.cdc.gov/hepatitis/hav/havfaq.htm
13. American Academy of Family Physicians. ACIP Recommends Hep A Vaccine for Homeless Patients. Available at: https://www.aafp.org/news/health-of-the-public/20181031acipmeeting.html
14. Centers for Disease Control and Prevention. Hepatitis B Questions and Answers for Health Professionals. Available at: https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm
15. McMahon BJ. Meeting the WHO and US goals to eliminate Hepatitis B infection by 2030: Opportunities and challenges. *Clinical Liver Disease.* 2018;12:29–32. doi:10.1002/cld.733
16. Centers for Disease Control and Prevention. Hepatitis B Questions and Answers for Health Professionals: What are the recommended schedules for hepatitis B vaccination? Available at: https://www.cdc.gov/hepatitis/hbv/hbvfaq.htm#D4
17. PreHevbrio Hep B vaccine. Available at: https://www.prehevbrio.com/wp-content/uploads/2021/11/PreHevbrio-Full-Prescribing-Information.pdf
18. Rosselot GA. Last-Minute Travelers. Available at: https://wwwnc.cdc.gov/travel/yellowbook/2020/preparing-international-travelers/last-minute-travelers
19. Centers for Disease Control and Prevention. HPV Vaccination Recommendations. Available at: https://www.cdc.gov/vaccines/vpd/hpv/hcp/recommendations.html
20. Garland SM, Brotherton JML, Moscicki AB, *et al*. HPV vaccination of immunocompromised hosts. *Papillomavirus Res.* 2017;4:35–38. doi:10.1016/j.pvr.2017.06.002
21. Centers for Disease Control and Prevention. HPV Vaccine Information For Young Women. Available at: https://www.cdc.gov/std/hpv/stdfact-hpv-vaccine-young-women.htm
22. Grohskopf LA, Alyanak E, Ferdinands JM, *et al*. Prevention and control of seasonal influenza with vaccines: Recommendations of the Advisory Committee on Immunization Practices, United States, 2021–22 Influenza Season. MMWR Recomm Rep. 2021;70(No. RR-5):1–28. doi:10.15585/mmwr.rr7005a1

23. Centers for Disease Control and Prevention. Flu Vaccine and People with Egg Allergies. Available at: https://www.cdc.gov/flu/prevent/egg-allergies.htm
24. Centers for Disease Control and Prevention. Guillain-Barré syndrome and Flu Vaccine. Available at: https://www.cdc.gov/flu/prevent/guillainbarre.htm
25. Centers for Disease Control and Prevention. Measles, Mumps, and Rubella (MMR) Vaccination: What Everyone Should Know. Available at: https://www.cdc.gov/vaccines/vpd/mmr/public/index.html#:~:text=CDC%20recommends%20all%20children%20get,days%20after%20the%20first%20dose
26. Centers for Disease Control and Prevention. Measles (Rubeola): For Healthcare Providers. Available at: https://www.cdc.gov/measles/hcp/index.html
27. Centers for Disease Control and Prevention. Mumps: For Healthcare Providers. Available at: https://www.cdc.gov/mumps/hcp.html
28. Centers for Disease Control and Prevention. Vaccines and Preventable Diseases: Meningococcal Vaccination. Available at: https://www.cdc.gov/vaccines/vpd/mening/index.html#:~:text=CDC%20recommends%20routine%20MenACWY%20vaccination,increased%20risk%20for%20meningococcal%20disease
29. Centers for Disease Control and Prevention. Meningococcal Vaccination for Adolescents: Information for Healthcare Professionals. Available at: https://www.cdc.gov/vaccines/vpd/mening/hcp/adolescent-vaccine.html#:~:text=You%20can%20administer%20MenACWY%20and,different%20injection%20sites%20if%20feasible
30. Centers for Disease Control and Prevention. Meningococcal Vaccine Recommendations. Available at: https://www.cdc.gov/vaccines/vpd/mening/hcp/recommendations.html
31. GSK. (2020). GSK announces first participant vaccinated in phase 3 clinical trials of its 5-in-1, meningitis ABCWY vaccine candidate. Available at: https://www.gsk.com/en-gb/media/press-releases/gsk-announces-first-participant-vaccinated-in-phase-3-clinical-trials-of-its-5-in-1-meningitis-abcwy-vaccine-candidate/
32. Park B. 2021. ACIP Recommends Updates to Pneumococcal Vaccination Guidelines. Available at: https://www.empr.com/home/news/acip-recommends-updates-to-pneumococcal-vaccination-guidelines/
33. Centers for Disease Control and Prevention. Pneumococcal Disease: Risk Factors. Available at: https://www.cdc.gov/pneumococcal/clinicians/risk-factors.html
34. Byrd F. Chickenpox (Varicella) Vaccine for Adults. *WebMD*. Available at: https://www.webmd.com/children/vaccines/chickenpox-varicella-vaccine-guidelines-for-adults
35. Centers for Disease Control and Prevention. Shingles (Herpes Zoster): Vaccination. Available at: https://www.cdc.gov/shingles/vaccination.html#:~:text=Recombinant%20zoster%20vaccine%20(RZV%2C%20Shingrix,within%202%20to%204%20weeks
36. Centers for Disease Control and Prevention. Administering Shingrix. Available at: www.cdc.gov/vaccines/vpd/shingles/hcp/shingrix/administering-vaccine.html
37. Anderson TC, Masters NB, Guo A, *et al*. Use of recombinant zoster vaccine in immunocompromised adults aged ≥19 years: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022. MMWR Morb Mortal Wkly Rep 2022;71:80–84. doi:10.15585/mmwr.mm7103a2
38. ACIP. November 2022 Vaccine Immunization discussion. Available at: https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-11-2-3/002-Immunization-Schedule-wodi-508.pdf
39. American Academy of Family Physicians. 2022 Immunization Schedules Updated at November ACIP Meeting. Available at: https://www.aafp.org/news/health-of-the-public/20211118acip.html