What's new in primary care

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The following represent additions to UpToDate from the past six months that were considered by the editors and authors to be of particular interest. The most recent What's New entries are at the top of each subsection.

SCREENING

Colonoscopy or fecal immunochemical testing for colorectal cancer screening (April 2025)

Screening for colorectal cancer (CRC) reduces CRC deaths, but comparative data between available screening tests are limited. In a population-based, randomized trial of over 57,000 adults at average risk for CRC, the risk of CRC mortality was similar among those screened by fecal immunochemical test (FIT) versus colonoscopy (0.24 versus 0.22 percent at 10 years) [1]. Participation in any form of CRC screening was higher in the group randomized to FIT (40 versus 32 percent). For adults at average risk of CRC, colonoscopy every 10 years or FIT every one to three years are our preferred screening strategies. (See "Screening for colorectal cancer: Strategies in patients at average risk", section on 'Test selection'.)

Prostate-specific antigen values in transgender women receiving estrogen (November 2024)

Gender-affirming hormone therapy for transgender women reduces prostate-specific antigen (PSA) levels; however, the magnitude of this effect is unknown. In a retrospective study of 210 transgender women receiving estrogen, the median PSA was 0.02 ng/mL [2]. Thirty-six percent of patients had undetectable PSA values. By comparison, the median PSA in similar-age cisgender male patients without known prostate cancer has historically been reported as 1.0 ng/mL. These findings suggest PSA may be falsely low in transgender women receiving estrogen. The role of PSA for prostate cancer screening in this population is an area

requiring further study. (See "Measurement of prostate-specific antigen", section on 'Medications'.)

IMMUNIZATIONS

2025 immunization schedules for adults in the United States (February 2025)

The United States Centers for Disease Control and Prevention (CDC) has published the 2025 immunization schedule for adults (figure 1 and figure 2) [3]. Persons 65 years of age or older are now recommended to receive two or more doses of a 2024-2025 COVID-19 vaccine. Pneumococcal vaccine is now recommended for all adults 50 years or older, and the newest conjugate vaccine (PCV21) is now included in the recommendations. Respiratory syncytial virus (RSV) vaccine has a stronger recommendation for persons 75 years or older. Our approach to immunization is largely consistent with these recommendations. (See "Standard immunizations for nonpregnant adults", section on 'Immunization schedule for nonpregnant adults'.)

Egg allergy no longer a concern for any vaccines (February 2025)

Some vaccines contain trace amounts of egg protein (table 1), but none contain enough to cause reactions in egg-allergic patients. For the last several years, it has been recommended that patients not be asked about egg allergy prior to receiving influenza vaccine. More recently, data have accumulated to show that egg allergy is similarly not a concern for administration of the yellow fever vaccine. In the largest study to date, 171 children with egg allergy, including 24 percent with a history of anaphylaxis, underwent skin testing with the yellow fever vaccine and then received it regardless of skin test results, with no allergic reactions [4]. Thus, we no longer inquire about egg allergy prior to the administration of any vaccine. Vaccine providers should remain prepared to treat rare allergic reactions that may occur after any vaccine, but no special precautions are necessary for recipients with egg allergy. (See "Allergic reactions to vaccines", section on 'Hen's egg'.)

RSV vaccination and Guillain-Barré syndrome (January 2025)

In January of 2025, the US Food and Drug Administration issued a warning about Guillain-Barré syndrome (GBS) in persons receiving either of the glycoprotein subunit RSV vaccines [5]. In analyses of observational data from persons ≥65 years, there were an estimated seven excess cases of GBS per million doses of the adjuvanted vaccine (Arexvy) and nine excess cases of GBS per million doses of the bivalent vaccine (Abrysvo). By contrast, RSV disease in adults ≥65 years causes 60,000 to 160,000 hospitalizations and 6000 to 10,000 deaths annually. This information is important for patients considering RSV vaccination, with

decisions tailored to individualized risk assessment for severe RSV disease (table 2). (See "Respiratory syncytial virus infection in adults", section on 'Risk of Guillain Barré'.)

Lower age cutoff for pneumococcal vaccine indications (November 2024)

In October 2024, the United States Advisory Committee (ACIP) extended pneumococcal vaccination recommendations to include all adults ≥50 years of age, regardless of risk factors (table 3) [6]. Previously, the age threshold was ≥65 years for healthy adults and ≥19 years for those at risk for pneumococcal infection or severe complications from pneumococcal infection. This decision is based on knowledge that the incidence of pneumococcal disease starts to increase at age 50 (table 4) and the predicted reduction in invasive pneumococcal disease cases in certain underrepresented ethnic/racial groups within the United States. We agree with the new guidelines from the ACIP and now suggest pneumococcal vaccination beginning at age 50 for all adults. (See "Pneumococcal vaccination in adults", section on 'Indications for vaccination'.)

RSV vaccine effective in mild to moderately immunocompromised individuals (October 2024)

The respiratory syncytial virus (RSV) vaccine is recommended for immunocompromised individuals aged 60 and above, although the data on the efficacy of the RSV vaccine in this population is limited. In an electronic health records-based observational study that included over 10,000 predominantly mild to moderately immunocompromised individuals ≥60 years old (46 percent of whom had a malignancy), the adjusted RSV vaccine effectiveness against respiratory virus-associated hospitalizations in the first year of follow-up was 73 percent [7]. This study provides preliminary evidence of vaccine efficacy in this patient population and supports vaccination against RSV in immunocompromised individuals aged 60 and above. (See "Immunizations in adults with cancer", section on 'Respiratory syncytial virus (RSV)'.)

Electronic letters to improve influenza vaccination rates (October 2024)

Electronic letters have been proposed to improve annual influenza vaccination rates. In a study including more than 300,000 Danish patients aged 18 to 64 years with chronic diseases, influenza vaccination rates were higher among those randomly assigned to receive one of six letters that included a behavioral nudge compared with those who received no letter (40 versus 28 percent) [8]. The largest effect sizes were observed with a repeat letter sent 10 days after the initial letter (42 percent) and a letter emphasizing potential cardiovascular benefits of vaccination (40 percent). Electronic letters are scalable, cost-effective, and may have beneficial public health implications. (See "Seasonal influenza vaccination in adults", section on 'Improving vaccination rates'.)

GENERAL INTERNAL MEDICINE

Diet and healthy aging (April 2025)

Healthy eating is associated with numerous benefits, including reduced mortality and improved quality of life. In a new observational study following over 100,000 patients for up to 30 years, higher intakes of fruits, vegetables, whole grains, unsaturated fats, nuts, legumes, and low-fat dairy were associated with an increased likelihood of healthy aging (defined as surviving to the age of 70 years without major chronic diseases or impairments in cognitive, physical, or mental health), whereas higher intakes of trans fats, sodium, sugary beverages, and red or processed meats were associated with a decreased likelihood of healthy aging [9]. These results are consistent with prior observational studies linking these specific dietary components to health benefits and harms. We continue to promote a healthy diet for all patients, emphasizing the components associated with health benefits and limiting or avoiding those associated with harms. (See "Healthy diet in adults", section on 'Dietary guidelines: Recommended dietary patterns'.)

Intermittent fasting for weight loss (April 2025)

Traditional daily calorie restriction is effective in the treatment of obesity, but long-term adherence can be challenging; intermittent fasting has gained attention as a possible alternative strategy. In a randomized trial of 165 patients with overweight or obesity, intermittent fasting (4:3 fasting; with 80 percent calorie restriction on 3 nonconsecutive days per week and ad-libitum intake on non-fasting days) achieved slightly greater weight loss after 12 months compared with traditional daily caloric restriction [10]. Caloric restriction was greater over the 12-month period with intermittent fasting, suggesting the benefit was due to reduced calorie consumption. We personalize dietary counseling and promote interventions that are most likely to be sustainable for individual patients. (See "Obesity in adults: Dietary therapy", section on 'Intermittent fasting'.)

Reduced-dose apixaban and rivaroxaban for indefinite venous thromboembolism treatment (April 2025)

The optimal anticoagulant dose for prevention of venous thromboembolism (VTE) among patients at high risk of recurrence is unknown. In a trial of over 2700 such patients who had completed 6 to 24 months of anticoagulation, patients who transitioned either to reduced-dose apixaban (2.5 mg twice daily) or rivaroxaban (10 mg once daily) had a higher five-year VTE recurrence rate, compared with patients who continued to take full-dose anticoagulants (2.2 versus 1.8 percent) [11]. However, low-dose anticoagulant therapy was associated with a lower risk of major and/or clinically relevant bleeding (9.9 versus 15.2 percent). Low-dose apixaban or rivaroxaban is appropriate for most patients at high risk of recurrent VTE who

require indefinite anticoagulation. (See "Selecting adult patients with lower extremity deep venous thrombosis and pulmonary embolism for indefinite anticoagulation", section on 'Reduced-dose regimens for indefinite anticoagulation'.)

Sibutramine and sildenafil found in weight loss supplements in France (March 2025)

Weight loss supplements are commonly used worldwide and may contain active ingredients that can cause adverse effects. In 2023, 29 people from France reported using weight loss supplements that were analyzed and found to contain sibutramine and sildenafil [12]. Sibutramine is no longer available by prescription because it increases the risk of stroke and myocardial infarction. Many of the patients in this study reported anorexia, tachycardia, chest pain, increased blood pressure, headaches, and insomnia. These findings support our recommendation to counsel patients not to use weight loss dietary supplements since none are proven safe or effective, and they often contain potentially harmful adulterants. (See "High-risk dietary supplements: Patient evaluation and counseling", section on 'Weight loss supplements'.)

Estimation of free calcium using albumin-adjusted calcium formulas (March 2025)

Albumin-adjusted calcium formulas are often used to estimate free calcium when albumin is abnormal, but none appears to be universally acceptable when compared with ionized calcium. In a new cross-sectional study that included 17,500 patients who had simultaneous testing of albumin, total calcium, and ionized calcium, very few (≤0.3 percent) patients with an albumin <3 g/dL and hypercalcemia by ionized calcium were misclassified as normocalcemic by a commonly used calcium correction formula [13]. However, the formula misclassified 44 percent with hypocalcemia by ionized calcium as normocalcemic, and 6.8 percent with normocalcemia by ionized calcium were misclassified as hypercalcemic. If reliable measurement of ionized calcium is not available, the total calcium may be corrected for any abnormalities in albumin, but the accuracy of the estimate may be poor in a variety of populations. (See "Diagnostic approach to hypercalcemia", section on 'Verify elevated calcium' and "Relation between total and ionized serum calcium concentrations".)

Suzetrigine, a first-in-class nonopioid analgesic, now available for acute pain (March 2025)

Suzetrigine, a first-in-class nonopioid oral analgesic, has been approved by the US Food and Drug Administration for management of acute pain in adults and is now available. Suzetrigine is a selective inhibitor of the Na_V 1.8 voltage-gated sodium channel, which is expressed in the dorsal root ganglia and is involved in transmission of nociceptive signals to the spinal cord. In randomized trials of 303 patients who had acute pain after abdominoplasty and 274 patients after bunionectomy, suzetrigine (100 mg orally followed by 50 mg orally every 12 hours) reduced pain scores compared with

hydrocodone/acetaminophen (5 mg/325 mg orally every six hours) or placebo [14]. Further study is required to determine the role of suzetrigine in acute pain management. (See "Nonopioid pharmacotherapy for acute pain in adults", section on 'Suzetrigine, a novel Nav1.8 inhibitor'.)

New classifications for patients with obesity (February 2025)

Body mass index (BMI) is increasingly recognized as an inadequate tool to fully capture an individual's obesity-related health status. A global commission of obesity experts has proposed new strategies to better identify those with increased adiposity and further classify patients based on obesity-related health consequences [15]. One important change is the proposal of new diagnostic categories for "preclinical" and "clinical" obesity. Those with clinical obesity have objectively altered organ function or symptoms related to obesity, whereas those with preclinical obesity have no identifiable health effects from extra weight. These new classifications may help identify those who would benefit most from intensive treatment. We continue to individualize obesity interventions based on overall health status and risk factors for obesity-related morbidity. (See "Obesity in adults: Prevalence, screening, and evaluation", section on 'Preclinical versus clinical obesity'.)

Perioperative management of renin-angiotensin system inhibitors (November 2024)

The optimal perioperative management strategy of renin-angiotensin system inhibitors (RASIs) is unclear. In a trial of over 2000 patients who had been on RASIs for at least three months and were undergoing major noncardiac surgery, intraoperative hypotension was more common in patients randomly assigned to RASI continuation compared with discontinuation 48 hours prior to surgery (54 versus 41 percent), although composite rates of all-cause mortality and major postoperative complications were equivalent in both groups [16]. In patients on RASIs undergoing major noncardiac surgery, management is individualized; discontinuation of RASIs may be favored in patients at higher risk of intraoperative hypotension. (See "Perioperative medication management", section on 'ACE inhibitors and angiotensin II receptor blockers'.)

Benefits of dietary plant-based fats (November 2024)

Although the optimal diet for cardiovascular health and mortality is not known, increasing evidence highlights the benefits of primarily plant-based diets. In a new prospective cohort study evaluating over 400,000 United States adults for up to 24 years, a greater intake of plant fat, particularly from grains and vegetable oils, was associated with lower overall and cardiovascular mortality [17]. Replacing 5 percent of energy from animal fat with energy from plant fat was associated with a 4 to 24 percent lower risk of all-cause mortality. These results provide additional support for a diet high in healthy unsaturated fat from plants,

including fruits, nuts, seeds, vegetables, legumes, whole grains, and plant oils. (See "Dietary fat", section on 'Plant versus animal fat'.)

PRIMARY CARE CARDIOVASCULAR MEDICINE

Bleeding risk with direct oral anticoagulants (March 2025)

Direct oral anticoagulants (DOACs) are often preferred to warfarin since they do not require routine monitoring, but bleeding risks are uncertain. A new meta-analysis of data from randomized trials involving over 26,000 individuals prescribed a DOAC or low-dose aspirin reported that bleeding risks with DOACs were similar to low-dose aspirin, which carries a small increased risk [18]. However, clinicians should use caution when comparing bleeding risks between DOACs from different trials, as trial populations may differ and data from direct comparisons are limited. (See "Risks and prevention of bleeding with oral anticoagulants", section on 'Drug class'.)

Home-based cardiac rehabilitation for older patients (February 2025)

Home-based cardiac rehabilitation (CR) using portable electronic devices is an attractive alternative to traditional CR; however, its benefits in older adults are unclear. In a study of 400 patients (median age 71 years, range 65 to 91 years), those who were randomly assigned to home-based CR did not experience clinically meaningful improvements in six-minute walk duration (6MWD) or the ability to perform activities of daily living (ADL) compared with those undergoing usual care [19]. Subgroup analysis showed improved 6MWD in female patients and patients who had undergone coronary artery bypass grafting (CABG). These findings suggest that home-based CR may not be effective for most older adults but may benefit certain subgroups; further studies are needed to confirm these results. (See "Cardiac rehabilitation: Indications, efficacy, and safety in patients with coronary artery disease", section on 'Home-based and hybrid cardiac rehabilitation'.)

Effects of exercise on lipoproteins (February 2025)

Although numerous randomized trials document the benefits of exercise on serum lipid profiles, few analyses have compared the effects of different types of exercise on specific lipoproteins. In a meta-analysis of 148 randomized trials, exercise modestly improved total, low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and high-density lipoprotein (HDL) cholesterol and triglyceride levels, with changes that ranged from 3.5 to 11.7 percent [20]. Interventions combining aerobic and resistance exercise produced optimal reductions in serum lipoproteins. On meta-regression, each extra weekly aerobic session reduced total cholesterol by 7.68 mg/dL (0.2 mmol/L). These results provide important

guidance for counseling patients on the benefits of exercise on lipid profiles. (See "Effects of exercise on lipoproteins and hemostatic factors", section on 'Type of exercise'.)

Intensive blood pressure lowering in patients with type 2 diabetes mellitus (January 2025)

We suggest intensive blood pressure (BP) lowering (eg, systolic blood pressure [SBP] <125 mmHg using standardized methods) for patients with type 2 diabetes based on goal BP trials that included diabetic patients and indirect data from the SPRINT trial, although one trial found no significant benefit to this approach. In a randomized trial in over 12,800 patients with type 2 diabetes, hypertension, and other cardiovascular risk factors, patients assigned to a target SBP of <120 mmHg had a lower incidence of a cardiovascular composite of nonfatal stroke, nonfatal myocardial infarction, heart failure, and cardiovascular death at a median of 4.2 years, compared with patients assigned to a target SBP of <140 mmHg [21]. The algorithm for follow-up and antihypertensive therapy was similar to that used in the SPRINT trial. These data, combined with previous studies, support a strong recommendation for intensive BP lowering in patients with diabetes mellitus. (See "Goal blood pressure in adults with hypertension", section on 'Patients with diabetes mellitus'.)

Colchicine after acute myocardial infarction (January 2025)

The efficacy of colchicine for prevention of recurrent myocardial infarction (MI) remains unclear. One previous trial in patients with MI found that colchicine decreased the rate of a composite cardiovascular endpoint compared with placebo, but this effect was largely driven by lower rates of angina and stroke; rates of mortality and recurrent MI were similar. In a more recent trial in over 7000 patients with acute MI, rates of death, recurrent MI, and stroke were comparable among patients treated with colchicine or placebo over a median of three years [22]. In patients with acute MI, we do not routinely treat with colchicine for secondary prevention of cardiovascular events. (See "Overview of the nonacute management of ST-elevation myocardial infarction", section on 'Colchicine'.)

Duration of beta blocker therapy after acute myocardial infarction (December 2024)

Most patients with a myocardial infarction (MI) are treated with a beta blocker indefinitely, although this practice is based on data obtained prior to modern advances in MI management such as stenting, dual antiplatelet therapy, and statin therapy. In a recent trial in nearly 3700 patients with a history of acute MI who had already received beta blocker therapy for at least six months (median 2.9 years) and had no other indication for beta blocker therapy (eg, reduced left ventricular systolic function), patients randomly assigned to discontinue beta blocker therapy had similar rates of mortality and recurrent MI after four years compared with those who continued such therapy [23]. Quality-of-life scores were also similar between the groups, suggesting that discontinuing beta blocker therapy did not

noticeably impact quality of life. For patients treated with a beta blocker for at least three years after MI and who have no other indication to continue a beta blocker, clinicians should discuss the potential benefits and risks of continued therapy. (See "Acute myocardial infarction: Role of beta blocker therapy", section on 'Duration'.)

Inferior vena cava filter retrieval rates among Medicare beneficiaries (November 2024)

Although retrievable inferior vena cava (IVC) filters should be removed when their protection is no longer needed, removal rates vary widely depending on the population studied. In a review of nearly 271,000 Medicare beneficiaries, the proportion of removed IVC filters increased incrementally after 2014; however, the cumulative incidence of removal was only 17 percent at a maximum follow-up of nine years [24]. This low rate compared with other studies may reflect population characteristics associated with lower removal rates (eg, older age, cancer). Nevertheless, this study underscores the need to periodically reevaluate whether a patient with an IVC filter is a candidate for its removal regardless of age or medical comorbidities. (See "Placement of vena cava filters and their complications", section on 'Filter retrieval'.)

Timing of anticoagulation after acute ischemic stroke in patients with atrial fibrillation (November 2024)

The timing of anticoagulation after acute ischemic stroke in patients with atrial fibrillation (AF) is controversial. Because of concern for intracranial hemorrhage, the start of anticoagulation is often delayed by one to two weeks for certain patients, such as those with large infarcts. However, recent findings from the OPTIMAS randomized trial and the CATALYST meta-analysis challenge this approach [25-27]. In a meta-analysis of patient-level data on over 6700 patients from trials (including OPTIMAS) evaluating the timing of direct oral anticoagulant (DOAC) initiation in patients with stroke and AF, rates of symptomatic intracranial hemorrhage were similarly low for both early (≤4 days from stroke onset) and late (≥5 days) DOAC administration, and the composite outcome of stroke or hemorrhage with early initiation was marginally lower at 30 but not 90 days [26]. Approximately 15 percent of patients had large or severe infarcts in the three largest trials. These data support the safety of early DOAC administration in patients with AF and ischemic stroke, but whether earlier DOAC treatment reduces the risk of recurrent ischemic stroke remains to be settled. (See "Early antithrombotic treatment of acute ischemic stroke and transient ischemic attack", section on 'Timing of anticoagulation after acute ischemic stroke or TIA in patients with atrial fibrillation'.)

Efficacy of catheter ablation for atrial fibrillation (November 2024)

Catheter ablation (CA) for atrial fibrillation (AF) improves AF symptoms in most patients, but AF commonly recurs and anticoagulation is commonly required to mitigate the risk of stroke

associated with AF. These issues were illustrated by a double-blind trial in which over 120 patients with symptomatic AF were randomly assigned to undergo either CA or a sham procedure [28]. At six months, the CA group had greater improvement in AF symptoms and greater reduction in frequency of AF than the sham group, although AF was common in both groups. These findings inform decisions regarding CA for AF as well as the approach to monitoring and anticoagulation after the procedure. (See "Atrial fibrillation: Catheter ablation", section on 'Effect on symptoms and AF burden'.)

Meta-analysis of goal blood pressure trials (October 2024)

UpToDate recommends intensive blood pressure lowering in patients with hypertension who are at high cardiovascular risk. A meta-analysis of seven goal blood pressure trials combining 72,138 patients found a reduction in major cardiovascular events (hazard ratio [HR] 0.78, 95% CI 0.70–0.87) and all-cause mortality (HR 0.89, 95% CI 0.79–0.99) with a systolic BP target <130 mmHg compared with higher targets [29]. This large meta-analysis further supports our goal blood pressure recommendations (table 5). (See "Goal blood pressure in adults with hypertension", section on 'Patients with established atherosclerotic cardiovascular disease'.)

PRIMARY CARE DERMATOLOGY

Antileukotriene drugs minimally helpful in chronic spontaneous urticaria (November 2024)

The benefit of adding a leukotriene receptor antagonist (LTRA) such as montelukast for patients with chronic spontaneous urticaria that is not controlled with antihistamines alone has not been clear. In a new meta-analysis of 34 randomized trials including over 3000 children and adults, the efficacy of a LTRA added to a nonsedating antihistamine at standard dose was compared with antihistamine alone [30]. The addition of LTRAs provided some benefit, but the degree of improvement on the Urticaria Activity Score was just 5 points, which was less than half of the minimally important difference of 11 points for the symptom scale used. Based upon these findings, we do not advocate for the use of LTRAs in the routine management of chronic spontaneous urticaria. (See "Chronic spontaneous urticaria: Standard management and patient education", section on 'Leukotriene modifiers'.)

PRIMARY CARE ENDOCRINOLOGY AND DIABETES

Global rates of overweight and obesity (March 2025)

Despite numerous associated health risks, rates of overweight and obesity continue to increase worldwide. In a new global analysis, the number of adults with overweight or

obesity is expected to increase from 2.1 billion in 2021 to 3.8 billion in 2050, which represents nearly 60 percent of the predicted adult population [31]. Among children and young adults, the projected global prevalence of obesity by 2050 is 15.6 percent for those ages 5 to 14 years, and 14.2 percent for those 15 to 24 years [32]. We continue to promote screening and prevention for all patients, routine growth monitoring and counseling on healthy behaviors and lifestyle for all children, comprehensive lifestyle intervention for children and adults with overweight and obesity, and intensive lifestyle, pharmacologic, or surgical management for those at the highest risk of obesity-related morbidity and mortality. (See "Obesity in adults: Prevalence, screening, and evaluation", section on 'Global'.)

Automated insulin delivery in adults with type 2 diabetes (March 2025)

Automated insulin delivery (AID) systems are often used to treat type 1 diabetes, but few studies have evaluated their use in type 2 diabetes. In a 13-week trial, 319 adults with type 2 diabetes (mean age 58 years, mean A1C 8.2 percent) were randomly assigned to treatment with AID (n = 215) or their usual insulin delivery strategy (predominantly multiple daily injections [MDI]; n = 104) [33]. AID use led to a greater reduction in mean A1C (-0.9 versus -0.3 percentage points with usual care) and a greater increase in time spent in the target glucose range (70 to 180 mg/dL [3.9 to 10 mmol/L]). The rate of hypoglycemia was low in both groups. These findings support the utility of AID in adults with type 2 diabetes who are not meeting glycemic goals with MDI insulin regimens. (See "Continuous subcutaneous insulin infusion (insulin pump)", section on 'Patient selection'.)

Accelerated bone loss in older men with type 2 diabetes (February 2025)

In people with type 2 diabetes, fracture risk is elevated despite normal or increased bone mineral density (BMD). In an analysis of 4095 older men (mean age approximately 73 years) in whom BMD at the total hip was measured at baseline and after a mean of 4.6 years, those with type 2 diabetes (n = 578) exhibited a greater decline in BMD than those with normoglycemia (n = 1993; mean decrease -2.23 versus -1.57 percent, respectively) [34]. Accelerated bone loss was evident despite higher mean baseline BMD at the hip among men with diabetes. These findings suggest that accelerated bone loss may contribute to fracture risk in people with type 2 diabetes. (See "Bone disease in diabetes mellitus", section on 'Bone quantity and quality'.)

Extended-interval dosing for zoledronic acid in postmenopausal women with low bone mass (February 2025)

In postmenopausal women with low bone mass, zoledronic acid administered every one to two years increases bone mineral density. The clinical efficacy of a longer dosing interval was evaluated in a 10-year trial of zoledronic acid (5 mg IV once at baseline only or once at baseline and again at five years) versus placebo in 1054 early postmenopausal women

(mean age 56 years) with T-scores >-2.5 and <0.0 [35]. Participants who received one or two doses of zoledronic acid had a lower incidence of morphometric vertebral fracture compared with those who received placebo. Both zoledronic acid regimens also reduced risk of major osteoporotic fracture. Extended dosing intervals for zoledronic acid may help reduce treatment burden for postmenopausal women who opt for pharmacotherapy to prevent osteoporosis. (See "Overview of the management of low bone mass and osteoporosis in postmenopausal women", section on 'Options for pharmacotherapy'.)

Age-related increase in upper reference limit for TSH (January 2025)

Although a growing number of studies have reported an age-related increase in the upper reference limit for thyroid stimulating hormone (TSH), few laboratories provide age-specific reference ranges for adults. In a recent multicenter, retrospective study (7.6 million TSH samples), the upper reference limit for TSH increased starting at age 50 years in females and 60 years in males [36]. The upper reference limit for an individual 70 to 80 years old ranged from 5.0 to 6.2 mU/L, depending on assay, with the reported upper limit ranging from 4.1 to 4.8 mU/L. If age-adjusted normal ranges for TSH were employed, there would be a decrease in the diagnosis of subclinical hypothyroidism in adults >50 to 60 years of age; we favor using age-based normal ranges for TSH. (See "Laboratory assessment of thyroid function", section on 'Serum TSH'.)

Diabetic neuroarthropathy risk factors (January 2025)

Risk factors for diabetic neuroarthropathy (ie, Charcot foot) include repeated trauma, foot ulceration, and infection or surgery of the affected foot. A retrospective study of 3400 patients with diabetic neuroarthropathy (and 27,000 patients with diabetes alone) identified additional risk factors for diabetic neuroarthropathy, including atherosclerosis, macroalbuminuria, microalbuminuria, and retinopathy, both in patients with type 1 and type 2 diabetes [37]. These data suggest that patients with atherosclerosis and/or microvascular complications of diabetes mellitus may benefit from screening for diabetic neuroarthropathy. (See "Diabetic neuroarthropathy", section on 'Epidemiology and risk factors'.)

PRIMARY CARE GASTROENTEROLOGY

Updated guidelines on eosinophilic esophagitis (January 2025)

The American College of Gastroenterology has published updated guidelines on diagnosis and management of eosinophilic esophagitis (EoE) [38]. The guidelines establish the diagnosis of EoE based esophageal symptoms, ≥15 eosinophils per high-power field on biopsy, and excluding other causes of eosinophilia. Endoscopic evaluation includes obtaining

multiple biopsies from two esophageal levels (ie, proximal/mid and distal esophagus). For initial treatment, the guidelines endorse a limited empiric food elimination diet or pharmacologic (proton pump inhibitor or topical glucocorticoid) therapy. Our approach is generally consistent with these guidelines. (See "Treatment of eosinophilic esophagitis (EoE)", section on 'Introduction'.)

Treatment of Helicobacter pylori infection in adults (November 2024)

Over half of individuals in the United States with *Helicobacter pylori* infection continue to receive clarithromycin-based treatment regimens, despite rising rates of *H. pylori* resistance to clarithromycin and declining rates of treatment success with these regimens [39]. Recent guidelines from the American College of Gastroenterology reinforce the importance of using non-clarithromycin-based regimens for the initial and salvage treatment of *H. pylori* infection [40]. Preferred regimens for the empiric management of *H. pylori* infection in treatment-naïve adults include optimized bismuth quadruple therapy, rifabutin triple therapy, and vonoprazan-amoxicillin dual therapy. The guidelines also emphasize testing to confirm *H. pylori* eradication after treatment and discuss the role of antimicrobial susceptibility testing in *H. pylori* management. Based on available evidence, we suggest optimized bismuth quadruple therapy as the preferred regimen for *H. pylori* infection in treatment-naïve adults. (See "Treatment of *Helicobacter pylori* infection in adults".)

PRIMARY CARE GERIATRICS

Risk of delayed bleeding in older adults following head trauma (January 2025)

Older adults, particularly those taking anticoagulant medication, are at high risk for intracranial hemorrhage (ICH) following blunt head trauma. However, the risk of delayed ICH is less well studied. In a prospective observational study of 3425 older adult patients with acute head injury (median age 82, 33 percent of whom were prescribed anticoagulants), acute ICH was identified in 6.7 percent of patients but only 0.4 percent had delayed ICH [41]. The rates of delayed bleeding were similar for patients prescribed anticoagulants versus those who were not. All delayed bleeding occurred between several hours and five days following injury. These findings are consistent with prior studies and support the safety of discharge in older adults with isolated closed head injury who have a normal initial neurologic examination, no bleeding on CT scan (if obtained), and remain stable with no change in neurologic status after 12 hours of observation. (See "Geriatric trauma: Initial evaluation and management", section on 'Risk of bleeding'.)

PRIMARY CARE GYNECOLOGY

Use of extended human papillomavirus genotyping to determine cervical cancer screening follow-up (April 2025)

In April 2025, the Enduring Consensus Cervical Cancer Screening and Management Guidelines Committee published recommendations for using extended human papillomavirus (HPV) genotyping results to guide clinical management of patients undergoing cervical cancer screening [42]. Extended HPV genotyping beyond 16 and 18 identifies two additional risk groups based on the risk of progression to cervical intraepithelial neoplasia [CIN] 3+. One group consists of HPV 45, 33/58, 31, 52, 35/39/68, and 51, and the other consists of HPV 56/59/66. This approach provides additional risk stratification (table 6) and guides appropriate follow-up (table 7). In the United States, only extended HPV genotyping assays approved by the US Food and Drug Administration should be used. (See "Cervical cancer screening: Risk assessment, evaluation, and management after screening", section on 'Terminology and incidence' and "Cervical cancer screening: Risk assessment, evaluation, and management after screening", section on 'HPV positive, genotyping performed'.)

Role of urodynamic testing in evaluating female urinary incontinence (April 2025)

While urodynamic testing has no role in the initial evaluation of females with stress urinary incontinence, studies continue to evaluate its utility in the initial evaluation of females with urgency or mixed urinary incontinence. In a multicenter trial of nearly 1,100 female patients with refractory overactive bladder or urgency-predominant mixed urinary incontinence, 15-month treatment success rates were similar whether the treatment was based on urodynamics with clinical assessment or clinical assessment alone [43]. These findings support our practice of not performing urodynamic testing in the initial evaluation of urinary incontinence in female patients whose symptoms are consistent with stress, urgency, or mixed urinary incontinence. (See "Female urinary incontinence: Evaluation", section on 'Clinical tests, including urodynamic testing'.)

Male partner treatment to prevent recurrence of bacterial vaginosis (March 2025)

Treatment of male sex partners to reduce bacterial vaginosis (BV) recurrence in females is an area of ongoing study. In a trial of 150 male-female monogamous couples with confirmed BV in the female, treatment of the male partner for one week with an oral and topical antibiotic (metronidazole tablet and clindamycin cream) in addition to standard antimicrobial treatment of the female patient reduced recurrences at 12 weeks compared with treating the female patient only (35 versus 63 percent; risk difference -2.6 recurrences per person-year) [44]. Based on these results, we now suggest dual topical and oral antimicrobial male partner therapy as an effective strategy to reduce BV recurrence in female patients. (See "Bacterial vaginosis: Initial treatment", section on 'Males'.)

New copper 175 mm2 intrauterine device (March 2025)

Patients who desire long-acting contraception will have two copper intrauterine devices (IUDs) to consider. The novel copper 175 mm^2 device (commercial name Miudella) has been approved for three years of use and will be commercially available later in 2025 [45]. Compared with the copper 380 mm^2 IUD, the new device has less than half the copper, which may reduce uterine cramping and bleeding; the applicator has a smaller diameter and is rounded, which may make placement easier for nulliparous patients or those with cervical stenosis; and the nitinol frame is flexible, which may better adapt to the intrauterine cavity and potentially reduce expulsion risk. (See "Intrauterine contraception: Background and device types", section on 'Device types and characteristics'.)

Human papillomavirus- versus cytology-based cervical cancer screening (January 2025)

Cervical cancer screening can be performed using a human papillomavirus (HPV)- or cytology-based test. While many guidelines have switched to HPV-based testing, others continue to use cytology as the primary screening test. In a recent randomized trial including over 395,000 participants aged 30 to 64 years, HPV-based screening resulted in fewer patients developing cervical cancer compared with cytology-based screening during the eight-year study period (hazard ratio 0.83, 95% CI 0.7-0.98) [46]. These data are consistent with previous evidence that HPV-based testing is superior to cervical cytology and support the increasing utilization of primary HPV testing for cervical cancer screening. (See "Screening for cervical cancer in resource-rich settings", section on 'Relative risks and benefits of each method'.)

Medication abortion in patients with pregnancy of unknown location (December 2024)

Patients seeking abortion who are found to have a pregnancy of unknown location (PUL) are typically managed either expectantly until the location is known or by uterine aspiration. Medication abortion before localization was investigated in a randomized trial of >1500 patients seeking this procedure at ≤6 weeks with a PUL [47]. Patients who received mifepristone plus misoprostol before confirmation of an intrauterine pregnancy (IUP) had a similar rate of complete abortion as those in whom medication was delayed until IUP confirmation. However, in patients who did not achieve a complete abortion, treatment before pregnancy localization resulted in a higher rate of ongoing IUP (3 versus 0.1 percent) and included one ruptured ectopic pregnancy (compared with none with delayed treatment). In our practice, most patients with PUL who are seeking abortion are managed with uterine evacuation. (See "Approach to the patient with pregnancy of unknown location", section on 'Hemodynamically stable patients'.)

Levonorgestrel intrauterine devices and breast cancer risk (November 2024)

Estrogen-progestin contraceptives have been associated with a small increase in risk of breast cancer, whereas the impact of progestin-only intrauterine devices (IUD) has been less clear. In an administrative database study, first-time levonorgestrel (LNG) IUD users (any dose) had a small increase in overall risk of breast cancer compared with matched nonusers of hormonal contraception (hazard ratio 1.4), in line with some prior studies [48]. To provide context and assist patients with assessing their own risk, we inform them that the breast cancer risk conferred by LNG IUDs appears to be modestly increased and similar to that of estrogen-progestin contraceptive pills. (See "Intrauterine contraception: Background and device types", section on 'Risk of cancer'.)

PRIMARY CARE HEMATOLOGY AND ONCOLOGY

Hypophosphatemia with intravenous ferric carboxymaltose (April 2025)

Several intravenous iron formulations are available, with similar efficacy and mostly similar adverse effects profiles. However, recent reports have emphasized a high rate of hypophosphatemia with ferric carboxymaltose (FCM). A new systematic review reported high rates of hypophosphatemia with FCM in randomized trials (50 to 92 percent, versus 2 to 8 percent with other intravenous iron formulations) [49]. This supports our practice of monitoring serum phosphate in all patients receiving more than one dose of FCM, especially individuals with borderline phosphate levels at baseline or receiving repeated doses. (See "Treatment of iron deficiency anemia in adults", section on 'Hypophosphatemia and cardiac iron uptake'.)

Frequency of mammographic surveillance in patients aged ≥50 years with breast cancer (February 2025)

There are limited data regarding the frequency of mammographic surveillance in breast cancer survivors. In a randomized trial in 5235 patients age ≥50 years with a history of breast cancer, annual versus less frequent mammographic surveillance resulted in similar five-year breast cancer-specific survival rates (98.1 versus 98.3 percent) and overall survival rates (94.7 versus 94.5 percent) [50]. Most breast cancer events in both groups were detected from emergency admissions or referrals for symptoms. Although these results are promising, the follow-up for this trial was short. The majority of patients (83 percent) had estrogen receptor-positive disease, which often recurs later. We await further data before altering our practice related to frequency of mammographic screening of breast cancer survivors. (See "Approach to the patient following treatment for breast cancer", section on 'Mammography'.)

High rate of iron deficiency in athletes (January 2025)

High-intensity athletics can cause iron deficiency by several mechanisms including reduced iron intake, gastrointestinal blood loss, iron loss in sweat, and traumatic hemolysis. A new meta-analysis including over 17,000 college athletes and military recruits reported iron deficiency in 31 percent, using a ferritin cutoff of 30 ng/mL [51]. Female athletes are more likely than male athletes to have iron deficiency; younger and older athletes are equally affected. These observations confirm that high-intensity athletics is a significant risk factor for iron deficiency and support a role for screening in this population. (See "Diagnosis of iron deficiency and iron deficiency anemia in adults", section on 'Epidemiology'.)

Increased risk of pulmonary embolism in sickle cell trait (December 2024)

Sickle cell trait is an asymptomatic carrier state, but risks are increased for certain complications. A new study used genetic data from almost four million individuals to assess risks for venous thromboembolism (VTE), including pulmonary embolism (PE) and deep vein thrombosis (DVT) [52]. Compared to individuals without sickle cell trait, those with sickle cell trait had an approximately 2-fold increased risk for PE; a definite increased risk for DVT was not identified, and the overall VTE risk was increased 1.5-fold. This VTE risk for sickle cell trait was less than that for factor V Leiden (3.3-fold) and is not great enough to warrant management changes. Appropriate VTE prophylaxis during hospitalization should be emphasized. (See "Sickle cell trait", section on 'Venous thromboembolism'.)

Carrier screening for hemophilia (December 2024)

Hemophilia A and B are X-linked conditions. Daughters of affected males are obligate carriers, and mothers of affected males are often carriers (some cases arise de novo). Carriers are typically asymptomatic, but they may require additional interventions during hemostatic challenges (surgery, delivery of a child), and their children may be affected. A new study illustrated the lack of comprehensive carrier screening in 287 kindreds followed in a single hemophilia treatment center [53]. Of 900 females screened, 454 were obligate or genetically proven carriers, but 328 had yet to undergo genetic testing, and 59 obligate carriers had yet to have their factor activity level measured. This study highlights the importance of testing female first-degree relatives of individuals with hemophilia. (See "Clinical manifestations and diagnosis of hemophilia A and B", section on 'Carrier detection'.)

PRIMARY CARE INFECTIOUS DISEASES

Updated IAS-USA guidelines for the treatment and prevention of HIV (February 2025)

In December of 2024, the International Antiviral Society-USA guideline panel released updated guidelines on the treatment and prevention of HIV [54]. They reaffirmed their preference for an initial regimen that includes dolutegravir or bictegravir combined with

tenofovir-emtricitabine or lamivudine. Protease inhibitor-containing regimens are typically reserved for patients with suspected or confirmed resistance to integrase strand transfer inhibitors, such as those who acquire HIV while receiving cabotegravir as pre-exposure prophylaxis. Antiretroviral therapy (ART) should be initiated as soon as possible. When one of the preferred three drug regimens is used, ART can be started before the results of baseline testing return. (See "Selecting antiretroviral regimens for treatment-naïve persons with HIV-1: General approach", section on 'Approach for most patients'.)

Updated guidelines for treatment of tuberculosis (February 2025)

New guidelines for treating tuberculosis (TB) have been issued by the American Thoracic Society, US Centers for Disease Control, European Respiratory Society, and Infectious Disease Society of America [55]. For drug-susceptible TB in patients ≥12 years of age who meet all conditions, the guidelines conditionally recommend a rifapentine-moxifloxacin-based regimen (rifapentine, moxifloxacin, isoniazid, and pyrazinamide for four months); we suggest a traditional regimen given the need for special monitoring in some patients on the shortened regimen. For patients age 3 months to 16 years with nonsevere, smear-negative, presumed drug-susceptible disease, we agree with the guidelines, which favor a shortened four-month regimen (isoniazid, rifampin, and pyrazinamide, with or without ethambutol). For patients ≥14 years of age with rifampin-resistant TB, we agree with the new guidelines, which favor bedaquiline, pretomanid, and linezolid, with or without moxifloxacin for six months (BPaL[M]). (See "Tuberculosis disease in children: Treatment and prevention", section on 'Regimen selection'.)

Lenacapavir for prevention of HIV (December 2024)

Antiretroviral pre-exposure prophylaxis (PrEP) is an effective HIV prevention strategy; however, available options are limited by adherence challenges and/or the risk of promoting resistance to first-line HIV regimens should infection occur. Lenacapavir, an HIV-1 capsid inhibitor, is a long-acting agent that had >96 percent efficacy for preventing HIV infection in two randomized, double-blind trials [56,57]. In both, lenacapavir was well tolerated and superior to oral regimens over at least 52 weeks of follow-up. In men and gender-diverse patients who have sex with men, new HIV infections occurred in 2 of 2179 versus 9 of 1086 persons receiving lenacapavir versus oral therapy, respectively. In cisgender women, new HIV infections occurred in 0 of 2134 versus 55 of 3204 persons. Although lenacapavir is not yet approved for use as PrEP in the United States, these data support its future role as an effective agent for HIV prevention. (See "HIV pre-exposure prophylaxis", section on 'Novel approaches to treatment'.)

Lithium aspartate ineffective for neurocognitive effects of long COVID (November 2024)

Anecdotal reports have suggested a benefit from low-dose lithium in patients with neurocognitive symptoms due to long COVID. However, in a placebo-controlled randomized trial in 52 patients with at least four weeks of neurocognitive symptoms following COVID-19 infection, three weeks of lithium aspartate (10 to 15 mg daily) failed to improve fatigue or cognitive dysfunction scores [58]. Limitations included small sample size and possible under-dosing. While low-dose lithium does not appear to benefit patients with long COVID-associated neurocognitive symptoms, further exploratory studies may be warranted. (See "COVID-19: Management of adults with persistent symptoms following acute illness ("long COVID")", section on 'Investigational therapies'.)

PRIMARY CARE NEPHROLOGY AND HYPERTENSION

Updated microscopic hematuria guidelines from the American Urologic Association (March 2025)

The American Urologic Association (AUA) has released a 2025 update to its guidelines for the diagnosis, evaluation, and follow-up of microscopic hematuria [59]. The amended guidelines include a revised risk stratification system and risk-based evaluation algorithm as well as updated guidance on the use of urine-based tumor markers and cytology. Our approach to the evaluation of microscopic hematuria in adults is largely consistent with these revised guidelines. (See "Evaluation of hematuria in adults", section on 'Asymptomatic patients'.)

Blood pressure measurement using a cuffless blood pressure device (March 2025)

The diagnosis and management of hypertension is based on standardized blood pressure (BP) measurement using cuff-based BP monitors, but studies are evaluating the accuracy of cuffless devices that estimate BP indirectly through measurements of photoplethysmography, pulse wave analysis, and other techniques. In a single-center observational study of 51 patients, the seven-day average daytime systolic BP obtained from the cuffless monitor was similar to that obtained by 24-hour ambulatory blood pressure monitoring (ABPM) [60]. However, the cuffless BP device consistently reported higher nocturnal systolic and diastolic BP compared with ABPM (mean difference 12.5 mmHg and 4.1 mmHg, respectively). Further validation and specific implementation guidelines are needed before cuffless devices can be recommended for clinical use. (See "Hypertension in adults: Blood pressure measurement and diagnosis", section on 'Cuffless blood pressure monitors'.)

Risk of chronic hypertension after a hypertensive disorder of pregnancy (November 2024)

Increasing evidence indicates that the occurrence of a hypertensive disorder of pregnancy (HDP; preeclampsia, gestational hypertension) identifies women at high risk of developing chronic hypertension later in life. In a study of all Danish residents giving birth at ≥20 weeks from 1995-2018 except those with prepregnancy cardiovascular disease or chronic hypertension, the cumulative incidence of initiating an antihypertensive medication within two years of delivery was 32 to 44 percent in those with HDP and 1.8 percent in those with normotensive pregnancies [61]. These and previous data support close postpartum blood pressure monitoring followed by at least annual measurement of blood pressure in women with a history of HDP. (See "Treatment of hypertension in pregnant and postpartum patients", section on 'Development of hypertension in nonpregnant patients after hypertension first presenting in pregnancy'.)

PRIMARY CARE NEUROLOGY

Surgical outcomes in cervical radiculopathy may depend on underlying cause (April 2025)

The benefits of surgery for the treatment of cervical radiculopathy have not been well established, and the role of the underlying compressive mechanism in surgical outcomes is uncertain. In a single-center study comprising two randomized trials of patients with cervical disc herniation (n = 89) or degenerative spondylosis (n = 91), patients with disc herniation assigned to anterior cervical discectomy and fusion had modestly better self-reported scores on the neck disability index (NDI) scale at 12 months than those who received nonoperative care [62]. Outcomes for patients with spondylosis were similar among surgical and nonsurgical groups. One patient undergoing surgery developed recurrent laryngeal nerve injury and another reported transient postoperative dysphonia. These results suggest the underlying mechanism may impact the benefits of surgery in cervical radiculopathy. (See "Treatment and prognosis of cervical radiculopathy", section on 'Evidence of efficacy'.)

Competing risks when resuming direct oral anticoagulants after intracerebral hemorrhage (March 2025)

Patients with atrial fibrillation and intracerebral hemorrhage (ICH) often have long-term competing risks of ischemic stroke and recurrent ICH. Limited data are available to help quantify these risks in patients taking direct oral anticoagulants (DOACs). In an open-label trial of 319 patients with prior ICH and atrial fibrillation who were randomly assigned to treatment with a DOAC or withholding anticoagulation, the subsequent ischemic stroke rate was lower in those assigned to a DOAC (0.8 versus 8.6 per 100 patient-years), but this benefit was partially offset by an increase in ICH recurrence (5 versus 0.8 per 100 patient-years) [63]. All-cause mortality was similar between groups, with wide confidence intervals. These data support the feasibility of resuming anticoagulation with a DOAC in selected patients with ICH

but highlight the importance of shared decision-making incorporating these competing risks. (See "Spontaneous intracerebral hemorrhage: Secondary prevention and long-term prognosis", section on 'Therapeutic options'.)

PRIMARY CARE ORTHOPEDICS AND SPORTS MEDICINE

Benefits of the weekend warrior exercise strategy (April 2025)

Evidence is growing that exercising for the same total period over two days ("weekend warriors") versus multiple days provides equivalent overall health benefits. According to a data registry study from over 95,000 participants in the United Kingdom, all-cause mortality rates were similarly lower for individuals who exercised multiple days of the week and "weekend warriors" compared with the higher rates found among inactive individuals [64]. Activity levels were determined by accelerometer-derived data. Although the weekend warrior approach is a reasonable exercise strategy for some, it may increase the risk for overuse injury, while those with comorbidities such as diabetes or hypertension may reap greater disease-modifying benefits from exercising most days of the week. (See "Exercise prescription and guidance for adults", section on 'Writing the aerobic exercise prescription'.)

Ultrasound screening for tendinopathy in asymptomatic athletes (February 2025)

The utility of ultrasound for identifying lesions that put asymptomatic athletes at risk of future injury remains unclear. In a systematic review and meta-analysis of 16 studies of asymptomatic, young adult athletes, including assessments of 810 Achilles and 1156 patellar tendons, abnormal ultrasound findings predicted the development of symptoms consistent with tendinopathy in only 27 percent of participants, while 92 to 93 percent of athletes without abnormalities remained symptom-free [65]. Ultrasound assessment may have a role in select athletes at high risk (eg, those with prior injury), but available evidence does not justify population-based screening. (See "Achilles tendinopathy", section on 'Diagnostic imaging' and "Patellar tendinopathy", section on 'Ultrasound'.)

Ice for treating musculoskeletal injury (November 2024)

For many years, ice has been a standard treatment for acute muscle and tendon injuries. However, evidence supporting the effectiveness of cryotherapy is largely unstudied. The authors of a systematic review identified only 27 controlled studies of cryotherapy for acute soft tissue injury, of which 26 were animal studies, most involving muscle injury [66]. No randomized trials in humans were identified. While ice can provide analgesia and may offer benefits for acute treatment of minor injuries, its longer-term effects on more severe muscle or tendon injury are largely unknown. Pending further research, we believe it is reasonable

to apply ice as part of the acute treatment of soft tissue musculoskeletal injury. (See "Initial management of soft tissue musculoskeletal injuries", section on 'Evidence'.)

Semaglutide in patients with moderate to severe knee osteoarthritis (November 2024)

Weight reduction through diet and exercise improves knee osteoarthritis (OA)-related pain in patients with overweight or obesity, but the effect of glucagon-like peptide-1 receptor agonists on knee OA has not been well studied. In a randomized trial in over 400 patients with obesity and moderate or severe knee OA, semaglutide achieved greater reductions in weight and pain scores than placebo, although both groups experienced improvements over the 68-week study period [67]. These data support weight reduction in patients with overweight or obesity and knee OA, and suggest that semaglutide may complement lifestyle changes for these patients. (See "Management of knee osteoarthritis", section on 'Weight loss'.)

Sex-related differences in recovery from concussion (October 2024)

Debate continues about whether female and male athletes recover from concussion at different rates. Preliminary studies had suggested that female athletes recover more slowly, but subsequent research suggests this may not be true. A prospective study of over 1000 concussions among United States collegiate athletes found that, while female athletes reported higher symptom burdens throughout convalescence, there was no significant difference between females and males in the overall time to resolution of symptoms, attainment of preinjury function on routine concussion testing, and return to play [68]. (See "Clinic-based management of sports-related concussion in adolescents and adults", section on 'Predicting duration of symptoms'.)

Resuming running after tibial stress fracture (October 2024)

The best approach to resuming running after a tibial stress fracture is unclear. In a systematic review of 50 studies, the suggested criteria for returning to running in athletes with a tibial stress fracture included resolution of bony tenderness, pain-free walking, assessment of functional movement and lower extremity strength, and, for injury at high-risk sites, radiographic signs of healing [69]. The authors also advised a training regimen that prioritized a gradual increase in distance before increasing speed or intensity. The overall quality of the evidence was low and indicates the need for more research. These findings are consistent with our approach. (See "Stress fractures of the tibia and fibula", section on 'Tibial stress fractures'.)

PRIMARY CARE PULMONOLOGY

Polygenic risk score to identify undiagnosed COPD (January 2025)

Chronic obstructive pulmonary disease (COPD) remains underdiagnosed despite case-finding strategies to actively identify those who have compatible symptoms and clinical risk factors (eg, smoking) and would thus warrant confirmatory spirometry testing. In a study evaluating almost 7500 patients from two cohorts from the United States, adding a polygenic risk score (PRS) to a traditional case-finding questionnaire helped retrospectively identify additional patients with undiagnosed moderate to severe airflow obstruction, particularly among younger patients with lower COPD risk [70]. This study highlights the potential value of incorporating genetic risk to identify patients for spirometry testing. However, whether patients identified by PRS rather than traditional case-finding benefit from early COPD treatment remains unknown, and PRS is not yet routinely used in clinical practice. (See "Chronic obstructive pulmonary disease: Risk factors and risk reduction", section on 'Gene polymorphisms'.)

Use of anti-inflammatory reliever therapies to reduce asthma exacerbations (November 2024)

Use of inhalers containing both a fast-acting bronchodilator and anti-inflammatory inhaled corticosteroids (ICS) for relief of symptoms has reduced the rate of asthma exacerbations compared with short-acting beta-agonists (SABA) alone in several randomized trials of adolescents and adults. In a new network meta-analysis, compared with SABA alone, severe asthma exacerbations were significantly reduced for both ICS-formoterol (13 trials, 19,184 patients; risk difference 10.3 percent, risk ratio [RR] 0.65) and ICS-SABA (4 trials, 4852 patients; risk difference 4.7 percent, RR 0.84) [71]. Our authors recommend these anti-inflammatory reliever therapies for those with variable asthma symptoms or frequent exacerbations and prefer them for all patients with asthma. (See "Ongoing monitoring and titration of asthma therapies in adolescents and adults", section on 'Anti-inflammatory reliever therapy (AIR) to reduce exacerbations'.)

High diagnostic uncertainty in community-acquired pneumonia (October 2024)

Because community-acquired pneumonia (CAP) is common and its symptoms overlap with many other cardiopulmonary disorders, it is both over- and underdiagnosed on presentation. In a recent study of over two million hospitalizations in the US Veterans Administration health system, 36 percent of over 215,000 patients with an initial emergency department (ED) diagnosis of pneumonia did not carry this diagnosis upon hospital discharge, and 33 percent of over 239,000 patients discharged with a diagnosis of pneumonia and positive initial chest imaging lacked an ED diagnosis [72]. These findings reinforce the importance of assessing patients initially diagnosed with CAP for alternative processes and being open to the possibility of CAP in patients initially diagnosed with other conditions. (See "Clinical evaluation and diagnostic testing for community-acquired pneumonia in adults", section on 'General approach'.)

PRIMARY CARE PSYCHIATRY

Treatment retention in opioid use disorder (February 2025)

Data from randomized trials suggest that in individuals with opioid use disorder (OUD), treatment retention is higher with methadone than buprenorphine-naloxone. However, many of these trials were conducted in selected populations before the widespread use of potent synthetic opioids, such as fentanyl. In a recent population-based cohort study including nearly 31,000 individuals initiating treatment for OUD, rates of treatment discontinuation were higher among recipients of buprenorphine-naloxone than methadone (89 versus 82 percent) [73]. Among participants who reached optimal medication doses, discontinuation rates continued to favor methadone (42 versus 31 percent), and these results were consistent after the introduction of fentanyl. This study reinforces prior evidence supporting greater treatment retention with methadone than buprenorphine-naloxone, even in populations using fentanyl. (See "Opioid use disorder: Treatment overview", section on 'Use of buprenorphine or methadone'.)

Bright light therapy in nonseasonal major depression (February 2025)

Although bright light therapy is a standard treatment for seasonal affective disorder, its efficacy for nonseasonal major depression has been less certain. In a recent meta-analysis of eight randomized trials involving 547 participants with nonseasonal depression, bright light therapy (eg, 10,000 lux for 30 minutes for four weeks) resulted in a greater remission rate than control interventions (typically dim red light; 41 versus 24 percent) [74]. Inclusion of individuals with both unipolar and bipolar depression limited the certainty of these findings. In individuals with nonseasonal major depression, we suggest bright light therapy as an adjunct to pharmacotherapy and/or psychotherapy. (See "Major depressive disorder in adults: Treatment with supplemental interventions", section on 'Bright light therapy'.)

Semaglutide for alcohol use disorder (February 2025)

Preliminary findings from cohort studies suggest that semaglutide, a glucagon-like peptide-1 receptor agonist, may reduce alcohol cravings and alcohol use. In a randomized trial including 48 participants with alcohol use disorder, nine weeks of subcutaneous semaglutide (doses from 0.25 mg to 1 mg weekly) reduced weekly alcohol cravings and the number of heavy drinking days (by approximately one day per week) compared with placebo [75]. These results suggest a potential role for semaglutide in the management of alcohol use disorder and justify the need for larger trials. (See "Alcohol use disorder: Pharmacologic management", section on 'Therapies with unclear efficacy'.)

Masked taper for discontinuing benzodiazepines (December 2024)

For individuals who need to discontinue chronic benzodiazepines, the optimal tapering strategy to minimize withdrawal symptoms is unclear. In a recent randomized trial of 188 older adults with insomnia, a masked taper over nine weeks (ie, benzodiazepine pills with progressively increasing inert filler) plus augmented cognitive-behavioral therapy for insomnia (CBT-I, with exercises targeting expectations about the taper and placebo effects) increased the rate of benzodiazepine discontinuation at six months compared with an unmasked taper plus standard CBT-I (73 versus 59 percent) [76]. Although the results suggest that blinding patients to the taper rate may help improve benzodiazepine discontinuation, participants took relatively low doses at baseline (4 mg diazepam equivalents); thus, the efficacy of this strategy in other populations using higher doses, as in benzodiazepine use disorder, is uncertain. (See "Benzodiazepine use disorder", section on 'Taper rate'.)

PRIMARY CARE RHEUMATOLOGY

Giant cell arteritis in patients initially diagnosed with polymyalgia rheumatica (April 2025)

Polymyalgia rheumatica (PMR) may be an isolated diagnosis or a feature of giant cell arteritis (GCA); however, the frequency with which patients with isolated PMR are eventually diagnosed as having GCA has been unclear. In a prospective cohort study of 62 patients with PMR, 3 percent of patients had radiologic evidence of subclinical GCA and another 3 percent developed late-onset GCA during the following year [77]. Although the risk is relatively low, GCA should be considered in all patients presenting with PMR. At presentation and at each follow-up visit, we assess for symptoms or physical findings referable to GCA (eg, new-onset headache, visual impairment, jaw pain with mastication) and pursue large-vessel imaging as indicated by symptoms. (See "Clinical manifestations and diagnosis of polymyalgia rheumatica", section on 'Association with GCA'.)

Risk of rheumatoid arthritis in patients with arthralgias (April 2025)

Patients presenting with arthralgias and seropositivity (ie, the presence of anti-citrullinated protein antibodies (ACPA) and/or rheumatoid factor (RF) are presumed to be at risk of progression to rheumatoid arthritis (RA), but the magnitude of risk has been unclear. In a prospective cohort of over 600 seropositive patients presenting with arthralgias, approximately one-third of patients were diagnosed with RA after a mean follow-up of approximately four years [78]. Risk factors for progression to RA included morning stiffness, high titer ACPA, double-positivity for ACPA and RF, and having a first-degree relative with RA. Patients with arthralgias who have these characteristics should be monitored closely for the development of RA. (See "Undifferentiated inflammatory arthritis in adults", section on 'Prognosis'.)

Recurrence of acute anterior uveitis (November 2024)

Patients with acute anterior uveitis (AAU) may experience a single episode or evolve to have recurrent disease; however, it is unclear what factors are associated with disease recurrence. In a study that followed over 2000 patients with AAU for a median of 8.9 years, 46 and 27 percent of patients experienced disease recurrence in the ipsilateral or contralateral eyes, respectively [79]. Factors associated with a higher risk of recurrent uveitis included underlying inflammatory arthritis/positive human leukocyte antigen B27 (HLA-B27), Māori ethnicity, and, for ipsilateral recurrence, viral uveitis, Asian ethnicity, and older age. Patients with risk factors for recurrent AAU should be counseled appropriately; future research is required to investigate if they might benefit from more aggressive monitoring and treatment. (See "Uveitis: Treatment", section on 'Prognosis'.)

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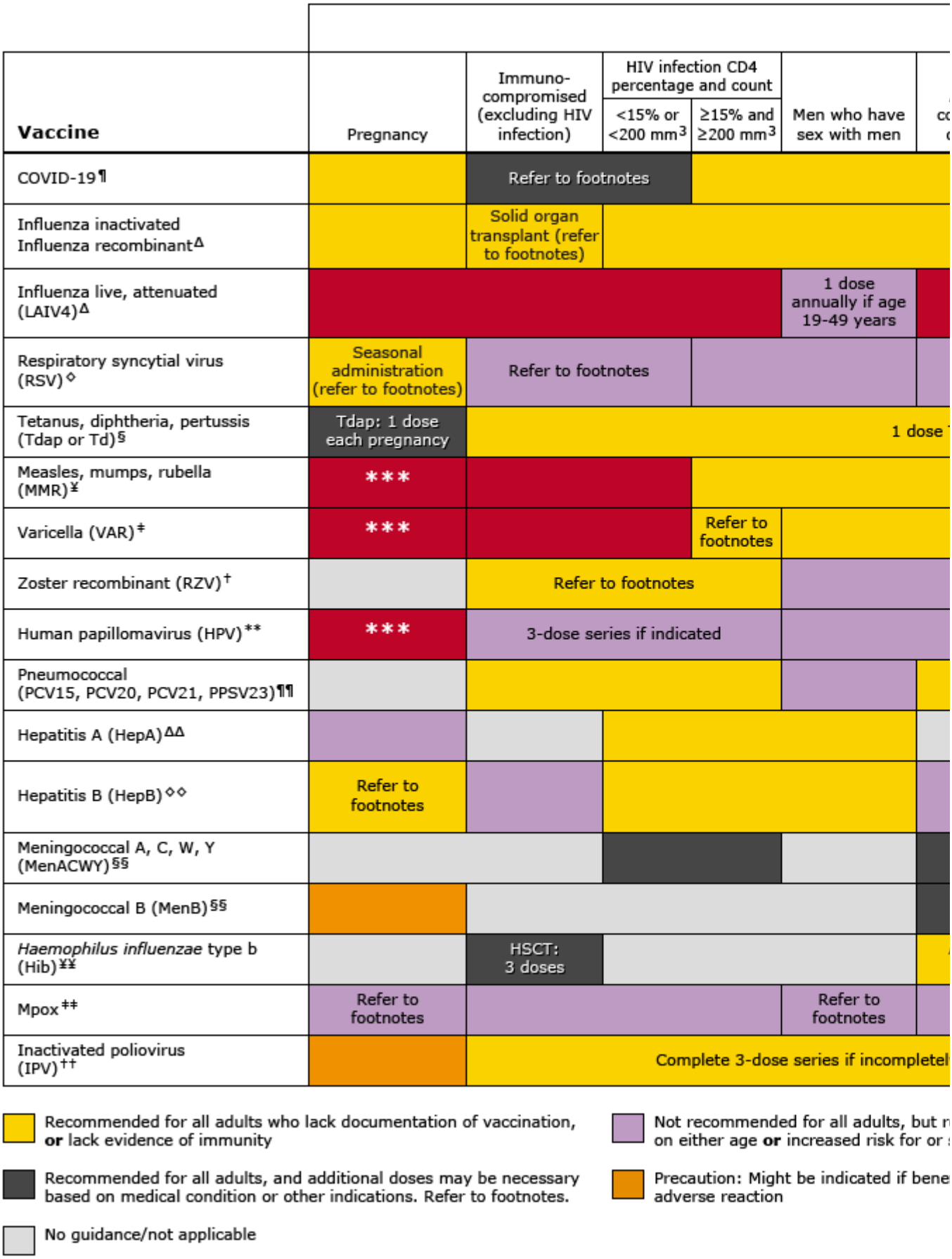
Topic 8357 Version 13410.0

GRAPHICS

Adult immunization schedule by medical condition and other indication - Recommendations for ages 19 years or older, United States, 2025



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

NOTES

For vaccine recommendations for persons 18 years of age or younger, refer to the Recommended Child and Adolescent Immunization Schedule.

Additional information

- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Within a number range (eg, 12-18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid and should be repeated. **The repeat dose should be spaced after the invalid dose by the recommended minimum interval.** For further details, refer to Table 3-2, Recommended and minimum ages and intervals between vaccine doses, in Timing and Spacing of Immunobiologics.
- Information on travel vaccination requirements and recommendations is available at cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, refer to Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in Altered Immunocompetence.
- For information about vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All vaccines included in the adult immunization schedule except PPSV23, RSV, RZV, mpox, and COVID-19 vaccines are covered by the National Vaccine Injury Compensation Program (VICP). Mpox and COVID-19 vaccines are covered by the Countermeasures Injury Compensation Program (CICP). For more information, refer to www.hrsa.gov/vaccinecompensation or www.hrsa.gov/cicp.

HSCT: hematopoietic stem cell transplant.

* Precaution for LAIV4 does not apply to alcoholism.

¶ COVID-19 vaccination

- **Routine vaccination:**
  - **Age 19-64 years.**
    - **Unvaccinated:**
      - 1 dose 2024-25 Moderna or Pfizer-BioNTech.
      - 2 doses 2024-25 Novavax at 0, 3-8 weeks.
    - **Previously vaccinated before 2024-25 vaccine with:**
      - **1 or more doses Moderna or Pfizer-BioNTech:** 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.
      - **1 dose Novavax:** 1 dose 2024-25 Novavax 3-8 weeks after most recent dose. If more than 8 weeks after the most recent dose, administer 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech.
      - **2 or more doses Novavax:** 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.
      - **1 or more doses Janssen:** 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech.
  - **Age 65 years and older.**
    - **Unvaccinated:** Follow recommendations above for unvaccinated persons ages 19-64 years **and** administer dose 2 of 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months).

- **Previously vaccinated before 2024-25 vaccine:** Follow recommendations above for previously vaccinated persons ages 19-64 years **and** administer dose 2 of 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months).

- **Special situations:**
  - **Persons who are moderately or severely immunocompromised. Use vaccine from the same manufacturer for all doses in the initial vaccination series.**
    - **Unvaccinated:**
      - 4 doses (3-dose initial series 2024-25 Moderna at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.¶¶¶
      - 4 doses (3-dose initial series 2024-25 Pfizer-BioNTech at 0, 3 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.¶¶¶
      - 3 doses (2-dose initial series 2024-25 Novavax at 0, 3 weeks, followed by 1 dose Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.¶¶¶
    - **Incomplete initial vaccination series before 2024-25 vaccine:**
      - **Previous vaccination with Moderna**
        - **1 dose Moderna:** Complete initial series with 2 doses 2024-25 Moderna at least 4 weeks apart (administer dose 1 4 weeks after most recent dose), followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.¶¶¶
        - **2 doses Moderna:** Complete initial series with 1 dose 2024-25 Moderna at least 4 weeks after most recent dose, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.¶¶¶
      - **Previous vaccination with Pfizer-BioNTech**
        - **1 dose Pfizer-BioNTech:** Complete initial series with 2 doses 2024-25 Pfizer-BioNTech at least 4 weeks apart (administer dose 1 3 weeks after most recent dose), followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.¶¶¶
        - **2 doses Pfizer-BioNTech:** Complete initial series with 1 dose 2024-25 Pfizer-BioNTech at least 4 weeks after most recent dose, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.¶¶¶
      - **Previous vaccination with Novavax**
        - **1 dose Novavax:** Complete initial series with 1 dose 2024-25 Novavax at least 3 weeks after most recent dose, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.¶¶¶
    - **Completed the initial vaccination series before 2024-25 vaccine with:**
      - **3 or more doses Moderna or 3 or more doses Pfizer-BioNTech:** 2 doses 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses.¶¶¶
      - **2 or more doses Novavax:** 2 doses 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses.¶¶¶

- **¶¶¶ Additional doses of 2024-25 COVID-19 vaccine for moderately or severely immunocompromised:**
  - Based on shared clinical decision-making and administered at least 2 months after the most recent dose (refer to Table 2 at www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#table-02). For description of moderate and severe immunocompromising conditions and treatment, refer to www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#immunocompromising-conditions-treatment.
  - Unvaccinated persons have never received any COVID-19 vaccine doses. There is no preferential recommendation for the use of one COVID-19 vaccine over another when more than one recommended age-appropriate vaccine is available. Administer an age-appropriate COVID-19 vaccine product for each dose.
  - For more information about the interchangeability of COVID-19 vaccines, refer to https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#Interchangeability.
  - Current COVID-19 schedule and dose formulation available at www.cdc.gov/covidschedule. For more information on Emergency Use Authorization (EUA) indications for COVID-19 vaccines, refer to https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines-2024-2025.

- **Contraindications and precautions:**
  - For contraindications and precautions to COVID-19 vaccination, refer to COVID-19 Appendix.

Δ Influenza vaccination

- **Routine vaccination:**
  - **Age 19 years or older:** 1 dose any influenza vaccine appropriate for age and health status annually.
    - **Solid organ transplant recipients aged 19 through 64 years receiving immunosuppressive medications:** HD-IIV3 and aIIV3 are acceptable options. No preference over other age-appropriate IIV3 or RIV3.
    - **Age 65 years or older:** Any one of HD-IIV3, RIV3, or aIIV3 is preferred. If none of these three vaccines are available, then any other age-appropriate influenza vaccine should be used.
  - For the 2024-25 season, refer to www.cdc.gov/mmwr/volumes/73/rr/rr7305a1.htm.
  - For the 2025-26 season, refer to the 2025-26 ACIP influenza vaccine recommendations.
- **Special situations:**
  - **Close contacts (eg, caregivers, health care workers) of severely immunosuppressed persons who require a protected environment:** Should not receive LAIV3. If LAIV3 is given, they should avoid contact with/caring for such immunosuppressed persons for 7 days after vaccination.
  - **NOTE:** Persons with an egg allergy can receive any influenza vaccine (egg-based and non-egg-based) appropriate for age and health status.
- **Contraindications and precautions:**
  - For contraindications and precautions to influenza vaccination, refer to IIV3 Appendix, LAIV3 Appendix, ccIIV3 Appendix, and RIV3 Appendix.

◇ Respiratory syncytial virus vaccination

- **Routine vaccination:**
  - **Pregnant persons of any age.**
    - **Pregnant at 32 weeks 0 days through 36 weeks and 6 days gestation from September through January in most of the continental United States** (NOTE:

Providers in jurisdictions with RSV seasonality that differs from most of the continental United States [eg, Alaska, jurisdiction with tropical climate] should follow guidance from public health authorities on timing of administration. Refer to the 2025 Child and Adolescent Immunization Schedule for considerations regarding nirsevimab administration to infants)**:** 1 dose Abrysvo. Administer RSV vaccine regardless of previous RSV infection.
    - Either maternal RSV vaccination with Abrysvo or infant immunization with nirsevimab (RSV monoclonal antibody) is recommended to prevent severe respiratory syncytial virus disease in infants.
    - **All other pregnant persons:** RSV vaccine not recommended.
    - **Subsequent pregnancies:** Additional doses not recommended. No data are available to inform whether additional doses are needed in subsequent pregnancies. Infants born to pregnant persons who received RSV vaccine during a previous pregnancy should receive nirsevimab.
  - **Age 75 years or older.**
    - **Unvaccinated:** 1 dose (Arexvy or Abrysvo or mResvia). Additional doses not recommended.
    - **Previously vaccinated:** Additional doses not recommended. No data are available to inform whether additional doses are needed.
- **Special situations:**
  - **Age 60-74 years.**
    - **Unvaccinated and at increased risk of severe RSV disease**ΔΔΔ**:** 1 dose (Arexvy or Abrysvo or mResvia). Additional doses not recommended.
    - **Previously vaccinated:** Additional doses not recommended. No data are available to inform whether additional doses are needed.
  - Persons 60 years and older can get RSV vaccine at any time but best to administer in late summer and early fall before RSV spreads in communities—ideally August through October in most of continental United States. For further guidance, refer to www.cdc.gov/mmwr/volumes/73/wr/mm7332e1.htm.
  - ΔΔΔ **People can self-attest to the presence of a risk factor. The following medical and other conditions increase the risk of severe RSV disease:**
    - Chronic cardiovascular disease (eg, heart failure, coronary artery disease, congenital heart disease). Excludes isolated hypertension.
    - Chronic lung or respiratory disease (eg, chronic obstructive pulmonary disease, emphysema, asthma, interstitial lung disease, cystic fibrosis).
    - End-stage renal disease, dependence on hemodialysis, or other renal replacement therapy.
    - Diabetes mellitus complicated by chronic kidney disease, neuropathy, retinopathy, or other end-organ damage.
    - Diabetes mellitus requiring treatment with insulin or sodium-glucose cotransporter 2 (SGLT2) inhibitor.
    - Neurologic or neuromuscular conditions causing impaired airway clearance or respiratory muscle weakness (eg, post-stroke dysphagia, amyotrophic lateral sclerosis, muscular dystrophy). Excludes history of stroke without impaired airway clearance.
    - Chronic liver disease (eg, cirrhosis).
    - Chronic hematologic conditions (eg, sickle cell disease, thalassemia).
    - Severe obesity (body mass index ≥40 kg/m^2).
    - Moderate or severe immune compromise.
    - Residence in a nursing home.

    - Other chronic medical conditions or risk factors that a health care provider determines would increase the risk of severe disease due to viral respiratory infection (eg, frailty, concern for presence of undiagnosed chronic medical conditions, residence in a remote or rural community where escalation of medical care is challenging).
- **Contraindications and precautions:**
  - For contraindications and precautions to RSV vaccine, refer to RSV Appendix.

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§ **Tetanus, diphtheria, and pertussis vaccination**

- **Routine vaccination:**
  - **Completed primary series and received at least 1 dose Tdap at age 10 years or older:** Td or Tdap every 10 years thereafter.
  - **Completed primary series and did NOT receive Tdap at age 10 years or older:** 1 dose Tdap, then Td or Tdap every 10 years thereafter.
  - **Unvaccinated or incomplete primary vaccination series for tetanus, diphtheria, or pertussis:** Administer remaining doses (1, 2, or 3 doses) to complete 3-dose primary series. 1 dose Tdap followed by 1 dose Td or Tdap at least 4 weeks later, and a third dose of Td or Tdap 6-12 months later (Tdap is preferred as first dose and can be substituted for any Td dose), then Td or Tdap every 10 years thereafter.
- **Special situations:**
  - **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27-36.
  - **Wound management:** Persons with 3 or more doses of tetanus-toxoid-containing vaccine: For clean and minor wounds, administer Tdap or Td if more than 10 years since last dose of tetanus-toxoid-containing vaccine; for all other wounds, administer Tdap or Td if more than 5 years since last dose of tetanus-toxoid-containing vaccine. Tdap is preferred for persons who have not previously received Tdap or whose Tdap history is unknown. If a tetanus-toxoid-containing vaccine is indicated for a pregnant person, use Tdap. For detailed information, refer to www.cdc.gov/mmwr/volumes/69/wr/mm6903a5.htm.
- **Contraindications and precautions:**
  - For contraindications and precautions to tetanus, diphtheria, and acellular pertussis (Tdap), refer to Tdap Appendix.

¥ **Measles, mumps, and rubella vaccination**

- **Routine vaccination:**
  - **No evidence of immunity to measles, mumps, or rubella:** 1 dose.
    - **Evidence of immunity:** Born before 1957 (except for health care personnel, refer below), documentation of receipt of MMR vaccine, 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.
  - **Nonpregnant persons of childbearing age with no evidence of immunity to rubella:** 1 dose.
  - **Human immunodeficiency virus (HIV) infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm^3 for at least 6 months and no evidence of immunity to measles, mumps, or rubella:** Complete 2-dose series at least 4 weeks apart; MMR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm^3.
  - **Severe immunocompromising conditions:** 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:** Complete 2-dose series at least 4 weeks apart if previously did not receive any doses of MMR or 1 dose if previously received 1 dose MMR.
- **In mumps outbreak settings,** for information about additional doses of MMR (including 3rd dose of MMR), refer to www.cdc.gov/mmwr/volumes/67/wr/mm6701a7.htm.
- **Health care personnel:**
  - **Born before 1957 with no evidence of immunity to measles, mumps, or rubella:** Consider 2-dose series at least 4 weeks apart for protection against measles or mumps or 1 dose for protection against rubella.
  - **Born in 1957 or later with no evidence of immunity to measles, mumps, or rubella:** Complete 2-dose series at least 4 weeks apart for protection against measles or mumps or at least 1 dose for protection against rubella.

- **Contraindications and precautions:**
  - For contraindications and precautions to measles, mumps, rubella (MMR) vaccine, refer to MMR Appendix.

‡ **Varicella vaccination**

- **Routine vaccination:**
  - **No evidence of immunity to varicella:** 2-dose series 4-8 weeks apart if previously did not receive varicella-containing vaccine (VAR or measles-mumps-rubella-varicella vaccine [MMRV] for children); if previously received 1 dose varicella-containing vaccine, 1 dose at least 4 weeks after first dose.
    - **Evidence of immunity:** United States-born before 1980 (except for pregnant persons and health care personnel [refer 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 if previously received 1 dose varicella-containing vaccine or dose 1 of 2-dose series (dose 2: 4 to 8 weeks later) if previously did not receive any varicella-containing vaccine, regardless of whether United States-born before 1980.
  - **Health care personnel with no evidence of immunity to varicella:** 1 dose if previously received 1 dose varicella-containing vaccine; 2-dose series 4-8 weeks apart if previously did not receive any varicella-containing vaccine, regardless of whether United States-born before 1980.
  - **HIV infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm^3 with no evidence of immunity:** Vaccination may be considered (2 doses 3 months apart); VAR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm^3.
  - **Severe immunocompromising conditions:** VAR contraindicated.
- **Contraindications and precautions:**
  - For contraindications and precautions to varicella (VAR) vaccine, refer to VAR Appendix.

† **Zoster vaccination**

- **Routine vaccination:**
  - **Age 50 years or older** (NOTE: Serologic evidence of prior varicella is not necessary for zoster vaccination. However, if serologic evidence of varicella susceptibility becomes available, providers should follow ACIP guidelines for varicella vaccination first. RZV is not indicated for the prevention of varicella, and there are limited data on the use of RZV in

persons without a history of varicella or varicella vaccination)**:** 2-dose series recombinant zoster vaccine (RZV; Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon), regardless of previous herpes zoster or history of zoster vaccine live (ZVL; Zostavax) vaccination.

- **Special situations:**
  - **Pregnancy:** There is currently no ACIP recommendation for RZV use in pregnancy. Consider delaying RZV until after pregnancy.
  - **Immunocompromising conditions (including persons with HIV regardless of CD4 count;** NOTE: If there is no documented history of varicella, varicella vaccination, or herpes zoster, providers should refer to the clinical considerations for use of RZV in immunocompromised adults aged ≥19 years and the ACIP varicella vaccine recommendations for further guidance: www.cdc.gov/mmwr/volumes/71/wr/mm7103a2.htm)**:** 2-dose series recombinant zoster vaccine (RZV; Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon). For detailed information, refer to www.cdc.gov/shingles/vaccination/immunocompromised-adults.html.
- **Contraindications and precautions:**
  - For contraindications and precautions to zoster recombinant vaccine (RZV), refer to RZV Appendix.

** **Human papillomavirus vaccination**

- **Routine vaccination:**
  - **All persons through age 26 years:** Complete 2- or 3-dose series depending on age at initial vaccination or condition.
    - **Age 9-14 years at initial vaccination and received 1 dose or 2 doses less than 5 months apart:** 1 additional dose.
    - **Age 9-14 years at initial vaccination and received 2 doses at least 5 months apart:** HPV vaccination series complete, no additional dose needed.
    - **Age 15 years or older at initial vaccination:** 3-dose series at 0, 1-2 months, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 12 weeks; dose 1 to dose 3: 5 months; repeat dose if administered too soon).
  - No additional dose recommended when any HPV vaccine series of any valency has been completed using the recommended dosing intervals.
- **Shared clinical decision-making:**
  - **Adults age 27-45 years:** Based on shared clinical decision-making, complete a 2-dose series (if initiated age 9-14 years) or 3-dose series (if initiated ≥15 years).
  - For additional information on shared clinical decision-making for HPV; refer to www.cdc.gov/vaccines/hcp/admin/downloads/isd-job-aid-scdm-hpv-shared-clinical-decision-making-hpv.pdf.
- **Special situations:**
  - **Age ranges recommended above for routine and catch-up vaccination or shared clinical decision-making also apply in special situations.**
    - **Immunocompromising conditions, including HIV infection:** Complete 3-dose series, even for those who initiate vaccination at age 9 through 14 years.
    - **Pregnancy:** Pregnancy testing is not needed before vaccination. HPV vaccination is not recommended until after pregnancy. No intervention needed if inadvertently vaccinated while pregnant.
- **Contraindications and precautions:**
  - For contraindications and precautions to human papillomavirus (HPV) vaccination, refer to HPV Appendix.

¶¶ **Pneumococcal vaccination**

- **Routine vaccination:**
  - **Age 50 years or older who have:**
    - **Not previously received a dose of PCV13, PCV15, PCV20, or PCV21 or whose previous vaccination history is unknown:** 1 dose PCV15 or 1 dose PCV20 or 1 dose PCV21.
      - If PCV15 is used, administer 1 dose PPSV23 at least 1 year after the PCV15 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or cerebrospinal fluid [CSF] leak).
    - **Previously received only PCV7:** Follow the recommendation above.
    - **Previously received only PCV13:** 1 dose PCV20 or 1 dose PCV21 at least 1 year after the last PCV13 dose.
    - **Previously received only PPSV23:** 1 dose PCV15 or 1 dose PCV20 or 1 dose PCV21 at least 1 year after the last PPSV23 dose.
      - If PCV15 is used, no additional PPSV23 doses are recommended.
    - **Previously received both PCV13 and PPSV23 but NO PPSV23 was received at age 65 years or older:** 1 dose PCV20 or 1 dose PCV21 at least 5 years after the last pneumococcal vaccine dose.
    - **Previously received both PCV13 and PPSV23, AND PPSV23 was received at age 65 years or older:** Based on shared clinical decision-making, 1 dose of PCV20 or 1 dose of PCV21 at least 5 years after the last pneumococcal vaccine dose.
  - For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app which can be downloaded here: www.cdc.gov/pneumococcal/hcp/vaccine-recommendations/app.html.
- **Special situations:**
  - **Age 19-49 years with certain underlying medical conditions or other risk factors who have** (NOTE: Underlying medical conditions or other risk factors include alcoholism, chronic heart/liver/lung disease, chronic renal failure, cigarette smoking, cochlear implant, congenital or acquired asplenia, CSF leak, diabetes mellitus, generalized malignancy, HIV infection, Hodgkin disease, immunodeficiencies, iatrogenic immunosuppression, leukemia, lymphoma, multiple myeloma, nephrotic syndrome, solid organ transplant, or sickle cell disease or other hemoglobinopathies)**:**
    - **Not previously received a PCV13, PCV15, PCV20, or PCV21 or whose previous vaccination history is unknown:** 1 dose PCV15 or 1 dose PCV20 or 1 dose PCV21.
      - If PCV15 is used, administer 1 dose PPSV23 at least 1 year after the PCV15 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or CSF leak).
    - **Previously received only PCV7:** Follow the recommendation above.
    - **Previously received only PCV13:** 1 dose PCV20 or 1 dose PCV21 at least 1 year after the last PCV13.

- **Previously received only PPSV23:** 1 dose PCV15 or 1 dose PCV20 or PCV21, at least 1 year after the last PPSV23 dose.
  - If PCV15 is used, no additional PPSV23 doses are recommended.
- **Previously received PCV13 and 1 dose of PPSV23:** 1 dose PCV20 or 1 dose PCV21 at least 5 years after the last pneumococcal vaccine dose.

- **Adults aged 19 years and older who have received PCV20 or PCV21:** No additional pneumococcal vaccine dose recommended.
- **Pregnancy:** No recommendation for PCV or PPSV23 due to limited data. Summary of existing data on pneumococcal vaccination during pregnancy can be found at www.cdc.gov/mmwr/volumes/72/rr/rr7203a1.htm.
- **PPSV23 not available:** Adults aged 19 years or older who received PCV15, but have not yet completed PPSV23 series, can complete the series with either 1 dose of PCV20 or 1 dose of PCV21 if they no longer have access to PPSV23.
- For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app which can be downloaded here: www.cdc.gov/pneumococcal/hcp/vaccine-recommendations/app.html.

- **Contraindications and precautions:**
  - For contraindications and precautions to Pneumococcal conjugate (PCV15 and PCV20), refer to PCV Appendix; and for Pneumococcal polysaccharide (PPSV23), refer to PPSV23 Appendix.

ΔΔ **Hepatitis A vaccination**

- **Routine vaccination:**
  - **Any person who is not fully vaccinated and requests vaccination** (identification of risk factor not required)**:** Complete 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: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 5 months]).
- **Special situations:**
  - **Any person who is not fully vaccinated and who is at risk for hepatitis A virus infection or severe disease from hepatitis A virus infection:** Complete 2-dose series HepA or 3-dose series HepA-HepB as above. Risk factors include:
    - **Chronic liver disease** including persons with hepatitis B, hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase (ALT) or aspartate aminotransferase (AST) level greater than twice the upper limit of normal.
    - **HIV infection**.
    - **Men who have sex with men (MSM)**.
    - **Injection or noninjection drug use**.
    - **Persons experiencing homelessness**.
    - **Work with hepatitis A virus** in research laboratory or with nonhuman primates with hepatitis A virus infection.
    - **Travel in countries with high or intermediate endemic hepatitis A:** HepA-HepB (Twinrix) may be administered on an accelerated schedule of 3 doses at 0, 7, and 21-30 days, followed by a booster dose at 12 months.
    - **Close, personal contact with international adoptee** (eg, household or regular babysitting) in first 60 days after arrival from country with high or intermediate endemic hepatitis A: Dose 1 as soon as adoption is planned; preferably at least 2 weeks before adoptee's arrival.
    - **Pregnancy** if at risk for infection or severe outcome from infection during pregnancy.
    - **Settings for exposure,** including health care settings serving persons who use injection or noninjection drugs, or group homes and nonresidential day care facilities for developmentally disabled persons (individual risk factor screening not required).

- **Contraindications and precautions:**
  - For contraindications and precautions to hepatitis A (HepA) vaccination, refer to HepA Appendix.

◇◇ **Hepatitis B vaccination**

- **Routine vaccination:**
  - **Age 19 through 59 years:** Complete a 2- or 3- or 4-dose series.
    - 2-dose series only applies when 2 doses of Heplisav-B are used at least 4 weeks apart.
    - 3-dose series Engerix-B, PreHevbrio (NOTE: PreHevbrio is not recommended in pregnancy due to lack of safety data in pregnant persons), or Recombivax HB at 0, 1, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 8 weeks; dose 1 to dose 3: 16 weeks).
    - 3-dose series HepA-HepB (Twinrix) at 0, 1, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 5 months).
    - 4-dose series HepA-HepB (Twinrix) accelerated schedule of 3 doses at 0, 7, and 21-30 days, followed by a booster dose at 12 months.
  - **Age 60 years or older without** known risk factors for hepatitis B virus infection **may** receive a HepB vaccine series.
  - **Age 60 years or older with** known risk factors for hepatitis B virus infection **should** receive a HepB vaccine series.
  - **Any adult age 60 years of age or older** who requests HepB vaccination **should** receive a HepB vaccine series.
    - **Risk factors for hepatitis B virus infection include:**
      - **Chronic liver disease** including persons with hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, ALT or AST level greater than twice the upper limit of normal.
      - **HIV infection**.
      - **Sexual exposure risk** (eg, 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, MSM).
      - **Current or recent injection drug use**.
      - **Percutaneous or mucosal risk for exposure to blood** (eg, 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, persons on maintenance dialysis [including in-center or home hemodialysis and peritoneal dialysis], persons who are predialysis, and patients with diabetes [NOTE: **Age 60 years or older with diabetes:** Based on shared clinical decision making, 2-, 3-, or 4-dose series as above]).
      - **Incarceration**.
      - **Travel in countries with high or intermediate endemic hepatitis B**.
- **Special situations:**
  - **Patients on dialysis:** Complete a 3- or 4-dose series.
    - 3-dose series Recombivax HB at 0, 1, 6 months (NOTE: Use Dialysis Formulation 1 mL = 40 mcg).
    - 4-dose series Engerix-B at 0, 1, 2, and 6 months (NOTE: Use 2 mL dose instead of the normal adult dose of 1 mL).
  - **Age 20 years or older with an immunocompromising condition:** Complete a 2- or 3- or 4-dose series.

- 3-dose series Recombivax HB at 0, 1, 6 months (NOTE: Use Dialysis Formulation 1 mL = 40 mcg).
- 4-dose series Engerix-B at 0, 1, 2, and 6 months (NOTE: Use 2 mL dose instead of the normal adult dose of 1 mL).
- 2-dose series Heplisav-B at 0, 1 months.
- 3-dose series PreHevbrio at 0, 1, 6 months (NOTE: PreHevbrio is not recommended in pregnancy due to lack of safety data in pregnant persons).

- **Contraindications and precautions:**
  - For contraindications and precautions to hepatitis B (HepB) vaccination, refer to HepB Appendix.

§§ **Meningococcal vaccination**

- **Special situations for MenACWY:**
  - **Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use:** 2-dose primary series Menveo or MenQuadfi at least 8 weeks apart; 1 booster dose 5 years after primary series and every 5 years if risk remains.
  - **Travel in countries with hyperendemic or epidemic meningococcal disease, or for microbiologists routinely exposed to *Neisseria meningitidis*:** 1 dose Menveo or MenQuadfi; 1 booster dose 5 years after primary series and 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) or military recruits:** 1 dose Menveo or MenQuadfi.
  - MenACWY vaccines may be administered simultaneously with MenB vaccines if indicated, but at a different anatomic site, if feasible.
  - For MenACWY recommendations **in outbreak setting** (eg, in community or organizational settings, or among MSM) and **additional meningococcal vaccination** information, refer to www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.
- **Shared clinical decision-making for MenB:**
  - **Adolescents and young adults age 16-23 years (age 16-18 years preferred;** NOTE: To optimize rapid protection [eg, for students starting college in less than 6 months], a 3-dose series [0, 1-2, 6 months] may be administered**) not at increased risk for meningococcal disease:** Based on shared clinical decision-making.
    - **Bexsero or Trumenba (use same brand for all doses):** 2-dose series at least 6 months apart (if dose 2 is administered earlier than 6 months, administer dose 3 at least 4 months after dose 2)
  - MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.
- **Special situations for MenB:**
  - **Anatomical or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use, or microbiologists routinely exposed to *Neisseria meningitidis*.**
    - **Bexsero or Trumenba (use same brand for all doses including booster doses):** 3-dose primary series at 0, 1-2, 6 months (if dose 2 was administered at least 6 months after dose 1, dose 3 not needed; if dose 3 is administered earlier than 4 months after dose 2, a 4th dose should be administered at least 4 months after dose 3).
    - **Booster doses:** 1 booster dose 1 year after primary series and every 2-3 years if risk remains.
  - **Pregnancy:** Delay MenB until after pregnancy due to lack of safety data in pregnant persons. May administer if at increased risk and vaccination benefits outweigh potential risks.

- For MenB recommendations **in outbreak setting** (eg, in community or organizational settings and among MSM) and **additional meningococcal vaccination information** refer to www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.
- MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.
- Adults may receive a single dose of Penbraya (MenACWY-TT/MenB-FHbp) as an alternative to separate administration of MenACWY and MenB when both vaccines would be given on the same clinic day. For adults not at increased risk, if Penbraya is used for dose 1 MenB, then MenB-FHbp (Trumenba) should be administered for dose 2 MenB. For adults at increased risk of meningococcal disease, Penbraya may be used for additional MenACWY and MenB doses (including booster doses) if both would be given on the same clinic day **and** at least 6 months have elapsed since most recent Penbraya dose.

▪ **Contraindications and precautions:**
- For contraindications and precautions to meningococcal ACWY (MenACWY) [MenACWY-CRM (Menveo); MenACWY-D (Menactra); MenACWY-TT (MenQuadfi)], refer to MenACWY Appendix.
- For contraindications and precautions to meningococcal B (MenB) [MenB-4C (Bexsero); MenB-FHbp (Trumenba)], refer to MenB Appendix.

¥¥ ***Haemophilus influenzae*** **type b vaccination**

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

▪ **Contraindications and precautions:**
- For contraindications and precautions to *Haemophilus influenzae* type b (Hib) vaccination, refer to Hib Appendix.

‡‡ **Mpox vaccination**

▪ **Special situations:**
- **Any person at risk for mpox infection:** Complete 2-dose series, 28 days apart.
  Risk factors for mpox infection include:
  - Persons who are gay or bisexual and other MSM, transgender, or nonbinary people who in the past 6 months have had:
    - A new diagnosis of at least 1 sexually transmitted disease.
    - More than 1 sex partner.
    - Sex at a commercial sex venue.
    - Sex in association with a large public event in a geographic area where mpox transmission is occurring.
  - Persons who are sexual partners of the persons described above.
  - Persons who anticipate experiencing any of the situations described above.
- **Pregnancy:** There is currently no ACIP recommendation for Jynneos use in pregnancy due to lack of safety data in pregnant persons. Pregnant persons with any risk factor described above may receive Jynneos.
- **Health care personnel:** Vaccination to protect against occupational risk in health care settings is not routinely recommended.

▪ **Contraindications and precautions:**
- For contraindications and precautions to mpox, refer to Mpox Appendix.

†† **Poliovirus vaccination**

- **Routine vaccination:**
  - **Adults known or suspected to be unvaccinated or incompletely vaccinated:** Administer remaining doses (1, 2, or 3 inactivated poliovirus [IPV] doses) to complete a 3-dose primary series (NOTE: Complete primary series consists of at least 3 doses of IPV or trivalent oral poliovirus vaccine [tOPV] in any combination). Unless there are specific reasons to believe they were not vaccinated, most adults who were born and raised in the United States can assume they were vaccinated against polio as children.
- **Special situations:**
  - **Adults at increased risk of exposure to poliovirus who completed primary series** (NOTE: Complete primary series consists of at least 3 doses of IPV or tOPV in any combination)**:** May administer one lifetime IPV booster.
  - For detailed information, refer to www.cdc.gov/vaccines/vpd/polio/hcp/recommendations.html.
- **Contraindications and precautions:**
  - For contraindications and precautions to Poliovirus vaccine, IPV, refer to Poliovirus Appendix.

*** Vaccinate after pregnancy, if indicated.

Reproduced from: Advisory Committee on Immunization Practices. Adult Immunization Schedule by Medical Condition and Other Indication, Recommendations for Ages 19 Years or Older, United States, 2025. Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/vaccines/hcp/imz-schedules/adult-medical-condition.html (Accessed on December 10, 2024).

Graphic 62130 Version 26.0

Adult immunization schedule by age - Recommendations for ages 19 years o older, United States, 2025

Vaccine	Age gr	
	19 through 26 years	27 through 49 years
COVID-19*	1 or more doses of 2024-2025 vaccine (refe	
Influenza inactivated (IIV3, ccIIV3)¶ Influenza recombinant (RIV3)¶	1 dose annually	
Influenza inactivated (aIIV3; HD-IIV3)¶ Influenza recombinant (RIV3)¶	Solid organ transplant (refer to foot	
Influenza live, attenuated (LAIV3)¶	1 dose annually	
Respiratory syncytial virus (RSV)Δ	Seasonal administration during pregnancy. (Refer to footnotes.)	
Tetanus, diphtheria, pertussis (Tdap or Td)◇	1 dose Tdap each pregnancy; 1 dose Td/T	
	1 dose Tdap, then Td or	
Measles, mumps, rubella (MMR)§	1 or 2 doses depending on indic (if born in 1957 or later)	
Varicella (VAR)¥	2 doses (if born in 1980 or later)	
Zoster recombinant (RZV)‡	2 doses for immunocompromising conditions (refer to footnotes)	
Human papillomavirus (HPV)†	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years
Pneumococcal (PCV15, PCV20, PCV21, PPSV23)**		
Hepatitis A (HepA)¶¶	2, 3, or 4 dose	
Hepatitis B (HepB)ΔΔ	2, 3, or 4 dose	
Meningococcal A, C, W, Y (MenACWY)◇◇	1 or 2 doses depending on indication (re	
Meningococcal B (MenB)◇◇	2 or 3 doses depending on vaccine and i	
	19 through 23 years	
Haemophilus influenzae type b (Hib)§§	1 or 3 doses de	
Mpox¥¥	2	
Inactivated poliovirus (IPV)‡‡	Complete 3-dose series if incompletely vaccinated. Se	

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of immunity

Recommended vaccination for adults with additional risk factor or another indication

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

NOTES

For vaccine recommendations for persons 18 years of age or younger, refer to the Recommended Child and Adolescent Immunization Schedule.

Additional information

- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Within a number range (eg, 12-18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid and should be repeated. **The repeat dose should be spaced after the invalid dose by the recommended minimum interval.** For further details, refer to Table 3-2, Recommended and minimum ages and intervals between vaccine doses, in Timing and Spacing of Immunobiologics.
- Information on travel vaccination requirements and recommendations is available at cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, refer to Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in Altered Immunocompetence.
- For information about vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All vaccines included in the adult immunization schedule except PPSV23, RSV, RZV, mpox, and COVID-19 vaccines are covered by the National Vaccine Injury Compensation Program (VICP). Mpox and COVID-19 vaccines are covered by the Countermeasures Injury Compensation Program (CICP). For more information, refer to www.hrsa.gov/vaccinecompensation or www.hrsa.gov/cicp.

*** COVID-19 vaccination**

- **Routine vaccination:**
  - **Age 19-64 years.**
    - **Unvaccinated:**
      - 1 dose 2024-25 Moderna or Pfizer-BioNTech.
      - 2 doses 2024-25 Novavax at 0, 3-8 weeks.
    - **Previously vaccinated before 2024-25 vaccine with:**
      - **1 or more doses Moderna or Pfizer-BioNTech:** 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.
      - **1 dose Novavax:** 1 dose 2024-25 Novavax 3-8 weeks after most recent dose. If more than 8 weeks after the most recent dose, administer 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech.
      - **2 or more doses Novavax:** 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech at least 8 weeks after the most recent dose.
      - **1 or more doses Janssen:** 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech.
  - **Age 65 years and older.**
    - **Unvaccinated:** Follow recommendations above for unvaccinated persons ages 19-64 years **and** administer dose 2 of 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months).

- **Previously vaccinated before 2024-25 vaccine:** Follow recommendations above for previously vaccinated persons ages 19-64 years **and** administer dose 2 of 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months).

- **Special situations:**
  - **Persons who are moderately or severely immunocompromised. Use vaccine from the same manufacturer for all doses in the initial vaccination series.**
    - **Unvaccinated:**
      - 4 doses (3-dose initial series 2024-25 Moderna at 0, 4 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.††
      - 4 doses (3-dose initial series 2024-25 Pfizer-BioNTech at 0, 3 weeks, and at least 4 weeks after dose 2, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.††
      - 3 doses (2-dose initial series 2024-25 Novavax at 0, 3 weeks, followed by 1 dose Moderna or Novavax or Pfizer-BioNTech 6 months later [minimum interval 2 months]). May administer additional doses.††
    - **Incomplete initial vaccination series before 2024-25 vaccine:**
      - **Previous vaccination with Moderna**
        - **1 dose Moderna:** Complete initial series with 2 doses 2024-25 Moderna at least 4 weeks apart (administer dose 1 4 weeks after most recent dose), followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.††
        - **2 doses Moderna:** Complete initial series with 1 dose 2024-25 Moderna at least 4 weeks after most recent dose, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.††
      - **Previous vaccination with Pfizer-BioNTech**
        - **1 dose Pfizer-BioNTech:** Complete initial series with 2 doses 2024-25 Pfizer-BioNTech at least 4 weeks apart (administer dose 1 3 weeks after most recent dose), followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.††
        - **2 doses Pfizer-BioNTech:** Complete initial series with 1 dose 2024-25 Pfizer-BioNTech at least 4 weeks after most recent dose, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.††
      - **Previous vaccination with Novavax**
        - **1 dose Novavax:** Complete initial series with 1 dose 2024-25 Novavax at least 3 weeks after most recent dose, followed by 1 dose 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months later (minimum interval 2 months). May administer additional doses.††
    - **Completed the initial vaccination series before 2024-25 vaccine with:**
      - **3 or more doses Moderna or 3 or more doses Pfizer-BioNTech:** 2 doses 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses.††
      - **2 or more doses Novavax:** 2 doses 2024-25 Moderna or Novavax or Pfizer-BioNTech 6 months apart (minimum interval 2 months). Administer dose 1 at least 8 weeks after the most recent dose. May administer additional doses.††

- †† **Additional doses of 2024-25 COVID-19 vaccine for moderately or severely immunocompromised:**
  - Based on shared clinical decision-making and administered at least 2 months after the most recent dose (refer to Table 2 at www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#table-02). For description of moderate and severe immunocompromising conditions and treatment, refer to www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#immunocompromising-conditions-treatment.
  - Unvaccinated persons have never received any COVID-19 vaccine doses. There is no preferential recommendation for the use of one COVID-19 vaccine over another when more than one recommended age-appropriate vaccine is available. Administer an age-appropriate COVID-19 vaccine product for each dose.
  - For more information about the interchangeability of COVID-19 vaccines, refer to https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#Interchangeability.
  - Current COVID-19 schedule and dose formulation available at www.cdc.gov/covidschedule. For more information on Emergency Use Authorization (EUA) indications for COVID-19 vaccines, refer to https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines-2024-2025.

- **Contraindications and precautions:**
  - For contraindications and precautions to COVID-19 vaccination, refer to COVID-19 Appendix.

¶ **Influenza vaccination**

- **Routine vaccination:**
  - **Age 19 years or older:** 1 dose any influenza vaccine appropriate for age and health status annually.
    - **Solid organ transplant recipients aged 19 through 64 years receiving immunosuppressive medications:** HD-IIV3 and aIIV3 are acceptable options. No preference over other age-appropriate IIV3 or RIV3.
    - **Age 65 years or older:** Any one of HD-IIV3, RIV3, or aIIV3 is preferred. If none of these three vaccines are available, then any other age-appropriate influenza vaccine should be used.
  - For the 2024-25 season, refer to www.cdc.gov/mmwr/volumes/73/rr/rr7305a1.htm.
  - For the 2025-26 season, refer to the 2025-26 ACIP influenza vaccine recommendations.
- **Special situations:**
  - **Close contacts (eg, caregivers, health care workers) of severely immunosuppressed persons who require a protected environment:** Should not receive LAIV3. If LAIV3 is given, they should avoid contact with/caring for such immunosuppressed persons for 7 days after vaccination.
  - **NOTE:** Persons with an egg allergy can receive any influenza vaccine (egg-based and non-egg-based) appropriate for age and health status.
- **Contraindications and precautions:**
  - For contraindications and precautions to influenza vaccination, refer to IIV3 Appendix, LAIV3 Appendix, ccIIV3 Appendix, and RIV3 Appendix.

Δ **Respiratory syncytial virus vaccination**

- **Routine vaccination:**
  - **Pregnant persons of any age.**
    - **Pregnant at 32 weeks 0 days through 36 weeks and 6 days gestation from September through January in most of the continental United States** (NOTE:

Providers in jurisdictions with RSV seasonality that differs from most of the continental United States [eg, Alaska, jurisdiction with tropical climate] should follow guidance from public health authorities on timing of administration. Refer to the 2025 Child and Adolescent Immunization Schedule for considerations regarding nirsevimab administration to infants)**:** 1 dose Abrysvo. Administer RSV vaccine regardless of previous RSV infection.

- Either maternal RSV vaccination with Abrysvo or infant immunization with nirsevimab (RSV monoclonal antibody) is recommended to prevent severe respiratory syncytial virus disease in infants.
- **All other pregnant persons:** RSV vaccine not recommended.
- **Subsequent pregnancies:** Additional doses not recommended. No data are available to inform whether additional doses are needed in subsequent pregnancies. Infants born to pregnant persons who received RSV vaccine during a previous pregnancy should receive nirsevimab.

- **Age 75 years or older.**
  - **Unvaccinated:** 1 dose (Arexvy or Abrysvo or mResvia). Additional doses not recommended.
  - **Previously vaccinated:** Additional doses not recommended. No data are available to inform whether additional doses are needed.

- **Special situations:**
  - **Age 60-74 years.**
    - **Unvaccinated and at increased risk of severe RSV disease*** **:** 1 dose (Arexvy or Abrysvo or mResvia). Additional doses not recommended.
    - **Previously vaccinated:** Additional doses not recommended. No data are available to inform whether additional doses are needed.
  - Persons 60 years and older can get RSV vaccine at any time but best to administer in late summer and early fall before RSV spreads in communities—ideally August through October in most of continental United States. For further guidance, refer to www.cdc.gov/mmwr/volumes/73/wr/mm7332e1.htm.
  - *** **People can self-attest to the presence of a risk factor. The following medical and other conditions increase the risk of severe RSV disease:**
    - Chronic cardiovascular disease (eg, heart failure, coronary artery disease, congenital heart disease). Excludes isolated hypertension.
    - Chronic lung or respiratory disease (eg, chronic obstructive pulmonary disease, emphysema, asthma, interstitial lung disease, cystic fibrosis).
    - End-stage renal disease, dependence on hemodialysis, or other renal replacement therapy.
    - Diabetes mellitus complicated by chronic kidney disease, neuropathy, retinopathy, or other end-organ damage.
    - Diabetes mellitus requiring treatment with insulin or sodium-glucose cotransporter 2 (SGLT2) inhibitor.
    - Neurologic or neuromuscular conditions causing impaired airway clearance or respiratory muscle weakness (eg, post-stroke dysphagia, amyotrophic lateral sclerosis, muscular dystrophy). Excludes history of stroke without impaired airway clearance.
    - Chronic liver disease (eg, cirrhosis).
    - Chronic hematologic conditions (eg, sickle cell disease, thalassemia).
    - Severe obesity (body mass index ≥40 kg/m^2).
    - Moderate or severe immune compromise.
    - Residence in a nursing home.

    - Other chronic medical conditions or risk factors that a health care provider determines would increase the risk of severe disease due to viral respiratory infection (eg, frailty, concern for presence of undiagnosed chronic medical conditions, residence in a remote or rural community where escalation of medical care is challenging).
- **Contraindications and precautions:**
  - For contraindications and precautions to RSV vaccine, refer to RSV Appendix.

◇ **Tetanus, diphtheria, and pertussis vaccination**

- **Routine vaccination:**
  - **Completed primary series and received at least 1 dose Tdap at age 10 years or older:** Td or Tdap every 10 years thereafter.
  - **Completed primary series and did NOT receive Tdap at age 10 years or older:** 1 dose Tdap, then Td or Tdap every 10 years thereafter.
  - **Unvaccinated or incomplete primary vaccination series for tetanus, diphtheria, or pertussis:** Administer remaining doses (1, 2, or 3 doses) to complete 3-dose primary series. 1 dose Tdap followed by 1 dose Td or Tdap at least 4 weeks later, and a third dose of Td or Tdap 6-12 months later (Tdap is preferred as first dose and can be substituted for any Td dose), then Td or Tdap every 10 years thereafter.
- **Special situations:**
  - **Pregnancy:** 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27-36.
  - **Wound management:** Persons with 3 or more doses of tetanus-toxoid-containing vaccine: For clean and minor wounds, administer Tdap or Td if more than 10 years since last dose of tetanus-toxoid-containing vaccine; for all other wounds, administer Tdap or Td if more than 5 years since last dose of tetanus-toxoid-containing vaccine. Tdap is preferred for persons who have not previously received Tdap or whose Tdap history is unknown. If a tetanus-toxoid-containing vaccine is indicated for a pregnant person, use Tdap. For detailed information, refer to www.cdc.gov/mmwr/volumes/69/wr/mm6903a5.htm.
- **Contraindications and precautions:**
  - For contraindications and precautions to tetanus, diphtheria, and acellular pertussis (Tdap), refer to Tdap Appendix.

§ **Measles, mumps, and rubella vaccination**

- **Routine vaccination:**
  - **No evidence of immunity to measles, mumps, or rubella:** 1 dose.
    - **Evidence of immunity:** Born before 1957 (except for health care personnel, refer below), documentation of receipt of MMR vaccine, 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.
  - **Nonpregnant persons of childbearing age with no evidence of immunity to rubella:** 1 dose.
  - **Human immunodeficiency virus (HIV) infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm^3 for at least 6 months and no evidence of immunity to measles, mumps, or rubella:** Complete 2-dose series at least 4 weeks apart; MMR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm^3.
  - **Severe immunocompromising conditions:** 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:** Complete 2-dose series at least 4 weeks apart if previously did not receive any doses of MMR or 1 dose if previously received 1 dose MMR.
- **In mumps outbreak settings,** for information about additional doses of MMR (including 3rd dose of MMR), refer to www.cdc.gov/mmwr/volumes/67/wr/mm6701a7.htm.
- **Health care personnel:**
  - **Born before 1957 with no evidence of immunity to measles, mumps, or rubella:** Consider 2-dose series at least 4 weeks apart for protection against measles or mumps or 1 dose for protection against rubella.
  - **Born in 1957 or later with no evidence of immunity to measles, mumps, or rubella:** Complete 2-dose series at least 4 weeks apart for protection against measles or mumps or at least 1 dose for protection against rubella.

- **Contraindications and precautions:**
  - For contraindications and precautions to measles, mumps, rubella (MMR) vaccine, refer to MMR Appendix.

¥ **Varicella vaccination**

- **Routine vaccination:**
  - **No evidence of immunity to varicella:** 2-dose series 4-8 weeks apart if previously did not receive varicella-containing vaccine (VAR or measles-mumps-rubella-varicella vaccine [MMRV] for children); if previously received 1 dose varicella-containing vaccine, 1 dose at least 4 weeks after first dose.
    - **Evidence of immunity:** United States-born before 1980 (except for pregnant persons and health care personnel [refer 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 if previously received 1 dose varicella-containing vaccine or dose 1 of 2-dose series (dose 2: 4 to 8 weeks later) if previously did not receive any varicella-containing vaccine, regardless of whether United States-born before 1980.
  - **Health care personnel with no evidence of immunity to varicella:** 1 dose if previously received 1 dose varicella-containing vaccine; 2-dose series 4-8 weeks apart if previously did not receive any varicella-containing vaccine, regardless of whether United States-born before 1980.
  - **HIV infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm^3 with no evidence of immunity:** Vaccination may be considered (2 doses 3 months apart); VAR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm^3.
  - **Severe immunocompromising conditions:** VAR contraindicated.
- **Contraindications and precautions:**
  - For contraindications and precautions to varicella (VAR) vaccine, refer to VAR Appendix.

‡ **Zoster vaccination**

- **Routine vaccination:**
  - **Age 50 years or older** (NOTE: Serologic evidence of prior varicella is not necessary for zoster vaccination. However, if serologic evidence of varicella susceptibility becomes available, providers should follow ACIP guidelines for varicella vaccination first. RZV is not indicated for the prevention of varicella, and there are limited data on the use of RZV in

persons without a history of varicella or varicella vaccination)**:** 2-dose series recombinant zoster vaccine (RZV; Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon), regardless of previous herpes zoster or history of zoster vaccine live (ZVL; Zostavax) vaccination.

- **Special situations:**
  - **Pregnancy:** There is currently no ACIP recommendation for RZV use in pregnancy. Consider delaying RZV until after pregnancy.
  - **Immunocompromising conditions (including persons with HIV regardless of CD4 count;** NOTE: If there is no documented history of varicella, varicella vaccination, or herpes zoster, providers should refer to the clinical considerations for use of RZV in immunocompromised adults aged ≥19 years and the ACIP varicella vaccine recommendations for further guidance: www.cdc.gov/mmwr/volumes/71/wr/mm7103a2.htm)**:** 2-dose series recombinant zoster vaccine (RZV; Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon). For detailed information, refer to www.cdc.gov/shingles/vaccination/immunocompromised-adults.html.
- **Contraindications and precautions:**
  - For contraindications and precautions to zoster recombinant vaccine (RZV), refer to RZV Appendix.

† **Human papillomavirus vaccination**

- **Routine vaccination:**
  - **All persons through age 26 years:** Complete 2- or 3-dose series depending on age at initial vaccination or condition.
    - **Age 9-14 years at initial vaccination and received 1 dose or 2 doses less than 5 months apart:** 1 additional dose.
    - **Age 9-14 years at initial vaccination and received 2 doses at least 5 months apart:** HPV vaccination series complete, no additional dose needed.
    - **Age 15 years or older at initial vaccination:** 3-dose series at 0, 1-2 months, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 12 weeks; dose 1 to dose 3: 5 months; repeat dose if administered too soon).
  - No additional dose recommended when any HPV vaccine series of any valency has been completed using the recommended dosing intervals.
- **Shared clinical decision-making:**
  - **Adults age 27-45 years:** Based on shared clinical decision-making, complete a 2-dose series (if initiated age 9-14 years) or 3-dose series (if initiated ≥15 years).
  - For additional information on shared clinical decision-making for HPV; refer to www.cdc.gov/vaccines/hcp/admin/downloads/isd-job-aid-scdm-hpv-shared-clinical-decision-making-hpv.pdf.
- **Special situations:**
  - **Age ranges recommended above for routine and catch-up vaccination or shared clinical decision-making also apply in special situations.**
    - **Immunocompromising conditions, including HIV infection:** Complete 3-dose series, even for those who initiate vaccination at age 9 through 14 years.
    - **Pregnancy:** Pregnancy testing is not needed before vaccination. HPV vaccination is not recommended until after pregnancy. No intervention needed if inadvertently vaccinated while pregnant.
- **Contraindications and precautions:**
  - For contraindications and precautions to human papillomavirus (HPV) vaccination, refer to HPV Appendix.

** **Pneumococcal vaccination**

- **Routine vaccination:**
  - **Age 50 years or older who have:**
    - **Not previously received a dose of PCV13, PCV15, PCV20, or PCV21 or whose previous vaccination history is unknown:** 1 dose PCV15 or 1 dose PCV20 or 1 dose PCV21.
      - If PCV15 is used, administer 1 dose PPSV23 at least 1 year after the PCV15 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or cerebrospinal fluid [CSF] leak).
    - **Previously received only PCV7:** Follow the recommendation above.
    - **Previously received only PCV13:** 1 dose PCV20 or 1 dose PCV21 at least 1 year after the last PCV13 dose.
    - **Previously received only PPSV23:** 1 dose PCV15 or 1 dose PCV20 or 1 dose PCV21 at least 1 year after the last PPSV23 dose.
      - If PCV15 is used, no additional PPSV23 doses are recommended.
    - **Previously received both PCV13 and PPSV23 but NO PPSV23 was received at age 65 years or older:** 1 dose PCV20 or 1 dose PCV21 at least 5 years after the last pneumococcal vaccine dose.
    - **Previously received both PCV13 and PPSV23, AND PPSV23 was received at age 65 years or older:** Based on shared clinical decision-making, 1 dose of PCV20 or 1 dose of PCV21 at least 5 years after the last pneumococcal vaccine dose.
  - For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app which can be downloaded here: www.cdc.gov/pneumococcal/hcp/vaccine-recommendations/app.html.
- **Special situations:**
  - **Age 19-49 years with certain underlying medical conditions or other risk factors who have** (NOTE: Underlying medical conditions or other risk factors include alcoholism, chronic heart/liver/lung disease, chronic renal failure, cigarette smoking, cochlear implant, congenital or acquired asplenia, CSF leak, diabetes mellitus, generalized malignancy, HIV infection, Hodgkin disease, immunodeficiencies, iatrogenic immunosuppression, leukemia, lymphoma, multiple myeloma, nephrotic syndrome, solid organ transplant, or sickle cell disease or other hemoglobinopathies)**:**
    - **Not previously received a PCV13, PCV15, PCV20, or PCV21 or whose previous vaccination history is unknown:** 1 dose PCV15 or 1 dose PCV20 or 1 dose PCV21.
      - If PCV15 is used, administer 1 dose PPSV23 at least 1 year after the PCV15 dose (may use minimum interval of 8 weeks for adults with an immunocompromising condition [NOTE: Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiencies, iatrogenic immunosuppression, generalized malignancy, HIV infection, Hodgkin disease, leukemia, lymphoma, multiple myeloma, solid organ transplant, congenital or acquired asplenia, or sickle cell disease or other hemoglobinopathies], cochlear implant, or CSF leak).
    - **Previously received only PCV7:** Follow the recommendation above.
    - **Previously received only PCV13:** 1 dose PCV20 or 1 dose PCV21 at least 1 year after the last PCV13.

- **Previously received only PPSV23:** 1 dose PCV15 or 1 dose PCV20 or PCV21, at least 1 year after the last PPSV23 dose.
  - If PCV15 is used, no additional PPSV23 doses are recommended.
- **Previously received PCV13 and 1 dose of PPSV23:** 1 dose PCV20 or 1 dose PCV21 at least 5 years after the last pneumococcal vaccine dose.

- **Adults aged 19 years and older who have received PCV20 or PCV21:** No additional pneumococcal vaccine dose recommended.
- **Pregnancy:** No recommendation for PCV or PPSV23 due to limited data. Summary of existing data on pneumococcal vaccination during pregnancy can be found at www.cdc.gov/mmwr/volumes/72/rr/rr7203a1.htm.
- **PPSV23 not available:** Adults aged 19 years or older who received PCV15, but have not yet completed PPSV23 series, can complete the series with either 1 dose of PCV20 or 1 dose of PCV21 if they no longer have access to PPSV23.
- For guidance on determining which pneumococcal vaccines a patient needs and when, please refer to the mobile app which can be downloaded here: www.cdc.gov/pneumococcal/hcp/vaccine-recommendations/app.html.

- **Contraindications and precautions:**
  - For contraindications and precautions to Pneumococcal conjugate (PCV15 and PCV20), refer to PCV Appendix; and for Pneumococcal polysaccharide (PPSV23), refer to PPSV23 Appendix.

¶¶ **Hepatitis A vaccination**

- **Routine vaccination:**
  - **Any person who is not fully vaccinated and requests vaccination** (identification of risk factor not required)**:** Complete 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: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 5 months]).
- **Special situations:**
  - **Any person who is not fully vaccinated and who is at risk for hepatitis A virus infection or severe disease from hepatitis A virus infection:** Complete 2-dose series HepA or 3-dose series HepA-HepB as above. Risk factors include:
    - **Chronic liver disease** including persons with hepatitis B, hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase (ALT) or aspartate aminotransferase (AST) level greater than twice the upper limit of normal.
    - **HIV infection**.
    - **Men who have sex with men (MSM)**.
    - **Injection or noninjection drug use**.
    - **Persons experiencing homelessness**.
    - **Work with hepatitis A virus** in research laboratory or with nonhuman primates with hepatitis A virus infection.
    - **Travel in countries with high or intermediate endemic hepatitis A:** HepA-HepB (Twinrix) may be administered on an accelerated schedule of 3 doses at 0, 7, and 21-30 days, followed by a booster dose at 12 months.
    - **Close, personal contact with international adoptee** (eg, household or regular babysitting) in first 60 days after arrival from country with high or intermediate endemic hepatitis A: Dose 1 as soon as adoption is planned; preferably at least 2 weeks before adoptee's arrival.
    - **Pregnancy** if at risk for infection or severe outcome from infection during pregnancy.
    - **Settings for exposure,** including health care settings serving persons who use injection or noninjection drugs, or group homes and nonresidential day care facilities for developmentally disabled persons (individual risk factor screening not required).

- **Contraindications and precautions:**
  - For contraindications and precautions to hepatitis A (HepA) vaccination, refer to HepA Appendix.

ΔΔ **Hepatitis B vaccination**

- **Routine vaccination:**
  - **Age 19 through 59 years:** Complete a 2- or 3- or 4-dose series.
    - 2-dose series only applies when 2 doses of Heplisav-B are used at least 4 weeks apart.
    - 3-dose series Engerix-B, PreHevbrio (NOTE: PreHevbrio is not recommended in pregnancy due to lack of safety data in pregnant persons), or Recombivax HB at 0, 1, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 8 weeks; dose 1 to dose 3: 16 weeks).
    - 3-dose series HepA-HepB (Twinrix) at 0, 1, 6 months (minimum intervals: dose 1 to dose 2: 4 weeks; dose 2 to dose 3: 5 months).
    - 4-dose series HepA-HepB (Twinrix) accelerated schedule of 3 doses at 0, 7, and 21-30 days, followed by a booster dose at 12 months.
  - **Age 60 years or older without** known risk factors for hepatitis B virus infection **may** receive a HepB vaccine series.
  - **Age 60 years or older with** known risk factors for hepatitis B virus infection **should** receive a HepB vaccine series.
  - **Any adult age 60 years of age or older** who requests HepB vaccination **should** receive a HepB vaccine series.
    - **Risk factors for hepatitis B virus infection include:**
      - **Chronic liver disease** including persons with hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, ALT or AST level greater than twice the upper limit of normal.
      - **HIV infection**.
      - **Sexual exposure risk** (eg, 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, MSM).
      - **Current or recent injection drug use**.
      - **Percutaneous or mucosal risk for exposure to blood** (eg, 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, persons on maintenance dialysis [including in-center or home hemodialysis and peritoneal dialysis], persons who are predialysis, and patients with diabetes [NOTE: **Age 60 years or older with diabetes:** Based on shared clinical decision making, 2-, 3-, or 4-dose series as above]).
      - **Incarceration**.
      - **Travel in countries with high or intermediate endemic hepatitis B**.
- **Special situations:**
  - **Patients on dialysis:** Complete a 3- or 4-dose series.
    - 3-dose series Recombivax HB at 0, 1, 6 months (NOTE: Use Dialysis Formulation 1 mL = 40 mcg).
    - 4-dose series Engerix-B at 0, 1, 2, and 6 months (NOTE: Use 2 mL dose instead of the normal adult dose of 1 mL).
  - **Age 20 years or older with an immunocompromising condition:** Complete a 2- or 3- or 4-dose series.

- 3-dose series Recombivax HB at 0, 1, 6 months (NOTE: Use Dialysis Formulation 1 mL = 40 mcg).
- 4-dose series Engerix-B at 0, 1, 2, and 6 months (NOTE: Use 2 mL dose instead of the normal adult dose of 1 mL).
- 2-dose series Heplisav-B at 0, 1 months.
- 3-dose series PreHevbrio at 0, 1, 6 months (NOTE: PreHevbrio is not recommended in pregnancy due to lack of safety data in pregnant persons).

- **Contraindications and precautions:**
  - For contraindications and precautions to hepatitis B (HepB) vaccination, refer to HepB Appendix.

◇◇ **Meningococcal vaccination**

- **Special situations for MenACWY:**
  - **Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use:** 2-dose primary series Menveo or MenQuadfi at least 8 weeks apart; 1 booster dose 5 years after primary series and every 5 years if risk remains.
  - **Travel in countries with hyperendemic or epidemic meningococcal disease, or for microbiologists routinely exposed to *Neisseria meningitidis*:** 1 dose Menveo or MenQuadfi; 1 booster dose 5 years after primary series and 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) or military recruits:** 1 dose Menveo or MenQuadfi.
  - MenACWY vaccines may be administered simultaneously with MenB vaccines if indicated, but at a different anatomic site, if feasible.
  - For MenACWY recommendations **in outbreak setting** (eg, in community or organizational settings, or among MSM) and **additional meningococcal vaccination** information, refer to www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.
- **Shared clinical decision-making for MenB:**
  - **Adolescents and young adults age 16-23 years (age 16-18 years preferred;** NOTE: To optimize rapid protection [eg, for students starting college in less than 6 months], a 3-dose series [0, 1-2, 6 months] may be administered**) not at increased risk for meningococcal disease:** Based on shared clinical decision-making.
    - **Bexsero or Trumenba (use same brand for all doses):** 2-dose series at least 6 months apart (if dose 2 is administered earlier than 6 months, administer dose 3 at least 4 months after dose 2)
  - MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.
- **Special situations for MenB:**
  - **Anatomical or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (eg, eculizumab, ravulizumab) use, or microbiologists routinely exposed to *Neisseria meningitidis*.**
    - **Bexsero or Trumenba (use same brand for all doses including booster doses):** 3-dose primary series at 0, 1-2, 6 months (if dose 2 was administered at least 6 months after dose 1, dose 3 not needed; if dose 3 is administered earlier than 4 months after dose 2, a 4th dose should be administered at least 4 months after dose 3).
    - **Booster doses:** 1 booster dose 1 year after primary series and every 2-3 years if risk remains.
  - **Pregnancy:** Delay MenB until after pregnancy due to lack of safety data in pregnant persons. May administer if at increased risk and vaccination benefits outweigh potential risks.

- For MenB recommendations **in outbreak setting** (eg, in community or organizational settings and among MSM) and **additional meningococcal vaccination information** refer to www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm.
- MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.
- Adults may receive a single dose of Penbraya (MenACWY-TT/MenB-FHbp) as an alternative to separate administration of MenACWY and MenB when both vaccines would be given on the same clinic day. For adults not at increased risk, if Penbraya is used for dose 1 MenB, then MenB-FHbp (Trumenba) should be administered for dose 2 MenB. For adults at increased risk of meningococcal disease, Penbraya may be used for additional MenACWY and MenB doses (including booster doses) if both would be given on the same clinic day **and** at least 6 months have elapsed since most recent Penbraya dose.

▪ **Contraindications and precautions:**
- For contraindications and precautions to meningococcal ACWY (MenACWY) [MenACWY-CRM (Menveo); MenACWY-D (Menactra); MenACWY-TT (MenQuadfi)], refer to MenACWY Appendix.
- For contraindications and precautions to meningococcal B (MenB) [MenB-4C (Bexsero); MenB-FHbp (Trumenba)], refer to MenB Appendix.

§§ ***Haemophilus influenzae*** **type b vaccination**

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

▪ **Contraindications and precautions:**
- For contraindications and precautions to *Haemophilus influenzae* type b (Hib) vaccination, refer to Hib Appendix.

¥¥ **Mpox vaccination**

▪ **Special situations:**
- **Any person at risk for mpox infection:** Complete 2-dose series, 28 days apart.
  Risk factors for mpox infection include:
  - Persons who are gay or bisexual and other MSM, transgender, or nonbinary people who in the past 6 months have had:
    - A new diagnosis of at least 1 sexually transmitted disease.
    - More than 1 sex partner.
    - Sex at a commercial sex venue.
    - Sex in association with a large public event in a geographic area where mpox transmission is occurring.
  - Persons who are sexual partners of the persons described above.
  - Persons who anticipate experiencing any of the situations described above.
- **Pregnancy:** There is currently no ACIP recommendation for Jynneos use in pregnancy due to lack of safety data in pregnant persons. Pregnant persons with any risk factor described above may receive Jynneos.
- **Health care personnel:** Vaccination to protect against occupational risk in health care settings is not routinely recommended.

▪ **Contraindications and precautions:**
- For contraindications and precautions to mpox, refer to Mpox Appendix.

‡‡ **Poliovirus vaccination**

- **Routine vaccination:**
  - **Adults known or suspected to be unvaccinated or incompletely vaccinated:** Administer remaining doses (1, 2, or 3 inactivated poliovirus [IPV] doses) to complete a 3-dose primary series (NOTE: Complete primary series consists of at least 3 doses of IPV or trivalent oral poliovirus vaccine [tOPV] in any combination). Unless there are specific reasons to believe they were not vaccinated, most adults who were born and raised in the United States can assume they were vaccinated against polio as children.
- **Special situations:**
  - **Adults at increased risk of exposure to poliovirus who completed primary series** (NOTE: Complete primary series consists of at least 3 doses of IPV or tOPV in any combination)**:** May administer one lifetime IPV booster.
  - For detailed information, refer to www.cdc.gov/vaccines/vpd/polio/hcp/recommendations.html.
- **Contraindications and precautions:**
  - For contraindications and precautions to Poliovirus vaccine, IPV, refer to Poliovirus Appendix.

Reproduced from: Advisory Committee on Immunization Practices. Adult Immunization Schedule by Age, Recommendations for Ages 19 Years or Older, United States, 2025. Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/vaccines/hcp/imz-schedules/adult-age.html (Accessed on December 10, 2024).

Graphic 82634 Version 38.0

Vaccines containing egg proteins

Vaccine	Grown in	Egg protein content	Approach in egg-allergic patient
Measles and mumps	Chick embryo fibroblast cell cultures	Picograms to nanograms	Administer in usual manner
Purified chick embryo rabies	Chick embryo fibroblast cell cultures	Picograms to nanograms	Administer in usual manner
Influenza (killed injected and live attenuated nasal)	Chick extra-embryonic allantoic fluid	<1 microgram	Administer in usual manner
Yellow fever	Chick embryos	Micrograms	Administer in usual manner

The table lists vaccines that contain small amounts of egg proteins derived from the cell lines used in production. The exact amounts are subject to change and are listed in the specific product inserts. Despite containing egg proteins, the vaccines have been shown to be safe for patients with egg allergy, including patients with past anaphylaxis due to egg ingestion.

Graphic 51011 Version 7.0

Factors to consider as part of shared decision making for RSV vaccination

Questions that patients may have	Points that may impact their decision
Am I at increased risk for infection?	**The following factors increase the risk of acquiring RSV:** ▪ Residing in a nursing home or other long-term care facility. ▪ Having frequent exposure to young children.
Am I at increased risk for severe disease if infected?	**The following conditions increase the risk of developing severe disease (eg, pneumonia, asthma, COPD exacerbation):** ▪ Cardiopulmonary disease (eg, COPD, asthma, CHF, CAD). ▪ Kidney disease. ▪ Liver disease. ▪ Diabetes mellitus. ▪ Chronic or progressive neurologic or neuromuscular conditions. ▪ Moderate to severe immunocompromise. ▪ Hematologic disorders. ▪ Frailty. ▪ Advanced age.
What happens if someone has severe disease?	**Persons who develop severe disease may require hospitalization, supplemental oxygen, ICU care, or mechanical ventilation:** ▪ RSV leads to approximately 60,000 to 160,000 hospitalizations and 6000 to 10,000 deaths each year among adults 65 years and older ▪ The risk of hospitalization in persons over 65 with underlying conditions can be as high as 16%. ▪ Among persons ≥60 years hospitalized with RSV between February 2022 and May 2023, approximately 80% required supplemental oxygen and 24% required ICU care. The risk of mechanical ventilation or death was 13.5%. ▪ In persons with severe immunocompromise (eg, selected HCT and lung transplant recipients), mortality rates with RSV can approach 80%.
How can the vaccine help me?	**Vaccination can:** ▪ Reduce the risk of lower tract respiratory disease (eg, cough, wheezing, sputum production, shortness of breath) by 74.5 to 84.4%. ▪ Reduce the need to seek medical care for RSV disease by 77.5 to 81.0%.
What are the risks of vaccination?	**Common side effects:** ▪ Mild to moderate injection site reactions. ▪ Systemic side effects (eg, fever, fatigue, myalgia) which typically resolve within 4 days. **Possible rare side effects:**

	▪ Guillain-Barré syndrome (GBS) has been associated with the RSV glycoprotein vaccines. In persons over 65, there are an estimated 9 excess cases of GBS per million doses of the bivalent vaccine and an estimated 7 excess cases of GBS per million doses of the adjuvanted vaccine.

Persons 60 years of age and over are eligible to receive one of the available RSV vaccines.

This table reviews factors that may inform a person's decision to be vaccinated. It is based on a shared decision making tool provided by the United States Centers for Disease Control and should be used in conjunction with UpToDate content on RSV.

CAD: coronary artery disease; CHF: congestive heart failure; COPD: chronic obstructive pulmonary disease; HCT: hematopoietic stem cell transplantation; ICU: intensive care unit.

References:

1. *Melgar M, Britton A, Roper LE, et al. Use of respiratory syncytial virus vaccines in older adults: Recommendations of the Advisory Committee on Immunization Practices - United States, 2023. MMWR Morb Mortal Wkly Rep 2023; 72:793.*
2. *Surie D, Yuengling KA, DeCuir J, et al. Disease severity of respiratory syncytial virus compared with COVID-19 and influenza among hospitalized adults aged ≥60 years - IVY Network, 20 U.S. States, February 2022-May 2023. MMWR Morb Mortal Wkly Rep 2023; 72:1083.*
3. *Falsey AR, Hennessey PA, Formica MA, et al. Respiratory syncytial virus infection in elderly and high-risk adults. N Engl J Med 2005; 352:1749.*
4. *Nam HH, Ison MG. Respiratory syncytial virus infection in adults. BMJ 2019; 366:l5021.*
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6. *Walsh EE, Pérez Marc G, Zareba AM, et al. Efficacy and safety of a bivalent RSV prefusion F vaccine in older adults. N Engl J Med 2023; 388:1465.*
7. *FDA requires Guillain-Barré syndrome (GBS) warning in the prescribing information for RSV Vaccines Abrysvo and Arexvy. US Food and Drug Administration. https://www.fda.gov/vaccines-blood-biologics/safety-availability-biologics/fda-requires-guillain-barre-syndrome-gbs-warning-prescribing-information-rsv-vaccines-abrysvo-and (Accessed on January 13, 2025).*
8. *Britton A, Roper LE, Kotton CN, et al. Use of respiratory syncytial virus vaccines in adults aged ≥60 years: Updated recommendations of the Advisory Committee on Immunization Practices — United States, 2024. MMWR Morb Mortal Wkly Rep 2024; 73:696.*

Graphic 143553 Version 2.0

Indications for pneumococcal vaccination in adults in the United States

All adults ≥50 years of age

Adults 19 to 49 years of age with any of the following:

- Predisposing medical conditions:
  - Alcohol use disorder
  - Chronic heart disease*
  - Chronic lung disease¶
  - Chronic liver disease
  - Diabetes mellitus
  - Sickle cell disease or other hemoglobinopathies
  - Current cigarette smoking
- Increased risk of meningitis:
  - Cerebrospinal fluid leak
  - Cochlear implant
- Immunocompromising conditions and other conditions associated with altered immunocompetence△:
  - Congenital or acquired immunodeficiency◇
  - Generalized active malignancy
  - HIV infection§
  - Iatrogenic immunosuppression¥
  - Hodgkin disease
  - Leukemia
  - Lymphoma
  - Multiple myeloma
  - Solid organ transplant
  - Chronic kidney disease‡ and nephrotic syndrome
- Functional or anatomic asplenia
- History of invasive pneumococcal disease†

Pneumococcal vaccination is indicated for adults with risk factors for acquisition of or severe adverse outcomes from pneumococcal disease. These adults should receive PCV21 alone, PCV20 alone, or PCV15 followed by PPSV23. When administering the PCV15 and PPSV23 combination, PCV15 should be given first when possible. The recommended intervals between the 2 vaccines vary based on sequence and indication. Refer to the UpToDate topic on pneumococcal vaccination in adults for additional detail.

ACIP: Advisory Committee on Immunization Practices; HIV: human immunodeficiency virus; PCV15: 15-valent pneumococcal conjugate vaccine; PCV20: 20-valent pneumococcal conjugate vaccine; PCV21: 21-valent pneumococcal conjugate vaccine; PPSV23: 23-valent pneumococcal polysaccharide vaccine.

* Including congestive heart failure and cardiomyopathies, excluding hypertension.

¶ Including chronic obstructive pulmonary disease, emphysema, and asthma.

Δ Some UpToDate authors differ from ACIP guidance on vaccine selection for immunocompromised individuals. Refer to the UpToDate topic on pneumococcal vaccination in adults for additional information.

◇ Includes B (humoral) or T lymphocyte deficiency, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), and phagocytic disorders (excluding chronic granulomatous disease).

§ HIV infection is an indication for pneumococcal vaccination, regardless of CD4 cell count.

¥ Treatment with any immunosuppressive drugs (including long-term glucocorticoids, tumor necrosis factor alpha inhibitors, cancer chemotherapy, and other cytokine inhibitors) or radiation therapy.

‡ Chronic kidney disease is defined as glomerular filtration rate <60 mL/min/1.73 m^2 for ≥3 months.

† The United States Centers for Disease Control and Prevention ACIP does not mention individuals with a prior history of invasive pneumococcal disease in their recommendations on pneumococcal vaccinations. We suggest pneumococcal vaccination in this population due to their increased risk for recurrent pneumococcal disease. Refer to the UpToDate topic on pneumococcal vaccination in adults for additional detail.

References:

1. *Kobayashi M, Pilishvili T, Farrar JL, et al. Pneumococcal vaccine for adults aged ≥19 years: Recommendations of the Advisory Committee on Immunization Practices. MMWR Recomm Rep 2023; 72:1.*
2. *Centers for Disease Control and Prevention. CDC Newsroom: CDC Recommends Lowering the Age for Pneumococcal Vaccination from 65 to 50 Years Old. https://www.cdc.gov/media/releases/2024/s1023-pneumococcal-vaccination.html (Accessed November 5, 2024).*

Graphic 86782 Version 37.0

Incidence and mortality rates of invasive pneumococcal disease in the United States, 2019 — Active Bacterial Core Surveillance (ABCs) report, Emerging Infections Program Network

Age (years)	Cases		Deaths	
	Number	(Rate*)	Number	(Rate*)
<1	55	(13.7)	4	(1.00)
1	42	(10.4)	2	(0.49)
2 to 4	54	(4.3)	1	(0.08)
5 to 17	78	(2.3)	5	(0.09)
18 to 34	189	(2.3)	5	(0.06)
35 to 49	472	(6.9)	37	(0.54)
50 to 64	1044	(15.6)	112	(1.68)
65 to 74	630	(19.9)	82	(2.59)
75 to 84	385	(25.2)	44	(2.88)
≥85	246	(37.8)	49	(7.53)
Total:	**3195**	**(9.2)**	**341**	**(0.98)**

* Cases or deaths per 100,000 population for ABCs areas, which represent nearly 35,000,000 persons in certain counties in 10 states in the United States.

Reproduced from: Active Bacterial Core Surveillance (ABCs) report, Emerging Infections Program Network Streptococcus pneumoniae, 2019. Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/abcs/downloads/SPN_Surveillance_Report_2019.pdf (Accessed February 1, 2022).

Graphic 88701 Version 4.0

Goal blood pressure according to baseline risk for cardiovascular disease and method of measuring blood pressure

	Casual/conventional office blood pressure (manual or oscillometric measurement without proper patient preparation or technique)*	AOBPM, standardized office blood pressure, daytime ABPM, or self-measured blood pressure¶
Higher-risk populationΔ		
▪ Known ASCVD◇ ▪ Heart failure ▪ Diabetes mellitus ▪ Chronic kidney disease ▪ Age ≥65 years§ ▪ Calculated 10-year risk of ASCVD event ≥10%¥	125 to 130/<80	120 to 125/<80
Lower-risk‡		
▪ None of the above risk factors	130 to 139/<90	125 to 135/<90

- All target ranges presented above are in mmHg.
- On average, blood pressure readings are 5 to 15 mmHg lower with standardized or out-of-office methods of measurement (ie, AOBPM, daytime ABPM, home blood pressure) than with casual/conventional methods of office measurement (ie, manual auscultatory or oscillometric measurement without proper patient preparation or technique). However, it is critical to realize that this average difference in blood pressures according to the methodology of measurement applies to the population and not the individual. Some patients do not experience a white coat effect, and therefore, there is some uncertainty in setting goals that are specific to the method of measurement.
- When treating to these goals, a patient may (inadvertently) attain a blood pressure below the given target. Provided the patient does not develop symptoms, side effects, or adverse events as a result of the treatment regimen, then reducing or withdrawing antihypertensive medications is unnecessary.
- Less aggressive goals than those presented in the table may be appropriate for specific groups of patients, including those with postural hypotension, the frail older adult patient, and those with side effects to multiple antihypertensive medications.

ABPM: ambulatory blood pressure monitoring; ACC/AHA: American College of Cardiology/American Heart Association; AOBPM: automated oscillometric blood pressure monitoring; ASCVD: atherosclerotic cardiovascular disease.

* Office blood pressure must be performed adequately to use such measurements to manage patients. Critical to an adequate office assessment of blood pressure are proper patient positioning (eg, seated in a chair, feet flat on the floor, arm supported, remove clothing covering the location of cuff placement) and proper technique (eg, calibrated device, proper-sized cuff). The average of multiple measurements should be used for management. Refer to UpToDate topics on measurement of blood pressure. Office readings should not be used to manage blood pressure unless they are performed adequately.

¶ Self-measured blood pressure, like office blood pressure, must be performed adequately in order for the measurements to be used to manage patients. First, the accuracy of the personal blood pressure device must be verified in the clinician's office. Second, the clinician should verify that the cuff and bladder that the patient will use are the appropriate size. Third, patients should measure their pressure after several minutes of rest and while seated in a chair (back supported and feet flat on the floor) with their arm supported (eg, resting on a table). Fourth, the blood pressure should be measured at different times per day and over multiple days. The average value of these multiple measurements is used for management. Self-measured blood pressure readings should not be used to manage blood pressure unless they are performed adequately and in conjunction with office blood pressure or ambulatory blood pressure.

Δ The level of evidence supporting the lower goal in higher-risk individuals is stronger for some risk groups (eg, patients with known coronary heart disease, patients with a calculated 10-year risk ≥15%, chronic kidney disease) than for other risk groups (eg, patients with diabetes, patients with a prior stroke). Refer to UpToDate topics on goal blood pressure for a discussion of the evidence.

◇ Prior history of coronary heart disease (acute coronary syndrome or stable angina), prior stroke or transient ischemic attack, prior history of peripheral artery disease.

§ In older adults with severe frailty, dementia, and/or a limited life expectancy or in patients who are nonambulatory or institutionalized (eg, reside in a skilled nursing facility), we individualize goals and share decision-making with the patient, relatives, and caretakers, rather than targeting 1 of the blood pressure goals in the table.

¥ The 2013 ACC/AHA cardiovascular risk assessment calculator should be used to estimate 10-year cardiovascular disease risk.

‡ In the large subgroup of patients who have an initial (pretreatment) blood pressure ≥140/≥90 mmHg but who do not have any of the other listed cardiovascular risk factors, some experts would set a more aggressive blood pressure goal of <130/<80 mmHg rather than those presented in the table. This more aggressive goal would likely reduce the chance of developing severe hypertension and ultimately lower the relative risk of cardiovascular events in these lower-risk patients over the long term. However, the absolute benefit of more aggressive blood pressure lowering in these patients is comparatively small, and a lower goal would require more intensive pharmacologic therapy and corresponding side effects.

Graphic 117101 Version 7.0

Contribution of carcinogenic HPV genotypes and CIN 3+ progression risk for progression to CIN grade 3 or worse

Carcinogenic HPV type	Percent of cervical cancers	9-year risk of progression to CIN3+ of incident HPV infection	Risk group
16	60.3	6.3	16
18	10.5	3.0	18/45
45	6.1	2.2	18/45
33	3.7	4.5	16-related
31	3.6	2.2	16-related
52	2.7	2.2	16-related
58	2.2	1.9	16-related
35	2.0	2.8	16-related
39	1.6	1.1	Other
51	1.2	1.1	Other
59	1.1	0.9	Other
56	0.9	0.8	Other
68	0.6	1.0	Other

This table summarizes the proportion of cancers caused by 13 HPV types and the risk of progression from infection to CIN 3+.

CIN: cervical intraepithelial neoplasia; HPV: human papillomavirus.

Graphic 148352 Version 1.0

Summary of management with extended genotyping when used with co-testing or cytology triage of primary HPV testing for patients undergoing screening and follow-up of low-grade abnormalities

	Current HPV	Current cytology	Past results	Management
HPV 16/18	16	HSIL	N/A*	Treatment preferred; colposcopy acceptable
	16	ASC-H	N/A	Treatment or colposcopy
	16	NILM, ASC-US, LSIL, AGC, or no cytology	N/A	Colposcopy¶ *with collection of cytology if not already done*
	18	HSIL	N/A	Treatment or colposcopy
	18	NILM, ASCUS, LSIL, ASC-H, AGC, or no cytology	N/A	Colposcopy¶ *with collection of cytology if not already done*
HPV 45, 33/58, 31, 52/35/39/68, 51 **Untyped or "other" types when 16 and 18 are not present**	45, 33/58, 31, 52/35/39/68, 51	HSIL, ASC-H, AGC	N/A	Colposcopy¶Δ
	45, 33/58, 31, 52/35/39/68, 51	ASC-US or LSIL	N/A	Colposcopy
	Untyped/other	ASC-US or LSIL	Documented HPV negative screen in past 5 years or colposcopy <CIN2◇ in past year	Repeat HPV test i 1 year
	Untyped/other	ASC-US or LSIL	Any history other than above	Colposcopy
	45, 33/58, 31, 52/35/39/68, 51, or untyped/other	NILM	Normal§ or colposcopy <CIN2 within past year	Repeat HPV test i 1 year
	45, 33/58, 31, 52/35/39/68, 51, or untyped/other	N/A	HPV+ without colposcopy (ie, current test is second consecutive HPV+)	Colposcopy

HPV 59/56/66	59/56/66	ASC-H, AGC, or HSIL¥	N/A	Colposcopy¶
	59/56/66	NILM, ASC-US, LSIL or no cytology¥	Normal or colposcopy <CIN2 within past 1 year	Repeat HPV test i 1 year
	59/56/66	N/A	HPV+ without colposcopy (ie, current test is second consecutive HPV+)	Colposcopy

For patients with a history of high-grade histology or cytology or following treatment, 2019 guidelines should be followed, but for those individuals, colposcopy is recommended for any HPV+ result and for all cytology LSIL or higher (even if HPV negative).

AGC: atypical glandular cells; ASC-H: atypical squamous cells, cannot exclude high-grade intraepithelial lesion; ASC-US: atypical squamous cells of undetermined significance; HPV: human papillomavirus; HSIL: high-grade squamous intraepithelial lesion; LSIL: low-grade squamous intraepithelial lesion; N/A: not applicable; NILM: negative for intraepithelial lesion or malignancy.

* Test result, if obtained, would not affect management.

¶ Endometrial biopsy recommended for an AGC result if risk factors for endometrial cancer are present (eg, age 35 years or older, obesity, irregular bleeding, anovulation) or if atypical endometrial cells are present.

Δ Colposcopy or treatment is acceptable for results of untyped HPV with ASC-H or HSIL cytology.

◇ Cervical intraepithelial neoplasia grade 2 or less severe.

§ Normal screening history per patient or documented in medical record.

¥ Cytology triage is not recommended for primary HPV screening with results positive for HPV59/56/66; this guideline may be used if cytology results are obtained.

Graphic 148353 Version 1.0

Contributor Disclosures

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