# The preconception office visit

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**INTRODUCTION** — Preconception care is a broad term that refers to the process of identifying social, behavioral, environmental, and biomedical risks to a woman's fertility and pregnancy outcome and then reducing these risks through education, counseling, and appropriate intervention, when possible, before conception [1,2]. Preconception intervention is more important than prenatal intervention for prevention of congenital anomalies since as many as 30 percent of pregnant women begin traditional prenatal care in the second trimester (>13 weeks of gestation), which is after the primary period of organogenesis (between 3 and 10 weeks of gestation) (figure 1).

**PROVIDING PRECONCEPTION CARE** — Preconception care should be an essential part of primary and preventive care for all women of childbearing age who present for a periodic health examination [1,3,4]. Routinely addressing preconception issues in women of childbearing potential is important because, although many women intend to obtain preconception evaluation and counseling before attempting pregnancy, almost 50 percent of pregnancies in the United States are unintended [5].

Ideally, the patient and her provider will create a reproductive health plan, which will be reviewed and revised, as needed, at each visit. As part of that plan, women should be asked about their intention to become pregnant and offered contraception that meets their current contraceptive needs while taking into account the timing of a planned pregnancy. Contraception should continue to be addressed during all medical visits of reproductive age women.

In addition to the periodic health evaluation, potential opportunities for preconception care occur during many nonemergency healthcare encounters, including:

- Premarital examination and testing
- Contraception counseling
- After a negative pregnancy test
- Evaluation for sexually transmitted disease or vaginal infection

Women's healthcare providers should be able to perform basic preconception assessment, provide basic patient education, and offer appropriate recommendations for intervention [6-8]. Situations beyond the provider's expertise should prompt consideration of referral to a genetic counselor and/or specialty care. Coordination of care among these providers is an important component of effective intervention.

However, there are several barriers to providing preconception care, including time constraints due to competing priorities within the practice setting, lack of health insurance or lack of adequate coverage for screening tests and counseling, lack of resources for assisting in the delivery of information, and the fact that most women do not schedule a preconception care visit [9].

Factors that facilitate provision of preconception care include the availability of preconception care checklists; patient informational resources such as brochures and handouts; and waiting room posters outlining the benefits and availability of preconception care consultations [9].

**Resources** — Informational resources on preconception care are available online at no cost from several sources, including:

- Centers for Disease Control and Prevention
- March of Dimes
- Perinatal Foundation
- American College of Obstetricians and Gynecologists

**GOALS** — The three major goals of preconception care are to:

- Identify potential risks to the mother, fetus, and pregnancy
- Educate the woman about these risks, options for intervention and management, and reproductive alternatives
- Initiate interventions to provide optimum maternal, fetal, and pregnancy outcomes. Interventions include motivational counseling, disease optimization, and specialist referral

There is limited evidence as to the best means for achieving these goals [1,10-12].

**RISK ASSESSMENT AT THE PRECONCEPTION OFFICE VISIT** — The key task in risk assessment is to obtain a thorough history. Several paper and computerized questionnaires and record forms are commercially available for this purpose (see 'Resources' above), and a questionnaire used by the author is provided as an example (form 1). Patient education and medical interventions can be initiated using this database.

**Age** — As maternal age increases, the risk of infertility, fetal aneuploidy, miscarriage, gestational diabetes, preeclampsia, and stillbirth also increases [13]. Women should be aware of these risks and the consequences of delaying conception until they are in their 30s or 40s. (See "Effect of advanced age on fertility and pregnancy in women".)

Advanced paternal age also has some risks for offspring. (See "Effect of advanced paternal age on fertility and pregnancy".)

**Medical history** — A thorough medical history is a good starting point for discussing how pregnancy can affect maternal health and the effect of maternal health and behavior on the fetus and pregnancy. Guidelines generally target the following areas for preconception risk assessment [1]:

- Chronic diseases (eg, diabetes, hypertension, oral health, severe obesity, obstructive sleep apnea)
- Medications known to be teratogens (see 'Resources for information on potential teratogens' below)

- Reproductive history (table 1)
- Genetic conditions and family history (table 2)
- Substance use, including tobacco, alcohol, and non-prescribed drugs
- Infectious diseases and vaccinations
- Nutrition, folic acid intake, and weight management
- Environmental hazards and toxins
- Family planning
- Social and mental health concerns (eg, depression, social support, intimate partner violence, housing)

A key component of medical assessment is to identify use of medications (including over-the-counter and prescription drugs) that are teratogenic and may be stopped (eg, valproic acid), should be stopped (eg, isotretinoin), or can be changed to one that is safer for the pregnant woman or fetus (eg, heparin for warfarin). It is especially important to elicit exposure to dietary supplements (eg, herbal supplements), as patients may not perceive them as medications that can be harmful to the fetus. Information on the pregnancy implications of drugs is available in the UpToDate drug database, and from other resources. (See 'Resources for information on potential teratogens' below.)

Although it makes intuitive sense that identifying and treating medical conditions, including mental health issues, prior to pregnancy is beneficial, data from clinical trials demonstrating improved pregnancy outcome with preconception intervention exist for only a handful of conditions [14-20]. These disorders are primarily metabolic, such as diabetes mellitus or phenylketonuria, or autoimmune, such as systemic lupus erythematosus. Preconception and pregnancy management of these and other medical conditions is reviewed separately (see individual topic reviews).

Likewise, the human teratogenic risk of drugs is undetermined for 98 percent of the drugs approved for human use and only approximately 30 drugs are considered to be proven as safe in pregnancy. Most of these are vitamins, minerals, electrolytes, and hormone replacement (eg, levothyroxine) at physiological doses. Therefore, the potential risk of medication use has to be considered on a case-by-case basis in terms of the harm of discontinuing the drug and the availability of alternative drugs.

In 2015, in utero Zika virus infection was found to have serious adverse fetal effects, particularly microcephaly. Providers and patients should be aware of the ways that Zika virus is transmitted (eg, mosquito bite, sex) and take appropriate precautions to avoid Zika virus infection during pregnancy. (See "Zika virus infection: An overview" and "Zika virus infection: Evaluation and management of pregnant women".)

The gynecologic and obstetric histories are important for identifying factors that may contribute to infertility or complications in a future pregnancy and initiating appropriate intervention to reduce or eliminate these risks, if possible [21].

**Environmental exposures** — Questions about the woman's work, hobbies, pets, and home environment can identify potentially toxic exposures, such as mercury, lead, pesticides, and endocrine disrupting chemicals (phthalates, bisphenol A, polybrominated diethyl ethers) [22]. In addition to occupational exposures, mercury may be found in fish and skin-lightening creams, and lead may be detected in paint (pre-1970), imported cosmetics/food additives/medicine, and clay [23].

In the United States, the Occupational Safety and Health Administration (OSHA) sets and enforces standards requiring employers to provide a workplace free from recognized hazards likely to cause serious physical harm. This information should be available at the patient's workplace.

Of note, there is no convincing evidence that exposure to common sources of electromagnetic field radiation, such as computer monitors, electric blankets, heated water beds, cell phones, and microwave ovens, is harmful [24].

(See "Overview of occupational and environmental health" and "Overview of occupational and environmental risks to reproduction in females".)

**Resources for information on potential teratogens**

- National Library of Medicine (NLM)
  Bethesda, MD
  800-638-8480
  (sis.nlm.nih.gov/)

- Reproductive Toxicology Center
  REPROTOX
  Columbia Hospital for Women Medical Center
  Washington, DC
  202-293-5137
  (www.reprotox.org)

- Teratogen Information System
  TERIS and Shepard's Catalog of Teratogenic Agents
  Seattle, WA
  http://depts.washington.edu/terisweb/teris/
  206-543-2465

- Pregnancy Exposure Registries
  A list is available at
  http://www.fda.gov/ScienceResearch/SpecialTopics/WomensHealthResearch/ucm134848.htm.

- Organization of Teratology Information Specialists (OTIS)
  www.OTISPregnancy.org
  877-311-8972

- The Hospital for Sick Children
  Toronto, Canada
  http://www.motherisk.org/women/drugs.jsp
  877-439-2744

- Pediatric Environmental Health Specialty Units (PEHSU)
  www.pehsu.net/aboutus.html

**Physical examination** — In healthy women, a reasonable preconception physical examination includes assessment of the heart, lungs, thyroid, abdomen, mouth, and genital tract, as well as

blood pressure and body mass index (BMI). This examination is pragmatic approach to detection of conditions that can affect maternal health and pregnancy outcome.

**Laboratory assessment** — In the United States and some other countries, human immunodeficiency virus (HIV) counseling and screening is recommended for all women planning pregnancy (patients may opt out) because treatment of maternal HIV infection can reduce the risk of congenital infection [1]. (See "Prenatal evaluation of the HIV-infected woman in resource-rich settings".)

The following screening tests should be considered selectively in appropriate high-risk groups for the reasons described.

- Screen for gonorrhea, chlamydia, syphilis, hepatitis, and other sexually transmitted infections according to standard guidelines. Depending on the disease, these infections can cause subfertility/infertility, as well as congenital infection and medical and pregnancy complications. (See "Screening for sexually transmitted infections".)

- Document rubella immunity or lack of immunity. Evidence of immunity consists of laboratory evidence of rubella immunity, laboratory confirmation of disease, documentation of vaccination with at least one dose of live rubella virus-containing vaccine at age ≥12 months [25].

- Genetic carrier testing based upon the woman's or partner's medical history or family history of heritable disease (table 2), ethnic origin, or patient request. This information allows patients planning pregnancy to make informed reproductive decisions about adoption, surrogacy, use of donor sperm, in vitro fertilization after preimplantation genetic diagnosis, avoidance of pregnancy, and prenatal diagnosis [26].

  - (See "Carrier screening for genetic disease in the Ashkenazi Jewish population".)
  - (See "Prenatal screening and testing for hemoglobinopathy".)
  - (See "Cystic fibrosis: Carrier screening".)
  - (See "Prenatal screening and diagnosis for fragile X syndrome".)
  - (See "Spinal muscular atrophy", section on 'Pregnancy'.)

  The simplest screening test is review of red cell indices, as mean corpuscular volume (MCV) <80 fL may indicate hemoglobinopathy. (See "Prenatal screening and testing for hemoglobinopathy".)

- Glycated hemoglobin (A1C), fasting plasma glucose (FPG) in women with a prior history of diabetes. Good glucose control in early pregnancy reduces the risk of miscarriage and congenital anomalies, and can take time to achieve. (See "Pregestational diabetes: Preconception counseling, evaluation, and management".)

- A tuberculin skin test in high-risk populations to avoid exposing the fetus to treatment, if indicated, during pregnancy. This would include women with recent travel to or from regions known to have a high prevalence of tuberculosis and those with close contact with active pulmonary tuberculosis (eg, living in the same household) or casual contact with individuals with highly contagious active tuberculosis (eg, healthcare workers). (See "Diagnosis of latent tuberculosis infection (tuberculosis screening) in HIV-uninfected adults".)

- Toxoplasmosis screening is controversial. Although national societies in the United States, Canada, and the United Kingdom advise against routine universal screening for

toxoplasmosis during pregnancy, a prepregnancy baseline titer can be useful if screening is performed in patients with occupational exposure, pet cats, or high-risk eating habits. Patients with a negative toxoplasmosis titer should be counseled to avoid changing the cat litter, forgo eating undercooked meat, wear gloves when gardening, and frequently wash food, hands, and food preparation areas. (See "Toxoplasmosis and pregnancy".)

- Cytomegalovirus infection screening is also controversial. Knowledge of a negative titer in women at high risk of exposure (eg, work in child care facilities or dialysis units or have children in day care) may increase their motivation to practice good hygiene and decrease their risk of seroconversion during pregnancy. (See "Cytomegalovirus infection in pregnancy".)

- Serum phenylalanine level if maternal phenylketonuria is known or suspected. Phenylalanine embryopathy can be prevented by dietary restriction of phenylalanine before and during pregnancy. (See "Overview of phenylketonuria".)

- Lead level, if the patient is at high risk of lead exposure or an increased lead level, given the potential for adverse effects on the mother and fetus. (See "Initial prenatal assessment and first-trimester prenatal care", section on 'Lead level screening' and "Adult occupational lead poisoning".)

**INTERVENTIONS** — Preconception interventions include health promotion education and counseling related to reproductive health risks, optimizing the control of medical disorders, and referral for specialized care, when appropriate. If pregnancy avoidance is desired, then contraceptive options should be discussed and a contraceptive chosen in line with the woman's planned timing of pregnancy. (See "Contraceptive counseling and selection".)

Available evidence, which is primarily observational data, supports an association between preconceptional counseling and positive changes in maternal behavior before pregnancy, particularly with respect to folic acid intake, improved glycemic control, and reduction in alcohol intake and cigarettes smoked [27-34]. There is also evidence from randomized trials that the prevalence of congenital anomalies was reduced by preconception care of women with diabetes [14] or epilepsy [35], while a cohort study supported a reduction in embryopathy in women with phenylketonuria who were placed on a strict low phenylalanine diet prior to conception [36]. However, many women are unable to adopt a healthy lifestyle while attempting pregnancy [37,38].

**Core interventions** — The following core interventions can reduce the occurrence of congenital anomalies, congenital disease, impaired or excessive fetal growth, and a variety of pregnancy complications (eg, preterm birth, abruptio placenta) [14,20,39,40]. The evidence for the efficacy of these interventions is discussed in topic reviews on each intervention.

- Folic acid supplementation and intake of folate fortified foods – Supplementation (400 to 800 mcg daily) and intake of fortified foods can reduce the risk of neural tube defects. (See "Folic acid supplementation in pregnancy".)

- Glycemic control in women with diabetes (the American Diabetes Association recommends aiming for an A1C <6.5 percent (48 mmol/mol) prior to conception if safely possible [41]), control of phenylalanine levels in women with phenylketonuria (less than 6 mg/dL for at least three months before conception and maintained at 2 to 6 mg/dL during pregnancy [42]) – These interventions can reduce the risk of miscarriage and embryopathy. In addition, women with diabetes who take angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor

blockers (ARBs), statins, and some oral anti-hyperglycemic agents should discontinue use and switch to alternatives (when available) with a better fetal safety profile (eg, methyldopa, labetalol, calcium channel blocker, insulin, glyburide). (See "Overview of phenylketonuria" and "Pregestational diabetes: Preconception counseling, evaluation, and management" and "Statins: Actions, side effects, and administration", section on 'Risks in pregnancy and breastfeeding'.)

- Abstinence from alcohol and illicit drugs – A safe level of alcohol intake during pregnancy has not been determined. Patients who use alcohol or illicit drugs can be referred to a cessation or opioid substitution program. (See "Alcohol intake and pregnancy" and "Overview of substance misuse in pregnant women".)

- Smoking cessation – Women who are planning pregnancy may be more motivated to stop smoking and utilize smoking cessation resources. (See "Cigarette smoking: Impact on pregnancy and the neonate".)

- Up-to-date vaccinations (figure 2 and figure 3 and table 3) – Vaccination protects against congenital infection. Live vaccines (varicella; measle, mumps, rubella) should be administered at least one month prior to pregnancy. All women who are pregnant or might be pregnant during the influenza season should receive the inactivated influenza vaccine as soon as it becomes available and before onset of influenza activity in the community, regardless of their stage of pregnancy. Pregnant women should receive a single dose of Tdap, ideally at 27 to 36 weeks of gestation, in each pregnancy. (See "Immunizations during pregnancy".)

- Weight reduction (or gain) to achieve a normal body mass index (BMI) – Obesity is associated with both infertility and several adverse pregnancy outcomes including birth defects. Underweight women (especially those with eating disorders) had a 20 percent increase in risk for preterm birth and a 40 percent increase in risk of having a small for gestational age infant in one large cohort study [43]. (See "Obesity in pregnancy: Complications and maternal management" and "Eating disorders in pregnancy".)

- Medication changes or discontinuation to avoid use of teratogens. (See 'Resources' above.)

- Avoidance of environmental teratogens. (See 'Resources' above.)

- Disease optimization (refer to individual topic reviews on each disease).

- Behavioral changes (eg, hand washing and other hygienic measures; avoiding consumption of undercooked meats and unpasteurized foods) can reduce the risk of acquiring infections, such as toxoplasmosis, cytomegalovirus, and listeriosis. (See "Toxoplasmosis and pregnancy" and "Cytomegalovirus infection in pregnancy" and "Treatment, prognosis, and prevention of Listeria monocytogenes infection".)

**Interventions for selected risks**

**Maternal medical problems** — Optimal management of maternal medical conditions, including changes in medications to those known to be safer in pregnancy, is important. Another key component is close follow-up and communication with specialist providers who are also involved in caring for the patient.

Some common or serious medical conditions other than diabetes (discussed above) that impact or are impacted by pregnancy are discussed briefly below; additional disorders are reviewed separately. (Refer to individual topic reviews on medical disorders, section on pregnancy.)

- Hypertension should be controlled prior to conception. Women on antihypertensive drugs who have normal blood pressures or mild hypertension and no end organ damage may be transitioned off of medication, with close monitoring of blood pressure response and reinstitution if blood pressure increases to potentially morbid levels. Certain agents, such as ACE inhibitors and ARBs, should be avoided in pregnancy, as their use at any stage of pregnancy is associated with adverse effects on the fetus. Patients who are on any of these agents should be advised to switch to agents whose safety in pregnancy is established. Women who have long-standing or poorly controlled hypertension should be evaluated for end-organ effects (eg, ventricular hypertrophy, retinopathy, renal insufficiency) [44]. (See "Management of hypertension in pregnant and postpartum women".)

- Asthma should be under good control prior to attempting conception. If necessary, the use of steroids (inhaled and systemic) in pregnancy is generally safe, particularly when compared with the risk of maternal acid base disturbance and fetal hypoxemia. (See "Physiology and clinical course of asthma in pregnancy" and "Management of asthma during pregnancy".)

- Thyroid disease requires close monitoring of thyroid function as both hyper- and hypothyroidism can affect fertility and pregnancy outcome. (See "Overview of thyroid disease in pregnancy".)

- Women with a history of seizures and women taking antiepileptic drugs should receive thorough information about the risks of pregnancy for mother and fetus, adjustments in their drug regimen (if appropriate), and folic acid supplementation to reduce the risk of neural tube defects. In particular, valproate should be discontinued if seizures can be adequately controlled with an alternative drug, since valproate appears to be a more potent teratogen than other antiepileptic drugs. (See "Management of epilepsy and pregnancy".)

- Pregnancy can pose additional risks to women with cardiovascular disease (congenital or acquired) that should be addressed before conception. Women taking statins are advised to discontinue them. (See "Acquired heart disease and pregnancy" and "Pregnancy in women with congenital heart disease: General principles".)

- For women with systemic lupus erythematosus, the prognosis is best when the disease has been quiescent for at least six months prior to pregnancy and the patient's underlying renal function is stable and normal or near normal. Maternal medications may need to be changed because of potential fetal risks. (See "Pregnancy in women with systemic lupus erythematosus".)

- Women with inherited thrombophilias are at higher risk of thromboembolic complications during pregnancy because of pregnancy-associated changes in several coagulation factors; in some cases, they are at increased risk of adverse pregnancy outcome, as well. Indications for, and management of, anticoagulation should be addressed with a thrombosis specialist. (See "Inherited thrombophilias in pregnancy".)

- Ideally, any woman with a history of anaphylaxis should be referred to an allergy specialist for evaluation prior to pregnancy. This is particularly important for women who experienced anaphylaxis in association with a previous medical or surgical procedure, as similar

medications may be needed during labor and delivery. (See "Anaphylaxis in pregnant and breastfeeding women".)

- Dental caries and other oral diseases (eg, periodontal disease) are common and may be associated with pregnancy complications, such as preterm delivery; thus, referral to a dentist is appropriate. (See "Preterm birth: Risk factors and interventions for risk reduction".)

**Heritable diseases** — For women with a positive history for a heritable disease, referral to a specialist in genetic counseling is usually required to discuss carrier testing, the risk of genetic disease in the fetus, options regarding prenatal diagnosis and intervention, the natural course of the disease, and reproductive alternatives. As options for prenatal diagnosis and reproductive alternatives are rapidly changing, a timely referral may be indicated even if the patient has had previous counseling.

**Psychosocial issues** — Psychosocial stress, mental health, and financial issues should be identified and appropriate interventions taken with the help of a community resource specialist. It is particularly important to screen for the presence of intimate partner violence, lack of social support, and barriers to prenatal care [45]. (See "Intimate partner violence: Diagnosis and screening".)

Maternal psychiatric illness should be identified and treated, as appropriate, because untreated or inadequately treated disease will result in maternal suffering and could lead to a variety of consequences, such as poor compliance with prenatal care, poor nutrition, substance abuse, or disturbed relationships between the mother and her infant [46]. Ideally, the patient should wait until she has become euthymic, which may take 6 to 12 months, before she attempts to conceive [47].

Drugs used to treat psychiatric disease can affect the fetus and neonate. Women who have been on medication and have mild or no symptoms for six or more months may be considered for medication taper and discontinuation (eg, decrease medication by 25 percent every one to two weeks) [47]. Some women may benefit from psychotherapy. Discontinuation of pharmacotherapy is generally not advised for women with a history of severe recurrent depressive disorders, psychosis, bipolar illness, psychiatric comorbidity requiring pharmacotherapy, or a history of suicidal ideation. (See "Severe antenatal unipolar major depression: Treatment" and "Bipolar disorder in women: Indications for preconception and prenatal maintenance pharmacotherapy" and "Bipolar disorder in women: Preconception and prenatal maintenance pharmacotherapy" and "Obsessive-compulsive disorder in pregnant and postpartum women".)

**Diet and supplements** — As discussed above (see 'Core interventions' above), all women planning pregnancy or capable of becoming pregnant should be counseled to take supplemental folic acid to reduce the risk of having an infant with a neural tube defect [48,49], and possibly other congenital anomalies [50] and abruption [51,52]. The neural tube closes between 18 and 26 days after conception so folic acid supplementation after the diagnosis of pregnancy is usually too late to reduce the risk of neural tube defects. The most convenient method of folic acid supplementation is daily intake of a multivitamin containing 400 to 800 mcg of folic acid. (See "Folic acid supplementation in pregnancy".)

A healthy diet is generally the same whether or not a woman is planning pregnancy, with some exceptions. High caffeine intake should probably be avoided; experts suggest that women who are attempting to conceive (or who are pregnant) limit caffeine consumption to less than 200 to 300 mg per day. (See "The effects of caffeine on reproductive outcomes in women".)

The quantity and type of fish consumed should also be regulated and certain types of fish should be avoided during pregnancy and the preconception period due to concerns about possible teratogenic effects from environmental toxins, particularly mercury. Only cooked fish should be eaten. There is no clear evidence that n-3 (also known as omega-3) long chain polyunsaturated fatty acids (docosahexaenoic acid [DHA] and eicosapentaenoic acid [EPA]) supplements during pregnancy improve offspring neurodevelopment. (See "Nutrition in pregnancy", section on 'Fish consumption' and "Fish consumption and omega-3 long-chain polyunsaturated fatty acid supplementation during pregnancy".)

Megavitamins, nonessential dietary supplements, and herbal preparations should be discontinued, given that the risk to the fetus from such substances has generally not been evaluated. Megadoses of vitamin A taken during early pregnancy have been associated with birth defects [53,54]. Multivitamin preparations containing more than 5000 international units of vitamin A should be avoided (increased risk of teratogenesis at >10,000 international units/day).

**Infertility, recurrent miscarriage, and adverse pregnancy outcome** — The general consensus among infertility experts is that infertility evaluation should be undertaken for couples who have not been able to conceive after 12 months of unprotected and frequent intercourse, but earlier evaluation should be undertaken based on medical history and physical findings and in women over 35 years of age (table 4). (See "Overview of infertility".)

Ideally, the work-up for potential causes of adverse pregnancy outcome (eg, miscarriage, preterm birth, fetal demise, congenital abnormalities) should be performed by the obstetrician-gynecologist as part of the antepartum or postpartum management of the affected pregnancy. Subsequent management depends on the cause. (Refer to individual topic reviews on miscarriage, recurrent pregnancy loss, stillbirth, and pregnancy complications.)

**MEASURES OF SUCCESSFUL PRECONCEPTION CARE** — A clinical workgroup of the National Preconception Health and Health Care Initiative proposed that achievement of the following nine targets at the first prenatal visit is indicative of quality preconception care [55]:

- Absence of tobacco use
- Absence of uncontrolled depression
- Absence of sexually transmitted infections
- Teratogen avoidance
- Healthy weight (body mass index >18 and <30 kg/m$^2$)
- Folic acid use beginning at least three months before conception
- Optimal glycemic control
- Planned pregnancy
- First prenatal visit before 12 weeks of gestation

**SOCIETY GUIDELINE LINKS** — Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Immunizations in adults".)

**SUMMARY AND RECOMMENDATIONS**

- Women of childbearing age should develop a reproductive health plan. As part of routine health maintenance, they should be asked about their intention to become pregnant and

offered contraception that meets their contraceptive needs. (See 'Providing preconception care' above.)

- The goals of preconception care are to (see 'Risk assessment at the preconception office visit' above):
  - Identify potential risks to the mother, fetus, and pregnancy.
  - Educate the woman about these risks, options for intervention and management, and reproductive alternatives.
  - Initiate interventions to provide optimum maternal, fetal, and pregnancy outcomes. Interventions include motivational counseling, disease optimization, and specialist referral.

- Any one of several commercially available paper and computerized questionnaires and record forms designed for obtaining a thorough preconception history will help in identifying risks to the woman and her pregnancy. A preconception history includes review of (see 'Medical history' above):
  - Chronic diseases (eg, diabetes, hypertension, oral health)
  - Medications known to be teratogens
  - Reproductive history (table 1)
  - Genetic conditions and family history (table 2)
  - Substance use, including tobacco, alcohol, and non-prescribed drugs
  - Infectious diseases and vaccinations
  - Nutrition, folic acid intake, and weight management
  - Environmental hazards and toxins
  - Family planning
  - Social and mental health concerns

- A key component of medical assessment is to identify use of medications (including over-the-counter and prescription drugs) that are teratogenic and may be stopped, should be stopped, or can be changed to one that is safer for the pregnant woman or fetus. (See 'Medical history' above.)

- Women should be made aware of fertility and pregnancy problems that increase with advancing age. (See 'Age' above.)

- With the exception of universal human immunodeficiency virus (HIV) screening, screening laboratory tests should be considered selectively in appropriate high-risk groups. (See 'Laboratory assessment' above.)

- Core preconception interventions that can reduce the occurrence of congenital disorders, fetal growth abnormalities, and pregnancy complications include (see 'Core interventions' above):
  - Folic acid supplementation and intake of fortified foods
  - Glycemic control in women with diabetes, control of phenylalanine levels in women with phenylketonuria
  - Abstinence from alcohol and illicit drugs, smoking cessation
  - Reduction of obesity
  - Medication changes to avoid use of teratogens

- Avoidance of environmental teratogens
- Disease optimization (see 'Maternal medical problems' above)
- Up to date vaccinations
- Behavioral changes to reduce the risk of acquiring infections, such as toxoplasmosis, cytomegalovirus, and listeriosis

- For women with a positive history for a heritable disease, referral to a specialist in genetic counseling is usually required to discuss carrier testing, the risk of genetic disease in the fetus, options regarding prenatal diagnosis and intervention, the natural course of the disease, and reproductive alternatives. (See 'Heritable diseases' above.)



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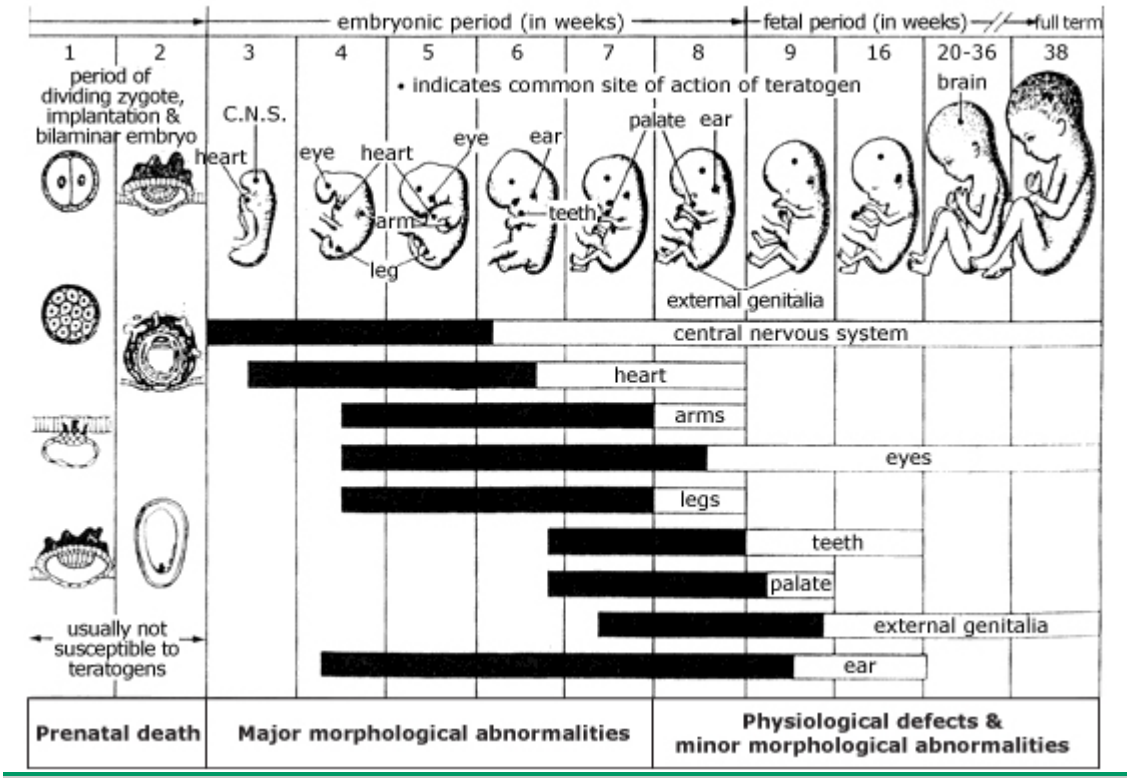
Topic 448 Version 33.0

## GRAPHICS

### The developing fetus




The black bars represent the critical period during which development may be disrupted by a teratogen resulting in a major structural malformation. Cell differentiation occurs over a longer period (white bars); exposure during this period can result in minor structural malformations, growth restriction, or functional deficiency. Note, embryonic age is counted from fertilization, whereas menstrual age (ie, gestational age) is counted from the first day of the last menstrual period. Thus, an embryonic age of six weeks corresponds to a menstrual age (gestational age) of eight weeks. Embryonic weeks 1 to 8 are considered the embryonic period of development and are followed by the fetal period of development.



Graphic 56642 Version 3.0

# Preconception care questionnaire

| |
|---|
| 1. Are you considering getting pregnant within the next year? |
| 2. Are you currently attempting to conceive? |
| 3. Do you use birth control on a regular basis? |
| Type of birth control: |
| a. Condoms and or diaphragm |
| b. Intrauterine device (IUD) |
| c. Birth control pill |
| d. Depo-vera or norplant |
| e. Other |
| **Medical history** |
| 4. List all chronic medical and psychiatric conditions for which you have been treated. |
| |
| 5. Do you take any medications (prescription and over-the-counter) on a regular basis? |
| List them: |
| |
| 6. List all drug allergies. |
| |
| **Gynecologic history** |
| 7. Is there a history of any of the following: |
| a. Irregular menstrual cycles |
| b. Abnormal pap smear |
| c. Uterine fibroids |
| d. Ectopic pregnancy |
| e. Gynecologic surgery |
| 8. Have you ever had any of the following: |
| a. Chlamydia |
| b. Genital wart |
| c. Syphilis |
| d. Gonorrhea (GC) |
| e. Herpes |
| **Prior pregnancy and obstetrical history** |
| 9. Is there a history of any of the following: |
| a. Recurrent miscarriages? |
| b. Stillbirth? |
| c. Low birth weight? |

d. Diabetes or gestational diabetes?

e. Phenylketonuria?

f. Neonate with neural tube defects?

g. Neonate with other congenital defects?

10. Please list all pregnancies below:

| Pregnancy (date) | Number of weeks pregnant | Outcome | Weight (for live births) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

11. Have you received the following immunizations (or a history of the illness):

a. Rubella (German measles)

b. Hepatitis B

c. Varicella (chicken pox)

## Family history

12. Is there a family history of any of the following?

a. Tay Sachs disease

b. Beta or alpha thalessemia

c. Cystic fibrosis

d. Sickle cell disease

e. Epilepsy

f. Mental retardation

## Habits and exposures

13. Do you drink alcohol? If so, how many drinks per day (week or month)?

14. Do you smoke? If so, how many cigarettes per day?

15. What is your daily caffeine intake?

16. Have you ever used any of the following:

a. Cocaine

b. Heroin

c. Other illicit drugs

17. Have you ever received blood products? If so, please state dates and type of product.

18. Are you on any special diet? Please describe.

19. Do you use any herbal, dietary or vitamin supplements?

List them:

| |
|---|
| 20. Do you exercise on a regular basis? Describe type of exercise and frequency. |
| |
| 21. Do you have any cats? |
| **Employment and occupational history** |
| 22. Occupation. |
| 23. Are you currently employed? |
| 24. Please list your last three places of work and your positions. |
| 1. |
| 2. |
| 3. |
| 25. In your daily work are you exposed to any of the following on a regular basis? |
| a. X-rays or radiation? |
| b. Radioactive substances? |
| c. Solvents? |
| d. Tuberculosis (TB)? Date and status of last purified protein derivative (PPD) placement? |
| e. Needle stick injury? Hepatitis B status? |
| f. Other (please list) |

*Courtesy of Joyce A Sackey, MD.*

Graphic 55575 Version 7.0

## Assessment of past obstetrical and gynecologic history

| **Past obstetrical history** |
|---|
| Date of delivery |
| Gestational age at delivery |
| Location of delivery |
| Sex of child |
| Birthweight and percentile for gestational age |
| Mode of delivery |
| Type of anesthesia |
| Length of labor |
| Outcome (miscarriage, stillbirth, ectopic, etc) |
| Details (eg, type of hysterotomy incision, forceps, etc) |
| Complications (maternal, fetal, child) |
| **Gynecologic history** |
| Age at menarche |
| Date of last menstrual period |
| Date of previous menstrual period |
| Cycle length and duration |
| Type of contraception |
| Sexually transmitted infections |
| Gynecologic surgery or disorders (eg, cervical, uterine, or ovarian surgery; endometriosis, fibroids, uterine anomalies) |

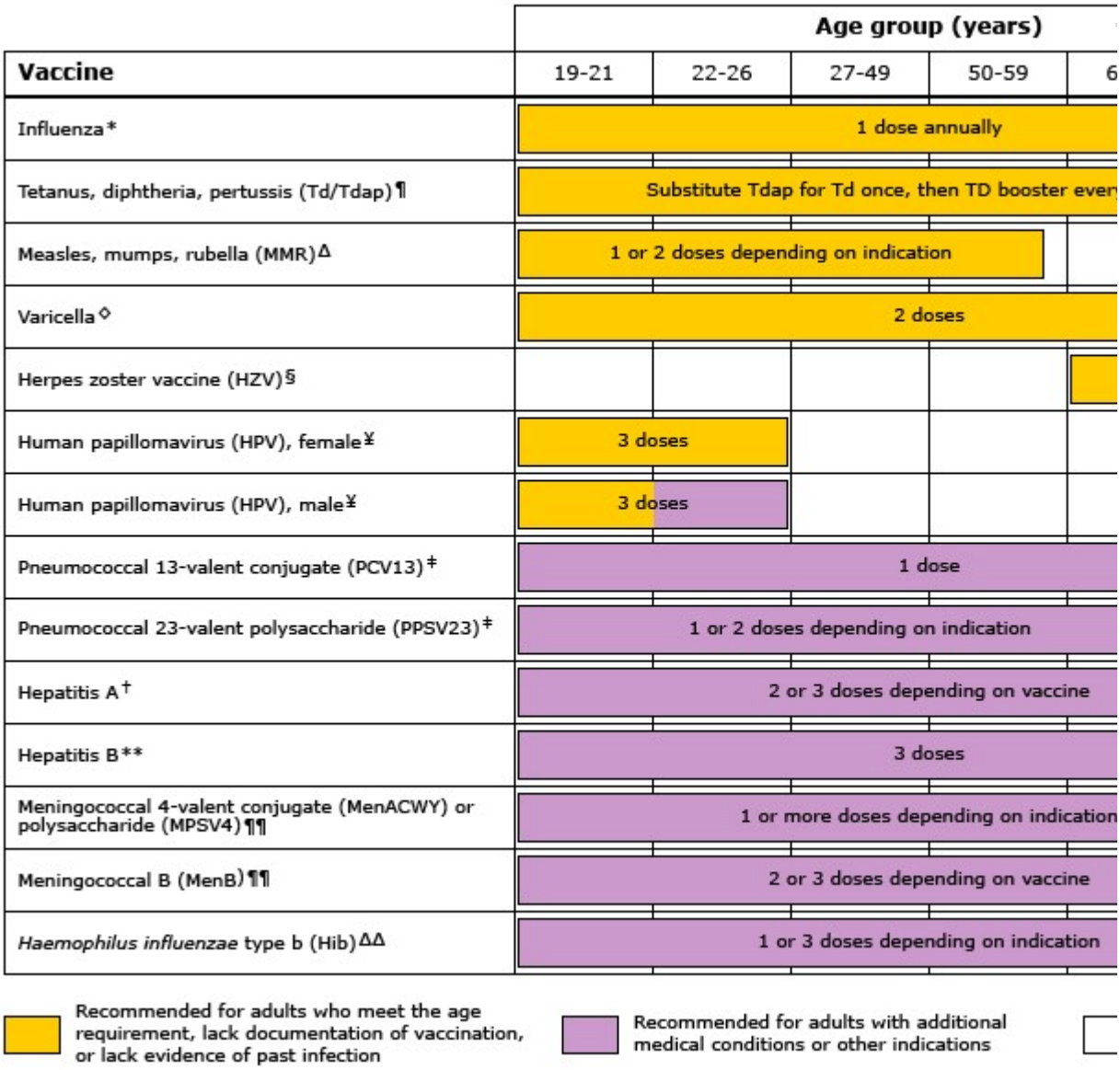
Graphic 78008 Version 2.0

## Patient, spouse, and family genetic history

| |
|---|
| History of congenital abnormalities |
| Neural tube defects |
| Heart defects |
| Orofacial clefts |
| Other |
| Chromosomal abnormalities |
| Down syndrome |
| Mental retardation or developmental delay (eg, fragile X risk) |
| Other |
| Advanced maternal or paternal age |
| Inherited diseases |
| Hemoglobinopathy or thrombophilia |
| Muscular dystrophy |
| Cystic fibrosis |
| Huntington's chorea |
| Hemophilia |
| Metabolic disorders (eg, phenylketonuria, diabetes) |
| Kidney disease |
| Deafness |
| Marfan syndrome |
| Other |
| Ethnicity |
| Eastern European (Ashkenazi) Jews (Tay-Sachs, Canavan risk, etc) |
| French Canadian or Cajun (Tay-Sachs risk) |
| Mediterranean region (hemoglobinopathy risk) |
| Asia, including Souteast Asia and Western Pacific (hemoglobinopathy risk) |
| Africa and Middle East (hemoglobinopathy risk) |
| South America and Caribbean (hemoglobinopathy risk) |
| Caucasian (cystic fibrosis) |
| Consanguinity |
| Recurrent pregnancy loss, stillbirth, or early infant death |
| Maternal metabolic disorder |

Graphic 78915 Version 3.0

## Recommended immunization schedule for adults aged 19 years or older, by v group - United States, 2017




* Influenza vaccination:

- General information
  - All persons aged 6 months or older who do not have a contraindication should receive annual influenza va appropriate formulation of inactivated influenza vaccine (IIV) or recombinant influenza vaccine (RIV).
  - In addition to standard-dose IIV, available options for adults in specific age groups include high-dose or a aged 65 years or older, intradermal IIV for adults aged 18 through 64 years, and RIV for adults aged 18 y
  - Notes: Live attenuated influenza vaccine (LAIV) should not be used during the 2016 to 2017 influenza sea available influenza vaccines is available at www.cdc.gov/flu/protect/vaccine/vaccines.htm.
- Special populations
  - Adults with a history of egg allergy who have only hives after exposure to egg should receive age-appropr
  - Adults with a history of egg allergy other than hives (eg, angioedema, respiratory distress, lightheadedne or who required epinephrine or another emergency medical intervention may receive age-appropriate IIV vaccine should be administered in an inpatient or outpatient medical setting and under the supervision of who is able to recognize and manage severe allergic conditions.
  - Pregnant women and women who might become pregnant in the upcoming influenza season should recei

¶ Tetanus, diphtheria, and acellular pertussis vaccination:

- General information

- Adults who have not received tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap) or for vaccination status is unknown should receive 1 dose of Tdap followed by a tetanus and diphtheria toxoids years. Tdap should be administered regardless of when a tetanus or diphtheria toxoid-containing vaccine
- Adults with an unknown or incomplete history of a 3-dose primary series with tetanus and diphtheria toxc should complete the primary series that includes 1 dose of Tdap. Unvaccinated adults should receive the f weeks apart and the third dose 6 to 12 months after the second dose.
- Notes: Information on the use of Td or Tdap as tetanus prophylaxis in wound management is available at www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm.

▪ Special populations
- Pregnant women should receive 1 dose of Tdap during each pregnancy, preferably during the early part o 36, regardless of prior history of receiving Tdap.

Δ Measles, mumps, and rubella vaccination:

▪ General information
- Adults born in 1957 or later without acceptable evidence of immunity to measles, mumps, or rubella (defi 1 dose of measles, mumps, and rubella vaccine (MMR) unless they have a medical contraindication to the or severe immunodeficiency).
- Notes: Acceptable evidence of immunity to measles, mumps, or rubella in adults is born before 1957, doc MMR, or laboratory evidence of immunity or disease. Documentation of healthcare provider-diagnosed dis confirmation is not acceptable evidence of immunity.

▪ Special populations
- Pregnant women who do not have evidence of immunity to rubella should receive 1 dose of MMR upon co pregnancy and before discharge from the healthcare facility; non-pregnant women of childbearing age wit immunity should receive 1 dose of MMR.
- Adults with primary or acquired immunodeficiency including malignant conditions affecting the bone marr systemic immunosuppressive therapy, or cellular immunodeficiency should not receive MMR.
- Adults with human immunodeficiency virus (HIV) infection and CD4+ T-lymphocyte count ≥200 cells/mcL who do not have evidence of measles, mumps, or rubella immunity should receive 2 doses of MMR at leas with HIV infection and CD4+ T-lymphocyte count <200 cells/mcL should not receive MMR.
- Adults who work in healthcare facilities should receive 2 doses of MMR at least 28 days apart; healthcare 1957 who are unvaccinated or lack laboratory evidence of measles, mumps, or rubella immunity, or labor disease should be considered for vaccination with 2 doses of MMR at least 28 days apart for measles or m for rubella.
- Adults who are students in postsecondary educational institutions or plan to travel internationally should r least 28 days apart.
- Adults who received inactivated (killed) measles vaccine or measles vaccine of unknown type during years revaccinated with 1 or 2 doses of MMR.
- Adults who were vaccinated before 1979 with either inactivated mumps vaccine or mumps vaccine of unk high risk for mumps infection, (eg, work in a healthcare facility) should be considered for revaccination wi least 28 days apart.

◇ Varicella vaccination:

▪ General information
- Adults without evidence of immunity to varicella (defined below) should receive 2 doses of single-antigen to 8 weeks apart, or a second dose if they have received only 1 dose.
- Persons without evidence of immunity for whom VAR should be emphasized are adults who have close co risk for serious complications, (eg, healthcare personnel and household contacts of immunocompromised or work in an environment in which transmission of varicella zoster virus is likely (eg, teachers, childcare and staff in institutional settings), adults who live or work in environments in which varicella transmission college students, residents and staff members of correctional institutions, and military personnel), non-pr childbearing age, adolescents and adults living in households with children, and international travelers.
- Notes: Evidence of immunity to varicella in adults is United States-born before 1980 (for pregnant womer personnel, United States-born before 1980 is not considered evidence of immunity), documentation of 2 c weeks apart, history of varicella or herpes zoster diagnosis or verification of varicella or herpes zoster dise provider, or laboratory evidence of immunity or disease.

▪ Special populations
- Pregnant women should be assessed for evidence of varicella immunity. Pregnant women who do not hav should receive the first dose of VAR upon completion or termination of pregnancy and before discharge fr and the second dose 4 to 8 weeks after the first dose.
- Healthcare institutions should assess and ensure that all healthcare personnel have evidence of immunity
- Adults with malignant conditions, including those that affect the bone marrow or lymphatic system or wh immunosuppressive therapy, should not receive VAR.

- Adults with human immunodeficiency virus (HIV) infection and CD4+ T-lymphocyte count ≥200 cells/mcL VAR 3 months apart. Adults with HIV infection and CD4+ T-lymphocyte count <200 cells/mcL should not

§ Herpes zoster vaccination:

- General information
  - Adults aged 60 years or older should receive 1 dose of herpes zoster vaccine (HZV), regardless of whethe of herpes zoster.
- Special populations
  - Adults aged 60 years or older with chronic medical conditions may receive HZV unless they have a medica pregnancy or severe immunodeficiency).
  - Adults with malignant conditions, including those that affect the bone marrow or lymphatic system or whc immunosuppressive therapy, should not receive HZV.
  - Adults with human immunodeficiency virus infection and CD4+ T-lymphocyte count <200 cells/mcL shoul

¥ Human papillomavirus vaccination:

- General information
  - Adult females through age 26 years and adult males through age 21 years who have not received any hu vaccine should receive a 3-dose series of HPV vaccine at 0, 1 to 2, and 6 months. Males aged 22 through vaccinated with a 3-dose series of HPV vaccine at 0, 1 to 2, and 6 months.
  - Adult females through age 26 years and adult males through age 21 years (and males aged 22 through 2 HPV vaccination) who initiated the HPV vaccination series before age 15 years and received 2 doses at lea considered adequately vaccinated and do not need an additional dose of HPV vaccine.
  - Adult females through age 26 years and adult males through age 21 years (and males aged 22 through 2 HPV vaccination) who initiated the HPV vaccination series before age 15 years and received only 1 dose, c months apart, are not considered adequately vaccinated and should receive 1 additional dose of HPV vacc
  - Notes: HPV vaccination is routinely recommended for children at age 11 or 12 years. For adults who had i complete the HPV vaccination series, consider their age at first HPV vaccination (described above) and otl below) to determine if they have been adequately vaccinated.
- Special populations
  - Men who have sex with men through age 26 years who have not received any HPV vaccine should receive vaccine at 0, 1 to 2, and 6 months.
  - Adult females and males through age 26 years with immunocompromising conditions (described below), i human immunodeficiency virus infection, should receive a 3-dose series of HPV vaccine at 0, 1 to 2, and 6
  - Pregnant women are not recommended to receive HPV vaccine, although there is no evidence that the va woman is found to be pregnant after initiating the HPV vaccination series, delay the remaining doses until other intervention is needed. Pregnancy testing is not needed before administering HPV vaccine.
  - Notes: Immunocompromising conditions for which a 3-dose series of HPV vaccine is indicated are primary immunocompromising conditions that might reduce cell-mediated or humoral immunity (eg, B-lymphocyte complete or partial T-lymphocyte defects, HIV infection, malignant neoplasm, transplantation, autoimmur immunosuppressive therapy).

‡ Pneumococcal vaccination:

- General information
  - Adults who are immunocompetent and aged 65 years or older should receive 13-valent pneumococcal cor followed by 23-valent pneumococcal polysaccharide vaccine (PPSV23) at least 1 year after PCV13.
  - Notes: Adults are recommended to receive 1 dose of PCV13 and 1, 2, or 3 doses of PPSV23 depending on PCV13 and PPSV23 are indicated, PCV13 should be administered first; PCV13 and PPSV23 should not be a same visit. If PPSV23 has previously been administered, PCV13 should be administered at least 1 year aft more doses of PPSV23 are indicated, the interval between PPSV23 doses should be at least 5 years. Supp pneumococcal vaccine timing for adults aged 65 years or older and adults aged 19 years or older at high r disease (described below) is available at https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo- additional doses of PPSV23 are indicated for adults who received PPSV23 at age 65 years or older. When i PPSV23 should be administered to adults whose pneumococcal vaccination history is incomplete or unkno
- Special populations
  - Adults aged 19 through 64 years with chronic heart disease including congestive heart failure and cardion hypertension); chronic lung disease including chronic obstructive lung disease, emphysema, and asthma; including cirrhosis; alcoholism; or diabetes mellitus; or who smoke cigarettes should receive PPSV23. At a they should receive PCV13 and another dose of PPSV23 at least 1 year after PCV13 and at least 5 years a of PPSV23.
  - Adults aged 19 years or older with immunocompromising conditions or anatomical or functional asplenia ( receive PCV13 and a dose of PPSV23 at least 8 weeks after PCV13, followed by a second dose of PPSV23 a first dose of PPSV23. If the most recent dose of PPSV23 was administered before age 65 years, at age 65 administer another dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the most recer

- Adults aged 19 years or older with cerebrospinal fluid leak or cochlear implant should receive PCV13 follo
weeks after PCV13. If the most recent dose of PPSV23 was administered before age 65 years, at age 65 y
another dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the most recent dose of P
- Notes: Immunocompromising conditions that are indications for pneumococcal vaccination are congenital
immunodeficiency including B- or T-lymphocyte deficiency, complement deficiencies, and phagocytic disor
granulomatous disease; human immunodeficiency virus infection; chronic renal failure and nephrotic sync
lymphoma, Hodgkin disease, generalized malignancy, and multiple myeloma; solid organ transplant; and
immunosuppression including long-term systemic corticosteroid and radiation therapy. Anatomical or func
indications for pneumococcal vaccination are sickle cell disease and other hemoglobinopathies, congenital
splenic dysfunction, and splenectomy. Pneumococcal vaccines should be given at least 2 weeks before imı
or an elective splenectomy, and as soon as possible to adults who are diagnosed with HIV infection.

† Hepatitis A vaccination:

- General information
  - Adults who seek protection from hepatitis A virus infection may receive a 2-dose series of single antigen h
at either 0 and 6 to 12 months (Havrix) or 0 and 6 to 18 months (Vaqta). Adults may also receive a comb
hepatitis B vaccine (HepA-HepB; Twinrix) as a 3-dose series at 0, 1, and 6 months. Acknowledgment of a
those who seek protection is not needed.
- Special populations
  - Adults with any of the following indications should receive a HepA series: have chronic liver disease, recei
concentrates, men who have sex with men, use injection or non-injection drugs, or work with hepatitis A
in a hepatitis A research laboratory setting.
  - Adults who travel in countries with high or intermediate levels of endemic hepatitis A infection or anticipat
with an international adoptee (eg, reside in the same household or regularly babysit) from a country with
of endemic hepatitis A infection within the first 60 days of arrival in the United States should receive a He

** Hepatitis B vaccination:

- General information
  - Adults who seek protection from hepatitis B virus infection may receive a 3-dose series of single-antigen h
Engerix-B, Recombivax HB) at 0, 1, and 6 months. Adults may also receive a combined hepatitis A and he
HepB; Twinrix) at 0, 1, and 6 months. Acknowledgment of a specific risk factor by those who seek protect
- Special populations
  - Adults at risk for hepatitis B virus infection by sexual exposure should receive a HepB series, including sex
surface antigen (HBsAg)-positive persons, sexually active persons who are not in a mutually monogamous
seeking evaluation or treatment for a sexually transmitted infection, and men who have sex with men (MS
  - Adults at risk for hepatitis B virus infection by percutaneous or mucosal exposure to blood should receive
adults who are recent or current users of injection drugs, household contacts of HBsAg-positive persons, r
facilities for developmentally disabled persons, incarcerated, healthcare and public safety workers at risk f
blood-contaminated body fluids, younger than age 60 years with diabetes mellitus, and age 60 years or o
at the discretion of the treating clinician.
  - Adults with chronic liver disease including, but not limited to, hepatitis C virus infection, cirrhosis, fatty liv
disease, autoimmune hepatitis, and an alanine aminotransferase (ALT) or aspartate aminotransferase (AS
twice the upper limit of normal should receive a HepB series.
  - Adults with end-stage renal disease including those on pre-dialysis care, hemodialysis, peritoneal dialysis,
receive a HepB series. Adults on hemodialysis should receive a 3-dose series of 40 mcg Recombivax HB a
4-dose series of 40 mcg Engerix-B at 0, 1, 2, and 6 months.
  - Adults with human immunodeficiency virus infection should receive a HepB series.
  - Pregnant women who are at risk for hepatitis B virus infection during pregnancy (eg, having more than or
previous six months, been evaluated or treated for a sexually transmitted infection, recent or current inje
HBsAg-positive sex partner) should receive a HepB series.
  - International travelers to regions with high or intermediate levels of endemic hepatitis B virus infection sh
series.
  - Adults in the following settings are assumed to be at risk for hepatitis B virus infection and should receive
transmitted disease treatment facilities, HIV testing and treatment facilities, facilities providing drug-abus
prevention services, healthcare settings targeting services to persons who inject drugs, correctional facilit
targeting services to MSM, hemodialysis facilities and end-stage renal disease programs, and institutions a
care facilities for developmentally disabled persons.

¶¶ Meningococcal vaccination:

- Special populations
  - Adults with anatomical or functional asplenia or persistent complement component deficiencies should rec
series of serogroups A, C, W, and Y meningococcal conjugate vaccine (MenACWY) at least 2 months apart

years. They should also receive a series of serogroup B meningococcal vaccine (MenB) with either a 2-dos (Bexsero) at least 1 month apart or a 3-dose series of MenB-FHbp (Trumenba) at 0, 1 to 2, and 6 months

- Adults with human immunodeficiency virus infection who have not been previously vaccinated should rece series of MenACWY at least 2 months apart and revaccinate every 5 years. Those who previously receivec should receive a second dose at least 2 months after the first dose. Adults with HIV infection are not routi receive MenB because meningococcal disease in this population is caused primarily by serogroups C, W, a
- Microbiologists who are routinely exposed to isolates of *Neisseria meningitidis* should receive 1 dose of Me every 5 years if the risk for infection remains, and either a 2-dose series of MenB-4C at least 1 month apa MenB-FHbp at 0, 1 to 2, and 6 months.
- Adults at risk because of a meningococcal disease outbreak should receive 1 dose of MenACWY if the outb serogroup A, C, W, or Y, or either a 2-dose series of MenB-4C at least 1 month apart or a 3-dose series o and 6 months if the outbreak is attributable to serogroup B.
- Adults who travel to or live in countries with hyperendemic or epidemic meningococcal disease should rec and revaccinate every 5 years if the risk for infection remains. MenB is not routinely indicated because me these countries is generally not caused by serogroup B.
- Military recruits should receive 1 dose of MenACWY and revaccinate every 5 years if the increased risk for
- First-year college students aged 21 years or younger who live in residence halls should receive 1 dose of received MenACWY at age 16 years or older.
- Young adults aged 16 through 23 years (preferred age range is 16 through 18 years) who are healthy and serogroup B meningococcal disease (described above) may receive either a 2-dose series of MenB-4C at l 2-dose series of MenB-FHbp at 0 and 6 months for short-term protection against most strains of serogrou disease.
- For adults aged 56 years or older who have not previously received serogroups A, C, W, and Y meningoco only 1 dose, meningococcal polysaccharide serogroups A, C, W, and Y vaccine (MPSV4) is preferred. For a received MenACWY or anticipate receiving multiple doses of serogroups A, C, W, and Y meningococcal vac preferred.
- Notes: MenB-4C and MenB-FHbp are not interchangeable (ie, the same vaccine should be used for all dos series). There is no recommendation for MenB revaccination at this time. MenB may be administered at th MenACWY but at a different anatomic site, if feasible.

ΔΔ *Haemophilus influenzae* type b vaccination:

- Special populations
  - Adults who have anatomical or functional asplenia or sickle cell disease, or are undergoing elective splene dose of *H. influenzae* type b conjugate vaccine (Hib) if they have not previously received Hib. Hib should l 14 days before splenectomy.
  - Adults with a hematopoietic stem cell transplant (HSCT) should receive 3 doses of Hib in at least 4 week i after transplant regardless of their Hib history.
  - Notes: Hib is not routinely recommended for adults with human immunodeficiency virus infection because Haemophilus influenzae type b infection is low.

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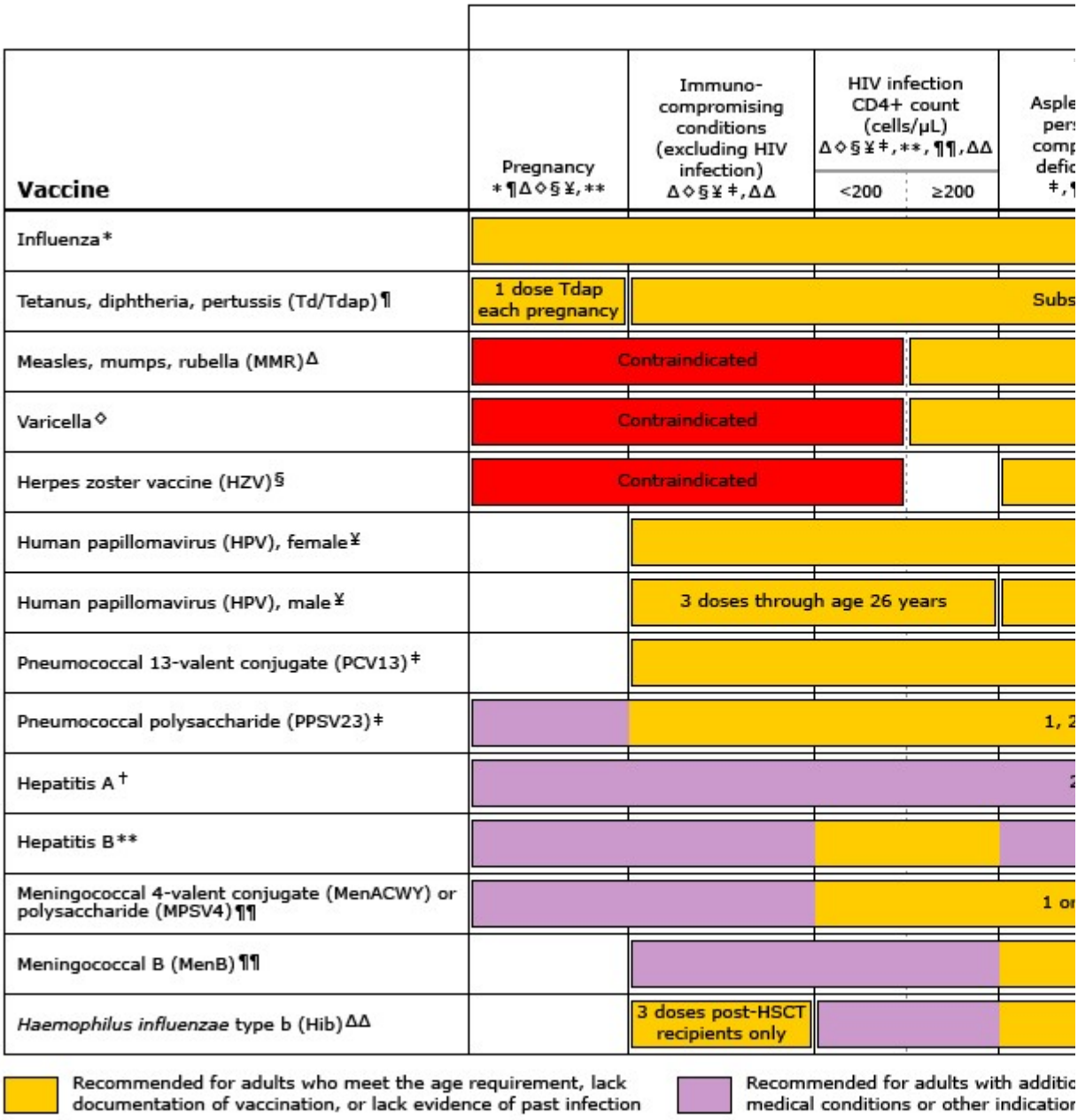
*Reproduced from: Advisory Committee on Immunization Practices (ACIP). Advisory Committee on Immunization P Immunization Schedule for Adults Aged 19 Years or Older: United States, 2017. Available at: http://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf (Accessed on February 8, 2*

Graphic 82634 Version 21.0

## Vaccines that might be indicated for adults based on medical and other indic




* Influenza vaccination:

- General information
  - All persons aged 6 months or older who do not have a contraindication should receive annual influenza va recombinant influenza vaccine (RIV).
  - In addition to standard-dose IIV, available options for adults in specific age groups include high-dose or a years, and RIV for adults aged 18 years or older.
  - Notes: Live attenuated influenza vaccine (LAIV) should not be used during the 2016 to 2017 influenza sea www.cdc.gov/flu/protect/vaccine/vaccines.htm.
- Special populations
  - Adults with a history of egg allergy who have only hives after exposure to egg should receive age-appropr
  - Adults with a history of egg allergy other than hives (eg, angioedema, respiratory distress, lightheadedne may receive age-appropriate IIV or RIV. The selected vaccine should be administered in an inpatient or ou recognize and manage severe allergic conditions.
  - Pregnant women and women who might become pregnant in the upcoming influenza season should receiv

¶ Tetanus, diphtheria, and acellular pertussis vaccination:

- General information

- Adults who have not received tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap) or for tetanus and diphtheria toxoids (Td) booster every 10 years. Tdap should be administered regardless of wl
- Adults with an unknown or incomplete history of a 3-dose primary series with tetanus and diphtheria toxc Unvaccinated adults should receive the first 2 doses at least 4 weeks apart and the third dose 6 to 12 mo
- Notes: Information on the use of Td or Tdap as tetanus prophylaxis in wound management is available at

▪ Special populations

- Pregnant women should receive 1 dose of Tdap during each pregnancy, preferably during the early part o

Δ Measles, mumps, and rubella vaccination:

▪ General information

- Adults born in 1957 or later without acceptable evidence of immunity to measles, mumps, or rubella (defi have a medical contraindication to the vaccine (eg, pregnancy or severe immunodeficiency).
- Notes: Acceptable evidence of immunity to measles, mumps, or rubella in adults is born before 1957, doc healthcare provider-diagnosed disease without laboratory confirmation is not acceptable evidence of imm

▪ Special populations

- Pregnant women who do not have evidence of immunity to rubella should receive 1 dose of MMR upon co pregnant women of childbearing age without evidence of rubella immunity should receive 1 dose of MMR.
- Adults with primary or acquired immunodeficiency including malignant conditions affecting the bone marr should not receive MMR.
- Adults with human immunodeficiency virus (HIV) infection and CD4+ T-lymphocyte count ≥200 cells/mcL receive 2 doses of MMR at least 28 days apart. Adults with HIV infection and CD4+ T-lymphocyte count <
- Adults who work in healthcare facilities should receive 2 doses of MMR at least 28 days apart; healthcare mumps, or rubella immunity, or laboratory confirmation of disease should be considered for vaccination w
- Adults who are students in postsecondary educational institutions or plan to travel internationally should r
- Adults who received inactivated (killed) measles vaccine or measles vaccine of unknown type during years
- Adults who were vaccinated before 1979 with either inactivated mumps vaccine or mumps vaccine of unk considered for revaccination with 2 doses of MMR at least 28 days apart.

◇ Varicella vaccination:

▪ General information

- Adults without evidence of immunity to varicella (defined below) should receive 2 doses of single-antigen
- Persons without evidence of immunity for whom VAR should be emphasized are adults who have close co household contacts of immunocompromised persons), adults who live or work in an environment in which staff in institutional settings), adults who live or work in environments in which varicella transmission has and military personnel), non-pregnant women of childbearing age, adolescents and adults living in housel
- Notes: Evidence of immunity to varicella in adults is United States-born before 1980 (for pregnant womer immunity), documentation of 2 doses of VAR at least 4 weeks apart, history of varicella or herpes zoster c laboratory evidence of immunity or disease.

▪ Special populations

- Pregnant women should be assessed for evidence of varicella immunity. Pregnant women who do not hav pregnancy and before discharge from the healthcare facility, and the second dose 4 to 8 weeks after the f
- Healthcare institutions should assess and ensure that all healthcare personnel have evidence of immunity
- Adults with malignant conditions, including those that affect the bone marrow or lymphatic system or who
- Adults with human immunodeficiency virus (HIV) infection and CD4+ T-lymphocyte count ≥200 cells/mcL count <200 cells/mcL should not receive VAR.

§ Herpes zoster vaccination:

▪ General information

- Adults aged 60 years or older should receive 1 dose of herpes zoster vaccine (HZV), regardless of whethe

▪ Special populations

- Adults aged 60 years or older with chronic medical conditions may receive HZV unless they have a medica
- Adults with malignant conditions, including those that affect the bone marrow or lymphatic system or who
- Adults with human immunodeficiency virus infection and CD4+ T-lymphocyte count <200 cells/mcL shoul

¥ Human papillomavirus vaccination:

▪ General information

- Adult females through age 26 years and adult males through age 21 years who have not received any hu 6 months. Males aged 22 through 26 years may be vaccinated with a 3-dose series of HPV vaccine at 0, 1
- Adult females through age 26 years and adult males through age 21 years (and males aged 22 through 2 15 years and received 2 doses at least 5 months apart are considered adequately vaccinated and do not r
- Adult females through age 26 years and adult males through age 21 years (and males aged 22 through 2 15 years and received only 1 dose, or 2 doses less than 5 months apart, are not considered adequately va
- Notes: HPV vaccination is routinely recommended for children at age 11 or 12 years. For adults who had i vaccination (described above) and other factors (described below) to determine if they have been adequa

- Special populations
  - Men who have sex with men through age 26 years who have not received any HPV vaccine should receive
  - Adult females and males through age 26 years with immunocompromising conditions (described below), i HPV vaccine at 0, 1 to 2, and 6 months.
  - Pregnant women are not recommended to receive HPV vaccine, although there is no evidence that the va delay the remaining doses until after the pregnancy. No other intervention is needed. Pregnancy testing is
  - Notes: Immunocompromising conditions for which a 3-dose series of HPV vaccine is indicated are primary immunity (eg, B-lymphocyte antibody deficiencies, complete or partial T-lymphocyte defects, HIV infectio

‡ Pneumococcal vaccination:

- General information
  - Adults who are immunocompetent and aged 65 years or older should receive 13-valent pneumococcal cor least 1 year after PCV13.
  - Notes: Adults are recommended to receive 1 dose of PCV13 and 1, 2, or 3 doses of PPSV23 depending on PCV13 and PPSV23 should not be administered during the same visit. If PPSV23 has previously been adm of PPSV23 are indicated, the interval between PPSV23 doses should be at least 5 years. Supplemental inf years or older at high risk for pneumococcal disease (described below) is available at https://www.cdc.go are indicated for adults who received PPSV23 at age 65 years or older. When indicated, PCV13 and PPSV2 unknown.
- Special populations
  - Adults aged 19 through 64 years with chronic heart disease including congestive heart failure and cardiom disease, emphysema, and asthma; chronic liver disease including cirrhosis; alcoholism; or diabetes mellit receive PCV13 and another dose of PPSV23 at least 1 year after PCV13 and at least 5 years after the mos
  - Adults aged 19 years or older with immunocompromising conditions or anatomical or functional asplenia ( followed by a second dose of PPSV23 at least 5 years after the first dose of PPSV23. If the most recent do another dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the most recent dose of P
  - Adults aged 19 years or older with cerebrospinal fluid leak or cochlear implant should receive PCV13 follov administered before age 65 years, at age 65 years or older, administer another dose of PPSV23 at least 8
  - Notes: Immunocompromising conditions that are indications for pneumococcal vaccination are congenital and phagocytic disorders excluding chronic granulomatous disease; human immunodeficiency virus infecti generalized malignancy, and multiple myeloma; solid organ transplant; and iatrogenic immunosuppressio asplenia that are indications for pneumococcal vaccination are sickle cell disease and other hemoglobinop vaccines should be given at least 2 weeks before immunosuppressive therapy or an elective splenectomy,

† Hepatitis A vaccination:

- General information
  - Adults who seek protection from hepatitis A virus infection may receive a 2-dose series of single antigen h (Vaqta). Adults may also receive a combined hepatitis A and hepatitis B vaccine (HepA-HepB; Twinrix) as seek protection is not needed.
- Special populations
  - Adults with any of the following indications should receive a HepA series: have chronic liver disease, recei drugs, or work with hepatitis A virus-infected primates or in a hepatitis A research laboratory setting.
  - Adults who travel in countries with high or intermediate levels of endemic hepatitis A infection or anticipat regularly babysit) from a country with high or intermediate level of endemic hepatitis A infection within th

** Hepatitis B vaccination:

- General information
  - Adults who seek protection from hepatitis B virus infection may receive a 3-dose series of single-antigen h receive a combined hepatitis A and hepatitis B vaccine (HepA-HepB; Twinrix) at 0, 1, and 6 months. Ackn
- Special populations
  - Adults at risk for hepatitis B virus infection by sexual exposure should receive a HepB series, including sex are not in a mutually monogamous relationship, persons seeking evaluation or treatment for a sexually tr
  - Adults at risk for hepatitis B virus infection by percutaneous or mucosal exposure to blood should receive contacts of HBsAg-positive persons, residents and staff of facilities for developmentally disabled persons, contaminated body fluids, younger than age 60 years with diabetes mellitus, and age 60 years or older wi
  - Adults with chronic liver disease including, but not limited to, hepatitis C virus infection, cirrhosis, fatty liv or aspartate aminotransferase (AST) level greater than twice the upper limit of normal should receive a H
  - Adults with end-stage renal disease including those on pre-dialysis care, hemodialysis, peritoneal dialysis, series of 40 mcg Recombivax HB at 0, 1, and 6 months or a 4-dose series of 40 mcg Engerix-B at 0, 1, 2,
  - Adults with human immunodeficiency virus infection should receive a HepB series.
  - Pregnant women who are at risk for hepatitis B virus infection during pregnancy (eg, having more than or transmitted infection, recent or current injection drug use, or had an HBsAg-positive sex partner) should r
  - International travelers to regions with high or intermediate levels of endemic hepatitis B virus infection sh

- Adults in the following settings are assumed to be at risk for hepatitis B virus infection and should receive facilities, facilities providing drug-abuse treatment and prevention services, healthcare settings targeting to MSM, hemodialysis facilities and end-stage renal disease programs, and institutions and nonresidential

¶¶ Meningococcal vaccination:

- Special populations
  - Adults with anatomical or functional asplenia or persistent complement component deficiencies should rec (MenACWY) at least 2 months apart and revaccinate every 5 years. They should also receive a series of s least 1 month apart or a 3-dose series of MenB-FHbp (Trumenba) at 0, 1 to 2, and 6 months.
  - Adults with human immunodeficiency virus infection who have not been previously vaccinated should rece Those who previously received 1 dose of MenACWY should receive a second dose at least 2 months after meningococcal disease in this population is caused primarily by serogroups C, W, and Y.
  - Microbiologists who are routinely exposed to isolates of *Neisseria meningitidis* should receive 1 dose of Me of MenB-4C at least 1 month apart or a 3-dose series of MenB-FHbp at 0, 1 to 2, and 6 months.
  - Adults at risk because of a meningococcal disease outbreak should receive 1 dose of MenACWY if the outb month apart or a 3-dose series of MenB-FHbp at 0, 1 to 2, and 6 months if the outbreak is attributable to
  - Adults who travel to or live in countries with hyperendemic or epidemic meningococcal disease should rec not routinely indicated because meningococcal disease in these countries is generally not caused by serog
  - Military recruits should receive 1 dose of MenACWY and revaccinate every 5 years if the increased risk for
  - First-year college students aged 21 years or younger who live in residence halls should receive 1 dose of
  - Young adults aged 16 through 23 years (preferred age range is 16 through 18 years) who are healthy an either a 2-dose series of MenB-4C at least 1 month apart or a 2-dose series of MenB-FHbp at 0 and 6 mo
  - For adults aged 56 years or older who have not previously received serogroups A, C, W, and Y meningoco vaccine (MPSV4) is preferred. For adults who previously received MenACWY or anticipate receiving multip
  - Notes: MenB-4C and MenB-FHbp are not interchangeable (ie, the same vaccine should be used for all dos MenB may be administered at the same time as MenACWY but at a different anatomic site, if feasible.

ΔΔ *Haemophilus influenzae* type b vaccination:

- Special populations
  - Adults who have anatomical or functional asplenia or sickle cell disease, or are undergoing elective splene previously received Hib. Hib should be administered at least 14 days before splenectomy.
  - Adults with a hematopoietic stem cell transplant (HSCT) should receive 3 doses of Hib in at least 4 week i
  - Notes: Hib is not routinely recommended for adults with human immunodeficiency virus infection because

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*Reproduced from: Advisory Committee on Immunization Practices (ACIP). Advisory Committee on Immunization P 2017. Available at: http://www.cdc.gov/vaccines/schedules/downloads/adult/adult-combined-schedule.pdf (Acces*

Graphic 62130 Version 14.0

## Administering vaccines to adults: Dose, route, site, needle size, and preparation

| Vaccine | Dose | Route | Site | Needle size | Vaccine preparation |
|---|---|---|---|---|---|
| Tetanus, Diphtheria (Td) with Pertussis (Tdap) | 0.5 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | Shake vial vigorously to obtain a uniform suspension prior to withdrawing each dose. Whenever solution and container permit, inspect vaccine visually for particulate matter and/or discoloration prior to administration. If problems are noted (eg, vaccine cannot be resuspended), the vaccine should not be administered. |
| Hepatitis A (HepA) | ≤18 yrs.:0.5 mL ≤19 yrs.:1.0 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| Hepatitis B (HepB) | ≤19 yrs.:0.5 mL ≥20 yrs.:1.0 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| HepA+HepB (Twinrix) | ≥18 yrs.:1.0 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| Human papillomavirus (HPV) | 0.5 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| Influenza, trivalent inactivated (TIV) | 0.5 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| Pneumococcal polysaccharide (PPSV) | 0.5 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| | | SC | Fatty tissue over triceps | 23 to 25 g, ⅝" | |
| Meningococcal, conjugated (MCV) | 0.5 mL | IM | Deltoid muscle | 22 to 25 g, 1 to 1½"* | |
| Meningococcal, polysaccharide (MPSV) | 0.5 mL | SC | Fatty tissue over triceps | 23 to 25 g, ⅝" | Reconstitute just before using. Use only the diluent supplied with the vaccine. Inject the volume of the diluent shown on the diluent label into the vial of lyophilized vaccine and gently agitate to mix thoroughly. Withdraw the entire contents and administer immediately after reconstitution.<br>Discard single dose MPSV, varicella, and zoster vaccines if not used within 30 minutes after reconstitution. |
| Measles, mumps, rubella (MMR) | 0.5 mL | SC | Fatty tissue over triceps | 23 to 25 g, ⅝" | |
| Zoster (Zos) | 0.65 mL | SC | Fatty tissue over triceps | 23 to 25 g, ⅝" | |
| Varicella (Var) | 0.5 mL | SC | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | Fatty tissue over triceps | 23 to 25 g, ⅝" | **Note:** Unused reconstituted MMR vaccine and multidose MPSV vaccine may be stored at 35°46°F (2°8°C) for a limited time. The reconstituted MPSV vaccine must be used within 35 days; the reconstituted MMR vaccine must be used within 8 hours. Do not freeze either reconstituted vaccine. |
| Influenza, live, attenuated (LAIV) | 0.2 mL (0.1 mL into each nostril) | Intranasal spray | Intranasal | NA | Consult package insert |

**Please note:** Always refer to the package insert included with each biologic for complete vaccine administration information. Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP) recommendations for the particular vaccine should be reviewed as well. Access the ACIP recommendations at www.immunize.org/acip.

IM: intramuscular; SC: subcutaneous; NA: not applicable.
* When giving intramuscular injections, a ⅝" needle is sufficient in adults weighing <130 lbs (<60 kg); a 1" needle is sufficient in adults weighing 130 to 152 lbs (60 to 70 kg); a 1 to 1½" needle is recommended in women weighing 152 to 200 lbs (70 to 90 kg) and men weighing 152 to 260 lbs (70 to 118 kg); a 1½" needle is recommended in women weighing >200 lbs (>90 kg) or men weighing >260 lbs (>118 kg). A ⅝" (16 mm) needle may be used only if the skin is stretched tight, the subcutaneous tissue is not bunched, and injection is made at a 90-degree angle.



Graphic 81508 Version 2.0

**Indications and timing of the infertility evaluation**

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|---|
| **Infertility evaluation is indicated for couples who seek help because they have not been able to conceive.** |
| **1. Initiate evaluation after 12 months of unprotected and frequent intercourse:** |
| Women under age 35 years without risk factors for infertility. |
| **2. Initiate evaluation after six months of unprotected and frequent intercourse:** |
| Women age 35 to 40 years. |
| **3. Initiate evaluation upon presentation despite less than six months of unprotected and frequent intercourse:** |
| Women over age 40 years. |
| Women with oligomenorrhea/amenorrhea. |
| Women with a history of chemotherapy, radiation therapy, or advanced stage endometriosis. |
| Women with known or suspected uterine/tubal disease. |
| Women whose male partner has a history of groin or testicular surgery, adult mumps, impotence or other sexual dysfunction, chemotherapy and/or radiation, or a history of subfertility with another partner. |

Graphic 70415 Version 4.0

## Contributor Disclosures

**Joyce A Sackey, MD, FACP** Nothing to disclose **Louise Wilkins-Haug, MD, PhD** Nothing to disclose **Vanessa A Barss, MD, FACOG** Nothing to disclose

Contributor disclosures are reviewed for conflicts of interest by the editorial group. When found, these are addressed by vetting through a multi-level review process, and through requirements for references to be provided to support the content. Appropriately referenced content is required of all authors and must conform to UpToDate standards of evidence.

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