



PHARMACY TECHNICIAN IMMUNIZATION

iCARE Pharmacy Services, Inc.

Table of Contents

| | |
|---|----------------|
| 1. Introduction..... | p . 2 |
| 2. Technician Role in Immunizations..... | p. 3 |
| 3. Vaccine Preventable Diseases..... | p. 4-16 |
| a. <i>Coronavirus</i> | |
| b. <i>Hepatitis A and B</i> | |
| c. <i>H. influenza type B</i> | |
| d. <i>Human Papillomavirus</i> | |
| e. <i>Influenza</i> | |
| f. <i>Measles, Mumps, Rubella</i> | |
| g. <i>Meningococcal Disease</i> | |
| h. <i>Pneumococcal</i> | |
| i. <i>Polio</i> | |
| j. <i>Respiratory Syncytial Virus</i> | |
| k. <i>Rotavirus</i> | |
| l. <i>Tetanus, Diphtheria, and Pertussis</i> | |
| m. <i>Varicella Zoster</i> | |
| 4. Types of Vaccines..... | p. 16 |
| 5. Routes of Administration..... | p. 20 |
| 6. Vaccine Preparation and Administration..... | p. 20 |
| 7. Storage and Handling..... | p. 22 |
| 8. Vaccine Information Statements..... | p. 23 |

| | |
|--|---------------|
| 9. Adult Vaccines..... | p. 24- |
| 10. International Vaccines..... | p. 41 |
| 11. Conclusion..... | p. 43 |
| 12. References..... | p. 44 |

INTRODUCTION

Vaccination is a simple, safe, and effective way of protecting the body against harmful diseases. It uses the body’s natural defenses to build resistance to specific infections and makes the immune system stronger.

Vaccines train the immune system to create antibodies, just as it does when it is exposed to a particular disease. Vaccines contain only killed or weakened forms of viruses or bacteria and do not cause the disease or put one at risk of its complications.

Vaccines reduce risks of acquiring a disease by working with the body’s natural defenses to build protection. When a person receives a vaccine, the immune system responds by:

- Recognizing the virus or bacteria
- Producing antibodies, which are proteins produced naturally by the immune system to fight disease
- Remembering the disease and how to fight it; If a person is exposed to the virus in the future, the immune system may quickly destroy it before becoming ill

The immune system is designed to remember. Vaccinated individuals typically remain protected against a disease for years, decades or even a lifetime once exposed to one or more doses of a vaccine, thus preventing persons from getting sick when exposed to a disease.

Vaccines have had a dramatic impact on public health, especially since the COVID-19 pandemic. Despite the effectiveness of vaccines, rates of immunization against some vaccine-preventable diseases have been low. Pharmacists have been instrumental in providing vaccinations. In Florida, pharmacists are authorized to give all vaccines listed in the Centers for Disease Control and Prevention and Advisory Committee on Immunization Practices Adult Immunization Schedule, as well as immunizations or vaccines recommended by the CDC for international travel and those licensed for use in the United States, or which have been authorized for emergency use, by the United States Food and Drug Administration. Effective July 1, 2021, pharmacists may also administer influenza vaccines to individuals seven years of age or older. In October 2020, the U.S. Department of Health and Human Services (HHS) issued guidance

authorizing trained pharmacy technicians in all states to administer immunizations under the Public Readiness and Emergency Preparedness Act (PREP Act). In October 2022, the Florida Board of Pharmacy finalized its statutes from 2022 legislation which allow pharmacy technicians to administer immunizations under the supervision of a pharmacist. Florida Statutes 465.189 (1) In accordance with guidelines of the Centers for Disease Control and Prevention for each recommended immunization or vaccine, a pharmacist who is certified under subsection (7) or a registered intern or a registered pharmacy technician under the supervision of such pharmacist may administer the following immunizations or vaccines to an adult within the framework of an established protocol under a supervising physician licensed under chapter 458 or chapter 459:

(a) Immunizations or vaccines listed in the Adult Immunization Schedule as of March 31, 2022, by the United States Centers for Disease Control and Prevention. The board may authorize by rule additional immunizations or vaccines as they are added to the Adult Immunization Schedule.

(b) Immunizations or vaccines recommended by the United States Centers for Disease Control and Prevention for international travel as of March 31, 2022. The board may authorize by rule additional immunizations or vaccines as they are recommended by the United States Centers for Disease Control and Prevention for international travel.

(c) Immunizations or vaccines licensed for use in the United States, or which have been authorized for emergency use, by the United States Food and Drug Administration as of March 31, 2022.

This course addresses the role of technicians in immunization and the benefits of their involvement in administering vaccines. The focus of the course is on the various vaccine preventable diseases, types of vaccines, routes of administration, vaccine preparation, and steps technicians must take to ensure the safe storage, handling, and administration of vaccines. Technicians play a pivotal role in increasing the number of vaccinated people, thus enhancing the overall health and well-being of today's society.

TECHNICIAN ROLE IN IMMUNIZATIONS

Pharmacists have played a role in immunization for decades. In July 2015, Florida House Bill 279 expanded authority of pharmacists to allow for the administration of immunizations and vaccines listed in the Centers for Disease Control and Prevention (CDC) and Advisory Committee on Immunization Practices (ACIP) Adult Immunization Schedule. Now, pharmacy technicians may administer Immunizations or vaccines listed in the Adult Immunization Schedule as of March 31, 2022, by the United States Centers

for Disease Control and Prevention. A registered intern or registered pharmacy technician who administers an immunization or vaccine under this subsection must be supervised by a certified pharmacist at a ratio of one pharmacist to a maximum of five registered interns or registered pharmacy technicians, or a combination thereof.

The adult immunization schedule includes vaccines against influenza, Tdap (tetanus, diphtheria, and pertussis) or Td (tetanus and diphtheria), MMR (measles, mumps, and rubella), varicella, zoster, human papillomavirus (HPV), pneumococcal, hepatitis A and B, meningococcal disease, and Covid-19. As stated, a vaccine protocol must be established under a remote supervising physician licensed under Chapter 458, Florida Statutes (F.S.) or Chapter 459, F.S.

Florida law does not require technicians to administer epinephrine in a case of anaphylactic reaction to a vaccination; however, it is recommended to be knowledgeable in the area.

A registered pharmacy technician seeking to administer vaccines under Florida Statute (F.S.) 465.189 must be certified to administer such vaccines pursuant to a certification program approved by the board in consultation with the Board of Medicine and the Board of Osteopathic Medicine. The certification program must have at least 6 hours of immunization-related training approved by the board that shall, at a minimum, have a curriculum of instruction concerning the safe and effective administration of such vaccines, including, but not limited to, potential allergic reactions to such vaccines. As a condition of registration renewal, a registered pharmacy technician seeking to administer vaccines under F.S. 465.189 must have at least 2 hours of continuing education approved by the board in addition to the biennial continuing education requirements.

VACCINE PREVENTABLE DISEASES

Coronaviruses

Coronaviruses (CoVs) are a group of single-stranded RNA viruses that can cause illness in a variety of mammals and birds. There are numerous CoV strains that cause infection in humans.

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some may not exhibit any symptoms at all. Older people and those with underlying medical conditions such as cardiovascular disease, diabetes, chronic respiratory disease, or cancer may develop serious illness. COVID-19 symptoms include cough, fever or chills, shortness of breath

or difficulty breathing, muscle or body aches, sore throat, loss of taste or smell, diarrhea, headache, fatigue, nausea or vomiting, congestion, or runny nose.

Anyone can get sick with COVID-19 and become seriously ill or die at any age. Currently, researchers are aware that the coronavirus is spread through droplets and virus particles released into the air when an infected person breathes, talks, laughs, sings, coughs, or sneezes. Larger droplets may fall to the ground in a few seconds, but tiny infectious particles can linger in the air and accumulate in indoor places, especially where many people are gathered and there is poor ventilation. Prevention strategies include good hygiene, physical distance between yourself and others, and wearing a mask. Treatment for mild to moderate COVID-19 include antiviral medications such as Nirmatrelvir with Ritonavir, Remdesivir, and Molnupiravir. Hospitalized COVID patients will receive other medications depending on severity. The FDA has authorized a preventive monoclonal antibody, Pemivibart, for people who are moderately or severely immunocompromised. The patients must be at least 12 years of age and weigh at least 88 pounds. A healthcare provider gives Pemivibart as a single intravenous infusion over 60 minutes at a doctor's office or healthcare facility. If continued protection is needed, additional doses should be administered every 3 months.

There are several COVID-19 vaccines recommended by the CDC. It is also important to recommend a booster when a patient is eligible. Vaccination and prevention strategies are the most effective means to prevent virus transmission. Although no one measure is 100%, the use of multiple strategies will enhance the effectiveness of spreading the virus.

TEST YOUR KNOWLEDGE #1

At what age can Pemibivart be administered?

- a. 6 months
- b. 5 years
- c. 12 years
- d. 18 years

Hepatitis A and B

Hepatitis means inflammation of the liver. Hepatitis A is an inflammation of the liver that can cause mild to severe illness. The hepatitis A virus (HAV) is transmitted through ingestion of contaminated food and water or through direct contact with an infectious person. Almost everyone recovers fully from hepatitis A with a lifelong immunity. The risk of hepatitis A infection is associated with unsafe water or food, poor sanitation, poor personal hygiene (such as contaminated and dirty hands), and oral-anal sex. Hepatitis A does not cause chronic liver disease like Hepatitis B and C. A safe and effective vaccine is available to prevent hepatitis A.

Hepatitis B is a serious liver infection caused by the hepatitis B virus (HBV). For most people, hepatitis B is short term, also called acute, and lasts less than six months. For others, the infection can become chronic, lasting more than six months. Chronic hepatitis B increases the risk of developing liver failure, liver cancer or cirrhosis — a condition that permanently scars the liver. Hepatitis B signs and symptoms may include abdominal pain, dark urine, fever, joint pain, loss of appetite, nausea and vomiting, weakness, and fatigue. Yellowing of the skin and the whites of the eyes is called jaundice. A vaccine can prevent hepatitis B, but there is no cure if one has the condition. The infected person can take certain precautions to help prevent spreading the virus to others.

TEST YOUR KNOWLEDGE #2

Which organ is affected by hepatitis?

- a. brain
- b. kidney
- c. liver
- d. lung

Human Papillomavirus (HPV) *(disclaimer: graphic pictures)*

HPV is a viral infection that commonly causes skin or mucous membrane growths (warts). There are more than 100 varieties of HPV. Some types of HPV infection cause warts, and some can cause different types of cancer. These infections are often transmitted sexually or through other skin-to-skin contact. Vaccines can help protect against the strains of HPV most likely to cause genital warts or cervical cancer. In most cases, the body's immune system defeats an HPV infection before it creates warts. When warts do appear, they vary in appearance depending on which kind of HPV is involved. The different types of warts are:

- **Genital warts.** These appear as flat lesions, small cauliflower-like bumps or tiny stemlike protrusions. In women, genital warts appear mostly on the

vulva but can also occur near the anus, on the cervix or in the vagina.



In men, genital warts appear on the penis and scrotum or around the anus. Genital warts rarely cause discomfort or pain, though they may itch or feel tender.

- **Common warts.** Common warts appear as rough, raised bumps and usually occur on the hands and fingers. In most cases, common warts are unharmed, but they can also be painful or susceptible to injury or bleeding.



- **Plantar warts.** Plantar warts are hard, grainy growths that usually appear on the heels or balls of your feet. These warts might cause discomfort.



- **Flat warts.** Flat warts are flat-topped, slightly raised lesions. They can appear anywhere, but children usually get them on the face and men tend to get them in the beard area. Women tend to get them on the legs.



Nearly all cervical cancers are caused by HPV infections, but cervical cancer may take 20 years or longer to develop after an HPV infection. The HPV infection and early cervical cancer typically do not cause noticeable symptoms. Getting vaccinated against HPV infection is the best protection from cervical cancer.

It is vital for women to have regular screening tests to detect any precancerous changes in the cervix that might lead to cancer because early cervical cancer does not cause symptoms. Current guidelines recommend that women ages 21 to 29 have a Pap test every three years.

Women ages 30 to 65 are advised to continue having a Pap test every three years, or every five years if they also get the HPV DNA test at the same time. Women over 65 can stop testing if they have had three normal Pap tests in a row, or two HPV DNA and Pap tests with no abnormal results.

TEST YOUR KNOWLEDGE #3

Which type of cancer can develop 20 years later after an HPV infection?

- a. breast
- b. cervical
- c. colon
- d. lung

H. influenzae type B

H. influenzae disease is a name for any infection caused by *H. influenzae* bacteria. *H. influenzae* live in people's nose and throat. These bacteria are usually harmless. However, they can move to other parts of the body and cause infection. People spread *H. influenzae* to others by **coughing or sneezing**, which creates small respiratory droplets that contain the bacteria. Other people can get infected if they inhale in the droplets. People who are not sick but have the bacteria in their nose and throat can still spread the bacteria.

H. influenzae can cause many different types of infections ranging from mild, like ear infections or bronchitis, to serious, like infections of the blood. The **most common serious infections** caused by *H. influenzae* are:

- Bloodstream infection
- Cellulitis (skin infection)
- Epiglottitis (throat swelling)
- Infectious arthritis (joint swelling)
- Meningitis (brain and spinal cord swelling)
- Pneumonia (lung infection)

People at increased risk for Hib include children younger than age 5, adults 65 years and older, and children of African American, Alaska Native and American Indian descent.

Vaccines can prevent Hib disease, but not disease caused by other *H. influenzae*. The best way to prevent Hib disease is to get vaccinated. CDC recommends Hib vaccines for **all children** younger than 5 years old.

FYI...there are 6 types of *H influenzae*, name a – f. Type b is the most common.

TEST YOUR KNOWLEDGE #4

Only sick people can spread the Hib bacteria?

- a. True
- b. False

Influenza

Influenza (Flu) is an infection of the respiratory tract, including the nose, throat, and lungs, and is a top leading cause of death in the United States (US). Initially, influenza may seem like a common cold with a runny nose, sneezing and sore throat. However, colds usually develop slowly, while influenza tends to come on suddenly. An infected person will usually feel worse with influenza versus a cold. Influenza virus is commonly spread by respiratory droplets introduced into the air by coughing or sneezing. Typically, the virus is spread from person to person. However, people can also acquire it by touching something with the virus on it and then by touching their mouth or nose.

Common symptoms of influenza include fever, muscle aches, chills and sweats, headaches, dry, persistent cough, shortness of breath, tiredness, and weakness. It is important to note that not everyone will have a fever with influenza. Runny or stuffy nose, sore throat, eye pain, vomiting and diarrhea may occur, but this is more common in children than adults.

Most people with influenza tend to get better on their own; however, influenza and its complications can be deadly. People at higher risk of developing influenza complications include:

- Children under age 2
- Adults older than age 65
- Residents of nursing homes and other long-term care facilities
- People who are pregnant or plan to be pregnant during flu season
- People with weakened immune systems
- American Indians or Alaska Natives
- People who have chronic illnesses, such as asthma, heart disease, kidney disease, liver disease and diabetes
- People with a body mass index (BMI) of 40 or higher

People with the flu can spread the virus to others without being sick. People with the flu are most contagious during the first three days of illness. Influenza is seasonal in the US, with a peak most often in February. Although the annual influenza vaccine is not 100% effective, it reduces the chances of having severe complications from infection.

TEST YOUR KNOWLEDGE #5

Which part of the respiratory tract is not infected by influenza?

- a. ear
- b. lung
- c. nose
- d. throat

Measles, Mumps, and Rubella (MMR)

Measles is a highly contagious virus transmitted primarily from person-to-person through respiratory droplets. Airborne transmission is also possible, especially in closed spaced areas. People without immunity who are exposed to the virus have an extremely high chance of becoming infected. The major sign of measles is an increasing fever followed by cough, runny nose and a rash beginning on the face and upper neck and moving down the body over the course of a few days. Most people with the disease recover after a week. Diarrhea, ear infection, and pneumonia are the three most common complications. Pneumonia accounts for the majority of measles-related deaths. Measles occurs most often in late winter and spring.

Mumps is an acute disease of children and young adults, caused by a group of viruses of which there is only a single serotype. It is spread through airborne droplets or by direct contact with an infected droplet or saliva. Mumps virus produces no symptoms in about one-third of infected people. In those with symptoms, glands and nerve tissue are most often affected. The most common signs are fever and swelling of the parotid glands. The mumps vaccine was introduced in the US in 1967, and there was a significant decrease in the number of reported cases of mumps. Recent years have shown outbreaks, and the ACIP recommended a third dose of a mumps-containing vaccine for people who have received two doses.

Rubella (German measles) is a mild illness, accompanied by few symptoms, such as a rash, and occurs most commonly in childhood. It is transmitted person-to-person through droplets shed from respiratory secretions to infected persons. If the infection occurs in a woman in early pregnancy, the virus may cross the placenta to reach the fetus and cause birth defects. These defects may be serious and permanent. The defects include congenital heart disease, cataract formation, deafness, and mental impairment. As a result, the prevention of fetal infection is the primary purpose of rubella immunization.

TEST YOUR KNOWLEDGE #6

How are measles transmitted?

- a. touching an infected person
- b. touching an infected surface
- c. respiratory droplets
- d. hugging an infected person

Meningococcal Disease

Meningococcal disease describes infections caused by the bacterium *Neisseria meningitidis* (also termed meningococcus). It has a high mortality rate if untreated but is vaccine-preventable. It is the cause of meningitis and can also result in sepsis, which is a life threatening and dangerous condition. Meningeal infection is characterized by a sudden onset of fever, headache, and stiff neck, often with symptoms of nausea, vomiting, and altered mental status. People spread meningococcal bacteria to other people by sharing respiratory and throat secretions (saliva or spit). Those at increased risk of getting sick include:

- Roommates
- People in the same household
- Anyone with direct contact with the patient's oral secretions, such as a kissing partner

TEST YOUR KNOWLEDGE #7

Which of the following is not a sudden onset of symptoms?

- a. bleeding
- b. fever
- c. headache
- d. stiff neck

Pneumococcal

Pneumococcal disease is an infection caused by bacteria called *Streptococcus pneumoniae* (also known as pneumococcus). It is contagious and may cause severe illness, so early diagnosis and treatment is important. Transmission occurs through direct person-to-person contact via respiratory droplets.

Pneumococcal disease can affect many different systems in your body. It may result in conditions with mild symptoms like sinusitis. It can also lead to pneumonia, sepsis (blood infection) or bacterial meningitis (infection of the membranes that protect the spinal cord and brain) — all which may be life-threatening at any age.

Treatment typically involves antibiotics. Vaccines can reduce the risk of infection, especially in young children and older adults.

TEST YOUR KNOWLEDGE #8

Which of the following is not a life threatening symptom of pneumococcal?

- a. meningitis
- b. pneumonia
- c. sepsis
- d. sinusitis

Polio

Poliovirus is very contagious. Poliovirus only infects people, entering the body through the mouth. It lives in an infected person's throat and intestines and spreads through person-to-person contact. It can also contaminate food and water in unsanitary conditions.

You can get polio from:

- Contact with the feces (poop) of an infected person
- Droplets from a sneeze or cough of an infected person (less common)

Polio vaccine protects children by preparing their bodies to fight the poliovirus. For best protection, children should get 4 doses of inactivated polio vaccine (IPV). Almost all children (more than 99%) who get all the recommended doses of the inactivated polio vaccine will be protected.

Most people who get infected with poliovirus **will not** have any visible symptoms. About **1 out of 4 people** with poliovirus infection will have flu-like symptoms that can include: Sore throat, Fever, Tiredness, Nausea; Headache; Stomach pain. Symptoms usually last 2 to 5 days, then go away on their own.

Respiratory Syncytial Virus (RSV)

Respiratory syncytial virus, or RSV, is a common respiratory virus that infects the lungs, nose, respiratory tract, and throat. RSV symptoms are not specific, which makes it difficult to distinguish RSV from the common cold or other respiratory viruses (like the flu or COVID-19). RSV spreads in the fall and winter along with other respiratory viruses and peaks in December and January.

RSV does not usually cause severe illness in healthy adults and children. However, some people with RSV infection, especially infants younger than 6 months of age and adults who are older or have certain risk factors, may experience more severe illnesses such as bronchiolitis (inflammation of the small airways in the lungs) and pneumonia (infection of the lungs).

RSV spreads when an infected person coughs or sneezes, by direct contact with someone who has RSV, or by touching a contaminated surface object. People with RSV are usually contagious for 3 to 8 days and may become contagious a day or two before they start showing signs of illness

Everyone can take actions to help reduce the spread of RSV and other respiratory viruses by practicing good hygiene, covering coughs and sneezes, taking steps for cleaner air, and staying home and away from others when ill.

TEST YOUR KNOWLEDGE #9

Which body part is not infected by RSV?

- a. eyes
- b. lungs
- c. nose
- d. throat

Rotavirus

Rotavirus disease is most common in infants and young children. However, older children and adults, including people with weakened immune systems, can also get sick from rotavirus. Rotavirus spreads in families, daycare centers, and hospitals. Children are most likely to obtain rotavirus in the winter and spring months, January through June.

Rotavirus causes common symptoms like watery diarrhea and vomiting. Other symptoms include fever and stomach pain. Symptoms of rotavirus usually start about 2 days after a person is exposed to the virus. Vomiting and watery diarrhea can last 3 to 8 days. Dehydration can occur and can be dangerous for infants and young children. Dehydration symptoms include: crying with few to no tears, decreased urine output, dry mouth and throat, dizziness upon standing and unusual sleepiness and fussiness.

Rotavirus vaccination is the best way to protect your child from rotavirus disease. Good hygiene like handwashing and cleanliness are important.

TEST YOUR KNOWLEDGE #10

Which of the following is not a sign of dehydration?

- a. crying tears of joy
- b. decrease urine
- c. dry mouth
- d. dizziness

Tetanus, diphtheria, and pertussis (Tdap) or Tetanus and diphtheria (Td)

Tetanus, also known as **lockjaw**, is a bacterial infection caused by *Clostridium tetani*, and is characterized by muscle spasms. In the most common type, the spasms begin in the jaw and then progress to the rest of the body. Each spasm usually lasts a few minutes. Spasms occur frequently for three to four weeks. Some spasms may be severe enough to fracture bones. Other symptoms of tetanus may include fever, sweating, headache, trouble swallowing, high blood pressure, and a fast heart rate. Onset of symptoms is typically three to twenty-one days following infection. Recovery may take months. Some cases have proven to be fatal. *C. tetani* is commonly found in soil, saliva, dust, and manure. The bacteria generally enter through a break in the skin such as a cut or puncture wound by a contaminated object and produce toxins that interfere with normal muscle contractions. Diagnosis is based on the presenting signs and symptoms. The disease does not spread between people. Tetanus can be prevented by immunization with the tetanus vaccine.

Diphtheria is a bacterial infection of the nose and throat caused by *Corynebacterium diphtheriae*. Diphtheria is an infectious disease that spreads from person to person through respiratory droplets expelled during coughing and sneezing. Common signs and symptoms associated with diphtheria include sore throat, fever, and the development of an adherent membrane covering the tonsils and throat. In the US, diphtheria was once a common cause of illness and death among children but is now rare. A vaccine was introduced in the 1920s, and it became a universal childhood vaccine in the late 1940s.

Pertussis, also known as whooping cough, is a highly contagious respiratory infection caused by the bacterium *Bordetella pertussis*. Pertussis spreads easily from person to person mainly through droplets produced by coughing or sneezing. The disease is most dangerous in infants and is a significant cause of disease and death in this population. The first symptoms generally appear 7 to 10 days after infection. The symptoms include mild fever, runny nose, and cough, which gradually develops into a hacking cough followed by whooping (hence the common name of whooping cough). Pneumonia is a relatively common complication of pertussis. People with pertussis are most contagious up to about 3 weeks after the cough begins, and many children who contract the infection have coughing spells lasting 4 to 8 weeks. Antibiotics are used to treat the infection. The best way to prevent pertussis is through immunization. The three-dose primary series diphtheria-tetanus-pertussis (DTP3) vaccine decreases the risk of severe pertussis in infancy.

The ACIP recommends the Tdap vaccine for all adults who did not receive the vaccine on or after the age of 11 years. Pregnant women should receive Tdap during each pregnancy, preferably at 27 to 36 weeks of gestation.

TEST YOUR KNOWLEDGE #11

Tetanus is caused by _____

- a. Clostridium difficile
- b. Clostridium tetani
- c. Tetanus difficile
- d. C diff

Varicella Zoster

Varicella-zoster is a herpes virus that causes chickenpox, a common childhood illness. It is highly contagious. It takes from 10-21 days after exposure for someone to develop chickenpox. The sores commonly occur in batches with different stages (bumps, blisters, and sores) present at the same time. The blisters usually scab over in 5 days. A person with chickenpox is contagious 1-2 days before the rash appears and until all blisters have formed scabs. If an adult develops chickenpox, the illness may be more severe. After a person has had chickenpox, the varicella-zoster virus can remain inactive in the body for many years.

Herpes zoster (shingles) occurs when the varicella-zoster virus becomes active again. Severe pain and numbness along nerve pathways, commonly on the trunk or on the face, are present. Clusters of blisters appear 1 to 5 days later. The blisters are usually on one side of the body and closer together than in chickenpox. **Shingles does not spread as shingles from one person to another.** If people who have never had chickenpox encounter the fluid from shingles blisters, they can develop chickenpox. Vaccination against zoster has led to a decline in incidence, with greater effectiveness in younger age-groups.

TEST YOUR KNOWLEDGE #12

The blisters from the shingles virus are _____:

- a. All over the body
- b. Spread apart
- c. On one side of the body
- d. None of the above

TYPES OF VACCINES

The US Department of Health and Human Services classifies vaccines according to six types: live attenuated (live); inactivated; subunit, recombinant, polysaccharide and conjugate; toxoid; messenger RNA (mRNA); and viral vector.

Live-attenuated vaccines

Live vaccines use a weakened (or attenuated) form of the virus that causes a disease. The weakened virus can still replicate, but does not cause disease, although sometimes a mild form of the disease may develop. These vaccines create a strong and long-lasting immune response because the vaccines are similar to the natural infection that they help prevent. Most live vaccines produce immunity in patients with one dose. Live vaccines also have some limitations. For example:

- People with weakened immune systems, long-term health problems, or people who have had an organ transplant must discuss with their healthcare provider before receiving due to the small amount of the weakened live virus.
- The vaccine must be kept cool, which affects travel and limited access to refrigeration.

Live vaccines are used to protect against:

- Measles, mumps, rubella (MMR combined vaccine)
- Rotavirus
- Smallpox
- Chickenpox
- Yellow fever

Inactivated vaccines are developed by growing the virus (or bacterium) in culture medium and then inactivating it. Inactivated vaccines do not replicate and cannot cause the disease they are designed to protect against. Inactivated vaccines usually do not provide immunity as strong as live vaccines. As a result, persons may need several doses over time (booster shots) in order to obtain ongoing immunity against diseases. Inactivated vaccines are used to protect against:

- Hepatitis A
- Flu (shot only)
- Polio (shot only)
- Rabies

Subunit, recombinant, polysaccharide and conjugated

These vaccines involve the use of a specific piece of a virus (or bacterium), such as its protein, sugar, or capsid. The advantage of these vaccines is that they can be given to immunocompromised individuals and others with long-term health issues. The primary disadvantage is that they do not provide long-lasting protection, and boosters are needed to provide immunity.

These vaccines are used to protect against:

- Hib (*Haemophilus influenzae* type b) disease
- Hepatitis B
- HPV (Human papillomavirus)
- Whooping cough (part of the DTaP combined vaccine)
- Pneumococcal disease
- Meningococcal disease
- Shingles

Toxoid vaccines

Toxoid vaccines use a toxin (harmful product) made by the virus or bacterium that causes a disease. This creates immunity to the parts of the virus that cause a disease instead of the virus itself. As a result, the immune response is targeted to the toxin instead of the entire virus. Immunity is typically not long-lasting, and booster shots are needed for ongoing protection.

Toxoid vaccines are used to protect against:

- Diphtheria
- Tetanus

Messenger RNA (mRNA) vaccines

Researchers have been studying and working with mRNA vaccines for decades and this technology was used to make some of the COVID-19 vaccines. mRNA vaccines make proteins to trigger an immune response. mRNA vaccines have several benefits compared to other types of vaccines, including shorter manufacturing times and because they do not contain a live virus, no risk of causing disease in the person getting vaccinated.

mRNA vaccines are used to protect against:

- COVID-19

Viral vector vaccines

Viral vector vaccines use a non-pathogenic virus to deliver DNA from the target pathogen. Some vaccines recently used for Ebola outbreaks have used viral vector technology, and a number of studies have focused on viral vector vaccines against other infectious diseases such as Zika, flu, and HIV. Viral vector vaccines are used to protect against:

- COVID-19

TEST YOUR KNOWLEDGE #13

Which of the following is a live vaccine?

- a. COVID-19
- b. Diphtheria
- c. Polio
- d. Yellow fever

ROUTES OF ADMINISTRATION

Each vaccine has a recommended administration route and site. This information is included in the manufacturer's package insert for each vaccine. Deviation from the recommended route may reduce vaccine efficacy or increase local adverse reactions. Vaccines available in the United States are administered by 4 routes:

- **Oral Route (PO):**
Oral vaccines are administered through drops to the mouth. Rotavirus vaccine (RV1 [Rotarix], RV5 [RotaTeq]) is the only routinely recommended vaccine administered orally. Rotavirus vaccine should never be injected.
- **Intranasal Route (NAS):**
Intranasal vaccines are administered into each nostril using a manufacturer-filled nasal sprayer. Live, attenuated influenza (LAIV [FluMist]) vaccine is the only vaccine administered by the intranasal route.
- **Subcutaneous Route (SC/Subcut):**
Subcutaneous injections are administered into the fatty tissue found below the dermis and above muscle tissue. A video demonstrating administering a vaccine by subcutaneous injection can be found [here](#).
- **Intramuscular Route (IM):**
Intramuscular injections are administered into the muscle through the skin and subcutaneous tissue. The recommended site is based on age. Use the correct needle length and gauge based on the age, weight, and gender of the recipient. A video demonstrating administering a vaccine by intramuscular injection can be found [here](#).

When administering a vaccine by injection, choose the correct needle size based on the route, age, patient size, and injection technique. See chart below to identify the route for each injectable vaccine.

| SINGLE VACCINES | ROUTE OF ADMINISTRATION |
|--|-------------------------|
| DTaP, DT, HepA, HepB, HPV, | Intramuscular injection |
| IIV4, RIV4, ccIIV4, IPV*, MenACWY, | Intramuscular injection |
| MenB, PCV13, PPS23*, RZV, Td, Tdap, TT | Intramuscular injection |
| | |
| IPV*, MMR, PPSV23*, VAR | Subcutaneous injection |
| | |

*IPV and PPSV23 may be administered IM or SC

| COMBINATION VACCINES | ROUTE OF ADMINISTRATION |
|---------------------------------------|-------------------------|
| DTaP-IPV, DTap-IPV-HepB, DTaP-IPV/Hib | Intramuscular injection |
| DTaP-IPV-HepB/Hib, HepA-HepB | Intramuscular injection |
| | |
| MMRV | Subcutaneous injection |

Vaccine Preparation and Administration

The CDC recommends a step-by-step process when administering vaccines. For each person, be sure to review the immunization history and screen for contraindications and precautions. Ask the following questions prior to vaccination:

- Are you sick today?
- Do you have allergies to medications, food, a vaccine component, or latex?
- Have you ever had a serious reaction after receiving a vaccination?
- Do you have a long-term chronic health problem(s)?
- Are you taking aspirin therapy?
- Do you have cancer, leukemia, HIV/AIDS, or any other immune system problem?
- In the past 3 months, have you taken medications that affect your immune system or received any radiation treatments?
- Have you had a seizure or a brain or other nervous system problem?
- During the past year, have you received a blood transfusion of blood or been given an antiviral drug?
- For women: Are you pregnant, or is there a chance you could become pregnant during the next month?
- Have you received any vaccinations in the past 4 weeks?

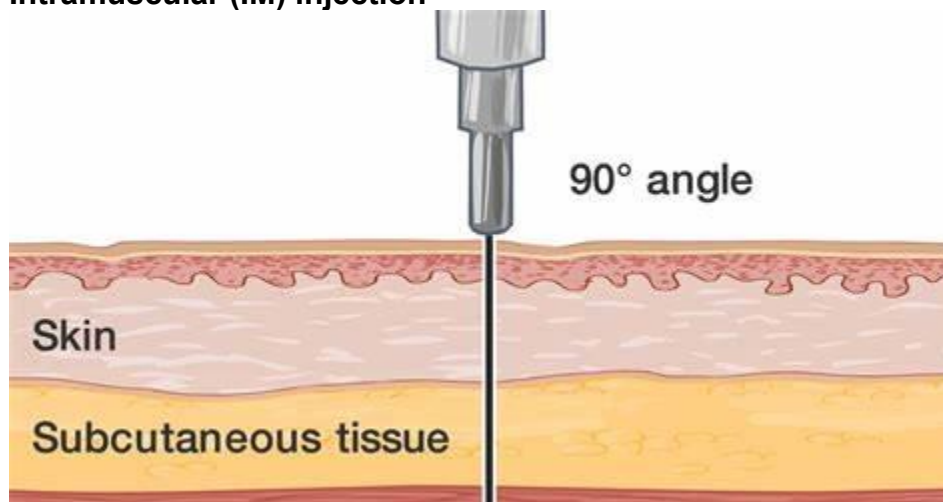
Safe administration of vaccines depends on some general steps and sterile techniques that apply to all vaccines. Regulations from the Occupational Safety and Health Administration do not require that gloves be worn.

- Wash your hands with soap and water or an alcohol-based waterless antiseptic hand sanitizer
- Get supplies together (alcohol pads, appropriate needle, syringe)
- Take vaccine out of refrigerator or freezer
 - Check the label to confirm it is the correct vaccine
 - Check the expiration date

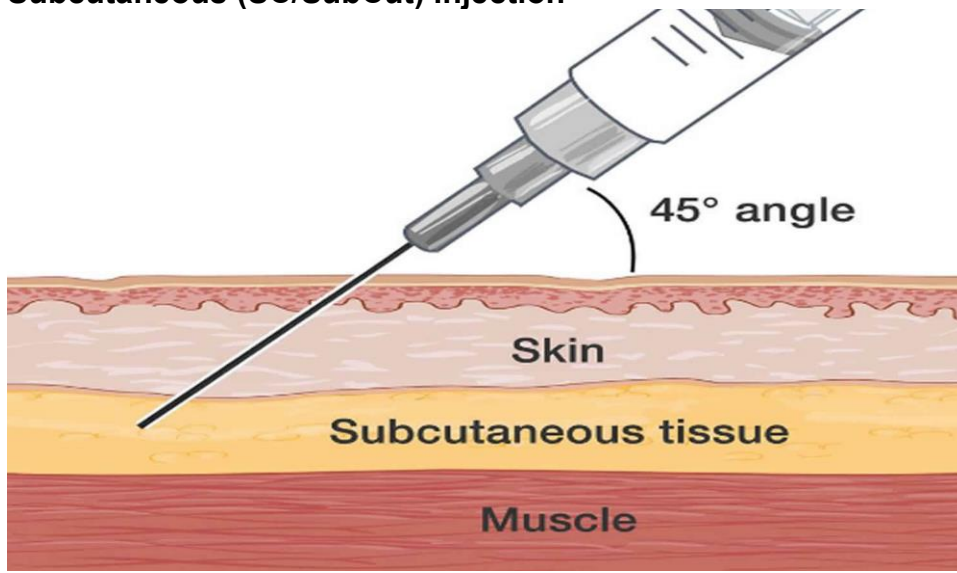
Most adult vaccines are given intramuscularly, although some are given subcutaneously. The size of the needle is an important factor to consider avoiding injury. The needle should be long enough to reach muscle mass but short enough to avoid underlying nerve, blood vessels, or bone. For an IM injection, the injection area is the deltoid muscle. A 22- to 25-gauge needle is recommended for intramuscular (IM) injections, with a needle length of 1 to 1½ inches, depending on the individual's weight. For subcutaneous injections, a 5/8-inch 23- to 25-gauge needle is recommended. A 5/8-inch needle can be used for individuals who weigh less than 130 pounds (59 kg).

One vaccine, the live influenza vaccine, is given intranasally. It is best to ask the person to sit down, as fainting may occur after any type of injection. with the head tilted slightly back. Gently place a hand behind the back of the person's head and insert the tip of the nasal sprayer slightly into one nostril. A dose-divider clip on the sprayer will allow 0.1 mL of spray.

Figure Vaccine Route, Site and Needle Size
Intramuscular (IM) injection



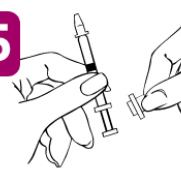



Subcutaneous (SC/SubCut) injection



Intranasal (NAS) administration of Flumist (LAIV) vaccine

Administration¹

| | | | |
|--|--|--|---|
| <p>3</p>  <p>With the patient in an upright position, place the tip just inside the nostril to ensure FLUMIST QUADRIVALENT is delivered into the nose.</p> | <p>4</p>  <p>With a single motion, depress plunger as rapidly as possible until the dose-divider clip prevents you from going further.</p> | <p>5</p>  <p>Pinch and remove the dose-divider clip from the plunger.</p> | <p>6</p>  <p>Place the tip just inside the other nostril and with a single motion, depress plunger as rapidly as possible to deliver remaining vaccine.</p> |
|--|--|--|---|

Most vaccines are available in a prefilled syringe. For these vaccines, shake the syringe thoroughly, remove the cover from the syringe tip, and attach the needle to the syringe.

When using a single-dose (or multidose) vial, remove the plastic cap and then shake the vial. Clean the stopper with an alcohol pad and let it dry before inserting the needle straight into the center of the vial stopper to draw up the contents of the vial. SOME vaccines given to adults are available as a powder and must be reconstituted with a liquid diluent supplied by the manufacturer in a separate vial. The diluent is typically saline or sterile water. Be sure to use the diluent that comes with vaccine, and not any other saline or sterile water.

For every vaccine administration, watch for an allergic reaction. Have available and follow an emergency plan for an unlikely event.

STORAGE AND HANDLING

Vaccines should be examined and stored at appropriate temperature upon immediate delivery. Vaccines should not be transferred and should be stored in their original containers. Be sure to check expiration dates and used the vials with the most recent expiration date.

Most vaccines are stored in the refrigerator, but a few must be frozen. For refrigerated vaccines, the temperature should be kept at 35° to 46° F from shipping through storage at the pharmacy. The ideal temperature is 40° F. For vaccines that must be kept frozen, the recommended temperature range is -58° to +5° F. A temperature monitoring device is required for each vaccine storage unit, and the CDC recommends a digital data logger, which provides the most accurate information on the temperature in the storage unit. Data on storage unit temperatures should be reviewed weekly to identify any problems. The best equipment for storing vaccines is a purpose-built unit, which is designed to specifically store biologics, including vaccines.

Many storage errors can be prevented by close attention to recommended guidelines. The following are recommended to prevent storage errors:

- Do not store food and drinks in the vaccine refrigerator
- Make sure the door to the storage unit is closed tightly
- Store vaccines in the body of the refrigerator (not in bins on the floor, or in the door)
- Record temperatures according to recommended guidelines

Pharmacies storing vaccines should have a routine storage and handling plan that provides guidelines on the following.

- Ordering and accepting vaccine deliveries
- Storing and handling vaccines
- Managing inventory
- Managing potentially compromised vaccines

Pharmacies should also have an emergency plan that provides details on a back-up location for storage of vaccines. A back-up generator for maintaining power to vaccine storage units is especially important when there is increased likelihood of power outages, such as hurricane season in Florida.

VACCINE INFORMATION STATEMENTS

Vaccine Information Statements (VIS) are required by law to be distributed to each person prior to receiving a vaccine. VIS are required under the National Childhood Vaccine Injury Act (NCVIA) for the following vaccines:

- Diphtheria, tetanus, and pertussis-containing vaccines (DTaP, DT, Td, and Tdap)
- *Haemophilus influenzae* type b (Hib)
- Hepatitis A
- Hepatitis B

- Human papillomavirus (HPV)
- Influenza (both inactivated and live, intranasal vaccines)
- MMR
- MMRV
- Meningococcal
- Pneumococcal conjugate (PCV13)
- Polio
- Rotavirus
- Varicella

The CDC also encourages the use of VISs for other vaccines that are not covered by the NCVIA. Vaccine providers are required to give a printed copy of a VIS before vaccination as a “Duty to Warn” clause if the vaccines are purchased under a CDC contract. These vaccines include the following:

- Pneumococcal polysaccharide
- Shingles
- Rabies
- Yellow fever
- Typhoid
- Anthrax
- Cholera
- Japanese encephalitis (Ixiaro)

VISs are available for download from the CDC website. The Immunization Action Coalition also has downloadable VISs and offers VISs translated into other languages as well. Technicians (and all vaccine providers) must document that an individual received a VIS.

ADULT VACCINES

Coronavirus

Currently, there are two types of COVID-19 vaccines for use in the United States: mRNA, and protein subunit vaccines. Vaccines do not use any live virus. These vaccines **do not** enter the nucleus of the cell where our DNA (genetic material) is located, so they cannot change or influence our genes. mRNA vaccines (Pfizer-BioNTech or Moderna) Protein subunit vaccines (Novavax). Protein subunit vaccines contain pieces (proteins) of the virus that causes COVID-19. These virus pieces are the spike protein. The vaccine also contains another ingredient called an adjuvant that helps the immune system respond to that spike protein in the future. Once the immune system knows how to respond to the spike protein, the immune system will be able to respond quickly to the actual virus spike protein and protect you against COVID-19.

Types of COVID-19 Vaccines

There are currently two different types of COVID-19 vaccines that are used in the United States: mRNA (Pfizer-BioNTech and Moderna); protein subunit (Novavax);

Dose and Administration

Technicians should follow the most recent guidelines for administering vaccines as doses vary by age and product. Adult doses range from 0.2 ml – 0.5 ml separated by 3-4 weeks between the first and second doses depending on covid vaccine. All COVID-19 vaccines are given intramuscularly and come in a multidose vial.

Contraindications

Caution should be used if there is a history of severe allergic reaction to any component of the vaccine or to a previous dose of a COVID-19 vaccine.

Adverse Effects

Common adverse effects include pain at the injection site, muscle aches, headaches, and fatigue.

Storage

mRNA vaccines are supplied as a frozen suspension that does not contain preservative. Each vial must be thawed and diluted prior to administration. Novavax should be stored in the refrigerator until the expiration date and protected from light.

Hepatitis A and B

The ACIP recommends Hepatitis A vaccination for the following populations: HIV patients, chronic liver disease patients, and men who have sex with men. The vaccine can be given to anyone at risk for hepatitis A infection. Hepatitis B vaccination is recommended for the following populations: HIV patients; patients with renal disease, chronic liver disease, or diabetes; health care workers; and men who have sex with men. Pregnant women who are at risk for infection may receive vaccination.

Types of Vaccines

There are six hepatitis vaccines available: two for hepatitis A, three for hepatitis B, and one for a combination of hepatitis A and B. **One must be 18 years or older to receive the combination vaccine.**

| Hepatitis A | Hepatitis B | Combination |
|--------------------|-----------------------|--------------------|
| Havrix (GSK) | Energix-B (GSK) | Twinrix (GSK) |
| Vaqta (Merck) | Heplisav-B (Dynavax) | |
| | Recombivax HB (Merck) | |

Dose and Administration

All hepatitis vaccines are given as a two- or three-dose series and administered intramuscularly. Adults 19 years and older receive 1 mL IM. (Children up to 18 years of age are to receive 0.5 mL intramuscularly.) If traveling where hepatitis is prevalent, it is best to receive all doses at least 2 weeks before potential exposure to the virus.

Contraindications and Precautions

Hepatitis vaccines are contraindicated in anyone who has had a severe allergic reaction to a previous dose of a hepatitis.

Adverse Events

The most common adverse events after vaccination were dizziness, nausea, fever, and injection-site redness.

Storage

Hepatitis vaccines should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F) and not be frozen. Be sure to shake the vial or prefilled syringe before use.

Haemophilus influenzae type b (Hib)

There are 5 vaccines available in the United States to protect against *Haemophilus influenzae* type b (Hib) disease. Some Hib vaccines are combined with other vaccines that protect against other diseases.

Hib-only vaccines

All Hib-only vaccines are given to children between the ages of 2 months through 15 months. Vaccine providers can give the first Hib shot as early as 6 weeks, if needed.

- **PedvaxHIB®**: 3 shots
- **ActHIB®**: 4 shots
- **Hiberix®**: 4 shots

Combination Vaccines

For both of the following vaccines, vaccine providers can give the first Hib shot as early as 6 weeks, if needed.

Pentacel®: 4 shots for children who are 2 months through 18 months old to protect against

- Hib disease
- Diphtheria
- Tetanus
- Pertussis (whooping cough)

- Polio

Vaxelis®: 3 shots for children who are 6 weeks through less than 1 year old to protect against

- Hib disease
- Diphtheria
- Tetanus
- Pertussis (whooping cough)
- Polio
- Hepatitis B

Human Papillomavirus

Vaccination is recommended to begin at the age of 9 years, but if the three-dose series was not given in adolescence, vaccination can be completed or can start in adulthood.

Types of Vaccine

Gardasil 9 (Merck) is the only HPV vaccine available in the US. It is a nine-valent recombinant vaccine used for females and males beginning at age 9 and up to 26 years of age. All HPV vaccines have been found to have high efficacy (close to 100%) for prevention of HPV vaccine type-related persistent infection, cervical intraepithelial neoplasia (CIN) 2/3, and adenocarcinoma in situ (AIS) in clinical trials in analyses limited to persons without evidence of infection with the vaccine types at the time of vaccination. The initial trials were conducted in women aged 15 or 16 through age 26 years, following a three-dose vaccination schedule.

Dose and Administration

HPV vaccine is given intramuscularly, at a dose of 0.5 mL. Gardasil 9 is given in a series of three doses at 0, 2, and 6 months. The vaccine is available in prefilled syringes or single-dose vials.

Contraindications and Precautions

HPV is contraindicated to persons who have experienced severe allergic reaction to any component of the vaccine

Adverse Events

The most common adverse events overall (all ages) were fainting, dizziness, nausea, and headache.

Storage

HPV vaccine should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F), protected from light and never frozen. Be sure to shake the vial or prefilled syringe before use.

Influenza

Influenza vaccine should be given as soon as it becomes available and preferably by October, although individuals can receive the vaccine any time during the influenza season. The United States Centers for Disease Control and Prevention (CDC) estimates that vaccination against influenza reduces sickness, medical visits, hospitalizations, and deaths. The influenza vaccine is recommended for all individuals 6 months of age or older every year, with the vaccine selected based on age and health status.

Types of Vaccine

There are several different types of influenza vaccines in the US: adjuvant, cell based, high dose, jet injector, nasal spray, recombinant and trivalent flu vaccines.

Adjuvanted flu vaccine, **Fluad**, is made with an ingredient (an adjuvant) that helps create a stronger immune response and is licensed specifically for people **65 years** and older.

Cell-based' refers to how the influenza vaccine is made. Most inactivated flu vaccines are produced by growing flu viruses in eggs. The flu viruses used in the cell-based vaccines are grown in cultured cells of mammalian origin instead of in hen's eggs. **Flucelvax** is the only influenza vaccine in use in the United States for which the vaccine viruses are grown in a mammalian cell culture. Flucelvax is licensed for use in people 6 months and older.

The high dose vaccine, **Fluzone High-Dose**, contains four times the amount of antigen (the part of the vaccine that helps your body build up protection against influenza viruses) as a regular inactivated flu shot to help create a stronger immune response. It is approved for use in people 65 years and older. Fluzone High-Dose is a three-component (trivalent) flu vaccine. It is one of three flu vaccines (along with Flublok and Fluad) that are preferentially recommended for people greater than 65.

A jet injector is a medical device used for vaccination that uses a high-pressure, narrow stream of fluid to penetrate the skin instead of a needle. One flu vaccine, **AFLURIA**, is approved for use with a jet injector this season. **AFLURIA** provides protection against an influenza A(H1N1) virus, and influenza A(H3N2) virus and one influenza B virus. AFLURIA via jet injector is approved for use in people 18 through 64 years. AFLURIA also may be given by needle and syringe for people 6 months and older.

Live Attenuated Influenza Vaccine, LAIV, **FluMist**, is given as a nasal spray. This vaccine is made with attenuated (weakened) live influenza viruses and is approved for

use in people aged 2 through 49 years. This vaccine is not recommended for the following population:

- Children younger than 2 years old.
- Adults 50 years and older.
- People with a history of severe allergic reaction to any ingredient of the vaccine (except for egg protein) or to a previous dose of any flu vaccine.
- Children 2 through 17 years old who are receiving aspirin- or salicylate-containing medications.
- Children 2 through 4 years old who have asthma or who have had a history of wheezing in the past 12 months.
- People with weakened immune systems (immunosuppression) from any cause.
- People who care for severely immunocompromised persons who require a protected environment (or otherwise avoid contact with those persons for 7 days after getting the nasal spray vaccine).
- People without a spleen, or with a non-functioning spleen.
- Pregnant women.
- People with an active leak between the cerebrospinal fluid and the mouth, nose, ear, or other place within the skull.
- People with cochlear implants.
- People who have taken flu antiviral drugs within a certain amount of time (within the past 48 hours for oseltamivir and zanamivir, the past 5 days for peramivir, and the past 17 days for baloxavir).

Recombinant influenza (flu) vaccines are produced using recombinant technology. This method does not require an egg-grown vaccine virus and does not use chicken eggs in the production process. There is one trivalent recombinant flu shot (Flublok Trivalent). Flublok is licensed for use in people 18 years and older.

The live vaccine is not recommended in pregnant women, children less than 2 years of age, adults older than 50, or people with a weakened immune system. The high-dose influenza vaccine is recommended for individuals older than 65.

Dose and Administration

Technicians should follow the guidelines for administering vaccines. All inactivated influenza vaccines are given intramuscularly and come in either a prefilled syringe, a single-dose (0.5 mL) vial, or a multidose (5 mL) vial. There is one live influenza vaccine given intranasally.

Contraindications and Precautions

Caution should be used in those who have had a severe allergy to a previous influenza vaccine, pregnant mothers, patients with asthma, immunosuppressed patients, and patients with history of Guillain-Barre Syndrome. There are two vaccines available for patients who have an egg allergy.

Adverse Events

Common adverse effects include redness and soreness at the injection site, fatigue and muscle pain.

Storage

All influenza vaccines should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F) and not be frozen.

| Vaccine (Manufacturer) | Age | Dose, Route |
|------------------------------------|----------|-------------|
| Inactivated | | |
| Afluria (Seqirus) | >6 mos | 0.5 mL, IM |
| Fluarix (GlaxoSmithKline) | >6 mos | 0.5 mL, IM |
| FluLaval (GlaxoSmithKline) | >6 mos | 0.5 mL, IM |
| Flucelvax (Seqirus) | >4 yrs | 0.5 mL, IM |
| Fluzone (Sanofi Pasteur) | >6 mos | 0.5 mL, IM |
| Flublok (Sanofi Pasteur) | >18 yrs | 0.5 mL, IM |
| Fluad (Seqirus) | >65 yrs | 0.5 mL, IM |
| Fluzone High-Dose (Sanofi Pasteur) | >65 yrs | 0.5 mL, IM |
| Fluvirin (Seqirus) | >4 yrs | 0.5 mL, IM |
| Live | | |
| FluMist (AstraZeneca) | 2-49 yrs | 0.2 mL, NAS |

Measles, Mumps, Rubella

MMR vaccination is recommended for all people with no evidence of immunity to measles, mumps, or rubella. Evidence of immunity includes persons born before 1957, documentation of receipt of MMR vaccine, laboratory evidence of immunity or disease. Adults born during or after 1957 without immunity evidence should be vaccinated with one dose.

Three vaccines containing measles, mumps, and rubella virus are licensed for use in the United States.

- M-M-R II® is a combination measles, mumps, and rubella (MMR) vaccine manufactured by Merck & Co, Inc.
- PRIORIX® is a combination measles, mumps, and rubella (MMR) vaccine manufactured by GlaxoSmithKline Biologicals (GSK).
- ProQuad® is a combination measles, mumps, rubella, and varicella (MMRV) vaccine.

M-M-R II and PRIORIX are fully interchangeable for all indications for which MMR vaccination is recommended. All three vaccines contain live, attenuated measles, mumps, and rubella virus. MMRV also contains live, attenuated varicella-zoster virus.

Type of Vaccine

MMR II (Merck) is the **live** vaccine used for individuals 12 months of age and older. Another live vaccine (Proquad; Merck) is also available but is indicated only for children 12 months to 12 years old.

Dose and Administration

MMR II is given subcutaneously, at a dose of 0.5 ml. Two doses of MMR vaccine are recommended for prevention of mumps in adults. The vaccines should be given at least 4 weeks apart. The vaccine must be reconstituted with the accompanying sterile diluent and given immediately thereafter.

Contraindications

The MMR vaccine is contraindicated for pregnant women, immunocompromised individuals, and patients who have had a hypersensitive reaction to a previous dose. The vaccine contains very small amounts of neomycin and gelatin. Patients who have experienced an anaphylactic reaction (a serious life-threatening allergic reaction) to one of these components should seek advice from their physician before receiving. Common effects are fever, rash, pain, and muscle aches.

Storage

Vaccine should be protected from light and stored in the refrigerator at 2°C to 8°C (36°F to 46°F) or in the freezer at temperatures as cold as -50°C (-58°F). The diluent should not be frozen. MMR vaccine must be administered within 8 hours of reconstitution or must be discarded. MMR must be used within 30 minutes of reconstitution.

Meningococcal Disease

ACIP recommends meningococcal vaccine for the following populations: HIV patients, sickle cell patients, first-year college students living in dormitories, military initiates, and people traveling to countries with high prevalence of meningococcal disease. Be sure to review the recommended guidelines.

There are 3 types of meningococcal vaccines used in the United States:

- Meningococcal conjugate or MenACWY vaccines
- Serogroup B meningococcal or MenB vaccines
- Pentavalent or MenABCWY vaccines
- There are 6 meningococcal vaccines available in the United States.

MenACWY vaccines

MenACWY vaccines (**Menveo®** and **MenQuadfi®**) help protect against 4 serogroups of the bacteria that cause meningococcal disease: A, C, W, and Y. This type of vaccine is

also known as a serogroup A, C, W, and Y, or quadrivalent, meningococcal vaccine.

MenB vaccines

MenB vaccines (**Bexsero**® and **Trumenba**®) help protect against serogroup B meningococcal disease. This type of vaccine is also known as a serogroup B meningococcal vaccine.

The number of shots varies by level of risk:

- People 16 through 23 years old not at increased risk: 2 shots
- People 10 years or older at increased risk: 3 shots

MenABCWY vaccines

MenABCWY vaccines (**Penbraya**® and **Penmenvay**®) help protect against 5 serogroups of the bacteria that cause meningococcal disease: A, B, C, W, and Y. This type of vaccine is also known as a serogroup A, B, C, W, and Y, or pentavalent, meningococcal vaccine.

MenABCWY vaccine is an option for people who are getting MenACWY and MenB vaccines at the same visit.

Types of Vaccines

There are six meningococcal vaccines: two against serogroups A, C, Y, and W, two against serogroup B, two against serogroup A, B, C, W and Y. Serogroups A, C, Y, W include Menveo (GSK) and MenQuadfi (Sanofi Pasteur). Serogroup B include Bexsero (Novartis) and Trumenba (Wyeth). Serogroup A, B, C, W and Y include **Penbraya**® and **Penmenvay**®.

Contraindications

Contraindications to the meningococcal vaccines include severe allergic reaction to any components of the vaccines. Menactra was approved by the FDA in 2005 but should be used with caution in persons previously diagnosed with Guillain-Barré syndrome (GBS). GBS is a rare disorder in which the person's immune system damages their nerve cells. The vaccine manufacturers changed the package insert for Menactra to identify the history.

Dose and Administration

All meningococcal vaccines are given intramuscularly, at a dose of 0.5 mL.

Meningococcal ACWY vaccines are given as an initial dose, and a booster can be given at least 4 years later if a risk for meningococcal disease is still present. Meningococcal B vaccines are given as a series of two doses, with the second dose 1 month later (Bexsero) or 6 months later (Trumenba). Menveo is provided in two vials that must be combined immediately before the vaccine is given. Menactra and MenQuadfi are available in single-dose vials, and Bexsero and Trumenba are available as prefilled syringes.

Adverse Events

The most common adverse events were injection-site erythema, pain, and swelling, headache, fever, and fainting.

Storage

All meningococcal vaccines should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F) and always protected from light. Be sure to shake before use.

Pneumococcal Disease

Pneumococcal vaccine should be administered to immunocompromised patients and persons over 65 years of age. It is also recommended for adults 19 to 64 years old who have certain medical conditions or who smoke. (The recommended vaccines based upon age and health condition should be reviewed prior to administration.)

The United States uses **2 types of pneumococcal vaccines**. Each individual vaccine helps protect against different serotypes of pneumococcal bacteria.

- Pneumococcal conjugate vaccines (PCVs)
 - PCV15
 - PCV20
 - PCV21
- Pneumococcal polysaccharide vaccine
 - PPSV23

There are 4 vaccines recommended for protection against pneumococcal disease: 3 conjugate and 1 polysaccharide. **PCV21** (CAPVAXIVE®) is a sterile solution of purified capsular polysaccharide; **PCV20** (Pevnar20®) is a sterile suspension of saccharides from 20 serotypes; **PCV15** (Vaxneuvance®) is a sterile suspension of purified capsular polysaccharides; **Pneumococcal polysaccharide vaccine, or PPSV23** (Pneumovax 23®), includes purified preparations of pneumococcal capsular polysaccharide.

The Food and Drug Administration (FDA) licensed PCV21 in 2024 for use in individuals 18 years of age and older. FDA licensed PCV15 and PCV20 in 2021 for use in adults. FDA approved PCV15 in 2022 and PCV20 in 2023 for use in children 6 weeks through 17 years of age

Types of Vaccine

There are two types of pneumococcal vaccine: pneumococcal conjugate vaccine and pneumococcal polysaccharide vaccine.

Dose and Administration

Pneumococcal vaccines are administered intramuscularly; however, Pneumovax23 may also be given subcutaneously. The dose is 0.5 mL. The vaccines are available as prefilled syringes, and Pneumovax23 is also available as single-dose vial or multidose vial.

Contraindications

Pneumococcal vaccines are contraindicated in persons who have had a severe allergic reaction to any component of the vaccine or any diphtheria toxoid containing vaccine (Prevnar13). Caution should be used with Pneumovax23 in patients with severely compromised cardiovascular and/or pulmonary disease.

Adverse Events

Adverse events associated with the pneumococcal vaccine are typically localized: pain at injection site, redness and swelling. The reactions usually resolve within 48 hours.

Storage

Both the PCV13 and PPSV23 vaccines should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F), not frozen and protected from light. Be sure to shake before use.

Polio

Types of Vaccine

There are two types of vaccines that protect against polio.

Inactivated polio vaccine (IPV)

- The only polio vaccine that has been used in the United States since 2000.
- It is given by shot in the leg or arm, depending on the patient's age.

ORAL POLIO VACCINE (OPV)

- **No longer licensed or available** in the United States
- It is still used in many parts of the world.
- Children receive doses of the vaccine by drops in the mouth.

Since 2000, only IPV has been used to eliminate the risk of polio. CDC recommends that children in the United States receive inactivated poliovirus vaccine (IPV) to protect against polio, or poliomyelitis, as part of their routine immunizations. IPV is given by injection in the leg or arm, depending on the person's age. It can be given at the same time as other vaccines.

Children get four doses of IPV, with one dose at each of these ages:

- 2 months
- 4 months

- 6 through 18 months
- 4 through 6 years

Dose and Administration

Children should receive 4 doses total. First dose at 2 months; Second dose at 4 months; Third dose at 6-18 months; Fourth dose at 4-6 years old.

Contraindications

Polio vaccines are contraindicated in persons who have had a severe allergic reaction to any component of the vaccine

Adverse Events

Adverse events associated with the polio vaccine are typically sore spot at the injection site. Some may experience severe and lasting shoulder pain.

Storage

Vaccine should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F)

Respiratory Syncytial Virus (RSV)

RSV vaccines are recommended for all adult ages 75 years and older and also adults ages 50-74 who are at increased risk of severe RSV.

There are two immunizations recommended to protect infants from severe RSV: a maternal RSV vaccine (Pfizer's Abrysvo) given during pregnancy or an infant RSV antibody given to infants after birth.

Three RSV vaccines are licensed by the U.S. Food and Drug Administration for use in adults of different ages in the United States:

- GSK's Arexvy in 2023
- Moderna's mResvia in 2024
- Pfizer's Abrysvo in 2023

Dose and Administration

One dose of RSV vaccine provide protection against RSV illness in adults ages 50 years and older for at least two years

The maternal RSV vaccine (Pfizer's Abrysvo) is recommended for pregnant women who are 32-36 weeks to pass the protection to your baby. Protection will last during your baby's first 6 months, while they are at highest risk of severe RSV.

An infant RSV antibody is recommended for all babies younger than 8 months of age born to mothers who did not receive a maternal RSV vaccine (Pfizer's Abrysvo) during pregnancy. Two long-acting RSV antibodies are available for infants: nirsevimab or clesrovimab. An infant RSV antibody dose should be given to babies shortly before the

RSV season, or within 1 week after birth if born during October through March in most of the U.S.

Contraindications

vaccines are contraindicated in persons who have had a severe allergic reaction to any component of the vaccine

Adverse Events

Adverse events associated with the RSV vaccine include pain, redness and swelling at the injection site. Other effects are fatigue, fever, headache, nausea, diarrhea, and muscle or joint pain.

Storage

Vaccine should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F)

Rotavirus

There are two rotavirus vaccines licensed for use in infants in the United States. Both available rotavirus vaccines are given by putting drops in the infant's mouth. Rotavirus vaccine can be safely given during the same doctor's visit with DTaP vaccine; Hib vaccine; polio vaccine; hepatitis B vaccine; and pneumococcal conjugate vaccine.

- RotaTeq® (RV5)
 - Licensed in 2006
 - Administered in three doses at 2 months, 4 months, and 6 months of age
 - Package insert for RotaTeq®[13 pages]

provides dosage forms and strengths as well as administration guidance.
- Rotarix® (RV1)
 - Licensed in 2008
 - Administered in two doses at 2 months and 4 months of age

Before children are 15 weeks, they should receive the first dose of either rotavirus vaccine. Before children are 8 months old, they should receive all doses of the rotavirus vaccine.

Dose and Administration

RotaTeq is given as 3 doses. Rotarix is given as 2 doses

Contraindications

Infants with a severe life threatening allergy to any component of rotavirus vaccine; severe combined immunodeficiency (SCID); previous episode of bowel blockage, or weakened immune system.

Adverse Events

Most babies who receive rotavirus vaccine do not have any problems. However, some babies may have mild side effects that subside on their own. Side effects may include irritability and mild, temporary diarrhea or vomiting after a dose of rotavirus vaccine.

Storage

Vaccine should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F)

Tetanus, Diphtheria, Pertussis

Types of Vaccine

There are two Tdap vaccines for use in adults: Boostrix (GlaxoSmithKline) and Adacel (Sanofi Pasteur); the primary difference between the two is the indicated age. Boostrix is indicated for all ages over 10 years, whereas Adacel is indicated only up to age 64 years. The vaccines available to protect against tetanus and diphtheria (Td) are Tenivac (Sanofi Pasteur) and Decavac (Sanofi-Pasteur).

Pertussis-containing Vaccines

- DTaP (Daptacel and Infanrix)
- Tdap (Adacel and Boostrix)
- DTaP-HepB-IPV (Pediarix)
- DTaP-IPV/Hib (Pentacel)
- DTaP-IPV (Kinrix and Quadracel)
- DTaP-IPV-Hib-HepB (Vaxelis)

There are five combination vaccines that contain DTaP vaccine. DTaP-HepB-IPV (Pediarix) is licensed for the first 3 doses of the DTaP series among children age 6 weeks through 6 years. DTaP-IPV/Hib (Pentacel) is licensed for the first 4 doses of the component vaccines among children age 6 weeks through 4 years. DTaP-IPV (Kinrix) is licensed only for the fifth dose of DTaP and fourth dose of IPV among children age 4 through 6 years. DTaP-IPV (Quadracel) is licensed only for the fifth dose of DTaP and fourth or fifth dose of IPV among children age 4 through 6 years. DTaP-IPV-Hib-HepB (Vaxelis) is licensed for use in children age 6 weeks through 4 years.

Dose and Administration

All vaccines are given as an IM injection, at a dose of 0.5 ml. They are available in prefilled syringes and single-dose vials. Be sure to shake the vial or prefilled syringe before use and administer the 0.5 mL dose intramuscularly.

Contraindications and Precautions

Tdap is contraindicated for individuals with encephalopathy, which is a disease that affects brain function and causes altered mental state and confusion. Both Tdap and Td

are contraindicated for people who have had a severe allergic reaction after a previous dose or to a component of the vaccine. Tdap should be used with caution in people who have a progressive neurologic disorder (until the condition has stabilized). Tdap and Td should be used with caution in people with a history of Guillain-Barre syndrome, a history of a severe local reaction (Arthus reaction) after a previous dose of tetanus or diphtheria toxoid-containing vaccine, or a moderate or severe acute illness with or without fever.

Tenivac and Decavac are contraindicated for people who have had a severe allergic reaction (e.g., anaphylaxis) to a previous dose of the vaccine or any other tetanus- or diphtheria toxoid-containing vaccine or any component of the vaccine. Both vaccines should also be used with caution in people with a history of Arthus-type hypersensitivity reactions after a previous dose of tetanus or diphtheria toxoid-containing vaccines. For these people, vaccination should be deferred until at least 10 years after the last tetanus toxoid-containing vaccine. Adults who did not receive Tdap on or after age 11 years should receive one dose of Tdap and then a dose of Td or Tdap every 10 years. CDC recommends giving a single dose of **Tdap during every pregnancy**, preferably during the early part of gestational weeks 27 through 36. A single Tdap dose is recommended for adolescents age 11 through 18 years who have completed the recommended childhood DTP/DTaP vaccination series, preferably at age 11 through 12 years.

Adverse Events

The most common adverse events are localized to the injection site: redness, pain at injection site, and swelling.

Storage

All vaccines containing tetanus, diphtheria, and pertussis should be stored in the refrigerator at 2°C to 8°C (36°F to 46°F) and not be frozen.

Varicella

The varicella vaccine is recommended for adults who have never had chickenpox or received the chickenpox vaccine.

Two vaccines containing varicella virus are licensed for use in the United States.

- Varivax® is the single-antigen varicella vaccine.
- ProQuad® is a combination measles, mumps, rubella, and varicella (MMRV) vaccine.

Both vaccines contain live, attenuated varicella-zoster virus derived from the Oka strain.

Type of Vaccine

Varivax (Merck) is a live vaccine.

Dose and Administration

Varicella vaccination includes two doses, given at least 28 days. The varicella vaccine is given subcutaneously at a dose of 0.5 mL. Individuals receiving the varicella vaccine should be informed to not receive an antibody-containing product for 2 weeks after the live vaccination.

Contraindications and Precautions

Varicella vaccination is contraindicated in the following situations:

- Pregnancy
- Immunocompromised status
- HIV infection, with a CD4 count of less than 200 mL
- Blood cancers
- Immunosuppressive therapy or high doses of oral steroids (2 weeks or more)
- Transfusion of blood products (such as whole blood, plasma, or immune globulin)
- Family history (first-degree relatives) of congenital hereditary immunodeficiency (unless person has been determined to be immunocompetent)
- History of anaphylactic reaction to gelatin, neomycin, or any other component of the vaccine
- Moderate or severe concurrent illness

Adverse Events

The most common adverse events are rash, fever, and injection-site reaction.

Storage

The vaccine should be protected from light and kept frozen at a temperature of -15°C (5°F) to -50°C (-58°F) or colder before use. The diluent is provided with the vaccine for reconstitution and can be stored in the refrigerator or at room temperature before use. Once reconstituted, varicella vaccine should be administered immediately to avoid loss of potency. Any vaccine that is not used within 30 minutes of reconstitution should be discarded.

Zoster

The ACIP recommends the zoster vaccine for immunocompetent people 50 years or older.

Types of Vaccine

There were two zoster vaccines available: Zostavax (Merck), a live vaccine, is no longer available in the US as of 2020, and was the only vaccine available. Shingrix (GlaxoSmithKline), an adjuvanted recombinant vaccine, is now recommended. Zostavax was recommended for people 60 years or older. Shingrix is recommended for people 50 years and older.

Dose and Administration

Zoster vaccine is given in a two-dose series, with the second dose given 2 to 6 months after the first. The minimum interval is 4 weeks. Shingrix is administered intramuscularly in two 0.5-mL doses.

Contraindications

Zostavax was not recommended in the following patients:

- Pregnant women
- Patients with severe immunocompromising conditions
- Patients with AIDS or HIV
- Patients receiving high-dose steroid treatment
- Patients receiving immunosuppressive treatments
- People with an allergy to any component of the vaccine, which includes neomycin or gelatin

Shingrix can be given to adults older than 50 regardless of chronic medical history or immunosuppressive treatments.

Adverse Events

Most common effects were injection site redness, swelling and pain.

Storage

The live vaccines should be protected from light and stored in the freezer at temperatures of -50°C to -15°C (-58°F to 5°F). The vaccine may be kept at refrigerator temperatures of 2°C to 8°C (36°F to 46°F) for up to 72 hours prior to reconstitution. The vaccine should be discarded if it is not used within 72 hours after removal from the freezer or not used within 30 minutes of reconstitution. The diluent should be stored separately from the vaccine and may be refrigerated or at room temperature. The vaccine must be reconstituted with the diluent immediately upon removal from the freezer and given within 30 minutes of reconstitution. The vaccine should be discarded if the reconstituted vaccine is not given within 30 minutes.

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2025

| Vaccine | 19–26 years | 27–49 years | 50–64 years | ≥65 years |
|--|---|--|------------------------------------|--|
| COVID-19 | 1 or more doses of 2024–2025 vaccine (See Notes) | | | 2 or more doses of 2024–2025 vaccine (See Notes) |
| Influenza inactivated (IIV3, ccIIV3) Influenza recombinant (RIV3) | 1 dose annually | | | 1 dose annually (HD-IIV3, RIV3, or allIIV3 preferred) |
| Influenza inactivated (allIIV3; HD-IIV3) Influenza recombinant (RIV3) | Solid organ transplant (See Notes) | | | |
| Influenza live, attenuated (LAIV3) | 1 dose annually | | | |
| Respiratory syncytial virus (RSV) | Seasonal administration during pregnancy (See Notes) | | 60 through 74 years (See Notes) | ≥75 years |
| Tetanus, diphtheria, pertussis (Tdap or Td) | 1 dose Tdap each pregnancy; 1 dose Td/Tdap for wound management (See Notes) | | | |
| | 1 dose Tdap, then Td or Tdap booster every 10 years | | | |
| Measles, mumps, rubella (MMR) | 1 or 2 doses depending on indication (if born in 1957 or later) | | | For health care personnel (See Notes) |
| Varicella (VAR) | 2 doses (if born in 1980 or later) | | 2 doses | |
| Zoster recombinant (RZV) | 2 doses for immunocompromising conditions (See Notes) | | 2 doses | |
| Human papillomavirus (HPV) | 2 or 3 doses depending on age at initial vaccination or condition | 27 through 45 years | | |
| Pneumococcal (PCV15, PCV20, PCV21, PPSV23) | | | See Notes | See Notes |
| Hepatitis A (HepA) | 2, 3, or 4 doses depending on vaccine | | | |
| Hepatitis B (HepB) | 2, 3, or 4 doses depending on vaccine or condition | | | |
| Meningococcal A, C, W, Y (MenACWY) | 1 or 2 doses depending on indication (See Notes for booster recommendations) | | | |
| Meningococcal B (MenB) | 19 through 23 years | 2 or 3 doses depending on vaccine and indication (See Notes for booster recommendations) | | |
| Haemophilus influenzae type b (Hib) | 1 or 3 doses depending on indication | | | |
| Mpox | 2 doses | | | |
| Inactivated poliovirus (IPV) | Complete 3-dose series if incompletely vaccinated. Self-report of previous doses acceptable (See Notes) | | | |

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2025

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars. To determine minimum intervals between doses, see the catch-up schedule (Table 2).

| Vaccine and other immunizing agents | Birth | 1 mo | 2 mos | 4 mos | 6 mos | 9 mos | 12 mos | 15 mos | 18 mos | 19–23 mos | 2–3 yrs | 4–6 yrs | 7–10 yrs | 11–12 yrs | 13–15 yrs | 16 yrs | 17–18 yrs | |
|--|---|--------------|----------|---|--------------|--------------|---------------------------------|--------|----------|-----------|-----------------------|---------|-----------|-----------|--|----------|-----------|-----------------|
| Respiratory syncytial virus (RSV-mAb [Nirsevimab]) | 1 dose depending on maternal RSV vaccination status (See Notes) | | | 1 dose (8 through 19 months), See Notes | | | | | | | | | | | | | | |
| Hepatitis B (HepB) | 1st dose | ← 2nd dose → | | ← 3rd dose → | | | | | | | | | | | | | | |
| Rotavirus (RV): RV1 (2-dose series), RVS (3-dose series) | | | 1st dose | 2nd dose | See Notes | | | | | | | | | | | | | |
| Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs) | | | 1st dose | 2nd dose | 3rd dose | ← 4th dose → | | | 5th dose | | | | | | | | | |
| Haemophilus influenzae type b (Hib) | | | 1st dose | 2nd dose | See Notes | | ← 3rd or 4th dose (See Notes) → | | | | | | | | | | | |
| Pneumococcal conjugate (PCV15, PCV20) | | | 1st dose | 2nd dose | 3rd dose | ← 4th dose → | | | | | | | | | | | | |
| Inactivated poliovirus (IPV) | | | 1st dose | 2nd dose | ← 3rd dose → | | | | 4th dose | | See Notes | | | | | | | |
| COVID-19 (1vCOV-mRNA, 1vCOV-aPS) | 1 or more doses of 2024–2025 vaccine (See Notes) | | | | | | | | | | | | | | | | | |
| Influenza (IIV3, cdlIV3) | 1 or 2 doses annually | | | | | | | | | | 1 dose annually | | | | | | | |
| Influenza (LAIV3) | OR | | | | | | | | | | 1 or 2 doses annually | | OR | | | | | 1 dose annually |
| Measles, mumps, rubella (MMR) | | | | | See Notes | | ← 1st dose → | | 2nd dose | | | | | | | | | |
| Varicella (VAR) | | | | | ← 1st dose → | | 2nd dose | | | | | | | | | | | |
| Hepatitis A (HepA) | | | | | See Notes | | 2-dose series (See Notes) | | | | | | | | | | | |
| Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs) | | | | | | | | | | | | | 1 dose | | | | | |
| Human papillomavirus (HPV) | | | | | | | | | | | | | See Notes | | | | | |
| Meningococcal (MenACWY-CRM ≥2 mos, MenACWY-TT ≥2years) | See Notes | | | | | | | | | | | | | | 1st dose | 2nd dose | | |
| Meningococcal B (MenB-4C, MenB-FHbp) | See Notes | | | | | | | | | | | | | | | | | |
| Respiratory syncytial virus vaccine (RSV [Abrysvo]) | | | | | | | | | | | | | | | Seasonal administration during pregnancy (See Notes) | | | |
| Dengue (DEN4CYD: 9–16 yrs) | | | | | | | | | | | | | | | Seropositive in endemic dengue areas (See Notes) | | | |
| Mpox | | | | | | | | | | | | | | | | | | |

Please note: Changes may have occurred during this update for children’s vaccinations by the government.

International Travel Vaccines

Yellow Fever

Yellow fever is a viral infection transmitted to humans by an infected mosquito bite. Signs and symptoms include fever, chills, muscle pain and headaches. The vaccine provides lifelong protection for most travelers.

- **Vaccine:** live vaccine, YF-Vax—Sanofi Pasteur
- **Dose and Administration:** 0.5 mL dose, administered by subcutaneous injection
- **Storage:** refrigerated and discarded within 60 minutes of reconstitution.

Typhoid Fever

Typhoid Fever is a food and water borne illness caused by the bacterium *Salmonella typhi*. Signs and symptoms include high fever, headache, stomach pain, constipation, or diarrhea. Antibiotics are used to treat typhoid fever. Commonly prescribed antibiotics are ciprofloxacin and azithromycin. Typhoid prevention options include a 4-dose series of live oral typhoid vaccine capsules or a single injection of inactivated typhoid polysaccharide vaccine.

- **Two Vaccines:**
 - Live, oral vaccine (Vivotif—Berna) which consists of four pills taken every other day and should be finished at least 1 week before travel.
 - Injectable vaccine (Typhim Vi—Sanofi Pasteur) can be given to people at least 2 years old and should be given at least 2 weeks before travel.
- **Dose and Administration:**
 - capsules are swallowed 1 hour before meals,
 - 0.5 mL dose, administered by intramuscular injectionReimmunization is recommended every 2 years for continuous travelers who are in highly exposed areas.
- **Storage:** Capsules should be refrigerated.

Japanese Encephalitis

Japanese encephalitis is a mosquito-borne viral illness endemic in areas of Asia. Japanese encephalitis vaccine is recommended for travelers who plan to spend 1 month or longer in endemic areas during the Japanese encephalitis transmission season.

- **Vaccine:** inactivated vaccine, Ixiaro—Novartis
- **Dose and Administration:** 0.5 mL dose, administered intramuscularly as a 2-dose series at 0 and 28 days. The last dose should be given at least 1 week before travel. Additional prevention strategies include using insect repellent, wearing long sleeve shirts and long pants.

Cholera

Cholera is an acute diarrheal illness caused by infection of contaminated food or water with *Vibrio cholerae*. Cholera is rare in the United States, but common in Africa, Southeast Asia, and Haiti. Symptoms vary from none, to mild, to severe. The classic symptom is large amounts of watery diarrhea that lasts a few days. Vomiting and muscle cramps may also occur.

- **Vaccine:** live, oral cholera vaccine (Vaxchora—ParVax)
- **Dose and Administration** given as a single oral dose at least 10 days prior to potential exposure to *Vibrio cholerae*. Individuals should not eat or drink for 60 minutes before or after taking the vaccine.

CONCLUSION

Vaccines have greatly decreased the morbidity and mortality associated with many diseases. The role of the pharmacist has shifted to a more clinical service which has allowed the role of the pharmacy technician to expand. In Florida, there are twice as many technicians as there are pharmacists. Technicians are not only in a position to help increase awareness on the importance of vaccination but can also administer immunizations under the supervision of a pharmacist. This advanced role has created a positive change on the overall public health by increasing the number of persons vaccinated by the pharmacy team. The increased number of immunizations will allow the public to stay healthy and avoid several contagious and infectious diseases. The pharmacy team was proven to be frontline heroes during the pandemic. As a result, this unique situation has increased awareness, heightened vaccine advocacy, enhanced vaccine knowledge and provided technicians the opportunity to administer all vaccines listed in the Centers for Disease Control and Prevention and Advisory Committee on Immunization Practices Adult Immunization Schedule. The expansion of vaccine providers will increase vaccine coverage and allow greater public access and overall safety. It is imperative for immunizing technicians to stay abreast of the evolving information about current vaccines and emerging vaccines in the pipeline as they have played a pivotal role in increasing widespread vaccine coverage.

TEST YOUR KNOWLEDGE ANSWERS

1. C
2. C
3. B
4. B
5. A
6. C
7. A
8. D
9. A
10. A
11. B
12. C
13. D

REFERENCES

Centers for Disease Control and Prevention. Updated August 26, 2024. Accessed January 2026. [Different Types of Flu Vaccines | CDC](#); [influenza - Search \(bing.com\)](#)

Centers for Disease Control and Prevention. Updated February 28, 2025. Accessed January 2026. [Vaccine Information Statement | Tdap | Tetanus-Diphtheria-Pertussis | VIS | CDC](#)

Centers for Disease Control and Prevention. Updated January 17, 2025. Accessed January 2026. [Measles, Mumps, and Rubella \(MMR\) Vaccination | CDC](#)

Centers for Disease Control and Prevention. Updated April 24, 2024. Accessed January 2026. [Chickenpox \(Varicella\) | CDC](#)

Centers for Disease Control and Prevention. Updated January 17, 2025. Accessed January 2026. [Shingles \(Herpes Zoster\) | CDC](#)

Centers for Disease Control and Prevention. Updated July 3, 2024. Accessed January 2026. [STD Facts - Human papillomavirus \(HPV\) \(cdc.gov\)](#)

Centers for Disease Control and Prevention. Updated October 26, 2024. Accessed January 2026. [Pneumococcal Disease | CDC](#)

Centers for Disease Control and Prevention. Updated January 31, 2025. Accessed January 2026. [What is Viral Hepatitis? | CDC](#)

Centers for Disease Control and Prevention. Updated July 1, 2025. Accessed January 2026. [Meningococcal Disease | CDC](#)

Centers for Disease Control and Prevention. Updated March 21, 2025. Accessed January 2026. [Coronavirus Disease 2019 \(COVID-19\) | CDC](#)

Centers for Disease Control and Prevention. Updated October 7, 2025. Accessed January 2026. [Immunization Basics | CDC](#)

Centers for Disease Control and Prevention. Updated June 12, 2024. Accessed January 2026. [Vaccines and immunization \(who.int\)](#)

Centers for Disease Control and Prevention. Vaccine recommendations and guidelines of the ACIP. Vaccine administration. [Adult Immunization Schedule by Vaccine and Age Group | CDC](#). Updated June 12, 2024. Accessed January 2026

Centers for Disease Control and Prevention. CDC Wonder. <http://wonder.cdc.gov/>. December 2025.

Flumist® Quadrivalent. Package Insert. AstraZeneca; 2026.

Mayo clinic. [HPV infection - Symptoms and causes - Mayo Clinic](#). Updated July 3, 2024. Accessed January 2026.

Mayo clinic. January 17, 2025. Accessed January 2026. [Shingles - Symptoms and causes - Mayo Clinic](#)

Vaccines.org