

Adult Vaccination Update
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EXPLORE
HEALTHCARE SUMMIT

Disclosures

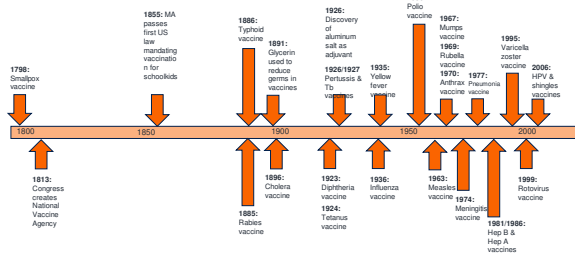
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Learning Objectives

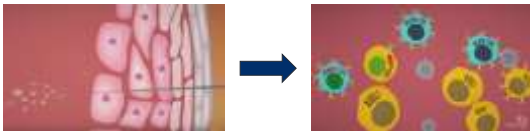
- Describe the recommend vaccinations for the adult patient
- Describe the recommend vaccinations for adults with various chronic medical conditions
- Discuss strategies to increase adult immunization rates

History of Vaccines



*Note that this timeline is abbreviated to give an overview of vaccine development and the recent explosion of discovery

How Vaccines Work



- Vaccines help us develop immunity by imitating an infection and triggering antibodies to develop
- Those antibodies will be available to fight the next time you are exposed to that virus or bacteria





Vaccine Safety

- Vaccines are tested by the FDA and are monitored by the CDC when in use
- Vaccine Adverse Events Reporting System (VAERS)
 - <http://vaers.hhs.gov/index>
 - Telephone number: 1-800-822-7967



Anti-Vaccination Movement



1802, Caricature by James Gillray
Edward Jenner inoculating patients in the Smallpox and Inoculation Hospital at St. Pancras. The patients are shown sprouting cow heads from various parts of their anatomy following vaccination.



1898. Death as a skeletal figure wielding a scythe. Representing fears concerning the Act of 1898 that made vaccination against smallpox compulsory.



Rally of the Anti-Vaccination League of Canada, Old City Hall, Toronto, November 13, 1919.



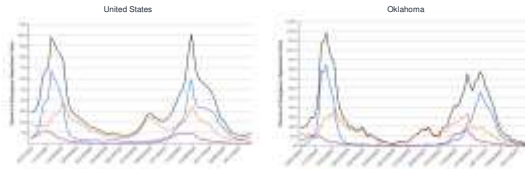


Table 1 Recommended MMR1 (measles, mumps, rubella) by Age Group, 1998-2020

| Age Group | 1998-2000 | 2001-2005 | 2006-2010 | 2011-2015 | 2016-2020 |
|-----------------|-----------|-----------|-----------|-----------|-----------|
| 12-23 months | MMR1 | MMR1 | MMR1 | MMR1 | MMR1 |
| 24-35 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 36-47 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 48-59 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 60-71 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 72-83 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 84-95 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 96-107 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 108-119 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 120-131 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 132-143 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 144-155 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 156-167 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 168-179 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 180-191 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 192-203 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 204-215 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 216-227 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 228-239 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 240-251 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 252-263 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 264-275 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 276-287 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 288-299 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 300-311 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 312-323 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 324-335 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 336-347 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 348-359 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 360-371 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 372-383 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 384-395 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 396-407 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 408-419 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 420-431 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 432-443 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 444-455 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 456-467 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 468-479 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 480-491 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 492-503 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 504-515 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 516-527 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 528-539 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 540-551 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 552-563 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 564-575 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 576-587 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 588-599 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 600-611 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 612-623 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 624-635 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 636-647 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 648-659 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 660-671 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 672-683 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 684-695 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 696-707 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 708-719 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 720-731 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 732-743 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 744-755 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 756-767 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 768-779 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 780-791 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 792-803 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 804-815 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 816-827 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 828-839 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 840-851 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 852-863 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 864-875 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 876-887 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 888-899 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 900-911 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 912-923 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 924-935 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 936-947 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 948-959 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 960-971 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 972-983 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 984-995 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |
| 996-1007 months | MMR2 | MMR2 | MMR2 | MMR2 | MMR2 |

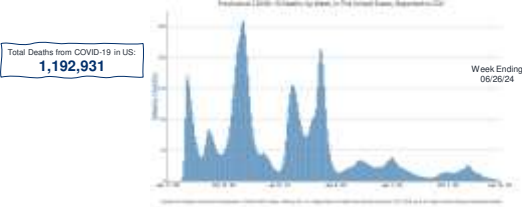


Respiratory Virus Activity Fall 2023 – Spring 2024



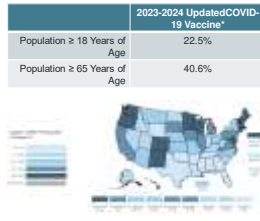
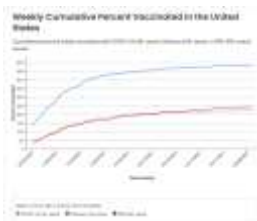
<https://www.cdc.gov/respiratory-viruses/data-research/dashboard/activity-levels.html> accessed June 26, 2024

COVID-19



https://covid.cdc.gov/covid-data-tracker/#maps_new-admissions-rate-county

COVID-19 Vaccination Rates



*As of May 11, 2024

<https://covid.cdc.gov/covid-data-tracker/#vaccination-states-3-panels>
<https://www.cdc.gov/respiratory-viruses/data-research/dashboard/vaccination-levels.html>

COVID-19

Routine Vaccination for Age ≥ 12 (not immunocompromised)

- **Unvaccinated:**
 - 2 doses of updated (2023-2024 Formula) Moderna or Pfizer-BioNTech vaccine at 0, 3-8 weeks
 - 2 dose series of updated (2023-2024 Formula) Novavax at 0, 3-8 weeks
- **Previously Vaccinated:**
 - Not including at least 1 dose of 2023-2024 vaccine
 - 1 dose of updated (2023-2024 Formula) COVID-19 vaccine at least 8 weeks after last dose
 - Including at least 1 dose of 2023-2024 vaccine
 - Age 12-64 years: No further doses indicated
 - Age ≥65 years: 1 additional dose at least 4 months after last dose

| Abbreviation(s) | Trade Name(s) |
|-----------------|--|
| 1vCOV-mRNA | Comirnaty/Pfizer-BioNTech COVID-19 Vaccine SPIKEVAX/Moderna COVID-19 Vaccine |
| 2vCOV-mRNA | Pfizer-BioNTech COVID-19 Vaccine, Bivalent Moderna COVID-19 Vaccine, Bivalent |
| 1vCOV-aPS | Novavax COVID-19 Vaccine |



<https://www.cdc.gov/vaccines/imz/downloads/COVID-19-immunization-schedule-ages-6months-older.pdf>

COVID-19

Moderate – Severe Immunocompromised



- **Unvaccinated:**
 - 3 dose series of updated (2023-2024 Formula) Moderna at 0, 4, 8 weeks
 - 3 dose series of updated (2023-2024 Formula) Pfizer-BioNTech at 0, 3, 7 weeks
 - 2 dose series of updated (2023-2024 Formula) Novavax at 0, 3 weeks

| | |
|---|--|
| <ul style="list-style-type: none"> • Previously Vaccinated with Moderna (mRNA): <ul style="list-style-type: none"> • Previously vaccinated with 1 dose of any Moderna <ul style="list-style-type: none"> • 2 dose series of updated (23-24 Formula) Moderna at 0, 4 weeks • Previously vaccinated with 2 dose of any Moderna <ul style="list-style-type: none"> • 1 dose series of updated (23-24 Formula) Moderna at least 4 weeks after most recent dose • Previously vaccinated with ≥3 doses of Moderna, Not including at least 1 dose of 23-24 Formula <ul style="list-style-type: none"> • Give 1 dose at least 8 weeks after last dose • Previously vaccinated ≥3 doses of Moderna, Including including at least 1 dose of 23-24 Formula <ul style="list-style-type: none"> • Age 12-64: may receive 1 additional dose at least 8 weeks after last dose • Age ≥65: administer 1 additional dose at least 8 weeks after last dose | <ul style="list-style-type: none"> • Previously Vaccinated with Pfizer-BioNTech (mRNA): <ul style="list-style-type: none"> • Previously vaccinated with 1 dose of any Pfizer-BioNTech <ul style="list-style-type: none"> • 2 dose series of updated (23-24 Formula) Pfizer-BioNTech at 0, 4 weeks • Previously vaccinated with 2 dose of any Pfizer-BioNTech <ul style="list-style-type: none"> • 1 dose series of updated (23-24 Formula) Pfizer-BioNTech at least 4 weeks after most recent dose • Previously vaccinated with ≥3 doses of Pfizer-BioNTech, Not including at least 1 dose of 23-24 Formula <ul style="list-style-type: none"> • Give 1 dose at least 8 weeks after last dose • Previously vaccinated with ≥3 doses of Pfizer-BioNTech, Including including at least 1 dose of 23-24 Formula <ul style="list-style-type: none"> • Age 12-64: may receive 1 additional dose at least 8 weeks after last dose • Age ≥65: administer 1 additional dose at least 8 weeks after last dose |
|---|--|

<https://www.cdc.gov/vaccines/imz/downloads/COVID-19-immunization-schedule-ages-6months-older.pdf>

COVID-19 mRNA Vaccination

Contraindicated or Not Recommended

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a component of an mRNA COVID-19 vaccine

Note:

- mRNA COVID-19 vaccines contain polyethylene glycol (PEG)
- Full list of vaccine ingredients available via package inserts & FDA EUA fact sheets

Precautions

- Diagnosed non-severe allergic (e.g., urticaria beyond the injection site) to a component of an mRNA COVID-19 vaccine, or non-severe, immediate (onset less than 4 hours) allergic reaction after administration of a previous dose of an mRNA COVID-19 vaccine
- Myocarditis or pericarditis within 3 weeks after a dose of any COVID-19 vaccine
- Multisystem inflammatory syndrome in children (MIS-C) or multisystem inflammatory syndrome in adults (MIS-A)
- Moderate or severe acute illness with or without fever



COVID-19 Protein Subunit Vaccination

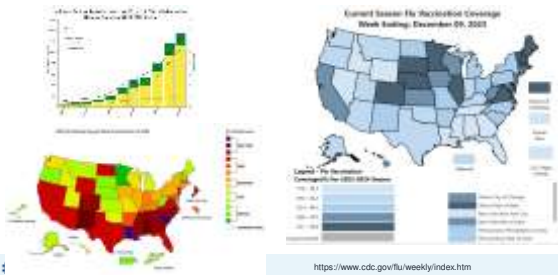
Contraindicated or Not Recommended

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a component of a Novavax COVID-19 vaccine
- Note:**
 - Full list of vaccine ingredients available via package inserts & FDA EUA fact sheets

Precautions

- Diagnosed non-severe allergy (e.g., urticaria beyond the injection site) to a component of the Novavax COVID-19 vaccine; or non-severe, immediate (onset less than 4 hours) allergic reaction after administration of a previous dose of the Novavax COVID-19 vaccine
- Myocarditis or pericarditis within 3 weeks after a dose of any COVID-19 vaccine
- Multisystem inflammatory syndrome in children (MIS-C) or multisystem inflammatory syndrome in adults (MIS-A)
- Moderate or severe acute illness with or without fever

Influenza



<https://www.cdc.gov/flu/weekly/index.htm>

Influenza Vaccination

Routine Vaccination for Age ≥ 19

- Unvaccinated:**
 - 1 dose of any influenza vaccine appropriate for age and health status annually
- Age ≥ 65 years**
 - Any one of quadrivalent high-dose inactivated influenza vaccine (HD-IV4), quadrivalent recombinant influenza vaccine (RIV4), or quadrivalent adjuvanted inactivated influenza vaccine (aIV4)

| Abbreviation(s) | Trade Name(s) |
|--------------------------|----------------------|
| Inactivated – IV4 | Many Brands |
| Live, Attenuated – LAIV4 | FluMist Quadrivalent |
| Recombinant – RIV4 | Flublok Quadrivalent |

Pregnant Women

- 1st or 2nd Trimester – vaccinate in September or October
- 3rd Trimester during July / August – vaccine to protect infant in first month of life

New 2023-2024

All persons aged 18 months with egg allergy should receive influenza vaccine. Any influenza vaccine that is otherwise appropriate for the recipient's age and health status can be used. Egg allergy alone necessitates no additional safety measures for influenza vaccination beyond those recommended for any recipient of any vaccine, regardless of severity of previous reaction to egg.

- 1982 – 2022:
 - 77% of seasons peaked after January
 - 62% of seasons peaked after February

<https://www.cdc.gov/mmwr/volumes/72/nr7/2023a1.htm>

What Flu Shot is Right for My Patient?

| | | |
|--|---|---|
| <p>Standard Dose Inactivated</p> <ul style="list-style-type: none"> • SD-IV4 • 15 mcg/strain • Egg-based • For people of all ages • Jet Injector (needle free) version for adults aged 18-64 years | <p>AGE ≥ 65</p> <p>High Dose</p> <ul style="list-style-type: none"> • HD-IV4 • At the standard dose • 60 mcg/strain • Egg-based | <p>Recombinant</p> <ul style="list-style-type: none"> • RIV4 • Triple antigen dose • 4 mcg/strain • Egg-free • Only for adults age ≥ 18 years |
| <p>Cell-Based</p> <ul style="list-style-type: none"> • cc-IV4 • Grown in cell culture • <u>Egg-free</u> • For people of all ages | | <p>Adjuvanted</p> <ul style="list-style-type: none"> • aIV4 • Includes adjuvant MSF • Egg-based |

| Flu Myths | vs. | Flu Facts |
|--|-----|--|
| The flu shot never works | | You are 40% to 60% less likely to get the flu with a flu shot ¹ . It also can lower the severity of sickness and reduce the risk of needing to go to the doctor or hospital |
| The flu shot can give me the flu. | | The flu shot cannot give you the flu. The virus in the vaccine is not active, so it can't infect you. |
| The flu shot will make me feel sick | | Most people have no symptoms from the flu shot except for soreness or redness at the injection site. You might develop other side effects, such as headache, fever, tiredness, and muscle aches ² . These symptoms are usually mild and will go away within a few days. |
| The only way to get a flu vaccine is through a shot | | As an alternative to a shot, there is a nasal spray vaccine that is approved for use in healthy, non-pregnant people ages 2-49 years old. People with certain medical conditions should not get the nasal spray flu vaccine. |
| It's best to wait to get a shot so I'm covered until the end of the flu season | | It's better to have your flu shot by September or October because it takes about two weeks for the body to build antibodies to the virus. That way, you'll be protected through the flu season, or about six months. |
| I never get the flu, so I don't need a vaccine | | The shot not only protects you, but it also protects others because you are less likely to spread the flu. |

1. Centers for Disease Control and Prevention: Vaccine Effectiveness: How Well Do Flu Vaccines Work? (accessed Dec 2023); cdc.gov.
 2. Centers for Disease Control and Prevention: Flu Vaccine Safety Information (accessed Dec 2023); cdc.gov.

Respiratory Syncytial Virus

RSV Vaccination Coverage: Adults Age ≥ 60 years (week ending 5/11/24)



<https://www.cdc.gov/vaccines/imz-managers/coverage/rsva/wire/ask/its-60-coverage-intent.html>

Respiratory Syncytial Virus

| Abbreviation(s) | Trade Name(s) |
|-----------------|-------------------|
| RSV | Abrysvo Arexvy |

Routine Vaccination

- **Pregnant at 32 weeks – 36w 6 days, from September - January**
 - 1 dose RSV vaccine
- **All other pregnant patients:**
 - RSV vaccination not indicated

Contraindicated or Not Recommended:

Severe allergic reaction (e.g., anaphylaxis) to a vaccine component

Special Situations

- **Age > 60 years**
 - Shared Clinical Decision-Making – 1 dose of RSV vaccine
- **Increased Risk for Severe RSV Disease**
 - Chronic Medical Conditions: lung disease, cardiovascular disease, neurologic or neuromuscular conditions, kidney disorders, liver disorders, hematologic disorders, diabetes mellitus, and moderate or severe immune compromise (due to medical condition or immunosuppressive medications)
- Frail
- Advanced Age
- Reside in nursing home or other long-term care facilities

Precautions:

Moderate or severe acute illness with or without fever

<https://www.cdc.gov/mmwr/volumes/72/wr/mm7229a4.htm>

Tetanus ~ *Clostridium tetani*



The Wounded following the Battle of Corunna: Tetanus Following Gunshot Wounds



<https://www.cdc.gov/mmwr/volumes/72/wr/mm7229a4.htm>

Diphtheria ~ *Corynebacterium diphtheriae*



Diphtheria Prevalence in U.S.

- 1920s (before vaccine): 100,000-200,000 cases; 13,000-15,000 deaths
- 1996-2018: 14 cases; 1 death

<https://doi.org/10.1093/infdis/jiy019>



Pertussis ~ *Bordetella pertussis*

Bordetella pertussis - An Overview



Pertussis Prevalence in U.S.

- **2012:** 48,277 cases
- **2022:** 2,388 cases

Gram-negative bacilli
Bordetella pertussis & *Bordetella parapertussis*

Respiratory tract
 • Main route of infection (via nasal)
 • Anterior (upper) respiratory tract
 • No Penetration (DTP)

Signs
 • 7-12 yr incubation
 • Coughing fits (3-5 sec) 1-2 min intervals
 • Bouts may last 2-3 wk with 1-2 mo of convalescence
 • 10-15% of cases may be asymptomatic

Transmission via 3-5 m droplets
 • Person-to-person
 • Aerosols
 • Contaminated surfaces

Vaccination Part 3 of
 • Tetanus, diphtheria, acellular pertussis (Tdap)
 • Tetanus, diphtheria, pertussis (Tdap)
 • Tetanus, diphtheria, pertussis (Tdap)
 • Tetanus, diphtheria, pertussis (Tdap)



Tetanus, Diphtheria, and Pertussis

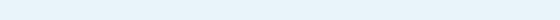
| Abbreviation(s) | Trade Name(s) |
|--|--------------------|
| Tetanus & diphtheria toxoids - Td | Tenivac Tdapax |
| Tetanus, diphtheria toxoids & acellular pertussis - Tdap | Adacel Boostrix |

Routine Vaccination

- **Previously did not receive Tdap or after age 11 years**
 - 1 dose Tdap, the TD or Tdap q10 years

Special Situations

- **Previously did not receive primary vaccination series for tetanus, diphtheria, or pertussis**
 - 1 dose Tdap followed by 1 dose 1 Td or Tdap at least 4 weeks later & 3rd dose of Td or Tdap 6-12 month later
 - Then Td or Tdap q10 years
- **Pregnancy**
 - 1-dose Tdap during each pregnancy, preferably in early part of gestational weeks 27-36.
- **Wound Management**
 - Persons with 3 or more doses of tetanus-toxoid-containing vaccine:
 - Clean & Minor wounds – administer Tdap or Td if ≥ 10 years since last vaccine
 - All other wounds – administer Tdap or Td if ≥ 5 years since last vaccine



Tetanus, Diphtheria, and Pertussis Vaccination

Contraindicated or Not Recommended

- Severe allergic reaction (e.g. anaphylaxis) after a previous dose or to a vaccine component.
- **For Tdap only:** Encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures), not attributable to another identifiable cause, within 7 days of administration of previous dose of DTP, DTaP, or Tdap

Precautions

- Guillain-Barre syndrome (GBS) within 6 weeks after a previous dose of tetanus-toxoid-containing vaccine
- History of Arthus-type hypersensitivity reactions after a previous dose of diphtheria-toxoid-containing or tetanus-toxoid-containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus-toxoid-containing vaccine.
- Moderate or severe acute illness with or without fever
- **For Tdap only:** Progressive or unstable neurologic disorder, uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized.



Rubeola (Measles)

Number of Measles Cases Reported by Year

<https://www.cdc.gov/measles/symptoms/photo.html>
<https://www.cdc.gov/measles/cases-and-trends.html>

Rubulavirus (Mumps)

Number of Mumps Cases Reported by Year

<https://www.cdc.gov/mumps/about/mumps101.html>
<https://www.cdc.gov/mumps/outbreaks.html>

Rubella

Rubella Rash

Blueberry muffin' skin lesions – congenital rubella syndrome

Congenital cataract – congenital rubella syndrome

<https://www.thehospital.com.au/press-releases/2019/05/rubella-rubella.pdf>

Measles, Mumps, & Rubella

Attenuated **Live** Virus Vaccine

| Abbreviation(s) | Trade Name(s) |
|-------------------------------|---------------------|
| Measles, Mumps, Rubella - MMR | M-M-R II Priorix |

Routine Vaccination

- **No Evidence of Immunity**
 - 1 dose
- **Evidence of Immunity**
 - Born before 1957 (except for healthcare personnel)
 - Documentation of receipt of MMR vaccine
 - Laboratory evidence of immunity or disease

Healthcare Personnel

- **Born before 1957 with no evidence of immunity to measles, mumps, or rubella**
 - **Consider:** 2-dose series at least 4 weeks apart (protection measles & mumps)
 - 1-dose (protection against rubella)
- **Born in or after 1957 with no evidence of immunity to measles, mumps, or rubella**
 - 2-dose series at least 4 weeks apart (protection measles & mumps)
 - 1-dose (protection against rubella)

Measles, Mumps, & Rubella

| Abbreviation(s) | Trade Name(s) |
|-------------------------------|---------------------|
| Measles, Mumps, Rubella - MMR | M-M-R II Priorix |

Special Situations

- **Pregnancy with no evidence of immunity to rubella** - MMR **CONTRAINDICATED** in Pregnancy
 - Vaccinate after delivery prior to d/c home: 1 dose
- **Nonpregnant woman of childbearing age with no evidence of immunity to rubella**
 - 1 dose
- **HIV infection with CD4 \geq 15% & CD4 count \geq 200 cells/mm³ for at least 6 months and no evidence of immunity to measles, mumps, or rubella**
 - Never vaccinated: 2-dose series at least 4 weeks apart
 - Previously vaccinated: 1-dose
- **Severe Immunocompromising Conditions** - MMR **CONTRAINDICATED**
- **Students in postsecondary educational institutions, international travelers, & household / close contacts of immunocompromised persons** - without evidence of immunity to measles, mumps, or rubella
 - 2 - dose series at least 4 weeks apart

Measles, Mumps, & Rubella Vaccination

Contraindicated or Not Recommended

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
- Severe immunodeficiency (e.g., hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy or patients with HIV infection who are severely immunocompromised)
- Pregnancy
- Family history of altered immunocompetence, unless verified clinically or by laboratory testing as immunocompetent

Precautions

- Recent (\leq 11 months) receipt of antibody-containing blood product (specific interval depends on product)
- History of thrombocytopenia or thrombocytopenic purpura
- Need for tuberculin skin testing or interferon-gamma release assay (IGRA) testing
- Moderate or severe acute illness with or without fever.

Varicella Zoster Virus → Chicken Pox



Contagious for 1-2 days prior to rash and until all lesions are scabbed over.

Chickenpox illness lasts 4 to 7 days
Classic Symptoms:

- Rash
 - Rash that turns into itchy, fluid-filled blisters that eventually turn into scabs.
 - Rash starts on chest, back and face, and then spreads to the entire body (including inside the mouth, eyelids, or genital area)
- Other typical symptoms (start 1-2 days before rash): fever, tiredness, loss of appetite, headache



Varicella

Attenuated Live Virus Vaccine

| Abbreviation(s) | Trade Name(s) |
|-----------------|---------------|
| Varicella – VAR | Varivax |

Routine Vaccination

No Evidence of Immunity to Varicella

- 2-dose series (4-8 weeks apart)
- Evidence of Immunity**
 - Born before 1980 (except pregnant persons and healthcare personnel), documentation of 2 doses varicella-containing vaccine at least 4 weeks apart, diagnosis or verification of history of varicella or herpes zoster by a healthcare provider, laboratory evidence of immunity or disease

Special Situations

- Pregnancy - No Evidence of Immunity**
 - Varicella vaccine is **CONTRAINDICATED** in pregnancy
 - Vaccinate prior to discharge following delivery if never received any varicella-containing vaccine (regardless of whether US-born before 1980)
- Healthcare Personnel - No Evidence of Immunity**
 - 2-dose series (4-8 weeks apart) if previously did not receive any varicella-containing vaccine regardless of whether U.S.-born before 1980.
 - 1-dose if previously received 1 dose of varicella-containing vaccine
- HIV with CD4% ≥15% and CD4 Count ≥200 cells/mm³**
 - Vaccination may be considered (2 doses 3 months apart)
 - Varicella vaccination **CONTRAINDICATED** CD4% ≤15% or CD4 count <200
- Severe Immunocompromising Conditions**
 - Varicella Vaccination **CONTRAINDICATED**

Varicella Vaccination

Contraindicated or Not Recommended

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component
- Severe immunodeficiency (e.g., hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy or patients with HIV infection who are severely immunocompromised)
- Pregnancy
- Family history of altered immunocompetence, unless verified clinically or by laboratory testing as immunocompetent

Precautions

- Recent (≤11 months) receipt of antibody-containing blood product (specific interval depends on product)
- Receipt of specific antiviral drugs (acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination (avoid use of these antiviral drugs for 14 days after vaccination)
- Use of aspirin or aspirin-containing products
- Moderate or severe acute illness with or without fever

Zoster

| Abbreviation(s) | Trade Name(s) |
|-----------------------------------|---------------|
| Zoster Vaccine, Recombinant - RZV | Shingrix |

Routine Vaccination

- **Age ≥ 50 years**
 - 2-dose recombinant zoster vaccine 2-6 months apart (minimum interval 4 weeks; repeat dose if administered too soon)
- **Note**
 - Serologic evidence or prior varicella is not necessary for zoster vaccine.
 - In patient with known serologic evidence of varicella susceptibility, administer varicella vaccination prior to RZV vaccine

Contraindicated or Not Recommended:

Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component

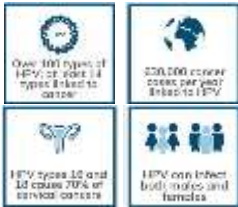
Special Situations

- **Pregnancy**
 - No ACIP recommendation for RZV use in pregnancy
- **Immunocompromising conditions (including persons with HIV regardless of CD4 count)**
 - 2-dose series recombinant zoster vaccine (RZV, Shingrix) 2-6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon)

Precautions:

Moderate or severe acute illness with or without fever; Current herpes zoster infection

Human Papillomavirus (HPV)



https://www.cdc.gov/vaccines/pubs/summarymanual/vhp05_hpv.html

Human Papillomavirus

| Abbreviation(s) | Trade Name(s) |
|------------------------------------|---------------|
| Human Papillomavirus Vaccine - HPV | Gardasil 9 |

All Persons age ≤ 26 years

- **Age 9-14 years**
 - Received 1 dose or 2 doses less than 5 months apart – 1 additional dose
- **Age ≥ 15 years**
 - 3-dose series (0, 1-2 months, 6 months)

Contraindicated or Not Recommended:

Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component

Precautions:

Moderate or severe acute illness with or without fever

Shared Decision Making

- Adults age 27 – 45 (Catch-Up)
 - 2-dose series (if initiated age 9-14)
 - 3-dose series (if initiated ≥ 15 years)

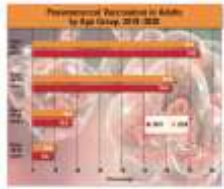
Special Situations

- **Immunocompromising conditions (including HIV)**
 - 3-dose series
- **Pregnancy**
 - HPV vaccine is **not recommended** until after pregnancy

Pneumococcal Pneumonia

Top 5 Principal Diagnosis Among Nonmaternal, Non-Neonatal Inpatient Stays, 2019

| ICD-10 Code | Diagnosis | Number of Stays | Rate per 100 Discharges | Rate per 100 Inpatient Days | Rate per 100 Outpatient Days |
|-------------|----------------------------|-----------------|-------------------------|-----------------------------|------------------------------|
| J01.90 | Unspecified antibiotic use | 2,326,000 | 10.1 | 10.1 | 10.1 |
| J02.90 | Unspecified antibiotic use | 1,122,000 | 5.2 | 5.2 | 5.2 |
| J01.01 | Penicillin G | 1,000,000 | 4.7 | 4.7 | 4.7 |
| J01.02 | Penicillin V | 700,000 | 3.2 | 3.2 | 3.2 |
| J01.80 | Other penicillins | 600,000 | 2.8 | 2.8 | 2.8 |



<https://www.hhs.gov/opa/foia-response/pneumonia-reports-the-top-most-frequent-diagnoses-for-inpatient-stays>

Pneumococcal Vaccination

| Abbreviation(s) | Trade Name(s) |
|-------------------------------------|---|
| Pneumococcal conjugate vaccine | PCV15 – Vaxneuvance PCV20 – Prevnar 20 |
| Pneumococcal polysaccharide vaccine | PPSV23 – Pneumovax 23 |

Routine Vaccination

- **Age ≥ 65 years who have**
 - Not previously received a dose of PCV13, PCV15, or PCV20 or whose previous vaccination history is unknown
 - 1 dose PCV15 OR 1 dose of PCV20
 - NOTE: If PCV15 is used, administer 1 dose of PPSV23 at least 1 year after the PCV15 dose (May use minimum interval of 8 weeks for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak)

Adults 185 years old Complete pneumococcal vaccine schedule

Pneumococcal

Complete vaccine series:

- PCV13 at any age
- PPSV23 at 65 years

Shared clinical decision-making for those who already completed the series with PCV13 and PPSV23:

- PCV15 at any age
- PCV20 at any age

www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf

Pneumococcal



Get the App



Hepatitis A

| Abbreviation(s) | Trade Name(s) |
|----------------------------|-----------------|
| Hepatitis A Vaccine - HepA | Havrix Vaqta |

Patients who Request Vaccination

Not Previously Vaccinated

- 2-dose series HepA
 - Havrix 0-12 months apart; or
 - Vaqta 6-18 months apart
- 3-dose series HepA-HepB
 - Twinrix at 0, 1, 6 months

Contraindicated or Not Recommended: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component including Neomycin

Population at Risk for Hepatitis A

Infection

- Chronic Liver Disease
- HIV Infection
- Men who have sex with men
- Injection or non-injection drug use
- Persons experiencing homelessness
- Work with Hepatitis A virus
- Travel in countries - high/intermediate endemic Hep A
- Close, personal contact - international adoptee
- Pregnancy
- Settings for exposure - healthcare, group homes, nonresidential day care facilities.

Precautions: Moderate or severe acute illness with or without fever

Hepatitis B

Routine Vaccination: Age 19 – 59

- 2-dose series HepBisav-B*
 - doses 4 weeks apart
- 3-dose series Engerix-B, Prehepbrio*, Recombivax HB
 - at 0, 1, 6 months
 - Minimum interval: dose 1 to dose 2: 4weeks; dose 2 to dose 3: 8 weeks
- 3-dose series HepA-HepB
 - Twinrix at 0, 1, 6 months
- 4-dose series HepA-HepB
 - Accelerated Twinrix schedule of 3 doses at 0, 7, and 21-30 days; booster at 12 months

Age ≥ 60 years without known risk factors – may receive a Hep B Vaccine Series

Age ≥ 60 years with known risk factors – should receive a Hep B Vaccine Series

HepB risk factors

- Chronic Liver Disease
- Sexual exposure risk
- Current or recent injection drug use
- Percutaneous or mucosal risk for exposure to blood
- Incarceration
- Travel in countries with high or intermediate endemic hepatitis B

Age ≥ 60 years with diabetes – shared clinical decision making to choose a HepB Vaccine Series.

Patients on dialysis – 3 dose Recombivax HB or 4-dose Engerix-B (use 2mL dose instead of 1 mL)

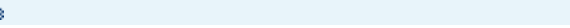
Hepatitis B Vaccination

Contraindicated or Not Recommended

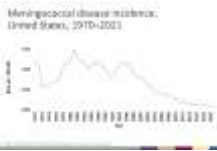
- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component including yeast
- Pregnancy; *Hepivisav-Band PreHevbro* are note recommended due to lack of safety data in pregnant persons

Precautions

- Moderate or severe acute illness with or without fever



Meningococcal



Types of Meningococcal Disease

- Septicemia
- Meningitis
- Septic meningitis
- Disseminated intravascular coagulation (DIC)
- Acute otitis media
- Acute epiglottitis
- Acute sinusitis
- Acute mastoiditis
- Acute otitis externa
- Acute otitis media with effusion
- Acute sinusitis with effusion
- Acute mastoiditis with effusion
- Acute otitis externa with effusion
- Acute otitis media with effusion with effusion
- Acute sinusitis with effusion with effusion
- Acute mastoiditis with effusion with effusion
- Acute otitis externa with effusion with effusion

Risk factors and other conditions

- Close contact with someone who has meningococcal disease
- Travel to areas where meningococcal disease is common
- Living in a crowded setting
- Having a weakened immune system
- Having a spleen that does not work properly
- Having a complement deficiency
- Having a prosthetic joint
- Having a cochlear implant
- Having a heart valve prosthesis
- Having a heart transplant
- Having a kidney transplant
- Having a liver transplant
- Having a lung transplant
- Having a pancreas transplant
- Having a small intestine transplant
- Having a stomach transplant
- Having a testis transplant
- Having a uterus transplant
- Having a heart, lung, or liver transplant
- Having a heart, lung, or liver transplant with effusion
- Having a heart, lung, or liver transplant with effusion with effusion
- Having a heart, lung, or liver transplant with effusion with effusion with effusion

4:1:1:1 FATAL

1 in 4,000 chance of death

1 in 10,000 chance of death

1 in 100,000 chance of death

1 in 1,000,000 chance of death

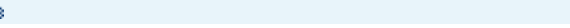
- Septicemia
- Meningitis
- Septic meningitis
- Disseminated intravascular coagulation (DIC)
- Acute otitis media
- Acute epiglottitis
- Acute sinusitis
- Acute mastoiditis
- Acute otitis externa
- Acute otitis media with effusion
- Acute sinusitis with effusion
- Acute mastoiditis with effusion
- Acute otitis externa with effusion
- Acute otitis media with effusion with effusion
- Acute sinusitis with effusion with effusion
- Acute mastoiditis with effusion with effusion
- Acute otitis externa with effusion with effusion

https://www.cdc.gov/meningococcal/surveillance/index.html#?_ga=2.101074140.1621944444.1621944444.1621944444

Meningococcal Serogroups ACWY

| Abbreviation(s) | Trade Name(s) |
|-----------------|---------------|
| MenACWY-D | Menactra |
| MenACWY-CRM | Menveo |
| MenACWY-TT | MenQuadfi |

- Special Situations**
- Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g. eculizumab, ravulizumab) use
 - 2-dose series MenACWY at least 8 weeks apart; revaccinate every 5 years if risk remains
 - Travel in countries with hyperendemic or epidemic meningococcal disease, or microbiologist routinely exposed to *Neisseria meningitidis*
 - 1 dose MenACWY; revaccinate every 5 years if risk remains
 - First-year college students who live in residential housing (if not previously vaccinated at age ≥ 16 years) or military recruit
 - 1 dose MenACWY



Poliovirus

Routine Vaccination

- **Adults known or suspected to be unvaccinated or incompletely vaccinated**
 - Administer remaining doses (1, 2, or 3 IPV doses) to complete a 3-dose primary series

Special Situations

- **Adults at increased risk of exposure to poliovirus who completed primary series***
 - Administer 1 lifetime IPV booster
- *Note: Complete primary series consists of at least 3 doses of IPV or trivalent oral poliovirus vaccine (tOPV) in any combination.



Haemophilus influenzae type b

| Abbreviation(s) | Trade Name(s) |
|-----------------|--------------------------------|
| Hib | ActHIB Hiberix PedvaxHIB |

Special Population

- Anatomical or Functional Asplenia (including sickle cell disease)
 - Not previously Vaccinated: 1 dose
 - Elective splenectomy: 1 dose preferably at least 14 days before splenectomy
- Hematopoietic Stem Cell Transplant (HSCT)
 - 3-dose series 4 weeks apart starting 6-12 months after successful transplant, regardless of Hib vaccination history.

Contraindicated or Not Recommended: Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component

Precautions: Moderate or severe acute illness with or without fever



Monkeypox

| Abbreviation(s) | Trade Name(s) |
|-----------------|---------------|
| Mpox | Jynneos |

Any person at risk for Mpox infection

- 2-dose series, 28 days apart

Mpox risk factors

- Persons who are gay, bisexual, and other MSM, transgender or nonbinary people who in the past 6 months have had:
 - A new diagnosis of at least 1 sexually transmitted disease
 - More than 1 sexual partner
 - Sex in a commercial sex venue
 - Sex in association with a large public event in a geographic area when Mpox transmission is occurring
 - Person who are sexual partners of the persons described above
 - Persons who anticipate experiencing any of the situations described above
- **Pregnancy** – no recommendation from ACIP due to lack of safety data; Engage in a shared decision-making process if above risk factors present regarding whether to receive the vaccination



Summary of Vaccines

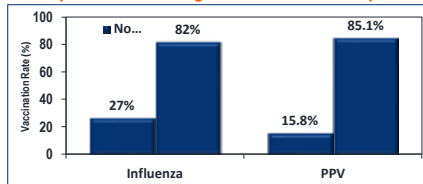
- Inactivated Vaccines
 - Hepatitis A
 - Flu
 - Polio
 - Rabies
- Live-Attenuated Vaccines
 - MMR (Measles, mumps, rubella)
 - Varicella (Chickenpox)
 - Yellow Fever
 - Rotavirus
 - Smallpox
 - Flu (Nasal Spray)
- Messenger RNA (mRNA) Vaccines
 - COVID-19
- Subunit, Recombinant, Polysaccharide, & Conjugate Vaccines
 - Hib (*Haemophilus influenzae type b*)
 - Hepatitis B
 - HPV (Human papillomavirus)
 - Whooping cough (part of DTaP)
 - Pneumococcal disease
 - Meningococcal disease
 - Shingles
- Toxoid Vaccines
 - Diphtheria
 - Tetanus
- Viral Vector Vaccines
 - COVID-19

Egg Allergy - Contraindication to Yellow Fever vaccine & Q fever vaccine
 Egg Allergy – Caution (but considered safe): MMR-V & Influenza Vaccine

Table 3 Recommended Adult Immunization Schedule for Medical Conditions or Other Indications (Selected Issues, 2019)

Clinician Recommendation Translates Into Higher Vaccination Rates

(Even for Patients with Negative Attitudes Toward Vaccines)



*High-risk patients were those ages 65 and older or those having heart disease, lung disease, diabetes, or other serious illness.

Nichol KL, et al. J Gen Intern Med. 1996;11(11):673-677.



Thank You – Questions?

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