Welcome to the

**Epidemiology and Prevention of Vaccine-Preventable Diseases**

Course

The “Pink Book” Course

Pediatric and Adult

ACIP Immunization Recommendations

August 14–15, 2019
CDC Course Faculty

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  - Medical Officer

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CDC does not accept commercial support
The recommendations to be discussed are primarily those of the Advisory Committee on Immunization Practices (ACIP):

- Composed of 15 nongovernment experts in clinical medicine and public health
- Provides guidance on use of vaccines and other biologic products to DHHS, CDC, and the U.S. Public Health Service

Divided into 2 tracks
- Day 1 Pediatric
- Day 2 Adult

Advisory Committee on Immunization Practices [www.cdc.gov/vaccines/acip/index.html](http://www.cdc.gov/vaccines/acip/index.html)
Course Text

**Epidemiology and Prevention of Vaccine-Preventable Diseases**

13th edition ("Pink Book")

- 13th Edition (2017) available online at:

- Supplement available on-line only at:
  - HTML: [www.cdc.gov/vaccines/pubs/pinkbook/supplement.html](http://www.cdc.gov/vaccines/pubs/pinkbook/supplement.html)

- Updated recommendations include:
  - Human papillomavirus vaccine
  - Meningococcal B vaccine
  - Pneumococcal vaccine
Course Objectives

At the end of the course, attendees will be able to:

1. Describe the difference between active and passive immunity.
2. List two characteristics of live, attenuated vaccines.
3. List two characteristics of inactivated vaccines.
4. For each vaccine-preventable disease discussed, identify those for whom routine immunization is recommended.
5. For each vaccine-preventable disease discussed, describe characteristics of vaccine used to prevent the disease.
6. Describe an emerging immunization issue.
7. Locate resources relevant to current immunization practice.
8. Implement disease detection and prevention health care services (e.g., smoking cessation, weight reduction, diabetes screening, blood pressure screening, immunization services) to prevent health problems and maintain health.
Clinical Resources for You and Other Staff

- Course immunization resources list included in your folder
- Additional clinical resources and job aids are highlighted in:
  - The slide show playing before we start and during lunch and breaks
  - Presentations throughout the course
Questions?

- Send your questions using the conference app
- We will answer questions throughout the day
Assessing Adult Immunization History and Needed Vaccines

Day 2: Adult Track

August 2019
The National Vaccine Advisory Committee (NVAC) revised the Standards for Adult Immunization Practice in 2013.

These updated Standards call on ALL healthcare professionals—whether they provide vaccinations or not—to take steps to help ensure adult patients are fully immunized.

Patients trust you to give them the best advice on how to protect their health.

Vaccine-preventable diseases can result in serious illness, hospitalization, and even death.

Why Were the Standards for Adult Immunization Practice Updated?

- Adult vaccination rates are extremely low

- Most adults are NOT aware that they need vaccines

- Recommendation from their healthcare professional is the strongest predictor of whether patients get vaccinated

- There are many missed opportunities for vaccination because many healthcare professionals are not routinely assessing vaccination status

Standards for Adult Immunization Practice

- **Step 1: Assess**
- **Step 2: Recommend**
- **Step 3: Administer or refer**
- **Step 4: Document**

1. Assess for Needed Vaccines

- Assessment is the critical first step in ensuring adult patients get the vaccines they need
- Patients’ vaccination needs will change over time based on factors such as:
  - Age
  - Health conditions
  - Lifestyle
  - Travel
  - Occupation

Step 1a: Review Immunization Record of History

- Proof of vaccination = written, dated records
  - Self-reported doses of influenza vaccine and PPSV23 are acceptable

Vaccine Information for Adults [https://www.cdc.gov/vaccines/adults/vaccination-records.html](https://www.cdc.gov/vaccines/adults/vaccination-records.html)
No Documentation?

- **Possible sources**
  - Medical records
  - ALERT and other Immunization Information Systems
  - School records

- **Still cannot find documentation of immunization history?**
  - No records = unvaccinated
  - ACIP General Best Practice Guidelines for Immunization states that a patient’s undocumented history can be accepted as proof of vaccination only for influenza and pneumococcal polysaccharide vaccines
1b. Assess for Needed Vaccines

- Use the current ACIP immunization schedule for adults
  - For persons 19 years of and older
  - Published annually
  - Outlines immunization recommendations for healthy persons and those at risk due
Step 1b: Think “H-A-L-O”

- Adult immunization recommendations are based on:
  - Age
  - Medical conditions
  - Lifestyle
  - Occupational risk

Before you vaccine adults, consider their “H-A-L-O”!

HALO checklist of factors that indicate a possible need for adult vaccination

Step 1b cont: Think “H-A-L-O”

H – Health conditions including:
- Pregnant
- Certain chronic diseases
- Immunosuppressed (including HIV)
- History of STD
- Asplenia
- Cochlear implant (candidate/recipient)
- Organ transplant
- CSF leaks
- Alcoholism
- Diabetes

A – Age factors including:
- Females 9–26 years (HPV)
- Males 9–21 years (HPV)
- High-risk males 22 – 26 years (HPV)
- 50 years and older (RZV)
- 65 years and older (PPSV23)
- 65 years and older if not previously vaccinated (PCV13)

Step 1b cont: Think “H-A-L-O”

L – Lifestyle factors including:
- Born in the U.S.
- Not in long-term, mutually monogamous relationship
- Men who have sex with men
- International traveler
- Close contact of international \ adoptee
- Cigarette smoker

O – Occupational or other factors including:
- College students
- Adults in institutional settings (e.g., chronic care, correctional)
- Health care personnel
- Certain lab workers
- Public safety workers

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–49 years</th>
<th>50–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza inactivated (IIV) or Influenza recombinant (RIV)</td>
<td></td>
<td></td>
<td></td>
<td>1 dose annually</td>
<td></td>
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<tr>
<td>Influenza live attenuated (LAIV)</td>
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<tr>
<td>Tetanus, diphtheria, pertussis (Tdap or Td)</td>
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<td>1 dose Tdap, then Td booster every 10 yrs</td>
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<tr>
<td>Measles, mumps, rubella (MMR)</td>
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<tr>
<td>Varicella (VAR)</td>
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<td>2 doses if born in 1980 or later</td>
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<tr>
<td>Zoster recombinant (RZV) (preferred)</td>
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<td>Zoster live (ZVL)</td>
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<td></td>
<td></td>
<td>2 doses</td>
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<tr>
<td>Human papillomavirus (HPV) Female</td>
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<td></td>
<td>1 dose</td>
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<tr>
<td>Human papillomavirus (HPV) Male</td>
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<td>Pneumococcal conjugate (PCV13)</td>
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<td>1 dose</td>
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<td>Pneumococcal polysaccharide (PPSV23)</td>
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<td>Hepatitis A (HepA)</td>
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<td>Hepatitis B (HepB)</td>
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<td>Meningococcal A, C, W, Y (MenACWY)</td>
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<tr>
<td>Meningococcal B (MenB)</td>
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<tr>
<td>Haemophilus influenzae type b (HiB)</td>
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</table>

Recommendation for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

No recommendation

02/01/19
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pregnancy</th>
<th>Immunocompromised (excluding HIV infection)</th>
<th>HIV infection CD4 count</th>
<th>Asplenia, complement deficiencies</th>
<th>End-stage renal disease, on hemodialysis</th>
<th>Heart or lung disease, alcoholism¹</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Health care personnel²</th>
<th>Men who have sex with men</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIV or RIV</td>
<td>CONTRAINDICATED</td>
<td>1 dose annually</td>
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<tr>
<td>Tdap or Td</td>
<td>1 dose Tdap each pregnancy</td>
<td>1 dose Tdap, then Td booster every 10 yrs</td>
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<tr>
<td>MMR</td>
<td>CONTRAINDICATED</td>
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<tr>
<td>VAR</td>
<td>CONTRAINDICATED</td>
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<tr>
<td>RZV (preferred)</td>
<td>DELAY</td>
<td>2 doses at age ≥ 50 yrs</td>
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<tr>
<td>ZVL</td>
<td>CONTRAINDICATED</td>
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<tr>
<td>HPV Female</td>
<td>DELAY</td>
<td>3 doses through age 26 yrs</td>
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<tr>
<td>HPV Male</td>
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<tr>
<td>PCV13</td>
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<td>1 dose</td>
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<tr>
<td>PPSV23</td>
<td></td>
<td>1, 2, or 3 doses depending on age and indication</td>
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<tr>
<td>HepA</td>
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<td>2 or 3 doses depending on vaccine</td>
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<tr>
<td>HepB</td>
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<td>2 or 3 doses depending on vaccine</td>
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<tr>
<td>MenACWY</td>
<td></td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
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<tr>
<td>MenB</td>
<td>PRECAUTION</td>
<td>2 or 3 doses depending on vaccine and indication</td>
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<tr>
<td>Boco</td>
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<td>3 doses HSCT recipients only</td>
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</tbody>
</table>

¹ Precaution for LAIV does not apply to alcoholism. ² See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. ³ Hematopoietic stem cell transplant.
Follow true contraindications!
  • Knowledgeable staff is key

Step 1d cont: Screen for Contraindications and Precautions
Conditions Commonly Misperceived as Contraindications

Quick Guide to Conditions Commonly Misperceived as Contraindications to Vaccination

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Conditions commonly misperceived as contraindications (i.e., vaccination may be administered under these conditions)</th>
</tr>
</thead>
</table>
| General for all vaccines, including DTaP, pediatric DT, adult Td, adolescent-adult Tdap, IPV, MMR, Hib, hepatitis A, hepatitis B, varicella, rotavirus, PCV, TIV, LAV, MPSV, MCV, MPSV4, HPV, and herpes zoster | - Mild acute illness with or without fever  
- Mild to moderate local reaction (i.e., swelling, redness, soreness), low-grade or moderate fever after previous dose  
- Lack of previous physical examination in well-appearing person  
- Current antimicrobial therapy  
- Convalescent phase of illness  
- Premature birth (hepatitis B vaccine is an exception in certain circumstances)  
- Recent exposure to an infectious disease  
- History of penicillin allergy, other nonvaccine allergies, relatives with allergies, or receiving allergen extract immunotherapy |
| DTaP | - Fever of <100.4°F (<38.0°C), fussiness or mild drowsiness after a previous dose of DTP/DTaP  
- Family history of seizures  
- Family history of sudden infant death syndrome  
- Family history of an adverse event after DTP or DTaP administration  
- Stable neurologic conditions (e.g., cerebral palsy, well-controlled seizures, or developmental delay) |
| Tdap | - Fever of ≥101.5°F (≥38.5°C) for 48 hours after vaccination with a previous dose of DTP or DTaP  
- Collapse or shock-like state (i.e., hypotonic hyporesponsive episode) within 48 hours after receiving a previous dose of DTP/DTaP  
- Seizure >3 days after receiving a previous dose of DTP/DTaP  
- Persistent, intractable crying lasting >3 hours within 48 hours after receiving a previous dose of DTP/DTaP  
- History of extensive limb swelling after DTP/DTaP/Td that is not an anaphylaxis-type reaction  
- Stable neurologic disorder  
- Presence of neurologic disorder with a prior history of DTP/DTaP/Td hypersensitivity |

https://www.cdc.gov/vaccines/hcp/admin/contraindications-misconceptions.html
Step 1e cont: Screen for Contraindications and Precautions
Screening Checklist for Contraindications to Vaccines for Adults

- Use a standardized screening tool
- IAC has screening checklists in English and other languages
- Standardized forms and procedures have been shown to decrease administration errors

2. Recommend Vaccines!

- Strongly recommend vaccines that patients need, whether the office stocks them or not
- Your recommendation can make a difference
  - Clinicians are the most valued and trusted source of health information for adults
  - Adults believe that vaccines are important, but many are not aware of all the vaccines they need

Share Important Information

- Share important information to help patients make informed decisions about vaccinations including why the recommended vaccine is right for the patient given his or her age, health status, lifestyle, occupation, or other risk factors.

- Offer information about the vaccine using Vaccine Information Statements (VIS)
  - Include positive experiences with vaccines (personal or in your practice), as appropriate, to reinforce the benefits and strengthen confidence in vaccination.

- Address patient questions and any concerns about the vaccine, including side effects, safety, and vaccine effectiveness.

- Remind patients that vaccines protect them and their loved ones from many common and serious diseases.

- Explain the potential costs of getting the disease, including serious health effects, time lost (such as missing work or family obligations), and financial costs.
Federal law requires immunization providers to share the appropriate vaccine information statement for:

- Each vaccine
- Each time it is given

Provide Vaccine Information Statements (VISs) for Recommended Vaccines

Federal law requires healthcare staff to provide a VIS to a patient, parent, or legal representative before each dose of certain vaccines.

https://www.cdc.gov/vaccines/hcp/vis/index.html
Provide Vaccine Information Statements (VISs) for Recommended Vaccines

<table>
<thead>
<tr>
<th>VACCINE INDEX</th>
<th>LANGUAGE INDEX</th>
<th>A-Z</th>
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<tbody>
<tr>
<td>English</td>
<td>Hindi</td>
<td>Romanian</td>
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<td>Amharic</td>
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<td>Russian</td>
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<td>Samoan</td>
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<td>Armenian</td>
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<td>Spanish</td>
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<td>Burmese</td>
<td>Karen</td>
<td>Swahili</td>
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<td>Cambodian (K̄mør)</td>
<td>Khmer (Cambodian)</td>
<td>Tagalog</td>
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<td>Laotian</td>
<td>Tigrigna</td>
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<td>Marshalloso</td>
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<td>German</td>
<td>Portuguese</td>
<td>Yiddish</td>
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<tr>
<td>Haitian Creole</td>
<td>Punjabi</td>
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</tbody>
</table>

http://www.immunize.org/vis/
3. Administer Needed Vaccines

- **Recommend and offer vaccines at the same visit**

- **Research shows that when patients receive a vaccine recommendation and are offered the vaccine at the same time, they are more likely to get vaccinated**

- **For vaccines you don’t stock, refer patients to a local immunization provider that can vaccinate**

Vaccine Documentation

- Keep an up-to-date record of the vaccines your patients have received to make sure they have the best protection against vaccine-preventable diseases.

- To ensure patients get the vaccines they need and to prevent unnecessary vaccination, you should:
  - Record vaccination in patients’ medical records
  - Provide documentation of vaccines received to patients for their personal records
  - Document vaccinations in immunization information systems (IIS)

Create an environment that supports immunization
  • This applies to ALL staff – both clinical AND administrative staff

Use standing orders or protocols
  • Immunization Action Coalition has templates for all vaccines

Put procedures in place to assess for needed vaccines at every visit

Remind patients when vaccines are due or doses are missed

Use provider prompts to help staff stay on top of needed vaccines that are due soon or are overdue

Review how your practice does in keeping your patients up to date on vaccines

No Vaccines?

- **Whether you provide vaccines for adults or not:**
  1. Assess immunization status at every clinical encounter
  2. Know adult immunization providers in your community and refer patients
     › Pharmacies
     › Health departments
     › Primary care providers
Questions?
Influenza Disease and Influenza Vaccines

Day 2: Adult Track

August 2019
Disease
Influenza

- Highly infectious viral illness
- First pandemic in 1580
- At least 4 pandemics in 19th century
- 3 pandemics in 20th century
  - “Spanish flu” pandemic of 1918-1919
  - Pandemics of 1957 and 1968 of lesser severity
- Most recent pandemic (H1N1) in 2009-2010
- Estimated 21 million deaths worldwide in pandemic of 1918-1919
- Virus first isolated in 1933
Influenza Virus Strains

- **Type A**
  - Moderate to severe illness
  - All age groups
  - Humans and other animals

- **Type B**
  - Milder epidemics
  - Primarily affects children
  - Humans only

- **Type C**
  - Rarely reported in humans
  - No epidemics
Influenza Type A Subtypes

Subtypes of type A determined by hemagglutinin (H) and neuraminidase (N)

<table>
<thead>
<tr>
<th>Virus type</th>
<th>Geographic origin</th>
<th>Strain number</th>
<th>Year of isolation</th>
<th>Virus subtype</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/California/7/2009 (H1N1)</td>
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WHO declares first flu pandemic in 41 years

By Steve Sternberg, USA TODAY

The World Health Organization scaled up its flu warning to its highest level Thursday, declaring the first global influenza pandemic in 41 years as cases of H1N1 continued to mount in the USA, Europe, Latin America and Australia.

"The scientific criteria for a pandemic have been met," said Margaret Chan, director general of the WHO. "The world is now at the start of the 2009 influenza pandemic."

The decision marks the agency's formal recognition of the magnitude of the challenge posed by a novel, H1N1 flu virus now spreading unchecked among people who, because the virus is new, are virtually all susceptible to it.

The WHO is working closely with vaccine makers, who are just wrapping up production of seasonal flu vaccine for fall and gearing up to produce the first doses of an H1N1 vaccine by September. The agency urged member nations to maintain their vigilance to detect ominous changes in the virus'
Influenza Pathogenesis

- Respiratory transmission of virus
- Replication in respiratory epithelium with subsequent destruction of cells
- Viremia rarely documented
- Virus shed in respiratory secretions for 5-10 days
Influenza Clinical Features

- Incubation period: 2 days (range: 1-4 days)

- 50% of infected persons develop classic symptoms

- Abrupt onset of fever (usually 101° -- 102°F), myalgia, sore throat, nonproductive cough, headache
Influenza Complications

- Pneumonia
  - Primary influenza pneumonia
  - Secondary bacterial pneumonia

- Reye syndrome

- Myocarditis

- Death reported in <1 per 1,000 cases
Impact of Influenza—United States, 1976–2007

- Number of influenza-associated deaths varies substantially by year, influenza virus type and subtype, and age group

- Annual influenza-associated deaths ranged from 3,349 (1985–86 season) to 48,614 (2003–04 season), average of 23,607 annual deaths


- Persons 65 years of age and older account for ~90% of deaths

- 2.7 times more deaths during seasons when A(H3N2) viruses were
Impact of Influenza--United States

- Highest rates of complications and hospitalizations among persons 65 years and older, young children, and persons of any age with certain underlying medical conditions
- Average of >200,000 influenza-related excess hospitalizations
- 37% of hospitalizations among persons younger than 65 years of age
- Greater number of hospitalizations during years that A(H3N2) is predominant
Influenza Epidemiology

- **Reservoir**
  - Human, animals (type A only)

- **Transmission**
  - Respiratory, probably airborne

- **Temporal pattern**
  - Peak December – March in temperate climate
  - May occur earlier or later

- **Communicability**
  - 1 day before to 5 days after onset (adults)
Influenza Diagnosis

- Clinical and epidemiological characteristics

- Isolation of influenza virus from clinical specimen (e.g., throat, nasopharynx, sputum)

- Significant rise in influenza IgG by serologic assay
## Influenza Virus Testing Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Types Detected</th>
<th>Test Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viral tissue cell culture</strong></td>
<td>A and B</td>
<td>3–10 days</td>
</tr>
<tr>
<td><strong>Rapid cell culture (shell vials; cell mixtures; yields live virus)</strong></td>
<td>A and B</td>
<td>1–3 days</td>
</tr>
<tr>
<td><strong>Immunofluorescence, direct (DFA) or indirect (IFA) fluorescent antibody staining</strong></td>
<td>A and B</td>
<td>1–4 hours</td>
</tr>
<tr>
<td><strong>Reverse transcriptase polymerase chain reaction (RT-PCR) and other molecular assays (influenza viral RNA or nucleic acid detection)</strong></td>
<td>A and B</td>
<td>Varies by assay (generally 60–80 minutes and 4–8 hours)</td>
</tr>
<tr>
<td><strong>Rapid molecular assay (influenza viral RNA or nucleic acid detection)</strong></td>
<td>A and B</td>
<td>Approximately 20 minutes</td>
</tr>
<tr>
<td><strong>Rapid influenza diagnostic tests (antigen detection)</strong></td>
<td>A and B</td>
<td>&lt;15 minutes</td>
</tr>
</tbody>
</table>

Adapted from http://www.cdc.gov/flu/professionals/diagnosis/rapidclin.htm#table
Influenza Surveillance

- Monitor prevalence of circulating strains and detect new strains
- Estimate influenza-related morbidity, mortality, and economic loss
- Rapidly detect outbreaks
- Assist disease control through rapid preventive action
Influenza Positive Tests Reported to CDC by U.S. Public Health Laboratories, National Summary, 2018-2019 Season
Vaccine
Inactivated Influenza Vaccine Efficacy

- About 47% effective among all age groups

- 50-60% effective in preventing hospitalization among elderly persons
Influenza and Complications Among Nursing Home Residents

### ACIP Statement, Table 1

- **13 distinct products**
- **More than one might be appropriate for any given recipient**
  - ACIP/CDC express no preferences for any one type of influenza vaccine over another, where more than one is appropriate and available
  - Vaccination should not be delayed in order to obtain a specific product.
Abbreviations

- IIV = Inactivated influenza vaccine
- LAIV = Live, attenuated influenza vaccine
- RIV = Recombinant influenza vaccine
- Prefixes: SD = standard dose
  HD = high dose
  a = adjuvanted
  cc = cell-culture-based
- Numeric suffixes (e.g., RIV3, IIV4) indicate trivalent or quadrivalent, respectively
There are Still Many Different Vaccines

- ACIP Statement, Table 1
- 13 distinct products
- More than one might be appropriate for any given recipient
  - ACIP/CDC express no preferences for any one type of influenza vaccine over another, where more than one is appropriate and available
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**Influenza Vaccines**

- **IIV:**
  - Contain inactivated virus, split or subunit
    - High dose or standard dose
    - Trivalent or quadrivalent
    - Unadjuvanted or adjuvanted
    - Egg- or cell-culture-based
  - Many brands, some approved for those as young as 6 months of age

- **LAIV**
  - Live, attenuated virus
  - Intranasal spray
2019-2020 Influenza Vaccine Composition

**Trivalent vaccines:**
- An A/Brisbane/2/2018 (H1N1)pdm09-like virus (*updated*)
- An A/Kansas/14/2017 (H3N2)-like virus (*updated*)
- B/Colorado/06/2017-like virus

**Quadrivalent vaccines:**
- The above three viruses
- A B/Phuket/3073/2013-like virus
Influenza Vaccines

**IIV:**
- Contain inactivated virus, split or subunit
  - High dose or standard dose
  - Trivalent or quadrivalent
  - Unadjuvanted or adjuvanted
  - Egg- or cell-culture-based
- Many brands, some approved for those as young as 6 months of age

**LAIV**
- Live, attenuated virus
- Intranasal spray

**RIV**
- Contain recombinant HA
- Egg-free
- Quadrivalent
Groups Recommended for Vaccination

- Routine annual influenza vaccination is recommended for all persons ≥6 months of age who do not have contraindications

- While vaccination is recommended for everyone in this age group, there are some for whom it is particularly important:
  - People age ≥6 months who are at high risk of complications and severe illness
  - Contacts and caregivers of these people, and of infants under age 6 months (because there is no vaccine approved for children this age)
Adult Groups at Increased Risk for Influenza Complications and Severe Illness

- Persons with chronic pulmonary (including asthma) or cardiovascular (except isolated hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus)
- Immunosuppressed persons
- Women who are or will be pregnant during the influenza season
- Residents of nursing homes and other long-term care facilities
- American Indians/Alaska Natives
- Persons who are extremely obese (BMI ≥40)
Influenza Vaccination of Pregnant Women

- Influenza vaccination recommended by ACIP for women who will be pregnant during influenza season since 2004
  - Increased risk for severe influenza illness in pregnant women, particularly during second and third trimesters

- Previous language stated pregnant women should receive inactivated influenza vaccine (IIV)

- For 2017-18, pregnant women may receive any licensed, recommended, age-appropriate influenza vaccine
  - IIV or RIV
Egg-allergic persons can receive any licensed, recommended vaccine that is otherwise appropriate (IIV, LAIV, or RIV)

However, RIV not licensed for persons under 18 years of age

One additional measure remains for persons with a history of severe allergic reaction to egg (i.e., any symptom other than hives)

• “The selected vaccine should be administered in an inpatient or outpatient medical setting (including but not necessarily limited to hospitals, clinics, health departments, and physician offices). Vaccine administration should be supervised by a health care provider who is able to recognize and manage severe allergic conditions.”

No specific postvaccination observation period recommended

• However, per the ACIP General Best Practices guidelines, providers should consider observing all recipients of any vaccine for 15 minutes to avoid injury due to syncope
Inactivated Influenza Vaccine (IIV) and RIV

Contraindications

- Severe allergic reaction (e.g., anaphylaxis) to a vaccine component or following a prior dose of inactivated influenza vaccine

Precautions

- Moderate or severe acute illness

- History of Guillain-Barré syndrome (GBS) within 6 weeks following a previous dose of influenza vaccine
# LAIV Contraindications and Precautions

<table>
<thead>
<tr>
<th>Contraindications</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• History of severe allergic reaction to any component of the vaccine† or after a previous dose of any influenza vaccine</td>
<td>• Moderate-to-severe acute illness with or without fever</td>
</tr>
<tr>
<td>• Concomitant aspirin or salicylate-containing therapy in children and adolescents</td>
<td>• History of Guillain-Barré syndrome within 6 weeks of receipt of influenza vaccine</td>
</tr>
<tr>
<td>• Children aged 2 through 4 years who have received a diagnosis of asthma or whose parents or caregivers report that a health care provider has told them during the preceding 12 months that their child had wheezing or asthma or whose medical record indicates a wheezing episode has occurred during the preceding 12 months</td>
<td>• Asthma in persons aged ≥5 years</td>
</tr>
<tr>
<td>• Children and adults who are immunocompromised due to any cause (including immunosuppression caused by medications or by HIV infection)</td>
<td>• Other underlying medical conditions that might predispose to complications after wild-type influenza infection (e.g., chronic pulmonary, cardiovascular [except isolated hypertension], renal, hepatic, neurologic, hematologic, or metabolic disorders [including diabetes mellitus])</td>
</tr>
<tr>
<td>• Close contacts and caregivers of severely immunosuppressed persons who require a protected environment</td>
<td></td>
</tr>
<tr>
<td>• Pregnancy</td>
<td></td>
</tr>
<tr>
<td>• Receipt of influenza antiviral medication within the previous 48 hours</td>
<td></td>
</tr>
</tbody>
</table>
Influenza Vaccine Adverse Events

- **IIV**
  - Local reactions — common
  - Guillain-Barré syndrome (GBS) - expected to be greater among persons with a history of GBS than among persons with no history of GBS

- **LAIV**
  - Nonspecific systemic symptoms - common
Inactivated Influenza Vaccine (IIV) Adverse Reactions

- **Local reactions (soreness, redness)**
  - 15%—20%

- **Fever, malaise, myalgia**
  - Less than 1%

- **Allergic reactions (hives, angioedema, anaphylaxis)**
  - Rare
Live, Attenuated Influenza Vaccine (LAIV) Adverse Reactions

- **Adults**
  - Significantly increased rate of cough, runny nose, nasal congestion, sore throat, and chills reported among vaccine recipients
  - No increase in the occurrence of fever

- No serious adverse reactions identified
Timing of Vaccination

- Vaccination should occur before onset of influenza activity. Health care providers should offer vaccination by the end of October, if possible.

- Vaccination should continue to be offered as long as influenza viruses are circulating and unexpired vaccine is available.

- To avoid missed opportunities for vaccination, providers should offer vaccination during routine health care visits and hospitalizations when vaccine is available.
Vaccine Administration

Inactivated Influenza Vaccine (IIV)

- **Route: IM injection**
  - Needle gauge: 22 – 25 gauge
  - Needle length*: 1 – 1.5 inch depending on the patient’s age and/or weight

- **IM injection Site:**
  - 6 months through 11 months: Vastus lateralis muscle
  - 1 through 2 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
  - 3 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used

- **Vaccine administration error:**
  - Wrong dosage
  - Wrong product – outside of age indications
Influenza Antiviral Agents*

- **Amantadine and rimantadine**
  - Not recommended because of documented resistance in U.S. influenza isolates

- **Zanamivir, oseltamivir, baloxavir**
  - Neuraminidase inhibitors
  - Effective against influenza A and B
  - Oseltamavir and zanamavir approved for prophylaxis
Vaccine Storage and Handling

- Store influenza vaccines in a refrigerator between 2°C – 8°C (36°F – 46°F)

- Do not freeze the vaccine

- Store influenza vaccines in:
  - The original packaging with the lids closed
  - A clearly labeled bin and/or area of the storage unit

Vaccine storage label examples
Available at www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf
Resources
Influenza Resources

- ACIP’s influenza recommendations web page
  www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/flu.html

- CDC’s influenza web page
  www.cdc.gov/flu/index.htm

- Immunization Action Coalition influenza web page
  www.immunize.org/influenza/

- Children’s Hospital of Philadelphia Vaccine Education Center influenza web page
  http://www.chop.edu/centers-programs/vaccine-education-center/vaccine-details/influenza-vaccine#.VgHMa3YpCAU
CDC website on influenza: https://www.cdc.gov/flu/index.htm
Questions?
Hepatitis B Disease and Hepatitis B Vaccine

Day 2: Adult Track

August 2019

Chapter 10
Disease
Hepatitis B Virus

- Hepadnaviridae family (DNA)
- Numerous antigenic components
- May retain infectivity for more than 7 days at room temperature
Hepatitis B Virus Infection

- 257 million chronic infections worldwide
- 850,000–2.2 million US chronic infections
- Causes 50% of hepatocellular carcinomas
- 786,000 deaths worldwide

https://www.cdc.gov/hepatitis/hbv/bfaq.htm#bFAQb04
Hepatitis B Epidemiology

- **Reservoir**
  - Human

- **Transmission**
  - percutaneous (i.e., puncture through the skin) or mucosal contact with infectious blood or body fluids (e.g., semen, saliva)

- **Communicability**
  - 1-2 months before and after onset of symptoms
  - Persons with either acute or chronic HBV infection with HBsAg present in blood
Hepatitis B Clinical Features

- Incubation period 60-150 days (average 90 days)

- Nonspecific prodrome of malaise, fever, headache, myalgia

- Children < 5 years and newly infected immunosuppressed adults generally asymptomatic
  - 30%–50% of persons aged ≥5 years have signs and symptoms
Hepatitis B Complications

- Fulminant hepatitis (<1%)
- Hospitalization
- Cirrhosis
- Hepatocellular carcinoma
- Death
Risk Factors for Hepatitis B

- Injection drug use
- 2 or more sexual partners
- Men who have sex with men
- Household contacts of persons with HBV
- Developmentally disabled persons in long-term-care facilities
- Correctional facilities
- Persons at risk for occupational exposure to HBV

- Hemodialysis patients
- Persons with HCV infection
- Persons with chronic liver disease
- Travelers to countries where HBV is endemic
- Persons with HIV
- Persons with Diabetes
Chronic Hepatitis B Virus Infection

- 80-90% of persons infected during infancy
- 30% of persons infected before age 6 years
- 1-12% of persons infected as an older child or adult
- Approximately 25% of persons chronically infected during childhood and 15% chronically infected after childhood will die prematurely from cirrhosis or liver cancer
Risk of Chronic HBV Infection

J Hepatol. 2008;48(2):335-52
Chronic Hepatitis B Virus Infection – 4 Phases

- **Immune tolerant**
  - Minimal or no hepatic inflammation or fibrosis

- **Immune active**
  - Hepatic inflammation with or without fibrosis

- **Immune inactive**
  - Improvement of hepatic inflammation and fibrosis

- **Reactivation**
  - Active hepatic inflammation with or without fibrosis
Hepatitis B Perinatal Transmission* 

HBsAg+ & HBeAg+ 

70-90% infected 

Up to 90% of infected infants become chronically infected 

HBsAg+ only 

10% infected 

*in the absence of post exposure prophylaxis
Strategy to Eliminate Hepatitis B Virus Transmission—United States

- Prevent perinatal HBV transmission
  - Routine testing of all pregnant women for HBsAg
    - Prophylaxis (HepB vaccine and HBIG) for infants born to HepB surface antigen (HBsAg) positive women
    - HBV DNA testing for HBsAg positive women and antiviral therapy if HBV DNA is >200,000 IU/mL

- Universal vaccination of all infants at birth

- Routine vaccination of previously unvaccinated children and adolescent (<19 years of age)

- Vaccination of adults at risk for HBV infection

[https://www.cdc.gov/mmwr/volumes/67/rr/rr6701a1.htm#B2_down](https://www.cdc.gov/mmwr/volumes/67/rr/rr6701a1.htm#B2_down)
Vaccine
## Hepatitis B-Containing Vaccine Products*

<table>
<thead>
<tr>
<th>Vaccine product</th>
<th>Age indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single-component vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>Engerix-B</td>
<td></td>
</tr>
<tr>
<td>Pediatric formulation</td>
<td>Birth–19 years</td>
</tr>
<tr>
<td>Adult formulation</td>
<td>20 years and older</td>
</tr>
<tr>
<td>Recombivax HB</td>
<td></td>
</tr>
<tr>
<td>Pediatric formulation</td>
<td>Birth–19 years</td>
</tr>
<tr>
<td>Adult formulation</td>
<td>20 years and older</td>
</tr>
<tr>
<td>Heplisav-B</td>
<td>18 years and older</td>
</tr>
<tr>
<td><strong>Combination vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>Pediarix–DTaP, IPV and HepB vaccines</td>
<td>6 weeks–6 years</td>
</tr>
<tr>
<td>Twinrix–HepA and HepB vaccines</td>
<td>18 years and older</td>
</tr>
</tbody>
</table>

*ACIP does not state a preference for vaccine product versus another if the patient is eligible for more than 1 product.
## Recommended Dosage of HepB Vaccine

<table>
<thead>
<tr>
<th></th>
<th>Recombivax HB Dose (mcg)</th>
<th>Engerix-B* Dose (mcg)</th>
<th>Heplisav-B Dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children: Birth through 19 years</strong></td>
<td>0.5 mL (5)</td>
<td>0.5 mL (10)</td>
<td>N/A: ≤17 yrs 0.5 mL (20): ≥18 yrs</td>
</tr>
<tr>
<td><strong>Adults: 20 years and older</strong></td>
<td>1.0 mL (10)</td>
<td>1.0 mL (20)</td>
<td>0.5 mL (20)</td>
</tr>
</tbody>
</table>

*Pediariix contains the pediatric formulation of Engerix-B
*Twinrix contains the adult formulation of Engerix-B
† Heplisav-B approved for use in persons 18 years of age or older
## HepB Vaccine

<table>
<thead>
<tr>
<th></th>
<th>Recombivax HB Dose (mcg)</th>
<th>Engerix-B* Dose (mcg)</th>
<th>Heplisav-B Dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Composition</strong></td>
<td>Recombinant HBsAg</td>
<td>Recombinant HBsAg</td>
<td>Adjuvanted Recombinant HBsAg</td>
</tr>
<tr>
<td><strong>Efficacy</strong></td>
<td>95% (Range, 80%–100%)</td>
<td>95% (Range, 80%–100%)</td>
<td>90%–100%</td>
</tr>
<tr>
<td><strong>Schedule</strong></td>
<td>3 doses</td>
<td>3 doses</td>
<td>2 doses</td>
</tr>
<tr>
<td><strong>Route</strong></td>
<td>IM</td>
<td>IM</td>
<td>IM</td>
</tr>
</tbody>
</table>

*Pediarix contains the pediatric formulation of Engerix-B
*Twinrix contains the adult formulation of Engerix-B
Vaccine Supply: Adult
Recombivax HB

- Merck is not currently distributing its adult hepatitis B vaccine and does not expect to be distributing adult hepatitis B vaccine throughout the remainder of 2019

- GSK has sufficient supplies of adult hepatitis B vaccines to address the anticipated gap in Merck’s supply of adult hepatitis B vaccine during this period. In addition, Dynavax makes an adult hepatitis B vaccine that is available for use.
Clinical Considerations
Vaccination recommended unvaccinated adults at risk for HBV infection and adults requesting protection from HBV infection

- Acknowledgement of a specific risk factor not required vaccination

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pregnancy</th>
<th>Immuno-compromised (excluding HIV infection)</th>
<th>HIV infection CD4 count</th>
<th>Asplenia, complement deficiencies</th>
<th>End-stage renal disease, on hemodialysis</th>
<th>Heart or lung disease, alcoholism</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Health care personnel</th>
<th>Men who have sex with men</th>
</tr>
</thead>
<tbody>
<tr>
<td>HepB</td>
<td></td>
<td></td>
<td>&lt;200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≥200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Adults at Risk for HBV Infection

- Hepatitis C virus infection
- Chronic liver disease
- HIV infection
- Sexual exposure risk

* Persons with more than one sex partner during the previous 6 months
Adults at Risk for HBV Infection

- Current or recent injection drug use
- Percutaneous or mucosal risk for exposure to blood
- Incarcerated persons
- Travel in countries with high or intermediate endemic hepatitis B

* Persons with more than one sex partner during the previous 6 months
**HepB Schedule: Adult**
**Recombivax HB or Engerix-B**

<table>
<thead>
<tr>
<th>Dose</th>
<th>Routine Interval</th>
<th>Minimum Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose 1</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Dose 2</td>
<td>1 month</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Dose 3</td>
<td>6 months</td>
<td>8 weeks <em>and</em> at least 16 weeks from Dose 1</td>
</tr>
</tbody>
</table>
# Heplisav-B (HepB-CpG)

<table>
<thead>
<tr>
<th><strong>Storage</strong></th>
<th>Store in the refrigerator between 2°C and 8°C (36°F and 46°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ages</strong></td>
<td>18 years of age and older</td>
</tr>
<tr>
<td><strong>Schedule</strong></td>
<td>Administer 2 doses separated by 4 weeks</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>Intramuscular (IM) injection in the deltoid</td>
</tr>
<tr>
<td></td>
<td>Can be administered at the same clinical visit as other vaccines. Administer in separate injection sites, 1 inch apart (if possible)</td>
</tr>
<tr>
<td><strong>Contraindication</strong></td>
<td>History of severe allergic reaction (e.g., anaphylaxis) after a previous dose of any hepatitis B vaccine or to any component of Heplisav-B, including yeast</td>
</tr>
</tbody>
</table>

Additional Heplisav-B Considerations

- 2-dose HepB series only applies when BOTH doses are Heplisav-B, administered at least 4 weeks apart
  - Any 2 doses of Heplisav-B separated by 4 weeks is considered complete, even if the patient has had other HepB vaccine products

- Until safety data are available for Heplisav-B, providers should vaccinate pregnant women needing HepB vaccination with Engerix-B or Recombivax HB
Scenarios

1. HepB Engerix-B or RecombivaxHB 01/01/2018
   HepB-CpG Heplisav-B 02/01/2018
   Heplisav-B 03/01/2018
   Completed series
   No additional doses are needed

2. HepB Engerix-B or RecombivaxHB 01/01/2018
   HepB-CpG Heplisav-B 02/01/2018
   HepB 05/01/2018
   Completed series
   No additional doses are needed
Compared with adults without diabetes, adults with diabetes have a 60% higher prevalence of past or present HBV infection and twice the odds of acquiring acute HBV

- Possibility of a higher case-fatality proportion among persons with diabetes acutely infected with HBV

ACIP recommends HepB vaccination for persons with diabetes mellitus aged <60 years and persons with diabetes mellitus aged ≥60 years at the discretion of the treating clinician

- No preference for any of the available vaccines
**Dialysis**

- Hepatitis B vaccination is recommended for susceptible hemodialysis patients

- Hepatitis B vaccine is also indicated for patients whose renal disease is likely to lead to dialysis or transplantation
For patients undergoing hemodialysis and for other immunosuppressed patients, higher vaccine doses or increased number of doses are required

- Special formulations of the vaccines are now available for such persons (Recombivax HB, 40 μg/mL, Energix_B, 40 μg/mL)

If an adult patient begins the vaccine series with a standard dose before beginning hemodialysis treatment, then moves to hemodialysis treatment before completing the series, complete the series using the higher dose recommended for hemodialysis patients
ACIP HepB Vaccine Recommendations: Healthcare and Public Safety Personnel

- All healthcare personnel (HCP) whose work-, training-, and volunteer-related activities involve reasonably anticipated risk for exposure to blood or body fluids should be assessed for evidence of immunity to hepatitis B.
Evidence of Immunity for HCP =

Written documentation of a complete HepB vaccine series

AND

Subsequent documented anti-HBs $\geq 10$ mIU/mL
Common Clinical Scenarios for HCP

- Documentation of complete series AND documented positive titer
- Unvaccinated (or incomplete series)
- Documentation of complete series but no documented positive titer
Documentation of complete vaccine series AND documented positive titer

- HCP considered immune
- **NO** additional serologic testing or vaccine “booster” doses
- Advise the person to keep a copy of the vaccine record and positive titer FOREVER
Unvaccinated HCP (or incomplete vaccine series)

Vaccinate

Post-vaccination serologic testing (1-2 months after final dose)

Positive (anti-HBs ≥10 mIU/mL)

HCP considered immune → No further serologic testing or vaccination recommended

Negative (anti-HBs <10 mIU/mL)

Administer a second complete HepB vaccine series → Post-vaccination serologic testing (1-2 months after final dose)
Documentation of complete vaccine series but no documented positive titer

- Serologic testing
  - Positive (anti-HBs ≥10 mIU/mL)
  - HCP considered immune
  - No further serologic testing or vaccination recommended
Serologic testing
Negative (anti-HBs <10 mIU/mL)

Administer 1 dose of HepB vaccine
Followed by post-vaccination serologic testing (1-2 months later)

HCP considered immune → No further serologic testing or vaccination recommended

Positive (anti-HBs ≥10 mIU/mL)

Complete second HepB vaccine series → Post-vaccination serologic testing (1-2 months after final dose)

Negative (anti-HBs <10 mIU/mL)
Persistent Nonresponse to HepB Vaccine

- Less than 5% of vaccinees do not develop anti-HBs after 6 valid doses
- May be nonresponder or “hyporesponder”
- Check HBsAg status
- If exposed, treat as nonresponder with postexposure prophylaxis
# HCP and Postexposure Management

## TABLE 5. Postexposure management of health care personnel after occupational percutaneous or mucosal exposure to blood or body fluids, by health care personnel HepB vaccination and response status

<table>
<thead>
<tr>
<th>HCP status</th>
<th>Source patient (HBsAg)</th>
<th>HCP testing (anti-HBs)</th>
<th>Postexposure prophylaxis</th>
<th>Postvaccination serologic testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documented responder after complete series</td>
<td>Positive/unknown</td>
<td>—*</td>
<td>No action needed</td>
<td>N/A</td>
</tr>
<tr>
<td>Documented nonresponder after two complete series</td>
<td>Negative</td>
<td>—*</td>
<td>No action needed</td>
<td></td>
</tr>
<tr>
<td>Response unknown after complete series</td>
<td>Positive/unknown</td>
<td>&lt;10 mIU/mL</td>
<td>HBIG x1 Initiate revaccination</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>&lt;10 mIU/mL</td>
<td>None Initiate revaccination</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Any result</td>
<td>≥10 mIU/mL</td>
<td>HBIG x1 Complete vaccination</td>
<td>Yes</td>
</tr>
<tr>
<td>Unvaccinated/incompletely vaccinated or vaccine refusers</td>
<td>Positive/unknown</td>
<td>—*</td>
<td>HBIG x1 Complete vaccination</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>—*</td>
<td>HBIG x1 Complete vaccination</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Abbreviations:** anti HBs = antibody to hepatitis B surface antigen; HBIG = hepatitis B immune globulin; HBsAg = hepatitis B surface antigen; HCP = health care personnel; N/A = not applicable.

* Not indicated.
Prevaccination Serologic Testing

**Recommended for:**
- All persons born in Africa, Asia, the Pacific Islands, and other regions with HBsAg prevalence of 2% or higher
- Household, sex, and needle-sharing contacts of HBsAg-positive persons
- Men who have sex with men
- Injection drug users
- Certain persons receiving cytotoxic or immunosuppressive therapy
Postvaccination Serologic Testing

- Serologic testing is NOT routinely recommended following vaccination of most adults

- **Recommended for:**
  - Chronic hemodialysis patients
  - Other immunocompromised persons
  - Persons with HIV infection
  - Sex partners of HBsAg+ persons
  - Health care personnel
Revaccination

- Revaccination is generally not recommended for persons with a normal immune status

- Recommended for the following:
  - HBsAg-negative infants with anti-HBs <10 mIU/mL (born to HBsAg-positive mothers)
  - Hemodialysis patients
  - HIV-infected persons
  - Other immunocompromised persons
Vaccine Administration

- **Route: IM Injection**
  - Needle gauge: 22–25 gauge
  - Needle length*: 5/8 – 1.5 inch depending on the patient’s age and/or weight

- **Site***:
  - Birth–11 months: Vastus lateralis muscle is preferred
  - 1–3 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
  - 4 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used

*Professional judgement should be used to determine the proper needle length and site. Factors influencing site including local reaction, number of vaccine to be administered age and muscle mass
**Vaccine Administration Considerations**

- **Route: IM Injection**
  - Administer HepB vaccine and HBIG (if needed) in different limbs

- **Site: NO BUTTS!**

<table>
<thead>
<tr>
<th>Administration Errors</th>
<th>Count the Dose or Revaccinate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult formulation administered to a child</td>
<td>Count the dose, if it meets minimum age and interval</td>
</tr>
<tr>
<td>Pediatric formulation administered to an adult</td>
<td>Dose does not count and should be repeated ASAP</td>
</tr>
<tr>
<td>HepA instead of HepB vaccine</td>
<td>Administer HepB vaccine ASAP</td>
</tr>
</tbody>
</table>
HepB Vaccine Contraindications and Precautions

- **Contraindication**
  - Severe allergic reaction to a vaccine component or following a prior dose

- **Precaution**
  - Moderate or severe acute illness
## HepB Vaccine Adverse Reactions

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain at injection site</td>
<td>3%-29%</td>
</tr>
<tr>
<td>Erythema</td>
<td>3%</td>
</tr>
<tr>
<td>Swelling</td>
<td>3%</td>
</tr>
<tr>
<td>Fever</td>
<td>1%-6%</td>
</tr>
<tr>
<td>Headache</td>
<td>3%</td>
</tr>
<tr>
<td>Severe systemic reactions</td>
<td>rare</td>
</tr>
</tbody>
</table>
Hepatitis B Vaccine Storage and Handling

- Store HepB-containing vaccines in a refrigerator between 2°C - 8°C (36°F - 46°F)
- **DO NOT FREEZE**
- Store in the original packaging with the lids closed in a clearly labeled bin and/or area of the storage unit
- Store pediatric and adult formulations separately, away from each other and other look- or sound-alike vaccines; e.g., HepA, Hib, HPV

Vaccine storage label example
Available at [www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)
Resources
Information for Parents:
Hepatitis B and the Vaccine (Shot) to Prevent It

The best way to protect against hepatitis B is by getting the hepatitis B vaccine. Doctors recommend that all children get the vaccine.

Why should my child get the hepatitis B shot?
The hepatitis B shot:
- Protects your child against hepatitis B, a potentially serious disease
- Protects other people from the disease because children with hepatitis B usually don’t have symptoms, but they may pass the disease to others without anyone knowing they were infected.
- Protects your child from developing liver disease and cancer from hepatitis B.
- Keeps your child from missing school or childcare (and keeps you from missing work to care for your sick child).

Is the hepatitis B shot safe?
The hepatitis B vaccine is very safe, and it is effective at preventing hepatitis B. Like any medicine, it can have side effects. But serious side effects caused by the hepatitis B vaccine are extremely rare.

What are the side effects? Most people who get the hepatitis B vaccine will have no side effects at all. When side effects do occur, they are often very mild, such as a low fever (less than 100 degrees) or a sore arm from the shot.

What is hepatitis B?
Hepatitis B is a contagious liver disease caused by the hepatitis B virus. When a person is first infected with the virus, he or she can develop an “acute” (short-term) infection. Acute hepatitis B refers to the first 6 months after someone is infected with the hepatitis B virus. This infection can range from a very mild illness with few or no symptoms to a serious condition requiring hospitalization. Some people are able to fight the infection and clear the virus.

For others, the infection remains and is “chronic” or lifelong. Chronic hepatitis B refers to the infection when it remains active instead of getting better after 6 months. Over time, the infection can cause serious health problems, and even liver cancer.

Doctors recommend that your child get 3 doses of the hepatitis B shot for best protection. Ask your doctor when your child should get the next shot. Typically, children get one dose at each of the following ages:
- Shortly after birth
- 1 through 2 months
- 6 through 18 months
Your child may get a 4th dose depending on the brand of vaccine the doctor uses.

# Hepatitis B Standing Order Templates

## Children and Adults

### Standing Orders for Administering Hepatitis B Vaccine to Children and Teens

**Purpose**
To reduce morbidity and mortality from hepatitis B virus (HBV) by vaccinating all children and teens who meet the criteria established by the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices (ACIP).

**Policy**
Where allowed by state law, standing orders enable eligible nurses and other healthcare professionals (e.g., pharmacists) to assess the need for and vaccinate children and teens who meet the criteria below.

**Procedure**
1. **Assess Children and Teens in Need of Vaccination against HBV infection based on the following criteria:**
   - Lack of documentation of at least 3 doses of hepatitis B vaccine (HBV) with the third dose given at least 14 weeks after the first dose, at least 6 weeks after the second dose, and when you are not of age 24 weeks.
2. **Screen for contraindications and precautions:**
   - Do not give HepB to a child or teen who has experienced a serious reaction (e.g., anaphylaxis) to a dose of the vaccine or any of its components. For information on vaccine components, refer to the manufacturer’s package insert (<http://www.immunize.org/catg.d/p3076.pdf>).
   - Do not give HepB to a child or teen who has experienced hypersensitivity to yeast.
   - Pneumonia: Moderate or severe acute illness with or without fever.
   - 3. **Provide Vaccine Information Statements:**
     - Provide all patients (or, in the case of minors, their parent, or legal representative) with a copy of the most current federal vaccine information statement (VIS). Provide non-English-speaking patients with a copy of the VIS in their native language. If these are not available, these can be found at <http://www.immunize.org/catg.d/p3076.pdf>. (For information about how to document that the VIS was given, see section 4.11 of “Document Vaccination.”)
   - 4. **Prepare to Administer Vaccine:**
     - Choose the needle gauge, needle length, and injection site according to the following chart:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Injection Site</th>
<th>Injection Site</th>
<th>Injection Site</th>
<th>Injection Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>neonates (0-28 days)</td>
<td>Anterior deltoid</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
</tr>
<tr>
<td>Infants (1-11 months)</td>
<td>Anterior deltoid</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
</tr>
<tr>
<td>Toddlers (12-23 months)</td>
<td>Anterior deltoid</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
</tr>
<tr>
<td>Children (2-11 years)</td>
<td>Anterior deltoid</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
</tr>
<tr>
<td>Adolescents and Teens</td>
<td>Anterior deltoid</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
<td>Ventrogluteal</td>
</tr>
</tbody>
</table>

### Standing Orders for Administering Hepatitis B Vaccine to Adults

**Purpose**
To reduce morbidity and mortality from hepatitis B virus (HBV) by vaccinating all adults who meet the criteria established by the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices.

**Policy**
Where allowed by state law, standing orders enable eligible nurses and other healthcare professionals (e.g., pharmacists) to assess the need for vaccination and to vaccinate adults who meet any of the criteria below.

**Procedure**
1. **Assess Adults for Need of Vaccination against HBV infection according to the following criteria:**
   - Any patient who wants to be protected from HBV infection.
   - People with diabetes mellitus (Note for those age 60 years or older with diabetes mellitus, the duration of the treatment changes)
   - People with end-stage renal disease, including patients receiving hemodialysis, HBV infection, or chronic liver disease.
   - Sexually active and not in a long-term, mutually monogamous relationship (e.g., more than 1 sex partner during the previous 6 months).
   - Sexually active or receiving treatment for a sexually transmitted infection (STI).
   - Male who has sex with men.
   - A current or recent injection drug user.
   - Any occupational risk of infection through exposure to body fluids (e.g., health care workers, public safety workers, inmates in a health or prison facility, school health providers).
   - Residents or staff of an institution for persons with developmental disabilities.
   - Any persons known or treated for persons who are chronically infected with HBV (HBeAg positive).
   - Planned travel to a country with high or intermediate prevalence of HBV.
   - People living in correctional facilities.
   - Any person age 18 or younger who is not fully vaccinated (see standing orders for children and teens at <http://www.immunize.org/catg.d/p3076a.pdf>.)
2. **Screen for contraindications and precautions:**
   - Do not give HepB to a person who has experienced a serious systemic or anaphylactic reaction to a prior dose of the vaccine or any of its components. For a list of vaccine components, refer to the manufacturer’s package insert (<http://www.immunize.org/catg.d/p3076.pdf>).
Ask the Experts—Hepatitis B FAQs:  
www.immunize.org/askexperts/experts_hepb.asp

CDC Viral Hepatitis—Hepatitis B Information:  
www.cdc.gov/hepatitis/hbv/index.htm

CDC Hepatitis B Vaccination:  
www.cdc.gov/vaccines/vpd/hepb/index.html

Hepatitis B and the Vaccine (Shot) to Prevent It—Information for Parents:  
- Preexposure Evaluation for Health Care Personnel Previously Vaccinated with Complete ≥3-Dose HepB Vaccine Series Who Have Not Had Postvaccination Serologic Testing (Figure 3): www.cdc.gov/mmwr/volumes/67/rr/pdfs/rr6701-H.pdf
Questions?
Hepatitis B vaccine was inadvertently administered subcutaneously instead of the recommended route, intramuscular injection. Does the dose count?

- Yes
- No

No. For optimal protection, it is crucial that the vaccine be administered IM, not subcutaneously. ACIP recommends repeating the dose.
Pneumococcal Disease and Pneumococcal Vaccines

Day 2: Adult Track

August 2019

Chapter 17
Disease
Streptococcus pneumoniae

- Gram-positive bacteria
- 92 known serotypes
- Polysaccharide capsule, important virulence factor
- Type-specific antibody is protective
- Limited cross-reactivity
Pneumococcal Disease

- Second most common cause of vaccine-preventable death in the U.S.

- Major clinical syndromes
  - Pneumonia
  - Bacteremia
  - Meningitis
Invasive Pneumococcal Disease Incidence by Age Group–2013*

Risk Factors for Invasive Pneumococcal Disease

- Functional or anatomic asplenia, including sickle-cell disease
- Altered immunocompetence
- Underlying medical conditions, including chronic renal disease, nephrotic syndrome, and CSF leak
- Cochlear implant
Incidence of IPD in Adults Aged 18-64 Years with Selected Underlying Conditions, United States, 2009

Unpublished data, Active Bacterial Core surveillance, 2009
Pneumococcal Disease Epidemiology

- Reservoir: Human carriers
- Transmission: Respiratory and autoinoculation
- Temporal pattern: Winter and early spring
- Communicability: Unknown; probably as long as organism in respiratory secretions
2

Vaccine
### Pneumococcal Vaccines

<table>
<thead>
<tr>
<th>Product</th>
<th>Age Recommendations</th>
<th>ACIP Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevnar13</td>
<td>6 weeks and older</td>
<td>PCV13</td>
</tr>
<tr>
<td>Pneumovax23</td>
<td>2 years and older</td>
<td>PPSV23</td>
</tr>
</tbody>
</table>

*Zostavax is FDA-approved for persons 50 years of age and older*
Pneumococcal Conjugate Vaccine (PCV13) Characteristics

- Contains 13 serotypes of S. pneumoniae conjugated to nontoxic diphtheria CRM197 carrier protein

- Approval based on demonstration of immunologic noninferiority to PCV7 rather than clinical efficacy
Pneumococcal Polysaccharide Vaccine (PPSV23) Characteristics

- Purified capsular polysaccharide antigen from 23 types of pneumococcus
- Not effective in children younger than 2 years
Clinical Considerations
ACIP Adult Pneumococcal Vaccination Recommendations

- PPSV23 recommendations
  - PPSV23 is recommended for persons 19 through 64 years of age at increased risk
  - PPSV23 is routinely recommended for persons 65 years of age and older

- PCV13 recommendations
  - PCV13 is recommended for previously unvaccinated adults 19 years of age and older at increased risk (2012, 2013)
ACIP recommends PCV13 based on shared clinical decision making for adults 65 years or older who do not have an immunocompromising condition and who have not previously received PCV13.

These recommendations have been adopted by the CDC Director and will become official once published in *MMWR*.
Administering PCV13 and PPSV23 Vaccines

General Rules

- Administer PCV13 before PPSV23 whenever possible
- PCV13 and PPSV23 should not be administered during the same clinic visit
  - Either vaccine may be administered simultaneously with influenza vaccine
- Prior doses count and do not need to be repeated
Pneumococcal Vaccination Schedule

**PCV13 schedule:**
- Administer 1 dose to eligible adults who have no history of PCV13 vaccine
- If PCV13 was administered before age 65, no additional doses are indicated at 65 years of age and older

**PPSV23 schedule:**
- No more than 2 doses of PPSV23 are recommended before age 65 and 1 dose after
- Separate doses of PPSV23 by at least 5 years
Assessing Adults for Pneumococcal Vaccination

- Ask which age group does the person fall into?
  1. 19 through 64 years of age?
  2. Is the person at increased risk for IPD?

  1. 65 years of age and older?
  2. What is their immunization history?
1. Age: Adults 19 Through 64 Years of Age:
2. Risk Factor: **High** Risk for IPD

- Those at high risk for IPD, include persons with:
  - Pulmonary disease (including asthma)
  - Cardiac disease (excluding hypertension)
  - Liver disease (including cirrhosis)
  - Diabetes
  - Alcoholism
  - Smokers
  - Residents of a long-term care facility

- Administer PPSV23 vaccine; PCV13 is not indicated at this time
1. Age: 19 Through 64 Years of Age
2. Risk Factor: **Higher** Risk for IPD

- Those at higher risk for IPD, include persons with a:
  - CSF leak
  - Cochlear implant

- Administer PCV13 followed by PPSV23 vaccine

*MMWR* 2015;64(34):944–47
Those at highest risk for IPD, include persons who:

- Are immunocompromised (including HIV infection)
- Have chronic renal failure or nephrotic syndrome
- Are asplenic

Administer PCV13 and 2 doses of PPSV23

1. Age: 19 Through 64 Years of Age:
2. Risk Factor: Highest Risk for IPD
1. Age: Age 65 Years and Older
2. Vaccination Status: No History of PCV13 or PPSV23

*8 weeks if at higher or highest risk
MMWR 2015;64(34):944–47

No additional doses of PPSV23 are recommended—
even if the person develops a high risk condition in the future
1. Age: 65 Years and Older

2. Vaccination Status: PPSV23 Before 65 Years of Age

**No doses of PCV13**
- Administer PCV13, followed by PPSV23 as below

- PPSV23  
  - At least 1 year*

- PCV13  
  - At least 1 year*

- PPSV23  
  - At least 5 years

No additional doses of PCV13 or PPSV23 are recommended—even if the person develops a high risk condition in the future

*8 weeks if at higher or highest risk

MMWR 2015;64(34):944–47
1. Age: Age 65 Years and Older
2. Vaccination Status: PCV13 and PPSV23 Before 65 Years of Age

*8 weeks if at higher or highest risk

*At least 1 year*

PCV13

At least 5 years

PPSV23

No additional doses of PCV13 or PPSV23 are recommended—even if the person develops a high risk condition in the future

*MMWR 2015;64(34):944–47*
1. Age: Age 65 Years and Older
2. Vaccination Status: PPSV23 After 65 Years of Age
   No History of PCV13

No additional doses of PCV13 or PPSV23 are recommended—even if the person develops a high risk condition in the future.
Pneumococcal Vaccines
Contraindications and Precautions

- Severe allergic reaction to vaccine component or following prior dose of vaccine
- Moderate or severe acute illness
Vaccine Administration
Pneumococcal Vaccines

- **Route:** IM injection PCV13 and PPSV23
  - Needle gauge: 22 – 25 gauge
  - Needle length*: 1 – 1.5 inch depending on the patient’s age and/or weight

- **IM injection site***:
  - 6 weeks – 11 months: Vastus lateralis muscle is recommended
  - 1 – 3 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
  - 3 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used

- **Note:** PPSV23 may also be administered by Subcut injection in the upper outer triceps area
  - Needle gauge/length: 23 – 25 gauge; 5/8th inch needle

- **Vaccine administration error:**
  - Wrong vaccine: PPSV23 to an infant
  - Schedule error: More than 1 PPSV23 revaccination dose to at-risk persons 19 – 64 years of age

*Professional judgement should be used to determine the proper needle length and site. Influencing factors include injection technique, local reaction, number of vaccines to be administered, patient age, size and muscle mass
Pneumococcal Vaccines Adverse Reactions

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>PPSV23</th>
<th>PCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local reactions</td>
<td>30%-50%</td>
<td>5%-49%</td>
</tr>
<tr>
<td>Fever, myalgia</td>
<td>&lt;1%</td>
<td>24-35%</td>
</tr>
<tr>
<td>Febrile seizures</td>
<td>---</td>
<td>Rare:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-14/100,000; with IIV 4 -45/100,000</td>
</tr>
<tr>
<td>Severe adverse reactions</td>
<td>rare</td>
<td>8% (local)</td>
</tr>
</tbody>
</table>
Vaccine Storage and Handling

- Store PCV13 and PPSV23 vaccines in a refrigerator between 2°C - 8°C (36°F - 46°F)

- Store:
  - In the original packaging with the lids closed
  - In a clearly labeled bin and/or area of the storage unit – not next to each other

- Do not freeze the vaccine
Resources
**Table 1. Medical conditions or other indications for administration of PCV13 and PPSV23 for adults**

<table>
<thead>
<tr>
<th>Medical indication</th>
<th>Underlying medical condition</th>
<th>PCV13 for ≥18 years Recommended</th>
<th>PPSV23 for 19 through 64 years Recommended</th>
<th>PCV13 at ≥65 years Recommended</th>
<th>PPSV23 at ≥65 years Recommended</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>None of the below</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>≥1 year after PCV13</td>
</tr>
<tr>
<td>Immuno-compromised parasites</td>
<td>Alcoholism</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>≥1 year after PCV13 ≥5 years after any PPSV23 at ≥65 years</td>
</tr>
<tr>
<td></td>
<td>Chronic heart disease</td>
<td></td>
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<tr>
<td></td>
<td>Chronic liver disease</td>
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<td></td>
<td>Chronic lung disease</td>
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<td></td>
<td>Cigarette smoking</td>
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<tr>
<td></td>
<td>Diabetes mellitus</td>
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<tr>
<td></td>
<td>Cocaine implants</td>
<td>Yes</td>
<td>≥8 weeks after PCV13</td>
<td>If no previous PCV13 vaccination</td>
<td></td>
<td>≥8 weeks after PCV13 ≥5 years after any PPSV23 at ≥65 years</td>
</tr>
<tr>
<td></td>
<td>CSH** leaks</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Immuno-compromised parasites</td>
<td>Congenital or acquired</td>
<td>Yes</td>
<td>≥8 weeks after PCV13</td>
<td>≥5 years after first dose PPSV23</td>
<td>If no previous PCV13 vaccination</td>
<td>≥8 weeks after PCV13 ≥5 years after any PPSV23 at ≥65 years</td>
</tr>
<tr>
<td></td>
<td>heart malformations</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Other hematological disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary immunodeficiency</td>
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<tr>
<td></td>
<td>Infections</td>
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<tr>
<td></td>
<td>Hodgkin disease</td>
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<tr>
<td></td>
<td>Immunocompromising** diseases</td>
<td></td>
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<tr>
<td></td>
<td>Lymphoma</td>
<td></td>
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<tr>
<td></td>
<td>Multiple myeloma</td>
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<tr>
<td></td>
<td>Neutropenia</td>
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<td></td>
<td>Solid organ transplant</td>
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</tbody>
</table>

**Notes:**
- The PPSV23 vaccine only refers to adults 19 through 64 years of age. At least 50 years or older should receive PCV13 or PPSV23. Omit the use of PCV13 and PPSV23 for Hyde TFV23 in adults ≥65 years of age and assess for other indications for the use of PCV13 and PPSV23.
- ≥1 year after PCV13: ≥5 years after any PPSV23 at ≥65 years.
- ≥8 weeks after PCV13: ≥65 years after any PPSV23 at ≥65 years.
- ≥5 years after first dose PPSV23: ≥65 years after any PPSV23 at ≥65 years.
- If no previous PCV13 vaccination: ≥65 years after any PPSV23 at ≥65 years.

**References:**
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.
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- Including chronic obstructive pulmonary disease, emphysema, and asthma.
- Including chronic obstructive pulmonary disease, emphysema, and asthma.

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Questions?
Hepatitis A Disease and Hepatitis A Vaccines

Day 2: Adult Track

August 2019

Chapter 9
Hepatitis A

- Epidemic jaundice described by Hippocrates
- Differentiated from hepatitis B in 1940s
- Serologic tests developed in 1970s
- Vaccines licensed in 1995 and 1996
- Until 2004, hepatitis A was the most frequently reported type of hepatitis in the U.S.
Hepatitis A Clinical Features

- Incubation period 28 days (range 15–50 days)
- Illness not specific for hepatitis A
- Likelihood of symptomatic illness directly related to age
- Children generally asymptomatic, adults symptomatic
### Hepatitis A Epidemiology

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>Fecal–oral</td>
</tr>
<tr>
<td>Temporal pattern</td>
<td>None</td>
</tr>
<tr>
<td>Communicability</td>
<td>2 weeks before to 1 week after onset of jaundice</td>
</tr>
</tbody>
</table>
Hepatitis A Outbreaks in 10 states have occurred primarily among persons who:

- Use injection and noninjection drugs
- Are homeless
- Are their close, direct contacts

Vaccine
## HepA-Containing Vaccines

<table>
<thead>
<tr>
<th>Vaccine product</th>
<th>Age indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single Antigen</strong></td>
<td></td>
</tr>
<tr>
<td>Havrix (Adult formulation)</td>
<td>19 years and older</td>
</tr>
<tr>
<td>Vaqta (Adult formulation)</td>
<td>19 years and older</td>
</tr>
<tr>
<td><strong>Combination vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>Twinrix (HepA and HepB)</td>
<td>18 years and older</td>
</tr>
</tbody>
</table>
Hepatitis A-Containing Vaccines

- Administer the appropriate formulation based on age
  - Pediatric formulations: 1 through 18 years of age
  - Adult formulations: 19 years and older

- Schedule:
  - 2 doses separated by at least 6 months
Hepatitis A-Containing Vaccines

- **Twinrix (HepA-HepB) combination vaccine contains:**
  - Hepatitis A 720 EL.U. (pediatric dose)
  - Hepatitis B 20 mcg (adult dose)

- **Approved for persons 18 years of age and older**

- **Schedules**
  - 3-dose: 0, 1, 6 months
  - or
  - 4-dose: 0, 7, 21–30 days and booster dose at 12 months after first dose
Vaccine Supply

- Large outbreaks of Hepatitis A among adults in several US cities resulted in increased demand for vaccine and constrained vaccine supply
- In response, CDC has
  - Collaborated with manufacturers to understand options for managing supplies in the public and private sector and increasing national supply
  - Increased vaccine availability on CDC’s adult vaccine contracts
- Available vaccine supplies have increased and progress has been made regarding ongoing outbreaks
- Manufacturers have supply to meet current demand
- CDC and vaccine manufacturers are monitoring the demand and need for adult Hepatitis A vaccine
- Note, supply constraints do not apply to the pediatric Hepatitis A vaccine supply

Hepatitis A Vaccine Efficacy

- **HAVRIX (GSK)**
  - 40,000 Thai children 1 to 16 years of age
  - Vaccine efficacy 94%

- **VAQTA (Merck)**
  - 1,000 New York children 2 to 16 years of age
  - Vaccine efficacy 100%

- **Twinrix (GSK)**
  - 1,551 healthy adults 17 to 70 years of age
  - Vaccine efficacy HepA 99.9% and HepB 98.5%
Clinical Considerations
### ACIP Hepatitis A Vaccine Recommendations: Adult

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–49 years</th>
<th>50–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis A (HepA)</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
<td>2 or 3 doses depending on vaccine</td>
</tr>
</tbody>
</table>
Administer vaccine to adults at increased risk, including:

- Travel to or work in areas with high or intermediate endemicity
- Close, personal contact with an international adoptee from an area with high or intermediate endemicity
- Men who have sex with men
- Injection or noninjection drug use
- Clotting factor disorders
- Work with nonhuman primates or in a hepatitis A research laboratory setting
- Chronic liver disease
- Adults who report homelessness
- Healthy adults who have recently been exposed to hepatitis A
- *Persons living with HIV*

* Newly voted on recommendations by ACIP. New recommendations will be published soon in MMWR once approved by CDC director.
Hepatitis A and International Travel

Hepatitis A, countries or areas at risk

http://gamapserver.who.int/mapLibrary/Files/Maps/Global_HepA_ITHRiskMap.png?ua=1.
Hepatitis A Vaccination for International Travelers: Children and Adults

- One dose of a monovalent hepatitis A vaccine protects most healthy people 1–40 years of age

- Administer HepA vaccine to persons 1 year of age and older
  - Start the series as soon as travel is being considered to an area outside the U.S. where protection against hepatitis A is recommended
  - The series should be completed for lifelong protection – even if the trip is over
  - Postvaccination testing is not recommended
### Summary: Hepatitis A Vaccine Recommendations and International Travel

<table>
<thead>
<tr>
<th>Age</th>
<th>Vaccine/Immunoglobulin (IG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants less than 6 months of age</td>
<td>Immunoglobulin (IG)</td>
</tr>
<tr>
<td>Infants 6 through 11 months of age</td>
<td>Vaccine¹ (or IG²)</td>
</tr>
<tr>
<td>Healthy persons 1 year of age or older</td>
<td>Vaccine</td>
</tr>
</tbody>
</table>

**Special Populations**

<table>
<thead>
<tr>
<th>Population</th>
<th>Vaccine/Immunoglobulin (IG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons with a vaccine contraindication</td>
<td>IG</td>
</tr>
<tr>
<td>Immunocompromised persons</td>
<td>Vaccine with addition of IG³</td>
</tr>
<tr>
<td>Persons with chronic liver disease</td>
<td>Vaccine</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>Vaccine</td>
</tr>
</tbody>
</table>

¹https://www.cdc.gov/mmwr/volumes/67/wr/mm6743a5.htm
²If measles is not endemic in the region
³Based on provider guidance risk assessment and availability of vaccine or IG
Hepatitis A Vaccination for International Travelers

- Persons at risk of severe disease from hepatitis A planning to travel in 2 weeks or sooner should receive the first dose of vaccine and also can receive immunoglobulin
**Twinrix and Single-Component Hepatitis A Vaccine**

- Adult formulation hepatitis A vaccine may be used to complete a schedule begun with Twinrix and vice versa *

- **Acceptable schedules**
  - 2 Twinrix and 1 hepatitis A (adult formulation)
  - 1 Twinrix and 2 hepatitis A (adult formulation)

- **Maintain spacing recommended for Twinrix**

*Use the pediatric formulation of single-component vaccine for persons 18 years of age and younger. Use the adult formulation of single-component vaccine for persons 19 years of age or older.*
Vaccination for Close Contacts of Newly Arriving International Adoptees

- Hepatitis A vaccination for unvaccinated persons who anticipate close, personal contact during the first 60 days after arrival of an international adoptee from a country of high or intermediate endemicity

- Administer dose 1 as soon as adoption is planned, ideally 2 or more weeks before the arrival of the adoptee
Hepatitis A Vaccination Additional Recommendations

- Not routinely recommended for:
  - Health care personnel
  - Child care center staff
  - Sewer workers or plumbers

- Food handlers may be considered based on local circumstances
Hepatitis A Serologic Testing

- **Prevaccination serologic testing is not indicated for children**
  - Older adolescents: Testing may be cost-effective for certain populations

- **Postvaccination**
  - Not indicated
Hepatitis A Vaccine Administration

- **Route: IM injection**
  - Needle gauge: 22 – 25 gauge
  - Needle length*: 1 – 1.5 inch depending on the patient’s age and/or weight

- **Site***:
  - 1-3 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
  - 4 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used

*Professional judgement should be used to determine the proper needle length and site. Influencing factors include injection technique, local reaction, number of vaccines to be administered, patient age, size and muscle mass
Vaccine Administration Errors

- **Adult formulation administered to a child**
  - MORE antigen than the recommended dose was administered
  - If the dose meets minimum age and interval, it may be counted

- **Pediatric formulation administered to an adult**
  - LESS antigen than the recommended dose was administered
  - The dose does not count and should be repeated ASAP
    - There is no time/spacing interval that must be met

- **HepB instead of HepA vaccine**
Hepatitis A Vaccine
Contraindications and Precautions

- Severe allergic reaction to a vaccine component or following a prior dose

- Moderate or severe acute illness
Hepatitis A Vaccine
Adverse Reactions

- Local reaction: 20% - 50%
- Systemic reactions (malaise, fatigue): Less than 10%
- No serious adverse reactions reported
Vaccine Storage and Handling

- Store hepatitis A vaccine in a refrigerator between 2°C-8°C (36°F-46°F)

- Store pediatric and adult formulations:
  - In the original packaging with the lids closed
  - In a clearly labeled bin and/or area of the storage unit—not next to each other

Vaccine storage label example
Available at [www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)
General Recommendations for Persons Vaccinated Outside the U.S.

- Vaccines administered outside the U.S. can be accepted as valid if the schedule is similar to U.S. recommendations.

- With the exception of influenza and PPSV23 vaccines, only written documentation should be accepted as evidence of previous vaccination.

Determining What to Do Next

- **Questions? Health care providers may:**
  - Repeat the vaccinations—safe and prevents the need for serologic testing
  - Use serologic testing judiciously—may avoid unnecessary injections
    - But for most vaccines, many serologic tests cannot document protection against infection
    - Cost can be a factor

ACIP General Best Practice Guidelines on Immunizations [https://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf](https://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf)
Adult Resources

- Ask the Experts–Hepatitis A FAQs: [www.immunize.org/askexperts/experts_hepa.asp](http://www.immunize.org/askexperts/experts_hepa.asp)
- CDC Hepatitis A Disease: [www.cdc.gov/hepatitis/hav/index.htm](http://www.cdc.gov/hepatitis/hav/index.htm)
- CDC Hepatitis A Vaccination: [www.cdc.gov/vaccines/vpd/hepa/hcp/index.html](http://www.cdc.gov/vaccines/vpd/hepa/hcp/index.html)
Foreign Language Terms Job Aids

2018 Binational Immunization Resource Tool for Children from Birth through 18 Years

Appendix B: Foreign Language Terms: Aids to translating foreign immunization records

Quick Chart of Vaccine-Preventable Disease Terms in Multiple Languages

IAC: Quick Chart of Vaccine-Preventable Disease Terms in Multiple Languages http://www.immunize.org/catg.d/p5122.pdf
A Quick Look at Twinrix Job Aid

Indications for Use and Schedule
Approved for:
- Routine schedule of 3 doses: 0, 1, 6 months
- Prophylaxis for both hepatitis A and hepatitis B vaccines
- Alternative schedule of 4 doses: 0, 1, 7, 21-30 days
- Booster dose 12 months after the 3rd dose

Each dose of Twinrix contains:
- One adult dose of hepatitis A vaccine
- One pediatric dose of hepatitis B vaccine

Make sure minimum age and minimum intervals are met:
- Minimum age for any dose is 18 years
- Minimum intervals for 3-dose schedule:
  - 4 weeks between dose 1 & 2
  - 6 months between dose 2 & 3

Contraindications:
- Anaphylactic reaction to a prior dose of Twinrix, hepatitis A or hepatitis B vaccine
- Anaphylactic reaction to a component of Twinrix (hep A, hep B) including yeast and thimerosal

Precautions:
- Moderate to severe acute illness

Further Points:
- Because the hepatitis B component of Twinrix is equivalent to a standard adult dose of hep B vaccine, the schedule is the same whether Twinrix or single-dose hep B vaccine is used.
- Because the hepatitis A component of Twinrix is equivalent to a pediatric dose of hep A vaccine, persons 19 years and older who receive only 1 or 2 doses of Twinrix will need additional adult doses of single-dose hep A vaccine.

- Completing hepatitis A and hepatitis B series with single-dose hep A, hep B and/or Twinrix

- If a combination of 3 doses of either hepatitis B or 2 doses of Twinrix is not given as a complete series of hepatitis B:
  - 1 dose of Twinrix + 4 doses of adult hepatitis A = a complete series of hepatitis A
  - 2 doses of Twinrix + 1 dose of adult hepatitis A = a complete series of hepatitis A

- There is not a separate Vaccine Information Statement (VIS) for Twinrix. Use the current VISs for hep A and hep B that include information about the Michigan Care Improvement Registry (MCIR).
- VISs with MCIR information are available at www.michigan.gov/参观or at your local health department.
- Document as "Hep A/Hep B" in MCIR, on the vaccine administration record & immunization record card.

Finally, a short course of A and/or B (Twinrix) and single-dose hep A and/or B vaccines are available for seniors at high risk for Hepatitis A or Hepatitis B virus infection. Hepatitis A vaccine is used for persons aged 19 years and older and those who are known or suspected to have chronic liver disease or at risk for Hepatitis B virus infection. Hepatitis A vaccine is not recommended for persons aged 19 years and older who have chronic liver disease. Hepatitis B vaccine is not recommended for persons aged 19 years and older who have chronic liver disease.
Hepatitis A Vaccine Standing Orders for Children and Adults

**STANDING ORDERS FOR Administering Hepatitis A Vaccine to Children and Teens**

**Purpose**
To reduce morbidity and mortality from Hepatitis A virus (HAV) by vaccinating all children and teens who meet the criteria established by the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (ACIP).

**Policy**
Where allowed by state law, standing orders enable eligible nurses and other healthcare professionals (e.g., pharmacists) to assess the need for and vaccinate children and teens who meet any of the criteria below.

**Procedure**
1. Assess Children and Teens in Need of Vaccination against HAV infection based on the following criteria:
   - Age 2-10 months and lacking documentation of at least one dose of hepatitis A vaccine (HepA).
   - Age 11-19 years and living in a community, region, or state where routine vaccination is recommended (contact your health department for recommendations).
   - Age 10 months and older with anticipated travel to a country with intermediate or high endemicity for hepatitis A, i.e., all except Canada, Japan, Australia, New Zealand, and Western Europe.
   - Anticipated close personal contact with an international student from a country of high or intermediate endemicity during the first 6 months after arrival of the student in the United States.
   - A male who has sex with other males.
   - Users of street drugs (injecting and non-injecting).
   - Diagnosis of transfusion-related disease, including hepatitis B and C.
   - Diagnosis of a clotting factor disorder, such as hemophilia.
   - Employment in a research laboratory requiring work with sera or plasma.
   - An unvaccinated child or teen with recent potential exposure to HAV, i.e., within previous two weeks.
   (New: Children younger than age 12 months should be given Hepatitis B instead of vaccine.)
   - Any other child or teen who wants to be protected from hepatitis A.

2. Screen for contraindications and precautions

   **Contraindications**
   - Do not give HepA to a child or teen who has experienced a serious reaction (e.g., anaphylaxis) to a prior dose of the vaccine or any of its components. For information on vaccine components, refer to the manufacturer's package insert (www.immunize.org/catg.d/p3077a.pdf) or go to the CDC’s vaccines app (www.vaers.hhs.gov) and search for adverse events.

3. Provide Vaccine Information Statements
   - Provide all patients (or, in the case of minors, their parent, or legal representative) with a copy of the most current National Vaccine Information Statement (NVIS). Provide non-English speaking patients with a copy of the VIS in their native language. A VIS is available and should be used at www.immunize.org/cvss.
   - For information about how to document that the VIS was given, see section 3 titled “Document Vaccine Statements.”

**Immunization Action Coalition**
Saint Paul, Minnesota - 651-647-8000 - www.immunize.org
www.immunize.org/catg.d/p3077a.pdf - tech#677 (4/18)

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**STANDING ORDERS FOR Administering Hepatitis A Vaccine to Adults**

**Purpose**
To reduce morbidity and mortality from Hepatitis A virus (HAV) by vaccinating all adults who meet the criteria established by the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices (ACIP).

**Policy**
Where allowed by state law, standing orders enable eligible nurses and other healthcare professionals (e.g., pharmacists) to assess the need for and vaccinate adults who meet any of the criteria below.

**Procedure**
1. Assess Adults in Need of Vaccination against HAV infection based on the following criteria:
   - Anticipated travel to a country with intermediate or high endemicity for hepatitis A, i.e., all except Canada, Japan, Australia, New Zealand, and Western Europe.
   - A male who has sex with other males.
   - Users of street drugs (injecting and non-injecting).
   - Diagnosis of transfusion-related disease, including hepatitis B and C.
   - Diagnosis of a clotting factor disorder, such as hemophilia.
   - Anticipated close personal contact with an international student from a country of high or intermediate endemicity during the first 6 months after arrival of the student in the United States.
   - Employment in a research laboratory requiring work with sera or plasma.
   - An unvaccinated child or teen with recent potential exposure to HAV, i.e., within previous two weeks.
   - Any other adult who wants to be protected from hepatitis A.

2. Screen for contraindications and precautions

   **Contraindications**
   - Do not give HepA to an adult who has experienced a serious reaction (e.g., anaphylaxis) to a prior dose of the vaccine or any of its components. For information on vaccine components, refer to the manufacturer’s package insert (www.immunize.org/catg.d/p3077a.pdf) or go to the CDC’s vaccines app (www.vaers.hhs.gov) and search for adverse events.

3. Provide Vaccine Information Statements
   - Provide all patients with a copy of the most current National Vaccine Information Statement (NVIS). Provide non-English speaking patients with a copy of the VIS in their native language. A VIS is available and should be used at www.immunize.org/cvss.
   - For information about how to document that the VIS was given, see section 3 titled “Document Vaccine Statements.”

**Immunization Action Coalition**
Saint Paul, Minnesota - 651-647-8000 - www.immunize.org
www.immunize.org/catg.d/p3077a.pdf - tech#677 (4/18)
Questions?
Meningococcal Disease and Meningococcal Vaccines

Day 2: Adult Track

August 2019

Chapter 14
*Neisseria meningitidis*

- Aerobic gram-negative bacteria
- At least 13 serogroups based polysaccharide capsule
- Most invasive disease caused by serogroups A, B, C, Y, and W
- Relative importance of serogroups depends on geographic location and other factors (e.g., age)
Meningococcal Disease Pathogenesis

- Organism colonizes nasopharynx

- In some persons organism enters the bloodstream and causes infection at distant site

- Antecedent URI may be a contributing factor
Neisseria meningitidis
Clinical Features

- Incubation period 3-4 days (range 2-10 days)

- Abrupt onset of fever, meningeal symptoms, hypotension, and rash

- Fatality rate 10%-15%, up to 40% in meningococcemia
Meningococcal Meningitis

- Most common presentation of invasive disease
- Results from hematogenous dissemination
- Clinical findings
  - fever
  - headache
  - stiff neck
Meningococcal Sepsis

- Meningococcemia
- Bloodstream infection
- May occur with or without meningitis

Clinical findings
  - fever
  - petechial or purpuric rash
  - hypotension
  - shock
  - acute adrenal hemorrhage
  - multi-organ failure
Meningococcal Disease

Neisseria meningitidis
Risk Factors for Invasive Disease

▪ Host Factors
  • Deficiencies in the terminal common complement pathways
  • Functional or anatomic asplenia
  • Chronic underlying disease
  • Certain genetic factors (altered genes: mannose-binding lectin and tumor necrosis factor)

▪ Environmental factors
  • Household crowding
  • Active and passive smoking
  • Antecedent viral infection

▪ Occupational (microbiologists)
Neisseria meningitidis
Risk Factors for Invasive Disease

- College students
  - Studies in 1990s—overall incidence similar to or lower than their counterparts in general population*
  - Case control study of 50 cases and other studies in the 1990s**
    - First-year college students living in residence halls at higher risk

*JAMA 1999;281:1906-10
**Abstracts of the 39th Meeting of the IDSA. Philadelphia, PA: IDSA; 1999:276
Meningococcal Outbreaks in the United States

- Outbreaks account for 2%-3% of reported cases

- Most recent outbreaks caused by serogroup C and B
<table>
<thead>
<tr>
<th>Vaccine product</th>
<th>Age indications (FDA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men A Vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>Menactra</td>
<td>Men A, C, W, Y</td>
</tr>
<tr>
<td></td>
<td>9 months-55 years</td>
</tr>
<tr>
<td>Menveo</td>
<td>Men A, C, W, Y</td>
</tr>
<tr>
<td></td>
<td>2 months–55 years</td>
</tr>
<tr>
<td><strong>Men B Vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>Trumemba</td>
<td>MenB-FHbp</td>
</tr>
<tr>
<td></td>
<td>10-25 years</td>
</tr>
<tr>
<td>Bexsero</td>
<td>Men B-4C</td>
</tr>
<tr>
<td></td>
<td>10-25 years</td>
</tr>
</tbody>
</table>
Meningococcal Conjugate Vaccines

- Meningococcal polysaccharide conjugated to protein carrier

- Elicit both T- and B-cell immunity (T-cell dependent immunity)

- 2 brands currently licensed in the United States
  - Menactra (Sanofi Pasteur); Abbr: MenACWY-D
  - Menveo (GlaxoSmithKline): Abbr: MenACWY-CRM
Menactra (MenACWY-D) Vaccine

- Licensed by FDA in January 2005

- Quadrivalent polysaccharide vaccine conjugated to diphtheria toxoid (MenACWY-D)

- Approved for persons 9 months through 55 years of age

- Intramuscular injection

- Single dose vials
Menveo (MenACWY-CRM) Vaccine

- Licensed by FDA in February 2010
- Lyophilized serogroup A vaccine reconstituted with liquid containing serogroups C, Y, and W135 (MenACWY-CRM)
- May be used for any person 2 months through 55 years of age for whom MenACWY is indicated, including revaccination
- Intermuscular injection
- Single dose vials
Interchangeability of Conjugate Vaccine Brands

- Limited data suggest that different conjugate vaccine products can be used interchangeably.

- Whenever feasible, the same brand of vaccine should be used for all doses of the vaccination series.

- If vaccination providers do not know or have available the type of vaccine product previously administered, any product should be used to continue or complete the series.
Clinical Considerations
## MenACWY Recommendations

### Child and adolescent immunization schedule

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningococcal (MenACWY-D ≥9 mos; MenACWY-CRM ≥2 mos)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td>1st dose</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>2nd dose</td>
</tr>
</tbody>
</table>

### Adult immunization schedule

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19-21 years</th>
<th>22-26 years</th>
<th>27-49 years</th>
<th>50-64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningococcal A, C, W, Y (MenACWY)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
High-risk Groups: Functional or Anatomic Asplenia or HIV Infection*

- 24 months or older who have not received a complete series
  - 2-dose primary series of either MenACWY 8-12 weeks apart

*Including sickle-cell disease
**Doses valid if 8 weeks apart
High-risk Groups: Persistent Complement Component Deficiency*

- 24 months or older who have not received a complete series of MenACWY
  - 2-dose primary series of MenACWY-D starting at least 12 weeks apart**

* Including persons taking Soliris (eculizumab)
** Doses valid if 8 weeks apart
Meningococcal Vaccine Recommendations for Persons 2 through 55 years at High Risk

- **Persons who:**
  - Are first-year college students aged ≤21 years living in residential housing
  - Travel to, or are residents of, countries where meningococcal disease is hyperendemic or epidemic
  - Are microbiologists routinely exposed to isolates of Neisseria meningitidis
  - Military recruits

- **Administer:** 1 dose of MenACWY
Meningococcal Vaccine Use in Outbreaks

- Both MenACWY recommended for use in control of outbreaks caused by A, C, W, and Y

Outbreak definition:
- At least 3 confirmed or probable primary cases of the same serogroup
- Period of 3 months or less
- Primary attack rate of more than 10 cases per 100,000 population
Meningococcal Vaccine Booster Doses

- Once adult completes primary immunization
  - first booster should be 5 years after primary immunization and every 5 years thereafter if at continued risk
Updated Guidance for Use of Meningococcal Vaccines in Persons Aged ≥56 Years

- Meningococcal vaccines that are licensed for use in person aged ≥56 year are not currently available in the United States

- Persons aged ≥56 years who are recommended meningococcal vaccination because they are at increased risk for meningococcal disease should receive MenACWY conjugate vaccine
  - This includes, meningococcal vaccine-naïve persons aged ≥56 years who anticipate requiring only a single dose of meningococcal vaccine (e.g. travelers and persons at risk as a risk of a community outbreak)
  - And persons who were vaccinated previously with MenACWY conjugate vaccine and are recommended for revaccination or for whom multiple doses are anticipated (e.g., person with asplenia, HIV, and microbiologists)
MenACWY Revaccination Recommendations

- Other high-risk persons recommended for boosters:
  - Microbiologists with prolonged exposure to *Neisseria meningitidis*
  - Frequent travelers to or persons living in areas with high rates of meningococcal disease (see next slide)

- Revaccinate every 5 years as long as the person remains at increased risk
  - MenACWY for persons 2 through 55 years of age
  - MenACWY for persons 56 years and older also (off-label recommendation) if repeated vaccination anticipated
International Travelers and Revaccination*

- International travelers should receive a booster dose of MenACWY if the last dose was administered 5 or more years previously.

  - Vaccination in the 3 years before the date of travel is required by the government of Saudi Arabia for all travelers to Mecca during the annual Hajj.

*CDC Travelers Health website at http://www.cdc.gov/travel
## Meningococcal Vaccines Adverse Reactions

<table>
<thead>
<tr>
<th>Reaction</th>
<th>MenACWY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local reactions for 1-2 days</td>
<td>11%-59%</td>
</tr>
<tr>
<td>Low-grade fever</td>
<td>5%-17%</td>
</tr>
<tr>
<td>Systemic reactions (headache, malaise, fatigue)</td>
<td>4%-54%</td>
</tr>
</tbody>
</table>
MenB Vaccine Recommendations
# Meningococcal B Vaccines

<table>
<thead>
<tr>
<th>Product Name (ACIP Abbreviation)</th>
<th>FDA Age Indications</th>
<th>Dosage/Route/Schedule</th>
</tr>
</thead>
</table>
| Trumenba® (MenB-FHbp)           | 10 through 25 years of age | • 3 doses–0.5 mL each  
• IM injection  
• 0, 1–2, and 6-month OR  
• 2 doses – 0.5 mL each  
• IM injection  
• 0, 6 month |
| Bexsero® (MenB-4C)              | 10 through 25 years of age | • 2 doses–0.5 mL each  
• IM injection  
• 0, 1–6 month |
Meningococcal B Recommendations

- Recommendation for use in individuals ≥10 years of age at increased risk of disease
- Recommendation for use in adolescents and young adults not at increased risk for disease
ACIP MenB Recommendations

- Certain persons aged $\geq 10$ years* who are at increased risk for meningococcal disease should receive MenB vaccine. These persons include:
  - Persons with persistent complement component deficiencies
  - Persons with anatomic or functional asplenia**
  - Microbiologists routinely exposed to isolates of Neisseria meningitides
  - Persons identified as at increased risk because of a serogroup B meningococcal disease outbreak

*ACIP off-label recommendation
**Including sickle cell disease

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6422a3.htm?s_cid=mm6422a3_w
ACIP MenB Recommendations

- Certain other groups included in MenACWY recommendations for persons at increased risk, are not in this recommendation

- MenB – NOT currently recommended for:
  - Persons who travel to or reside in countries where meningococcal disease is hyperendemic or epidemic because risk is generally not caused by serogroup B
  - Routine use in first-year college students living in residence halls, military recruits, or all adolescents

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6422a3.htm?s_cid=mm6422a3_w
MenB for Adolescents and Young Adults

- A MenB vaccine series *may* be administered to adolescents and young adults aged 16–23 years to provide short-term protection against most strains of serogroup B meningococcal disease*

- The preferred age for MenB vaccination is 16–18 years

* Permissive recommendation (Category B)
MMWR October 23, 2015 / 64(41);1171-6
ACIP MenB Recommendations

- MenB should be administered as either a 2-dose series of MenB-4C or a 2 or 3-dose series of MenB-FHbp

- The same vaccine product should be used for all doses

- MenB-4C and MenB-FHbp may be administered concomitantly with other vaccines indicated for this age, but at a different anatomic site, if feasible

- No product preference to be stated
Use of 2- and 3-Dose Schedules of MenB-FHbp (Trumenba) Meningococcal Serogroup B Vaccine

- For persons at increased risk for meningococcal disease and for use during serogroup B outbreaks, 3 doses of MenB-FHbp should be administered at 0, 1-2, 6 months.

- When given to healthy adolescents who are not at increased risk for meningococcal disease, 2 doses of MenB-FHbp should be administered at 0 and 6 months.
Trumenba Timing and Spacing Errors

- If a patient is recommended for 3 doses of Trumenba, but the second dose is delayed beyond a 6-month interval, a third dose is NOT necessary.

- If a patient is recommended for 2 doses of Trumenba, and the second dose is given less than 6 months after the first dose, then a repeat (3rd) dose must be administered 4 months after the second dose.
MenB Vaccine Brand Error

- If a dose of MenB vaccine is administered and found to be a different brand from a dose previously administered:
  - Pick the brand with which you want to continue the series
  - Invalidate the dose of the other brand
  - Continue the series

- Need a 4 week minimum interval from any invalid doses

- Need to follow the minimum intervals between doses of the chosen brand
## Meningococcal B Adverse Reactions

<table>
<thead>
<tr>
<th>Adverse Reactions</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain at injection site, injection site reactions, erythema</td>
<td>28%-85%</td>
</tr>
<tr>
<td>fatigue, headache, chills, nausea, arthralgia</td>
<td>13%-60%</td>
</tr>
</tbody>
</table>
Vaccine Administration
Meningococcal-containing Vaccine

- **Route: IM injection**
  - Needle gauge: 22 – 25 gauge
  - Needle length*: 1 – 1.5 inch depending on the patient’s age and/or weight

- **IM injection Site***:
  - Deltoid muscle is preferred; vastus lateralis muscle may be used

- **Vaccine administration error:**
  - Wrong product based on age or medical indications

*Professional judgement should be used to determine the proper needle length and site. Influencing factors include injection technique, local reaction, number of vaccines to be administered, patient age, size and muscle mass
Resources
Meningococcal Resources

▪ ACIP’s Meningococcal Recommendations web page
  www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mening.html

▪ CDC’s Meningococcal Infection web page
  www.cdc.gov/meningococcal/index.html

▪ CDC’s Meningococcal Vaccination web page
  www.cdc.gov/vaccines/vpd-vac/mening/default.htm

▪ Immunization Action Coalition Meningococcal web page
  www.immunize.org/meningococcal/

▪ Children’s Hospital of Philadelphia Vaccine Education Center
  Meningococcal web page
  http://www.chop.edu/centers-programs/vaccine-education-
Measles, Mumps, and Rubella Diseases and Vaccines

Adult Track

August 2019

Chapters 13, 15 and 20
Disease
## Epidemiology

<table>
<thead>
<tr>
<th></th>
<th>Measles</th>
<th>Mumps</th>
<th>Rubella</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reservoir</strong></td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>Respiratory airborne</td>
<td>Airborne</td>
<td>Respiratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct contact with droplet or saliva</td>
<td></td>
</tr>
<tr>
<td><strong>Temporal Pattern</strong></td>
<td>Peaks in late winter/spring</td>
<td>Peaks in late winter/spring</td>
<td>Peaks in late winter/spring</td>
</tr>
<tr>
<td><strong>Communicability</strong></td>
<td>4 days before to 4 days after rash onset</td>
<td>Several days before and after onset of parotitis</td>
<td>7 days before to 5–7 days after rash onset</td>
</tr>
</tbody>
</table>
The states that have reported cases to CDC are Alaska, Arizona, California, Colorado, Connecticut, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Missouri, New Mexico, Nevada, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Texas, Tennessee, Virginia, and Washington.
U.S. Mumps Cases as of July 19, 2019

AL, AK, AR, AZ, CA, CO, CT, DE, FL, GA, HI, IA, IL, IN, KS, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, TN, TX, UT, VA, VT, WA, WI, WV

Preliminary data reported to CDC. Mumps outbreaks are not reportable.
### Number of Rubella and Congenital Rubella Syndrome (CRS) Cases by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>United States Rubella</th>
<th>CRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>2013</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2016</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2018</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

[www.cdc.gov/mmwr/volumes/66/wr/mm6630md.htm?s_cid=mm6630md_w](http://apps.who.int/immunization_monitoring/globalsummary/incidences?c=USA)
[www.cdc.gov/globalhealth/immunization/infographic/stop_rubella.htm](http://apps.who.int/immunization_monitoring/globalsummary/incidences?c=USA)
Be vigilant about measles, mumps and rubella!

Consider measles in patients with febrile rash illness and clinically compatible measles symptoms—cough, coryza, and conjunctivitis
  • Promptly isolate patients with suspected measles
  • Call the health department!

Ask patients about:
  • Recent international travel
  • Recent travel to domestic venues frequented by international travelers
  • Recent contact with international travelers
  • History of measles in the community

Vaccine
MMR Vaccine

- **Composition**: Live, attenuated viruses
- **Efficacy**
  - Measles: 95% at 12 months; 98% at 15 months
  - Mumps: 88% (range: 31%–95%) (2 doses)
  - Rubella: 95% or more (1 dose)
- **Schedule**: 2 doses given subcutaneously (Subcut)
Clinical Considerations
## Adult Schedule

### Routine administration

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–49 years</th>
<th>50–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 or 2 doses depending on indication (if born in 1957 or later)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Medical Indications

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pregnancy</th>
<th>Immuno-compromised (excluding HIV infection)</th>
<th>HIV infection CD4 count</th>
<th>Asplenia, complement deficiencies</th>
<th>End-stage renal disease, on hemodialysis</th>
<th>Heart or lung disease, alcoholism¹</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Health care personnel²</th>
<th>Men who have sex with men</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMR</td>
<td>CONTRAINDICATED</td>
<td></td>
<td>&lt;200</td>
<td>≥200</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

1 or 2 doses depending on indication
ACIP Immunization Recommendations: Adults

- Adults born in 1957 or later without acceptable evidence of immunity to measles, mumps, or rubella should receive 1 dose of MMR unless they have a medical contraindication to the vaccine (e.g., pregnancy or severe immunodeficiency)
  • Pregnant women without evidence of immunity to rubella should receive 1 dose of MMR upon completion or termination of pregnancy and before discharge from the health care facility

- A routine second dose of MMR vaccine at least 28 days after the first dose is recommended for adults who are:
  • College and post-high-school students
  • Working in medical facilities
  • International travelers

- Adults born before 1957 are generally presumed immune to measles, mumps, and rubella (except rubella for women of childbearing age who could become pregnant)
MMR Recommendations Adults

- Adults without acceptable evidence of immunity to measles, mumps, or rubella who work in a health care facility should receive 2 doses of MMR
  - Personnel born before 1957 without acceptable evidence of immunity to measles, mumps, or rubella should be considered for vaccination with 2 doses of MMR for measles or mumps, or 1 dose for rubella
## Acceptable Presumptive Evidence of Immunity

<table>
<thead>
<tr>
<th>Routine</th>
<th>Students (College/Post High School)</th>
<th>Health Care Personnel</th>
<th>International Travelers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Documented age-appropriate vaccination with live measles-, mumps-, and rubella-virus-containing vaccines, or</td>
<td>(1) Documented doses of live measles and mumps virus-containing vaccines; dose of rubella-virus-containing vaccine, or</td>
<td>(1) Documented doses of live measles and mumps virus-containing vaccines; dose of rubella-virus-containing vaccine, or</td>
<td>(1) Documented age-appropriate vaccination with live measles-, mumps-, and rubella-virus-containing vaccines, or</td>
</tr>
<tr>
<td>(2) Laboratory evidence of immunity, or</td>
<td>(2) Laboratory evidence of immunity, or</td>
<td>(2) Laboratory evidence of immunity, or</td>
<td>(2) Laboratory evidence of immunity, or</td>
</tr>
<tr>
<td>(3) Laboratory confirmation of disease</td>
<td>(3) Laboratory confirmation of disease</td>
<td>(3) Laboratory confirmation of disease</td>
<td>(3) Laboratory confirmation of disease</td>
</tr>
<tr>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
</tr>
</tbody>
</table>
MMR Revaccination Indications

- Vaccinated before the first birthday
- Vaccinated with inactivated (killed) measles vaccine (KMV) or measles vaccine of unknown type from 1963 through 1967
- Vaccinated with immune globulin (IG) in addition to a further attenuated strain or vaccine of unknown type (revaccination not necessary if IG given with Edmonston B vaccine)
- Vaccinated before 1979 with either inactivated mumps vaccine or mumps vaccine of unknown type who are at high risk for mumps infection (e.g., work in a health care facility) should be considered for revaccination with 2 doses of MMR
Mumps: New ACIP Recommendation

Summary:

A substantial increase in the number of mumps outbreaks and outbreak-associated cases has occurred in the United States since late 2015 (1,2). To address this public health problem, the Advisory Committee on Immunization Practices (ACIP) reviewed the available evidence and determined that a third dose of measles, mumps, rubella (MMR) vaccine is safe and effective at preventing mumps. During its October 2017 meeting, ACIP recommended a third dose of a mumps virus-containing vaccine for persons previously vaccinated with 2 doses who are identified by public health authorities as being part of a group or population at increased risk for acquiring mumps because of an outbreak. The purpose of the recommendation is to improve protection of persons in outbreak settings against mumps disease and mumps-related complications. This recommendation supplements the existing ACIP recommendations for mumps vaccination (3).

In 1977, ACIP recommended 1 dose of mumps vaccine for all children aged ≥12 months (4). In response to multiple measles outbreaks in the late 1980s, in 1989 ACIP recom-

Methods

Despite this recommendation, mumps outbreaks continued to be reported throughout the United States, particularly in settings where persons have close, prolonged contact (e.g., universities and close-knit communities). To assist state and local health departments in responding to mumps outbreaks, CDC issued guidance on use of a third dose of MMR vaccine in the 2012 Manual for the Surveillance of Vaccine-Preventable Diseases. The guidance was based on limited data and provided criteria for health departments regarding when to consider use of a third dose in specifically identified target populations. Additional evidence on effectiveness and safety of the third dose of MMR vaccine recently became available and was presented to ACIP during 2017. This report summarizes the evidence considered by ACIP regarding use of a third dose of a mumps virus-containing vaccine during outbreaks and provides the recommendation for its use among persons who are at increased risk for acquiring mumps because of an outbreak.

https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html
Measles, Mumps, Rubella Serologic Testing

- Serologic screening before vaccination is not necessary unless considered cost-effective
- Postvaccination serologic testing to verify immunity is not recommended, including HCP
  - Documented, age-appropriate vaccination supersedes the results of subsequent serologic testing
  - Exception: Women of childbearing age with 1 or 2 documented doses of rubella-containing vaccine and rubella-specific IgG levels that are not clearly positive should receive 1 additional dose of MMR vaccine (maximum of 3 doses) and do not need retesting

www.cdc.gov/mmwr/pdf/rr/rr6204.pdf
HCP Born Before 1957

- Birth before 1957 generally is considered acceptable evidence of measles, mumps, and rubella immunity.
- However, 2 doses of MMR vaccine should be considered for unvaccinated HCP born before 1957 who do not have laboratory evidence of disease or immunity to measles and/or mumps.
- 1 dose of MMR vaccine should be considered for HCP with no laboratory evidence of disease or immunity to rubella.
- For these same HCP who do not have evidence of immunity, 2 doses of MMR vaccine are recommended during an outbreak of measles or mumps and 1 dose during an outbreak of rubella.
Health care facilities should recommend 2 doses of MMR vaccine at the appropriate interval for unvaccinated health care personnel regardless of birth year who lack laboratory evidence of measles or mumps immunity or laboratory confirmation of disease.

A third dose of MMR can be administered to adults who previously received 2 or more doses of mumps-containing vaccine and are identified by public health authority to be at increased risk for mumps in an outbreak.
Tuberculin Skin Testing (TST)* or Tuberculosis Interferon-Gamma Release-Assay (IGRA) and MMR or MMRV Vaccines

- Apply TST or IGRA at same visit as MMR or MMRV

- Delay TST or IGRA at least 4 weeks (28 days) if MMR or MMRV given first

- Apply TST first and administer MMR or MMRV when skin test read (least favored option because receipt of MMR or MMRV is delayed)

*Previously called PPD
Measles, Mumps, Rubella Postexposure Prophylaxis

- If given within 72 hours of exposure, MMR vaccine might protect or modify clinical course of measles (preferable to IG for persons >12 months if given within 72 hours of exposure)

- If administered within 6 days of exposure, IG can prevent or modify measles in persons who are nonimmune
  - Not indicated for persons who have received 1 dose of measles-containing vaccine at age ≥12 months, unless they are severely immunocompromised

- Postexposure MMR vaccination or IG not shown to prevent or alter the clinical severity of rubella or mumps and is not recommended
MMR Administration

- **Preparation**
  - MMR-containing vaccines must be reconstituted **BEFORE** administering
  - Use ONLY the diluent supplied by the manufacturer

- **Route: Subcutaneous (Subcut) injection**
  - Needle gauge: 23 – 25 gauge
  - Needle length: 5/8 inch

- **Site: Upper outer triceps of the arm or the thigh**
MMR Vaccination Administration Errors

- **Wrong diluent used to reconstitute vaccine**
  - Dose does NOT count and should be repeated ASAP

- **MMRV administered after the age of 12 years**
  - Dose counts if the minimum interval has been met

- **Always remember** – store vaccine according to the manufacturer’s recommendations and use a new needle and syringe for each patient
MMR Contraindications and Precautions

- History of anaphylactic reaction to neomycin
- History of severe allergic reaction to any component of the vaccine
- Pregnancy
  - Ask if pregnant or likely to become so in next 4 weeks*
  - Exclude those who say "yes"
  - For others, explain theoretical risks and then vaccinate
- Moderate or severe acute illness
- Recent blood product

*ACIP off-label recommendation; Vaccine package insert states 3 months
MMR Vaccine Contraindications and Precautions

- Immunosuppression
  - HIV
    - Prevaccination HIV testing not recommended
    - MMR recommended for persons who do not have evidence of current severe immunosuppression
    - Revaccination recommended for persons with perinatal HIV infection who were vaccinated before establishment of effective antiretroviral therapy (ART) with 2 appropriately spaced doses of MMR vaccine once effective ART has been established
    - MMRV not for use in persons with HIV infection
  - Low-dose steroids – vaccinate anytime
  - Leukemia in remission without chemotherapy for 3 months – vaccinate
  - Hematopoietic cell transplant (HCT) recipient who is immunocompetent
### MMR Vaccine Adverse Reactions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Frequency/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>5%–15% (measles)</td>
</tr>
<tr>
<td>Rash, pruritis, purpura</td>
<td>5% (measles)</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>1/30,000–40,000 doses (measles)</td>
</tr>
<tr>
<td>Lymphadenopathy</td>
<td>Rare (rash, pruritis, purpura)</td>
</tr>
<tr>
<td>Allergic reactions</td>
<td>Rare</td>
</tr>
<tr>
<td>Parotitis</td>
<td>Rare (mumps)</td>
</tr>
<tr>
<td>Deafness</td>
<td>Rare (mumps)</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>&lt;1/1,000,000 doses (measles)</td>
</tr>
</tbody>
</table>
MMR Vaccine and Arthropathy

- Acute joint symptoms 25% of susceptible women (Rubella)
- Frank arthritis-like signs and symptoms 10% of susceptible women (Rubella)
- Chronic or persistent symptoms Rare
- Population-based studies have not confirmed association
MMR Storage and Handling

- Store in the refrigerator between 2°C and 8°C (36°F and 46°F)
  - May also be stored in the freezer
  - Protect vaccine from light by keeping in the original packaging with the lid closed

- Store diluent at room temperature or refrigerate

- Discard if not used within 8 hours after reconstitution
  - Do not fill syringe with reconstituted vaccine until ready to administer

MMR (M-M-R II)

- Ages: 12 months and older
- Use for: Any dose in the series
- Route: Subcutaneous (subcut) injection

Reconstitute MMR powder ONLY with manufacturer-supplied sterile water diluent

Beyond Use Time: If not used immediately after reconstitution, store in vaccine vial in dark place at 2°C to 8°C (36°F to 46°F) and discard if not used within 8 hours.
Measles Outbreak Toolkit for Providers

Measles Outbreak Toolkit for Healthcare Providers

For information about measles for healthcare professionals, visit https://www.cdc.gov/measles/hcp/index.html

If you are looking for resources for you or your staff to learn more about having effective vaccine conversations with parents, these may help:

- Guidance for Talking with Parents about Vaccines
- Tips for Preparing for Questions Parents may Ask about Vaccines
- Vaccine safety fact sheets, such as Understanding Thimerosal, Mercury, and Vaccine Safety
- You Call the Shots module on MMR

Examples of resources for providers to share with parents include:

- Parent-friendly immunization schedule for children ages 0-6
- Fact Sheet: Infant Immunization FAQs
- Fact Sheet: If You Choose Not to Vaccinate Your Child, Understand the Risks and Responsibilities
- Infographic: Measles: It isn't just a little rash
- Fact Sheet: Tips for a Less Stressful Shot Visit
- Infographic: Illustrated list of Six Reasons to Follow CDC's Immunization Schedule
- Fact sheet: Measles and the Vaccine (Shot) to Prevent It
- Fact Sheet: Vaccines When Your Child is Sick

Measles Clinical Features and Diagnosis

Learn the signs and symptoms of measles for quicker diagnosing and share this resource with health care providers in your community.

Measles Outbreak Toolkit https://www.cdc.gov/measles/toolkit/healthcare-providers.html
Measles Video

https://www.youtube.com/watch?v=3HFeQEcDVY
Questions?
Human Papillomavirus and HPV Vaccine

August, 2019

Chapter 11
Disease
Human Papillomavirus (HPV) Disease

- Most common sexually transmitted infection in the U.S.
- Small DNA virus
- More than 150 types
- First vaccine was licensed in 2006
Human Papillomavirus Type and Disease Association

- Mucosal (~40 types)
  - "High-risk" Types (16, 18, others)
    - Low-grade cervical abnormalities
    - High grade abnormalities/Cancer precursors
    - Anogenital cancers
  - "Low-risk" Types (6, 11, others)
    - Low-grade cervical abnormalities
    - Genital warts
    - Respiratory papillomas
- Cutaneous (other types)
  - "Common" Warts (hands/feet)
**Natural History of HPV Infection**

- **Initial HPV Infection**
- **Within 1 Year**: Persistent Infection
- **1–5 Years**: CIN *1*
- **Up to Decades**: CIN *2/3*
- **Cervical Cancer**

- *CIN = cervical intraepithelial neoplasia*
Most HPV infections are asymptomatic and result in no clinical disease

Clinical manifestations of HPV infection include:
- Anogenital warts
- Recurrent respiratory papillomatosis
- Cervical cancer precursors (cervical intraepithelial neoplasia)
- Cancer (cervical, anal, vaginal, vulvar, penile, and some oropharyngeal cancers)
Cancers Caused by HPV per Year, U.S., 2010–2014

<table>
<thead>
<tr>
<th>Cancer site</th>
<th>Percentage probably caused by any HPV type</th>
<th>Number probably caused by any HPV type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Cervix</td>
<td>91%</td>
<td>10,600</td>
</tr>
<tr>
<td>Vagina</td>
<td>75%</td>
<td>600</td>
</tr>
<tr>
<td>Vulva</td>
<td>69%</td>
<td>2,600</td>
</tr>
<tr>
<td>Penis</td>
<td>63%</td>
<td>0</td>
</tr>
<tr>
<td>Anus*</td>
<td>91%</td>
<td>3,800</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>70%</td>
<td>2,100</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>19,700</td>
</tr>
</tbody>
</table>

*Includes anal and rectal squamous cell carcinomas
## HPV Epidemiology

<table>
<thead>
<tr>
<th>Property</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reservoir</strong></td>
<td>Human</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>Direct contact (usually sexual)</td>
</tr>
<tr>
<td><strong>Temporal pattern</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Communicability</strong></td>
<td>Presumed to be high</td>
</tr>
</tbody>
</table>
Cumulative Incidence of any HPV Infection Months after Sexual Initiation

HPV Disease Burden in the U.S.

- Estimated 79 million persons are infected
  - ~ 14 million new infections annually

- Common among adolescents and young adults
  - 50% of new infections occur in persons 15–24 years of age

- About $8 billion spent annually on management of sequelae of HPV infections
Cervical Cancer Screening

- Revised in 2012
- Screening should begin at age 21 years
- Screen women 21 to 65 years of age with Pap test every 3 years
- Cotesting (Pap and HPV testing) every 5 years in women 30 to 65 years of age
## HPV Vaccine Products

<table>
<thead>
<tr>
<th>Vaccine product</th>
<th>Age indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gardasil (4vHPV)</td>
<td>Girls and women 9–26 years</td>
</tr>
<tr>
<td></td>
<td>Boys and men 9-26 years</td>
</tr>
<tr>
<td>Gardasil 9 (9vHPV)</td>
<td>Girls and women 9–45 years*</td>
</tr>
<tr>
<td></td>
<td>Boys and men 9–45 years*</td>
</tr>
<tr>
<td>Cervarix (2vHPV)</td>
<td>Girls and women 9–25 years</td>
</tr>
</tbody>
</table>

**Only 9vHPV vaccine is available in the U.S.**

*Gardasil 9 is FDA approved for use in women and men through 45 years, and ACIP recently approved its use for this age range using a shared clinical decision making process.*
Human Papillomavirus Virus Vaccine

- HPV L1 major capsid protein of the virus is antigen used for immunization
- L1 protein produced using recombinant DNA technology
- L1 proteins self-assemble into virus-like particles (VLP)
- VLPs are noninfectious and nononcogenic
Human Papillomavirus Vaccine

**Efficacy**

- High efficacy among females without evidence of infection with vaccine HPV types (>95%)
- No evidence of efficacy against disease caused by vaccine types participants were infected with at the time of vaccination
- Prior infection with one HPV type did not diminish efficacy of the vaccine against other vaccine HPV types
9vHPV (Gardasil 9)
Efficacy and Safety

- **Efficacy**
  - ~97% protection against 31-, 33-, 45-, 52-, 58-related outcomes
  - Similar protection against 6-, 11-, 16-, 18-related disease

- **Noninferior immunogenicity to 4vHPV**

- **5 additional types account for 11% of invasive cancers**
  - Differences by gender: 14% for females; 5% for males

- **9vHPV can be administered at the same medical visit with MenACWY and Tdap**

- **Safety profile similar to 4vHPV across age, gender, race, ethnicity groups**
Human Papillomavirus Vaccine
Duration of Immunity

- The duration of immunity after a complete 3-dose series is not known
  - Available evidence indicates protection for at least 8 years for 4vHPV and at least 9 years for 2vHPV
  - Multiple cohort studies are in progress to monitor the duration of immunity
ACIP HPV Vaccine Recommendations: Adults

- **Routine vaccination for females through age 26 and males through age 26* years**
  - 2- or 3-dose series, depending on age at initial vaccination

- **Vaccination for females and males 26-45 can be considered based on a shared clinical decision-making process***

---

*Newly voted on during the June 2019 ACIP meeting. New recommendations will be published once the recommendations are approved by the CDC director.
Human Papillomavirus Vaccine Immunization Schedules

- **Routine 3-dose schedule**: 0, 1–2, 6 months
  - Dose 2: Administer at least 1 to 2 months after dose 1
  - Dose 3: Administer at least:
    - 12 weeks after dose 2 AND
    - 6 months (24 weeks) after dose 1

- **An accelerated schedule using minimum intervals is not recommended**

*ACIP off-label recommendation, MMWR 2015;64(29):300–4
HPV Immunization Schedule
Unvaccinated Adults 18 Years of Age and Older

- ACIP recommends following the routine 3-dose schedule (0, 1–2, 6 months) for adults 18 years and older

*MMWR 2016;65(49):1405–08*
ACIP HPV Immunization Recommendations

Medical Condition Considerations

- ACIP recommends HPV vaccination for immunocompromised females and males 18 years and older with 3 doses of HPV vaccine (0, 1–2, 6 months)
- Administer a 3-dose series to immunocompromised persons, including those with:
  - Primary or secondary immunocompromising conditions that might reduce cell-mediated or humoral immunity, such as B lymphocyte antibody deficiencies, T lymphocyte complete or partial defects, HIV infection, malignant neoplasm, transplantation, autoimmune disease, or immunosuppressive therapy
ACIP HPV Immunization Recommendations
Schedule Considerations

- Number of recommended doses is based on:
  - Age at administration of the first dose OR
  - Health status – immunosuppression

- Series does not need to be restarted if it is delayed or interrupted
  - There is NO maximum interval between HPV vaccine doses

- HPV vaccine can be administered during the same clinical visit as other vaccines

- No booster doses are recommended—even if the series was completed years ago

- No therapeutic effect on HPV infection, genital warts, cervical lesions
Human Papillomavirus Vaccine
Product Interchangeability

- No data on schedules that include 2vHPV and 4vHPV and/or 9vHPV
- Response to types 16 and 18 likely to be similar when 2vHPV, 4vHPV, or 9vHPV used in the same series
- Protection against other vaccine types is probably reduced if fewer than 3 doses of 4vHPV or 9vHPV received
- Use same vaccine for all doses whenever possible
Human Papillomavirus Vaccine
Special Situations

- **Administer vaccine to:**
  - Females who:
    - Have equivocal or abnormal Pap test
    - Have positive HPV DNA test
    - Are breastfeeding
  - Males and females who:
    - Have genital warts
    - Are immunosuppressed
Human Papillomavirus Vaccine and Pregnancy

- Starting the vaccine series should be delayed until after the pregnancy.
- If a woman becomes pregnant after starting the vaccination series, remaining doses should be delayed until after the pregnancy.
- If a vaccine dose has been administered during pregnancy, there is no indication for intervention.
- Women vaccinated during pregnancy should be reported to the respective manufacturer.
  - Active pregnancy registry for 9vHPV established; others are closed.
  - Contact information is in the package insert.

MMWR 2014;63(No. 5):1–30; MMWR 2015;64(29):300–4
## Persons Previously Vaccinated

<table>
<thead>
<tr>
<th>Age</th>
<th>Previous Vaccines</th>
<th>Followed Schedule</th>
<th>Adequately Vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 15th birthday</td>
<td>2 doses of any HPV vaccine</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Before 15th birthday</td>
<td>3 doses of any HPV vaccine</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>After 15th birthday</td>
<td>3 doses of any HPV vaccine</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*For persons who have been adequately vaccinated with 2vHPV or 4vHPV, no ACIP recommendation regarding additional vaccination with 9vHPV.*
Based on 2015 data alone, as many as 9.1 million women and about 13.9 million men age 19–26 years were unvaccinated and might benefit from HPV vaccination.

These estimates reflect the current pool of females and males who could benefit from catch-up vaccination and the number of unprotected older adolescents adding to that pool annually.

Studies have found that although HPV infection increases with increasing age after sexual debut, most have not been infected with all the high-risk HPV types included in the vaccine.

In June, 2019 ACIP voted to vaccinate women and men 26-45 years through shared clinical decision making.
Vaccine Administration

- **Route:** intramuscular (IM) injection
  - Needle size: 1 to 1½ inch, 22–25-gauge

- **Site:** Deltoid muscle in the upper arm

- **Administer at the same medical visit as other vaccines**
Human Papillomavirus Vaccine
Contraindications and Precautions

- **Contraindication**
  - Severe allergic reaction to a vaccine component or following a prior dose

- **Precaution**
  - Moderate or severe acute illness (defer until symptoms improve)
### Adverse Events Following Any Dose of HPV Vaccine among Females*

<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>2vHPV</th>
<th>4vHPV</th>
<th>9vHPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>92%</td>
<td>84%</td>
<td>89%</td>
</tr>
<tr>
<td>Swelling</td>
<td>44%</td>
<td>29%</td>
<td>40%</td>
</tr>
<tr>
<td>Erythema</td>
<td>48%</td>
<td>25%</td>
<td>34%</td>
</tr>
<tr>
<td>Fever</td>
<td>13%</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>Nausea</td>
<td>7%</td>
<td>GI 28%**</td>
<td>4%</td>
</tr>
<tr>
<td>Headache</td>
<td>12%</td>
<td>55%</td>
<td>11%</td>
</tr>
</tbody>
</table>

*FDA product approval data

**GI = Gastrointestinal symptoms, including nausea, vomiting, diarrhea, and/or abdominal pain
Syncope Following Vaccination

- An increase in the number of reports of syncope has been detected by the Vaccine Adverse Event Reporting System (VAERS)
  - Most of the increase among females 11–18 years

- Serious injuries have resulted

- ACIP recommends providers strongly consider observing patients for 15 minutes after they are vaccinated
Vaccine Storage and Handling

▪ Store HPV vaccine in a refrigerator between 2°C–8°C (36°F–46°F)

▪ Store HPV vaccines:
  • In the original packaging with the lids closed
  • In a clearly labeled bin and/or area of the storage unit

▪ Do not freeze the vaccine

Vaccine Storage Label Example
Available at www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf
Resources
- Ask the Experts–HPV FAQs:  
  www.immunize.org/askexperts/experts_hpv.asp
- CDC HPV Disease and Vaccination:  
  www.cdc.gov/hpv/hcp/index.html
- CDC HPV Vaccine Schedule Decision Tree:  
- HPV and Cancer:  www.cdc.gov/cancer/hpv/index.htm
Talking to Parents about HPV Vaccine: 
www.cdc.gov/hpv/hcp/for-hcp-tipsheet-hpv.pdf

National HPV Vaccination Roundtable Resource Library: hpvroundtable.org/resource-library/

Standing Orders for Administering HPV Vaccine:
• Children and Teens: www.immunize.org/catg.d/p3090.pdf
• Adults: www.immunize.org/catg.d/p3091.pdf
Strategies for Increasing
HPV Vaccination Coverage in Clinical Practices

- Give a presumptive, bundled recommendation for vaccination!
  - Include HPV vaccine when discussing other recommended vaccines
Same Way
Same Day
Make an Effective Recommendation

- **Same way:**
  - Effective recommendations group all of the adolescent vaccines
  - Recommend HPV vaccination the same way you recommend Tdap and meningococcal vaccines

- **Same day:**
  - Recommend HPV vaccine TODAY with other adolescent vaccines

Your preteen needs three vaccines today to protect against meningitis, HPV cancers, and pertussis.
Align communication with mission
Give staff a cancer prevention mission
All staff needs to be saying the same thing
Share talking points
Use the Tip Sheet
Educate staff about HPV vaccine recommendations, including schedule, administration, storage, and handling

www.cdc.gov/hpv/hcp/for-hcp-tipsheet-hpv.pdf
Questions?
Tdap/Td Vaccines

Adults

August, 2019

Chapters 7, 21 and 16
Disease
Diphtheria

- A toxin-mediated disease caused by Corynebacterium diphtheriae
- Usually produces exudate and pseudomembrane involving pharynx and tonsils
- Complications attributable to toxin – severity generally related to extent of local disease
- Most complications are myocarditis and neuritis
- Death in 5% to 10% of cases
Diphtheria Clinical Features

- Incubation period 2–5 days (range: 1–10 days)
- May involve any mucous membrane
- Classified based on site of disease
  - Anterior nasal
  - Pharyngeal and tonsillar
  - Laryngeal
  - Cutaneous
  - Ocular
  - Genital
Tonsillar diphtheria
Tetanus

- A toxin-mediated disease caused by *Clostridium tetani*
- Anaerobic gram-positive, spore-forming bacteria
- Spores found in soil, animal feces
- Two exotoxins produced with growth of bacteria
  - Tetanospasmin responsible for clinical manifestations of tetanus
Tetanus Clinical Features

- Incubation period: 8 days (range: 3–21 days)
- Three clinical forms: local (uncommon), cephalic (rare), generalized (most common)
- Generalized tetanus: descending pattern of trismus (lockjaw), stiffness of the neck, difficulty swallowing, rigidity of abdominal muscles
  - Spasms continue for 3–4 weeks
  - Complete recovery may take months
- Neonatal tetanus
  - Generalized tetanus in newborn infant
  - Infant born without protective passive immunity
  - 58,000 neonates died in 2010 worldwide
Annual incidence* of and deaths due to tetanus -- United States, 1900-2015

Sources: National Notifiable Diseases Surveillance System and passive reports to the Public Health Service
* Per 100,000 population
Pertussis

- Acute infectious disease caused by *Bordetella pertussis*
- Outbreaks first described in 16th century
- *Bordetella pertussis* isolated in 1906
- Estimated 195,000 deaths worldwide in 2008
Pertussis Clinical Features

- Incubation period: 7–10 days (range: 4–21 days)
- Insidious onset, similar to the common cold with nonspecific cough
- Fever usually minimal throughout course of illness
- Catarrhal stage
  - 1–2 weeks
- Paroxysmal cough stage
  - 1–6 weeks
- Convalescence
  - Weeks to months
Reported Pertussis Incidence by Age Group: 1990-2016*

*2016 data are provisional.

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System
Why Adolescents and Adults Need Pertussis Vaccine

- 18,975 pertussis cases reported in the U.S. in 2017, 13,439 cases in 2018
  - >50% of cases in those 11 years and older

- Infection may be asymptomatic, or may present as classic pertussis

- Disease often milder than in infants and children
  - Persons with mild disease may transmit the infection

- Older persons and household contacts often source of infection for infants and children

* Provisional data [www.cdc.gov/pertussis](http://www.cdc.gov/pertussis)
Pertussis Complications Among Adolescents and Adults

- Difficulty sleeping
- Urinary incontinence
- Pneumonia
- Rib fracture
- Plus:
  - Medical costs
  - Missed school and work
  - Impact on public health system
Vaccine
## Tdap Vaccines

<table>
<thead>
<tr>
<th>Vaccine product</th>
<th>Age indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tdap vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>Boostrix</td>
<td>10 years and older</td>
</tr>
<tr>
<td>Adacel</td>
<td>10-64 years</td>
</tr>
<tr>
<td><strong>Td vaccines</strong></td>
<td></td>
</tr>
<tr>
<td>TDVAX</td>
<td>7 years and older</td>
</tr>
<tr>
<td>Tenivac</td>
<td>7 years and older</td>
</tr>
</tbody>
</table>
Clinical Considerations
## Tdap Vaccination Recommendations: Adolescents

*Off-label recommendation  MMWR 2013;62(No. 7):131-5

### Adolescents 11 through 18 years of age
- Preferred administration at 11-12 years

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tdap For Persons Without History of DTP or DTaP

- All adolescents and adults should have documentation of having received a series of DTaP, DTP, DT, or Td

- Persons without documentation should receive a series of 3 vaccinations

- One dose should be Tdap, preferably the first
Tdap For Persons Without History of DTP or DTaP

**Preferred schedule:**

- Dose 1  Tdap
- Dose 2  Td at least 4 weeks after dose 1
- Dose 3  Td at least 6 months after dose 2
- Booster Td every 10 years
Administer a dose of Tdap during each pregnancy, regardless of the patient's prior history of receiving the vaccine.

Tdap should be administered early in the interval between 27 and 36 weeks’ gestation, although it may be given at any time during pregnancy.

- Currently available data suggest that vaccinating earlier in the 27- through 36-week time period will maximize passive antibody transfer to the infant.

*Off-label ACIP recommendation  MMWR 67(2):1–44
Vaccination coverage for pregnant women:
- 2010 and earlier: <1%
- 2013: 28%
- 2015: 53%

96% of Tdap vaccinations were administered in physicians' offices or clinics.
Maternal Tdap Vaccination is Very Effective in Prevention of Infant Pertussis Infection

<table>
<thead>
<tr>
<th>Definitions</th>
<th>Vaccine effectiveness (95% confidence intervals)</th>
<th>Infant age at pertussis onset</th>
<th>Mother gestational age received Tdap</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observational,¹ screening method</td>
<td>91% (83–95%)</td>
<td>Younger than 3 months</td>
<td>At least 28 days before birth*</td>
</tr>
<tr>
<td>Case-Control,² retrospective</td>
<td>91% (77–97%), unadjusted 93% (81–97%), adjusted¶</td>
<td>Younger than 2 months</td>
<td>Cases: 31.5 weeks (range, 28–38) Controls: 33 weeks (range, 26–38)</td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort,³ retrospective</td>
<td>85% (33–98%)</td>
<td>Younger than 2 months</td>
<td>27–36 weeks</td>
</tr>
<tr>
<td>Case-Control,⁴ retrospective</td>
<td>78% (44–91%)</td>
<td>Younger than 2 months</td>
<td>27–36 weeks</td>
</tr>
</tbody>
</table>

*2012 UK recommendation: Tdap between 28 and 38 weeks
¶Adjusted for sex, geographical area, and birth period
ACIP Conclusions: Safety of Tdap for Every Pregnancy

- Data reassuring on 2 doses of Tdap

- Data and experience with tetanus toxoid vaccine suggest no excess risk of adverse events
  - ~5% of women would receive 4 or more doses

- CDC provides ongoing monitoring to address concerns about the safety of Tdap given during subsequent pregnancies
Postpartum Women and Close Contacts of Infants

- Previously unvaccinated EVER or vaccination status unknown—administer Tdap

- Previously vaccinated persons – Tdap is NOT indicated
  - Including mothers, fathers, siblings, and grandparents
  - Any previous, documented dose counts
ACIP recognizes the increasing burden of pertussis and the need for an effective strategy to reduce this burden.

A study evaluating additional doses of Tdap administered at either a 5- or 10-year interval suggested that the reduction in pertussis disease burden would be limited.

ACIP concluded that the data do not support a general recommendation for a routine second dose of Tdap, and that the public health impact of routinely recommending a second dose of Tdap would be limited.
Previously unvaccinated HCP should receive a single dose of Tdap as soon as feasible, regardless of time since last Td dose

After receipt of 1 dose of Tdap, health care personnel should receive routine Td booster immunizations according to the recommended schedule

Additional doses of Tdap are not recommended for previously vaccinated HCP*

*Except pregnant women

MMWR 2006;55(RR-17):1–37
Vaccine Administration
Tdap Vaccines

- **Route: IM injection**
  - Needle gauge: 22–25 gauge
  - Needle length*: 1–1.5 inch depending on the patient’s age and/or weight

- **Site***:
  - 7 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used

*Professional judgement should be used to determine the proper needle length and site. Influencing factors include injection technique, local reaction, number of vaccines to be administered, patient age, size and muscle mass
Tdap Contraindications

- Severe allergic reaction to vaccine component or following a prior dose

- Encephalopathy not due to another identifiable cause within 7 days of administration of a pertussis-containing vaccine
Tdap Precautions

- History of Guillain-Barré syndrome within 6 weeks after a prior dose of tetanus toxoid-containing vaccine
- Progressive neurologic disorder until the condition has stabilized
- History of a severe local reaction (Arthus reaction) following a prior dose of a tetanus and/or diphtheria toxoid-containing vaccine
- Moderate or severe acute illness
Conditions NOT Precautions for Tdap

- Following a dose of DTaP/DTP:
  - Temperature 105°F (40.5°C) or higher
  - Collapse or shock-like state
  - Persistent crying lasting 3 hours or longer
  - Convulsions with or without fever
  - History of an extensive limb swelling reaction
Tdap/Td Adverse Reactions

- **Local reactions (pain, redness, swelling)**
  - 21%-66%
- **Temp of 100.4°F or higher**
  - 1.4%
- **Adverse reactions occur at approximately the same rate as Td alone (without acellular pertussis vaccine)**
- Ask the Experts—DTaP/DT/Tdap/Td FAQs: www.immunize.org/askexperts/experts_per.asp
- CDC Diphtheria Disease and Vaccination: www.cdc.gov/diphtheria/index.html
- CDC Pertussis Disease and Vaccination: www.cdc.gov/pertussis/index.html
- CDC Tetanus Disease and Vaccination: www.cdc.gov/tetanus/index.html
Questions?
Polio Disease and Polio Vaccine

Day 2: Adult Track

August, 2019

Chapter 18
Poliomyelitis Disease

- First outbreak described in the U.S. in 1843
- Polio epidemics were reported each summer and fall
- More than 21,000 paralytic cases reported in the U.S. in 1952
Disease
Poliovirus

- Three serotypes of wild poliovirus:
  - WPV1
  - WPV2
  - WPV3
- Minimal heterotypic immunity between serotypes
- Rapidly inactivated by heat, chlorine, formaldehyde, and ultraviolet light
Outcomes of Poliovirus Infection

- Asymptomatic: 70%
- Minor non-specific illness: 20%
- Aseptic meningitis: 5%
- Flaccid paralysis: 5%
## Poliovirus Epidemiology

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>Fecal-oral</td>
</tr>
<tr>
<td></td>
<td>Oral-oral possible</td>
</tr>
<tr>
<td>Communicability</td>
<td>Most infectious: 7–10 days before onset</td>
</tr>
<tr>
<td></td>
<td>Virus present in stool 3–6 weeks</td>
</tr>
</tbody>
</table>
Poliomyelitis—United States, 1950–2011

Source: National Notifiable Disease Surveillance System, CDC
Vaccine
Enhanced Inactivated Polio Vaccine

- Highly effective in producing immunity to poliovirus
  - ≥90% of recipients immune after 2 doses
  - ≥99% of recipients immune after 3 doses

- Duration of immunity not known with certainty
## Polio-Containing Vaccine Products

<table>
<thead>
<tr>
<th>Product ACIP Abbreviation</th>
<th>Age Indications</th>
<th>IPV Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPOL</td>
<td>6 weeks and older</td>
<td>Any dose in the series</td>
</tr>
<tr>
<td>IPV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IPV** stands for Inactivated Polio Vaccine.
Clinical Considerations
Routine vaccination of U.S. residents 18 years of age or older is not necessary or recommended

May consider 1 dose for:
- Travelers to polio-endemic countries
- Selected lab workers
Contraindications and Precautions

- Severe allergic reaction to a vaccine component or following a prior dose of vaccine
- Moderate to severe acute illness
Vaccine Administration

- **Route: IM injection**
  - IPV
  - Needle gauge: 22 – 25 gauge
  - Needle length*: 1 – 1.5 inch depending on the patient’s weight

- **IM injection site***:
  - 3 years and older: Deltoid muscle is preferred; vastus lateralis muscle may also be used

- **Note:** IPV single component may also be Subcut injection in the anterolateral thigh or upper outer triceps area of the arm

---

*Professional judgement should be used to determine the proper needle length and site. Influencing factors include injection technique, local reaction, number of vaccines to be administered, patient age, size and muscle mass
IPV Adverse Reactions

- Local reactions: 2.8% (pain, redness, swelling)
- Severe reactions: rare
Storage and Handling

- Store all IPV-containing vaccines in a refrigerator between 2°C and 8°C (36°F and 46°F)
- Store in original packaging with lids closed
- Store DTaP-IPV/Hib (Pentacel) diluent in the refrigerator and lyophilized Hib vaccine
- Do not freeze vaccine or diluent
Haemophilus influenzae Type b

Adult Vaccination

May 2019
**Haemophilus influenzae**

- Severe bacterial infection, particularly among infants
- Aerobic gram-negative bacteria
- Polysaccharide capsule
- 6 different serotypes (a–f) of polysaccharide capsule
- 95% of invasive disease caused by type b (prevaccine era)
**Haemophilus influenzae** Type b
Clinical Manifestations*

- **Epiglottitis**: 17%
- **Meningitis**: 50%
- **Pneumonia**: 15%
- **Osteomyelitis**: 2%
- **Arthritis**: 8%
- **Cellulitis**: 6%
- **Bacteremia**: 2%

*Prevaccine era
**Haemophilus influenzae Type b Epidemiology**

- **Reservoir**: Human asymptomatic carriers
- **Transmission**: Respiratory droplets presumed
- **Temporal pattern**: Peaks in Sept–Dec and March–May
- **Communicability**: Generally limited but higher in some circumstances (e.g., household, child care)
Hib Disease in Adults

- Uptick in disease among adults in Utah from 1998-2008
  - 121 cases
  - persons 65 years of age and older
  - 51% of cases
  - 66% of Hib-related deaths
  - increase also in nontypeable Hib strains and in serotype f
  - increases have also been noted in Illinois, Alaska, and Spain

- Reasons may include:
  - changes in the organism
  - greater numbers of high-risk people
  - waning immunity to the organism
Vaccine
Haemophilus influenzae Type b Conjugate Vaccines

- Conjugation improves immunogenicity
  - Immune response with booster doses

- Same polysaccharide capsule linked to different carrier proteins

- 3 single-component conjugate Hib vaccine products

- 1 combination vaccine products available that contain Hib conjugate vaccine
<table>
<thead>
<tr>
<th>Vaccine product</th>
<th>Age indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRP-T (polysaccharide, tetanus toxoid)</td>
<td>All doses of primary schedule and booster dose</td>
</tr>
<tr>
<td></td>
<td>2 months through 5 years</td>
</tr>
<tr>
<td>Act-HIB</td>
<td>All doses of primary schedule and booster dose</td>
</tr>
<tr>
<td></td>
<td>6 weeks through 4 years</td>
</tr>
<tr>
<td>Hiberix</td>
<td>All doses of primary schedule and booster dose</td>
</tr>
<tr>
<td></td>
<td>6 weeks through 4 years</td>
</tr>
<tr>
<td>Pentacel (DTaP, IPV, Hib)</td>
<td>For doses 1 through 4</td>
</tr>
<tr>
<td></td>
<td>6 weeks through 4 years</td>
</tr>
<tr>
<td>PRP-OMP (polysaccharide, outer membrane protein)</td>
<td>All doses of primary schedule and booster dose</td>
</tr>
<tr>
<td>PedvaxHIB</td>
<td>2 to 71 months of age</td>
</tr>
</tbody>
</table>

*ACIP does not state a preference for vaccine product versus another if the patient is eligible for more than 1 product*
ACIP Hib Immunization Recommendations
Older Children and Adults

- Generally not recommended for healthy persons older than 59 months of age

- Vaccinate high-risk adults if not vaccinated in childhood
ACIP Hib Vaccine Recommendations: Adult

- Recommended in adults with:
  - Anatomic or functional asplenia
    - For elective splenectomy, prefer to give 1 dose 14 days before splenectomy
  - Hematopoietic stem cell transplant
    - 3-dose series 4 weeks apart starting 6-12 months after transplant, regardless of Hib vaccination history

Hib Vaccine Interchangeability

- All single-component conjugate Hib vaccines are interchangeable for primary series and booster dose
- 3-dose primary series (4 doses total) if more than one brand of vaccine used at 2 or 4 months of age
-Whenever feasible, use same combination vaccine for subsequent doses
- If vaccine used for earlier doses is not known or not available, any brand may be used to complete the series
Contraindications and Precautions

- Severe allergic reaction to vaccine component or following previous dose
- Moderate to severe acute illness
Vaccine Administration - Hib-containing Vaccines

- **Preparation:**
  - ActHIB and Pentacel must be reconstituted BEFORE administering
  - PedvaxHib: None

- **Route: IM injection:**
  - Needle gauge: 22–25 gauge
  - Needle length*: 1–1.5 inch depending on the patient’s age and/or weight

- **Site***:
  - 6 weeks through 11 months: Vastus lateralis muscle
  - 1 through 2 years: Vastus lateralis muscle is preferred; deltoid muscle may be used if the muscle mass is adequate
  - 3 years and older: Deltoid muscle is preferred; vastus lateralis muscle may be used

- **Vaccine administration error:**
  - Preparation error: Wrong diluent used to reconstitute ActHIB or Pentacel

---

*Professional judgement should be used to determine the proper needle length and site. Influencing factors include injection technique, local reaction, number of vaccines to be administered, patient age, size, and muscle mass.
Hib Vaccine Adverse Reactions

- Swelling, redness, or pain in 5%–30% of recipients
- Systemic reactions infrequent
- Serious adverse reactions rare
Vaccine Storage and Handling

- Store Hib-containing vaccines in a refrigerator between 2°C -- 8°C (36°F -- 46°F)

- Store Hib-containing vaccines:
  - In the original packaging with the lids closed
  - In a clearly labeled bin and/or area of the storage unit

- Store Pentacel diluent (DTaP-IPV) in the refrigerator with the ActHIB vaccine

- Do not freeze vaccine or diluent

Vaccine storage label examples
Available at www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf
PLEASE PLACE QUESTIONS IN THE BASKET
Disease
Varicella Zoster Virus

- Primary infection results in varicella (chickenpox)
- Recurrent infection results in herpes zoster (shingles)
Varicella Clinical Features

- Incubation period: 14 to 16 days (range: 10 to 21 days)
- Mild prodrome for 1 to 2 days (adults)
- Rash generally appears first on the head; most concentrated on the trunk
- Successive crops over several days with lesions present in several stages of development
Varicella Complications

- Bacterial infection of lesions
- Hemorrhagic varicella
- CNS manifestations
- Pneumonia (primary viral or secondary bacterial)

Increase risk of complications for:
- Persons older that 15 years of age
- Immunocompromised persons
Varicella Epidemiology

- **Reservoir**  
  Human

- **Transmission**  
  Person to person – respiratory tract secretions  
  Direct contact with lesions

- **Temporal Pattern**  
  Peak in late winter and spring (U.S.)

- **Communicability**  
  1 to 2 days before until lesions have formed crusts  
  May be longer in immunocompromised
Herpes Zoster (Shingles)

- Reactivation of varicella zoster virus
- Generally occurs unilaterally in the distribution of a sensory nerve
  - Most often the trunk or 5th cranial nerve
- Associated with:
  - Aging
  - Immunosuppression
  - Intrauterine exposure
  - Varicella disease younger than 18 months of age
Complications of Herpes Zoster

- Dissemination with generalized skin eruptions and involvement of the central nervous system, lungs, liver, and pancreas

- Postherpetic neuralgia (PHN)

- Ophthalmic zoster
Zoster involving the ophthalmic division of the trigeminal nerve
Herpes Zoster

- 500,000 to 1 million episodes occur annually in the United States
- Lifetime risk of zoster estimated to be 32%
- 50% of persons living until age 85 will develop zoster
Vaccine
### Varicella and Zoster Vaccines

<table>
<thead>
<tr>
<th>Product</th>
<th>ACIP Age Recommendations</th>
<th>ACIP Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varivax</td>
<td>12 months and older</td>
<td>VAR</td>
</tr>
<tr>
<td>Shingrix</td>
<td>50 years and older</td>
<td>RZV</td>
</tr>
<tr>
<td>Zostavax</td>
<td>60 years and older*</td>
<td>ZVL</td>
</tr>
</tbody>
</table>

*Zostavax is FDA-approved for persons 50 years of age and older*
Live Zoster Vaccine (ZVL) Efficacy

- Vaccine recipients 60 to 80 years of age had 51% fewer episodes of zoster
  - Efficacy declines with increasing age
  - Significantly reduces the risk of postherpetic neuralgia
  - Reduces the risk of zoster 69.8% in persons 50 through 59 years of age
RZV Vaccine Efficacy

- **Efficacy for the prevention of zoster:**
  - 96.6% in adults age 50 to 59 years
  - 97.4% in adults age 60 to 69 years
  - 91.3% in adults age 70 years and older

- **The efficacy for the prevention of postherpetic neuralgia (PHN) was:**
  - 91.2% in adults age 50 years and older
  - 88.8% in adults age 70 years and older

CDC Shingrix Information for Healthcare Professionals [https://www.cdc.gov/vaccines/vpd/shingles/hcp/shingrix/about-vaccine.html](https://www.cdc.gov/vaccines/vpd/shingles/hcp/shingrix/about-vaccine.html), accessed 8/12/2018
Vaccine Efficacy and Effectiveness against HZ for HZ/su and ZVL, by Age Group, During the First 4‡ Years Following Vaccination

‡ Median follow-up may be less than 3 yrs: Schmader 2012= 1.3 yrs
^ZOE 50/70= 50-59 and 60-69yr: Lal 2015, 70+yrs: Cunningham 2016
*RCTs= 50-59 yrs: Schmader 2012, 60-69 and 70+ yrs: Oxman 2005,
Clinical Considerations
Varicella Vaccine
Acceptable Evidence of Varicella Immunity

- Written documentation of age-appropriate vaccination

- Laboratory evidence of immunity or laboratory confirmation of varicella disease

- U.S.-born before 1980*

- Health care provider diagnosis or verification of varicella disease

- History of herpes zoster based on health care provider diagnosis

*Birth year immunity criterion does not apply to health care personnel or pregnant women

MMWR 2007;56(RR-4):16-17
ACIP Immunization Recommendations

- All adults without evidence of varicella immunity
  - 2 doses separated by at least 4 weeks
- Do not repeat first dose because of extended interval between doses
- Second dose recommended for persons of any age who have only received 1 dose
ACIP Immunization Recommendations

HCP

- All healthcare personnel should have evidence of immunity
- Those without evidence of immunity should receive 2 doses of varicella vaccine at least 4 weeks apart
- Presumptive evidence of immunity for HCP includes:
  - Written documentation of age-appropriate vaccination
  - Laboratory evidence of immunity or laboratory confirmation of varicella disease
  - Health care provider diagnosis or verification of varicella disease
  - History of herpes zoster based on health care provider diagnosis
Varicella Serology and Vaccination
Persons Without Evidence of Immunity

- At least 90% of adolescents and adults from the U.S. can be expected to be immune to varicella, including those who do not recall having had the disease
- Serologic screening may be considered for people age 13 years and older who do not have a history of chickenpox or other evidence of immunity
Varicella Serology and Vaccination
Post Vaccination

- CDC and ACIP do not recommend antibody testing after varicella vaccination
  - Commercially available laboratory tests for varicella antibody are usually not sufficiently sensitive to detect vaccine–induced antibody
  - Even though they are generally sensitive to deduce antibodies resulting from varicella zoster virus infection

- Documented receipt of 2 doses of varicella vaccine supersedes results of subsequent serologic testing
VAR Administration

- **Preparation:**
  - Varicella-containing vaccines must be reconstituted BEFORE administering
  - Use the diluent supplied by the manufacturer

- **Route: Subcutaneous injection**
  - Needle gauge: 23–25 gauge
  - Needle length: 5/8 inch

- **Site:** Upper outer triceps of the arm or the thigh may be used if necessary
Var Vaccine Administration Errors

- Live, attenuated zoster vaccine administered to an adult instead of varicella vaccine
  - MORE antigen (15X antigen in varicella vaccine) than the recommended dose was administered
  - If the dose meets minimum age and interval, it may be counted

- Wrong diluent used to reconstitute the vaccine
  - Dose does NOT count and should be repeated ASAP
Varicella Vaccine Contraindications and Precautions

- Severe allergic reaction to a vaccine component or following a prior dose
- Pregnancy or planned pregnancy within 4 weeks*
- Immunosuppression
- Moderate or severe acute illness
- Recent blood product
  - Varicella vaccine should not be administered for 3–11 months after receipt of antibody-containing blood products

*ACIP off-label recommendation
Varicella Vaccine
Immunocompromised Persons

- Single-antigen varicella vaccine may be administered to persons with isolated humoral immunodeficiency

- Consider varicella vaccination for:
  - HIV-infected adults with CD4 count of 200 or higher
Varicella Vaccine Adverse Reactions

- **Local reactions (pain, erythema)**
  - 19% (children)
  - 24% (adolescents and adults)

- **Rash: varicella recipients (3%–4%)**
  - May be maculopapular rather than vesicular
  - Average 5 lesions

- **Systemic reactions not common**
Storage and Handling: Varicella Vaccine

- Store varicella-containing vaccines in a freezer between -50°C and -15°C (-58°F and +5°F)*
  - Protect from light
- Store vaccines in the original packaging with the lids closed in a clearly labeled bin and/or area of the storage unit
- Store diluent in a refrigerator or at room temperature
  - Do not freeze diluent
- Use ONLY the manufacturer-supplied diluent to reconstitute the lyophilized vaccine

*Vaccine may be stored in the refrigerator between 2°C and 8°C (36°F and 46°F) for up to 72 continuous hours after removal from freezer. Discard unused vaccine after 72 hours.
Vaccine storage label examples [www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)
Zoster Vaccine
ACIP Zoster Immunization Recommendations

- Administer 2 doses of Shingrix to immunocompetent persons 50 years of age and older
  - Regardless of previous history of:
    - Vaccination with varicella-containing vaccines—Varivax or Zostavax
    - Zoster disease

- Shingrix is preferred to Zostavax for persons 60 years and older
  - Separate varicella-containing vaccines and Shingrix by at least 8 weeks
Zoster Vaccination:
Patients Who Do Not Report A Prior Episode of Varicella

- When vaccinating adults 50 years of age and older, there is no need to:
  - Screen for a history of varicella (chickenpox) infection OR
  - Conduct laboratory testing for serologic evidence of prior varicella infection

- More than 99% of adults age 50 years and older worldwide have been exposed to varicella zoster virus

- ACIP considers people born in the United States prior to 1980 immune to varicella
Zoster Vaccine and Serology

- **If tested and varicella-negative:**
  - Administer 2 doses of single-antigen varicella vaccine (Varivax) separated by at least 4 weeks.
  - Followed by 2 doses of RZV, separated by 2–6 months.
    - Separate the 2nd (last) dose of varicella and 1st dose of RZV by at least 8 weeks.
Zoster Vaccine Administration

- **Preparation**
  - Zoster vaccine: Reconstitute just prior to administration
  - Use the diluent supplied by the vaccine’s manufacturer

- **Zostavax**
  - Route: Subcut injection
  - Site: Upper outer triceps of the arm or the thigh may be used if necessary
  - Needle gauge: 23–25 gauge
  - Needle length: 5/8 inch

- **Shingrix**
  - Route: IM injection
  - Site: Deltoid or the thigh may be used if necessary
  - Needle gauge: 22–25 gauge
  - Needle length: Varies by age/weight
Administer RZV to persons:

- Taking low-dose immunosuppressive therapy (e.g., <20 mg/day of prednisone or equivalent or using inhaled or topical steroids)
- Anticipating immunosuppression
- Who have recovered from an immunocompromising illness

ACIP has not yet made recommendations regarding use RZV in these patients

- Persons on moderate to high doses of immunosuppressive therapy were excluded from RZV efficacy studies
Zostavax (ZVL) Contraindications

- History of a life-threatening or severe allergic reaction to gelatin, the antibiotic neomycin, or any other component of ZVL

- A weakened immune system because of:
  - HIV/AIDS or another disease that affects the immune system
  - Treatment with drugs that affect the immune system
  - Cancer treatment such as radiation or chemotherapy
  - Cancer affecting the bone marrow or lymphatic system, such as leukemia or lymphoma

- Women who are or might be pregnant
  - Women should not become pregnant until at least 4 weeks* after getting ZVL

*ACIP off-label recommendation
MMWR 2008;57(RR-5)
Zostavax (ZVL) Vaccine Precautions

- Moderate or severe acute illness

- Current treatment with an antiviral drug active against herpes viruses
  - Discontinue at least 24 hours before administration of zoster vaccine
  - Should not be taken for at least 14 days after vaccination

- Recent receipt of a blood product is NOT a precaution
RZV Contraindications and Precautions

- History of severe allergic reaction, such as anaphylaxis, to any component of a vaccine or after a previous dose of Shingrix

- Moderate to severe illness, including an acute episode of herpes zoster
  - Shingrix is not a treatment for herpes zoster or postherpetic neuralgia (PHN)

- Shingrix has not been studied in pregnant women or women who are breastfeeding. Providers should consider delaying Shingrix vaccination for these women

CDC Shingrix Recommendations [www.cdc.gov/vaccines/vpd/shingles/hcp/shingrix/recommendations.html](http://www.cdc.gov/vaccines/vpd/shingles/hcp/shingrix/recommendations.html), accessed 8/12/2018
**Zostavax and Immunosuppression**

- **Leukemia, lymphoma, or other malignant neoplasm affecting the bone marrow or lymphatic system**
  - Persons whose leukemia or lymphoma is in remission and who have not received chemotherapy or radiation for at least 1 month can be vaccinated*

- **AIDS or other clinical manifestation of HIV infection**
  - Includes adults with CD4+ T-lymphocyte values less than 200 per mm$^3$

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*ACIP off-label recommendation

*MMWR 2008;57(RR-5)*
Zostavax and Immunosuppression

- High-dose corticosteroid therapy
  - 20 milligrams or more per day of prednisone or equivalent lasting 2 or more weeks
  - Vaccination should be deferred for at least 1 month after discontinuation of therapy

- Hematopoietic cell transplant recipients
  - Experience is limited
  - Assess the immune status of the recipient on a case-by-case basis
  - If a decision is made to vaccinate, the vaccine should be administered at least 24 months after transplantation
Zostavax and Immunosuppression

- Preferred: Administer zoster vaccine before treatment with recombinant human immune mediators and immune modulators
  - If not, assess the immune status of the recipient on a case-by-case basis

- Defer vaccination for at least 1 month after discontinuation of treatment
Zostavax (ZVL) Adverse Reactions

- Local reactions—34% (pain, erythema)
- No increased risk of fever
- No serious adverse reactions identified
### RZV (Shingrix) Adverse Reactions

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local reactions</td>
<td>49%</td>
</tr>
<tr>
<td>Local reactions—Grade 3</td>
<td>9.4%</td>
</tr>
<tr>
<td>Systemic reactions (headache, malaise, fatigue)</td>
<td>45–78%</td>
</tr>
<tr>
<td>Systemic reactions (headache, malaise, fatigue)—Grade 3</td>
<td>11%</td>
</tr>
</tbody>
</table>
Adverse Reactions after Shingrix

- Educate patients regarding:
  - Potential adverse reactions, including injection site and systemic reactions
  - The need for a second dose—even if s/he has an adverse reaction

- Offer comfort measures and strategies
Shingrix Vaccine Administration Errors

- Vaccine administration errors reported to VAERS include:
  - **Wrong route**: Subcut route rather than the IM
  - **Wrong age**: Administered to persons less than 50 years of age
  - **Wrong vaccine**: Shingrix instead of varicella (Varivax) vaccine
  - **Improper storage**: Administered after frozen storage
  - **Wrong preparation**: Administered the adjuvanted diluent only
  - **Wrong schedule**: Interval violations between doses of Shingrix or a previous dose of varicella-containing vaccine

- Other errors we have heard about:
  - Staff unaware of the need for a second dose
  - Staff thinks Zostavax can count toward completing the 2-dose Shingrix series
Storage and Handling: Shingrix

- Store both vaccine and diluent at refrigerator temperature 2°C and 8°C (36°F and 46°F)
- Store vaccine and diluent in the original packaging with the lids closed in a clearly labeled bin and/or area of the storage unit
- Use ONLY the manufacturer-supplied diluent to reconstitute the lyophilized vaccine

Vaccine storage label example available at [www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)
4

Resources
Describes who should be vaccinated as well as:

- Benefits and side effects of the vaccine
- Administration
- Storage and handling
Varicella and Zoster Vaccine Resources and References

- Resources and references are available on the webinar web page.

Varicella and Zoster Vaccines Resources and References

2018 Pink Book Webinar Series

- ACIP recommendations
  - Current ACIP varicella vaccine recommendations: [www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/varicella.html](http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/varicella.html)
  - Current ACIP MMWR recommendations: [www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmwr.html](http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmwr.html)
  - Current ACIP zoster vaccine recommendation: [www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/zoster.html](http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/zoster.html)
  - ACIP Update on the use of herpes zoster vaccine: [www.cdc.gov/mmwr/volumes/67/rr/mm6723a5.html](http://www.cdc.gov/mmwr/volumes/67/rr/mm6723a5.html)

- Manufacturer’s vaccine package inserts (PI):
  - VAR (Varivax), Merck & Co., Inc.: [www.fda.gov/BiologicalDrugs/Vaccines/VaccinesApprovedProducts/ucm205582.htm](http://www.fda.gov/BiologicalDrugs/Vaccines/VaccinesApprovedProducts/ucm205582.htm)
  - MMRV (ProFluar), Merck & Co., Inc.: [www.fda.gov/BiologicalDrugs/Vaccines/VaccinesApprovedProducts/ucm304805.htm](http://www.fda.gov/BiologicalDrugs/Vaccines/VaccinesApprovedProducts/ucm304805.htm)

- Schedule
  - 2018 Recommended immunization schedule for persons aged 18 years and younger: [www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html](http://www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html)
  - 2018 Recommended immunization schedule for adults 19 years and older: [www.cdc.gov/vaccines/schedules/hcp/adult.html](http://www.cdc.gov/vaccines/schedules/hcp/adult.html)

- Disease
  - Chickenpox disease webpage: [www.cdc.gov/chickenpox/about/](http://www.cdc.gov/chickenpox/about/)
  - Information one need to know: [www.yourhealthinformation.org/chickenpox/](http://www.yourhealthinformation.org/chickenpox/)
  - Shingles (Herpes Zoster): [www.cdc.gov/shingles/hcp/index.html](http://www.cdc.gov/shingles/hcp/index.html)

- Information for health care personnel
  - Epidemiology and Prevention of Varicella-Preventable Disease: Varicella chapter: [www.cdc.gov/vaccines/youth/pinkbook/chapters.html](http://www.cdc.gov/vaccines/youth/pinkbook/chapters.html)
  - MMR & varicella vaccines or MMRV vaccine - discussing options with parents: [www.cdc.gov/vaccines/pdf/mmrv/vaccfactsheet_hcp.pdf](http://www.cdc.gov/vaccines/pdf/mmrv/vaccfactsheet_hcp.pdf)
  - You Call the Shots: Varicella: [www.cdc.gov/vaccines/ed/eschool/vaccines.html](http://www.cdc.gov/vaccines/ed/eschool/vaccines.html)
  - Varicella information: [www.immunize.org/varicella/](http://www.immunize.org/varicella/)
  - Zoster information: [www.immunize.org/zoster/](http://www.immunize.org/zoster/)
Questions?
What Do You Think?

- A 62-year old patient comes to your facility for zoster vaccine. Zostavax is the only product in your inventory. You:
  - Send the patient home until Shingrix is available.
  - Administer Zostavax.

- Administer Zostavax today. Administer 2-dose series of Shingrix when the product is available—at least 8 weeks after the dose of Zostavax.
If a person has not had documented chickenpox but has had shingles, is varicella vaccination recommended?

- Yes
- No

No. Shingles is caused by varicella zoster virus, the same virus that causes chickenpox. A history of shingles based on a health care provider diagnosis is evidence of immunity to chickenpox.
There is a VIS for:
- ZVL (Zostavax)
- RZV (Shingrix)
- Var (Varicella)

Give the patient the appropriate VIS for the product that will be administered
Resources and CE Information

Day 2: Adult Track

August 2019
Vaccine Information for Adults

www.cdc.gov/vaccines/adults/index.html

CDC and Adult Immunizations

Vaccine Information for Adults

www.cdc.gov/vaccines/adults/index.html

Standards for Adult Immunization Practice

www.cdc.gov/vaccines/hcp/adults/for-practice/standards/index.html
Advisory Committee on Immunization Practices

ACIP Vaccine Recommendations
www.cdc.gov/vaccines/hcp/acip-recs/index.html

Immunization Schedules
www.cdc.gov/vaccines/schedules/index.html
Advisory Committee on Immunizations Practices Meetings

- Watch the live webcast
- Register at
  - [https://www.cdc.gov/vaccines/acip/meetings/webcast-instructions.html](https://www.cdc.gov/vaccines/acip/meetings/webcast-instructions.html)

Next ACIP meeting
October 23-24, 2019
Clinical Issues in Immunization Netconferences (CIINCs)

- CIINCs provide clinicians with the most up-to-date information on immunization
  - Live, 1-hour webinars
  - Conducted 4 to 5 times a year
  - Topics announced prior to each one
  - Webinars are archived
  - CE available

- Sign up for e-mail alerts at [www.cdc.gov/vaccines/ed/ciinc/index.html](http://www.cdc.gov/vaccines/ed/ciinc/index.html)
You Call the Shots Web-Based Training

- YCTS is a series of modules on each vaccine-preventable disease and ACIP recommendations.
- Each module provides learning opportunities, self-test practice questions, reference and resource materials, and an extensive glossary.
- CE available.

You Call the Shots: [www.cdc.gov/vaccines/ed/youcalltheshots.html](www.cdc.gov/vaccines/ed/youcalltheshots.html)
Vaccine Administration Resources for Health Care Personnel

- CDC vaccine administration materials for health care personnel include:
  - Printable clinical job aids
  - Demonstration videos
  - Vaccine administration e-Learn

CDC Vaccine Administration: [www.cdc.gov/vaccines/hcp/admin/admin-protocols.html](http://www.cdc.gov/vaccines/hcp/admin/admin-protocols.html)
Staying Up To Date

- Bookmark web resources for staff such as:
  - State and/or local health department
  - Immunization Action Coalition
  - Every Child By Two
  - Vaccine Education Center at Children’s Hospital of Philadelphia

- Sign up for e-mail alerts and/or newsletters if available
Immunization Questions?

- Questions? E-mail CDC
  - nipinfo@cdc.gov or www.cdc.gov/cdcinfo

- Vaccines and Immunizations website  www.cdc.gov/vaccines

- HCP education  www.cdc.gov/vaccines/hcp.htm

- Twitter  @DrNancyM_CDC

- Influenza  www.cdc.gov/flu

- Vaccine Safety  www.cdc.gov/vaccinesafety
Do You Need CE?

- NOTE: Complete the CE process for each day
- For CE credit, go to www.cdc.gov/GetCE
- Search course number
- CE credit expires: September 16, 2019

For help with CE, contact:
- Call 1-800-41TRAIN or email ce@cdc.gov
- Melissa Barnett at MBarnett2@cdc.gov
CE Summary

- Follow the instructions in your packet
- Additional guidance is on the CDC website at [www.cdc.gov/vaccines/ed/ce-credit-how-to.html](http://www.cdc.gov/vaccines/ed/ce-credit-how-to.html)
Course Evaluation: Pretest and Post-test

- **Pretest e-mailed August 8th**
  - If you did not receive pretest
    - You may have registered for the course after August 7\textsuperscript{th}
    - Some emails on registration list were undeliverable

- **If you completed the pretest, you will receive post-test August 20\textsuperscript{th}**
  - Post-test will not fulfill CE requirements
  - Aid CDC in measuring knowledge gained from course participation
  - Expires August 27\textsuperscript{th}, 11:59pm

- **CDC staff will also e-mail course evaluation August 20\textsuperscript{th}**
  - Expires September 17\textsuperscript{th}
“The reward for work well done is the opportunity to do more.” — Jonas Salk
Safe Travels Home!