2015 Immunization Update

Nathan Pope, PharmD, R.Ph.
Clinical Assistant Professor

Sharon Rush, RPh
Clinical Assistant Professor

University of Texas College of Pharmacy
Health Outcomes and Pharmacy Practice

What level of immunizer would you consider yourself?

1. Beginner
2. Intermediate
3. Advanced

ACPE Numbers

- 2015 Immunization Update is accredited by ACPE for pharmacists, ACPE # 154-0000-15-034-L04-P and for technicians, ACPE # 154-0000-15-034-L04-T for 3 contact hours.
- Nathan Pope and Sharon Rush have not disclosed any financial or conflicts of interest in relation to this program.

Objectives

- Identify changes or updates to the immunization schedules for persons aged 0 through 18 years and adults based on January 2015
- Evaluate the most current Advisory Committee on Immunization Practices (ACIP) recommendations
- Evaluate various questions that have been submitted to the CDC website as well as self-submitted by participants.

Objectives

- Determine appropriate answers for the questions that commonly arise and discuss related counseling points and key considerations.
- Review Ebola and its current investigative vaccines
- Discuss vaccines under investigation or in the pipeline
MMWR Report

ACIP Recommendations

- ALL recommendations are reviewed every 3 to 5 years
- Recommendations are published in MMWR updates by disease and chronological order on the CDC-ACIP website at http://www.cdc.gov/vaccines/acip/

Category A versus B

- Category A – Made for all persons in an age- or risk-factor-based group
  - Strong recommendation – Need to give
- Category B – Made for individual clinical decision making
  - Conditional or weak recommendation – Option to give
- Both categories:
  - Go on schedules
  - Fall under Vaccines for Children program
  - Covered by Affordable Care Act – Insurance plans have one year to include in coverage

Vaccine Errors


Influenza
Influenza 2014-15 Update

- 61% of hospitalizations in ages 18-64 yrs (usually 35% of cases)
- >80% of Influenza A (H3N2) viruses tested by CDC were antigenically different from vaccine component
- Cases seen
  - 83% Influenza A (H3N2)
  - 17% Influenza B
    - 85% B-Yamagata (trivalent/quadrivalent)
    - 15% B-Victoria (quadrivalent)

2014-2015 Vaccine Effectiveness

- Overall effectiveness – 53% (excluding partial vaccination cases)
  - Inactivated
    - Quadrivalent – 51%
    - Trivalent – 49%
  - LAIV
    - Patients aged 2 to 17 yrs – 26%
    - High dose trivalent
      - Patients aged ≥ 65 yrs – 9%

2014-2015 Vaccine Effectiveness

- Influenza A (H3N2) – 13%
- Influenza B (Yamagata) – 55%
- Influenza B (Victoria) – 63%
- Reduced or non-significant effectiveness against H3N2
  - LAIV vs IIV in children
  - High dose vs standard dose in ≥ 65 yrs

2014-2015 Safety Concerns

- Anaphylaxis - No confirmed anaphylaxis reports in patients with documented egg allergy
- Guillain-Barre’ syndrome – No cases directly related to vaccine
- No new safety concerns detected for any influenza vaccines
- Enhanced safety monitoring will be conducted in 2015-16
  - Study of 2010-11 and 2011-12 seasons’ data show increased risk of spontaneous abortions following IIV3 in pregnant women during 1-28 day risk window
    - Had received H1N1-containing vaccine in previous year
    - Findings inconsistent with prior studies
    - Follow-up studies planned

U.S. Influenza Vaccine Abbreviations

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>ABBREVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trivalent inactivated influenza vaccine</td>
<td>IIV3</td>
</tr>
<tr>
<td>Quadrivalent inactivated influenza vaccine</td>
<td>IIV4</td>
</tr>
<tr>
<td>Quadrivalent live attenuated influenza vaccine</td>
<td>LAIV4</td>
</tr>
<tr>
<td>High-dose trivalent inactivated influenza vaccine</td>
<td>IIV3-HD</td>
</tr>
<tr>
<td>Intradermal quadrivalent inactivated influenza vaccine</td>
<td>IIV4-ID</td>
</tr>
<tr>
<td>Cell culture-based trivalent inactivated influenza vaccine</td>
<td>ccIIV3</td>
</tr>
<tr>
<td>Recombinant trivalent inactivated influenza vaccine</td>
<td>RIV3</td>
</tr>
</tbody>
</table>

IIV and LAIV can be used when generally discussing inactivated and live attenuated vaccines

Influenza Vaccine 2015-2016

- A/California/7/2009 (H1N1) pdm09-like virus
- A/Switzerland/9715293/2013 (H3N2)-like virus
  - Replaces A/Texas/50/2012 (H3N2)-like virus
- B/Phuket/3073/2013-like virus (Yamagata lineage)
  - Replaces B/Massachusetts/2/2012-like virus (Yamagata lineage)

Quadrivalent vaccines will add:
- B/Brisbane/60/2008-like virus (Victoria lineage)
### Influenza Vaccine 2015-2016

<table>
<thead>
<tr>
<th>VACCINE AND MANUFACTURER</th>
<th>SPECIAL NOTES</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluvirin (Novartis)</td>
<td>For ages 4 yrs and up</td>
<td>IIV3</td>
</tr>
<tr>
<td>Fluzone Quadrivalent (GSK)</td>
<td>For ages 3 years and up</td>
<td>IIV4</td>
</tr>
<tr>
<td>FluMist (MedImmune)</td>
<td>Quadrivalent only</td>
<td>LAIV</td>
</tr>
</tbody>
</table>

*No egg protein detectable in the final product due to multiple dilutions

**Can produce vaccine in one month if strain change is needed.

---

### Novartis Divestiture

- March 1, 2015
  - Divested influenza vaccine business to CSL Limited
  - Transition to close at end of 2015
  - Both companies working to honor all agreements and provide seamless transition
- March 2, 2015
  - Divested non-influenza vaccine business (meningococcal and travel franchises) to GSK

---

### ACIP - LAIV vs IIV

- **VOTE – Approved 2014**
  - When available, LAIV should be used for healthy children ages 2 to 8 years of age who have no contraindications or precautions to LAIV. If LAIV not available, use IIV. Do not delay vaccination to obtain LAIV.

---

### ACIP - LAIV vs IIV

- **VOTE – Approved 2015**
  - When available, LAIV should be used for healthy children ages 2 to 8 years of age who have no contraindications or precautions to LAIV. If LAIV not available, use IIV. Do not delay vaccination to obtain LAIV.
ACIP - LAIV vs IIV – CHANGE!

- February 2015 ACIP vote – APPROVED!
  - “For healthy children aged 2 through 8 years who have no contraindications or precautions, either LAIV or IIV is an appropriate option. No preference is expressed for LAIV or IIV for any person aged 2 through 49 years for whom either vaccine is appropriate.”
  - Will continue to study

LAIV Issues

- 2013-14
  - LAIV H1N1pdm09 less stable
    - Higher susceptibility to heat degradation
- 2014-15
  - No evidence that shows LAIV provided more protection than IIV against drifted H3N2 strains
- 2015-16
  - Expect more thermal-stable product
  - New environmentally safer packaging*
    - Reduces carton size volume ~18%

*National Adult and Immunization Influenza Summit – May 14, 2015

Schedule Changes - Childhood

- Gold bar reworked on 0 – 18 yrs child schedule
  - LAIV beginning at 2 yrs of age
  - For children aged 6 months through 8 years who need 2 doses of influenza vaccine in the first year vaccinated
  - New gold bar from ages 9 yrs and up

# of Doses for Children 6 Months through 8 Years of Age – APPROVED!

Has the child received 2 or more total doses of trivalent or quadrivalent influenza vaccine during any prior season(s)?

Yes

No

Administer 1 dose of 2015-2016 vaccine

Administer 2 doses of 2015-2016 vaccine 2-4 weeks apart

*The 2 doses need not be received in the same season or consecutive seasons

Footnote Changes - Adult

- The footnote for influenza vaccination has been updated to indicate that adults aged 18 years or older (changed from adults aged 18 through 49 years) can receive RIV.

- Adults aged 18 years or older can receive the recombinant influenza vaccine (RIV) (FluBlok). RIV does not contain any egg protein and can be given to age-appropriate persons with egg allergy of any severity.

Footnote Changes

- The influenza vaccine footnote was updated to reflect revised contraindications for LAIV. LAIV should not be administered to some persons, including
  1) persons who have experienced severe allergic reactions to LAIV, any of its components, or to a previous dose of any other influenza vaccine;
  2) children aged 2 through 17 years receiving aspirin or aspirin-containing products;
  3) persons who are allergic to eggs;
  4) pregnant women;
  5) immunosuppressed persons;
  6) children aged 2 through 4 years with asthma or who had wheezing in the past 12 months; and
  7) persons who have taken influenza antiviral medications in the previous 48 hours
LAIV revised contraindications
- Persons who have experienced severe allergic reactions to LAIV, any of its components, or to a previous dose of any other influenza vaccine
- Persons allergic to eggs
- Pregnant women
- Persons who have taken influenza antiviral medications in previous 48 hours

Contraindications and Precautions Table Changes - Adult
- LAIV
  - "Influenza antiviral use within the last 48 hours" Moved from Precautions column to Contraindications column
  - The following were moved from Contraindications column to Precautions column:
    - Asthma and chronic lung diseases
    - Cardiovascular, renal and hepatic diseases
    - Diabetes and other conditions

Safety Errors
- 75% of all reports in community pharmacies
- Wrong formula given for age group
- Not familiar with dosing
- Non-verification of patient age before administration
- Most common with LAIV – has an 18-week shelf life so usually expires first week of November. Most IIV products last until June 30th. Usually expires early November.

H5N1 Update

ISMP National Vaccine Errors Reporting Program report, December 4, 2014
H5N1

- Vote on recommendations for use of Influenza A (H5N1) vaccine during inter-pandemic periods slated for February 2015 meeting
  - Session cancelled due to bad weather and re-scheduled for June 2015 meeting
- Q-Pan H5N1 vaccine by GSK
  - Production delays following Quebec plant inspection*
  - 2015-16 will see additional delays due to plant manufacturing upgrades
  - Current schedule – mid-2017
- Vote delayed indefinitely until vaccine is available

Avian Influenza H5

- Now present in 65 countries
- 2004 – 2015
  - 840 human cases in 16 countries
  - 413 deaths (53% mortality)
  - Most recent cases in Egypt due to economic and poultry production changes
    - Not believed upsurge is due to change in virus but an increase in exposure to infected poultry
  - Eurasian HPAI H5N2 detected in birds November 28, 2014 in Canada

- U.S.
  - 47 million birds infected in U.S. – captive and wild
  - 90% in commercial operations – appears to be waning but may increase in the fall
  - Pacific and Mississippi flyways – majority of cases
  - Three viruses found – different from Egypt virus
    - H5N1 reassortment, H5N2 and H5N8
  - All exposed humans have tested negative
  - Q-Pan not cross-reactive against U.S. strains H5N2 and H5N8
  - CDC working on vaccine for U.S. circulating viruses
  - Recommend USDA response workers to be vaccinated

Vaccination Coverage

<table>
<thead>
<tr>
<th>AGE / SPECIAL CONDITION</th>
<th>COVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 to 64 yrs, high-risk - Total</td>
<td>21.2</td>
</tr>
<tr>
<td>19 to 64 yrs, high-risk - Hispanic</td>
<td>17.9</td>
</tr>
<tr>
<td>19 to 64 yrs, high-risk - Asian</td>
<td>11</td>
</tr>
<tr>
<td>≥ 65 yrs - Total</td>
<td>59.7</td>
</tr>
<tr>
<td>≥ 65 yrs - Hispanic</td>
<td>39.2</td>
</tr>
<tr>
<td>≥ 65 yrs - Asian</td>
<td>45.3</td>
</tr>
</tbody>
</table>

*http://www.fda.gov/ICECI/EnforcementActions/WarningLetters/2014/ucm401719.htm

Pneumococcal
### Proposed Interval Changes – APPROVED!

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>UNDERLYING CONDITIONS</th>
<th>PCV13 → PPSV23</th>
<th>PPSV23 → PCV13</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 – 71 mths</td>
<td>• Immunocompetent with underlying chronic conditions</td>
<td>≥8 weeks</td>
<td>≥8 weeks</td>
</tr>
<tr>
<td>6 – 18 yrs</td>
<td>• High-risk immunocompetent (CSF leak, cochlear implants)</td>
<td>≥8 weeks</td>
<td>≥8 weeks</td>
</tr>
<tr>
<td>≥ 19 yrs</td>
<td>• High-risk immunocompetent (CSF leak, cochlear implants)</td>
<td>≥8 weeks</td>
<td>≥1 yr</td>
</tr>
<tr>
<td>≥ 65 yrs</td>
<td>N/A</td>
<td>≥1 yr</td>
<td>≥1 yr</td>
</tr>
</tbody>
</table>

**Guidance on intervals for sequential use of PCV13 followed by PPSV23:**

- “A dose of PPSV23 should be given at least 1 year following a dose of PCV13. The two vaccines should not be co-administered. If a dose of PPSV23 is given earlier than the recommended interval, the dose need not be repeated.”

---

### Current CMS Policy

- **January 2015**
  - Medicare will cover “a different, second pneumococcal vaccine one year after the first vaccine was administered (i.e., 11 full months have passed following the month in which the last pneumococcal vaccine was administered).”

---

### Schedule Changes - Adult

- **Figure 1**, the recommended adult immunization schedule by vaccine and age group, has been revised to designate PCV13 for adults aged 65 years or older as “recommended” (from the previous “recommended if some other risk is present”).

---

### Footnote Changes - Adult

- The footnotes for pneumococcal vaccination have been revised to provide algorithmic, patient-based guidance for the health care provider to arrive at appropriate vaccination decisions for individual patients.

---

**Additional Information:**

- [Guidance on intervals for sequential use of PCV13 followed by PPSV23](http://www.cdc.gov/mmwr/preview/mmwrhtml/su6404a1.htm).
- [CDC MMWR Vol. 64 No. 4, February 6, 2015](http://www.cdc.gov/mmwr/preview/mmwrhtml/su6404a1.htm).
- [Footnote Changes - Adult](http://www.cdc.gov/mmwr/preview/mmwrhtml/su6404a1.htm).
Footnote Changes - Children

- The pneumococcal vaccine footnote was updated to provide clearer guidance for vaccination of persons with high-risk conditions:
  - Administer 1 dose of PCV13 if any incomplete schedule of 3 doses of PCV (PCV7 and/or PCV13) was received previously.
  - Administer 2 doses of PCV13 at least 8 weeks apart if unvaccinated or any incomplete schedule of fewer than 3 doses of PCV (PCV7 and/or PCV13) was received previously.

Recommendations Table

- The Immunization Action Coalition (IAC) has developed a new table to serve as a guide in determining pneumococcal vaccine need and how to administer. You can find the entire table at www.immunize.org/catg.d/p2019.pdf

Future Vote

- Proposed guidance on intervals for sequential use of PPSV23 and PCV13 in children 2 – 18 years with underlying conditions
  - "A dose of PCV13 should be given at least 1 year following a dose of PPSV23. The two vaccines should not be co-administered. If a dose of PCV13 is given earlier than the recommended interval, the dose need not be repeated.

Safety Issues

- Main issue with pneumococcal is its confusing schedule. ACIP is continually working to simplify this.
  - Utilize the footnote algorithms and IAC table to determine proper administration.
**Pertussis Revaccination**

- **Cocooning** - Vaccinate all individuals that come in contact with infant to create a "cocoon" of protection around the infant
- Unpublished CDC study
  - From 2006-2013, 66-85% of identified sources classified as family members (35.5% were siblings)
- Mother – If vaccinated during recommended interval in pregnancy, high levels of transplacental maternal antibodies in infants are present. *This remains the most optimal strategy.*

**ACIP Stance**

- No supportive evidence available that indicates additional doses would be beneficial
- GSK currently conducting clinical studies on revaccination
  - Data submission to FDA for label update consideration will depend on pertussis epidemiology and ACIP recommendations
  - *No change in current recommendations*

**Footnote Changes**

- DTaP in childhood schedule now states if the fourth dose of DTaP vaccine was administered 4 months or more after the third dose at an appropriate age, it can be counted as a valid. It does not need to be repeated after the recommended 6-month interval between doses 3 and 4.

**Safety Errors**

- 10% of all reports in all settings
- Similar vaccine abbreviations
- Not familiar with product
- Similar generic names

---

**Vaccination Coverage**

<table>
<thead>
<tr>
<th>AGE / SPECIAL CONDITION</th>
<th>COVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 19 yrs – Total</td>
<td>17.2</td>
</tr>
<tr>
<td>≥ 19 yrs – White</td>
<td>19.7</td>
</tr>
<tr>
<td>≥ 19 yrs – Asian</td>
<td>15.5</td>
</tr>
<tr>
<td>≥ 19 yrs – Black</td>
<td>12.6</td>
</tr>
<tr>
<td>≥ 19 yrs - Hispanic</td>
<td>10.2</td>
</tr>
<tr>
<td>≥ 19 yrs – Living with infant aged &lt; 1 yr</td>
<td>29.4</td>
</tr>
<tr>
<td>19 to 64 yrs - Total</td>
<td>18.4</td>
</tr>
<tr>
<td>≥ 65 yrs – Total</td>
<td>11.9</td>
</tr>
</tbody>
</table>

CDC MMWR Vaccination Coverage Among Adults report, February 6, 2015 / 64(04);95-102

**ISMP National Vaccine Errors Reporting Program report, December 4, 2014**
### Vaccination Coverage

<table>
<thead>
<tr>
<th>AGE / SPECIAL CONDITION – FEMALE (≥ 1 dose)</th>
<th>COVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 to 26 yrs - Total</td>
<td>36.9</td>
</tr>
<tr>
<td>19 to 21 yrs – Total</td>
<td>44.7</td>
</tr>
<tr>
<td>22 to 25 yrs - Total</td>
<td>32.4</td>
</tr>
<tr>
<td>19 to 26 yrs - Asian</td>
<td>19.8</td>
</tr>
<tr>
<td>19 to 26 yrs - Hispanic</td>
<td>30.3</td>
</tr>
<tr>
<td>19 to 26 yrs - Black</td>
<td>30.6</td>
</tr>
</tbody>
</table>

CDC MMWR Vaccination Coverage Among Adults report, February 6, 2015 / 64(04);95-102

### HPV Types

<table>
<thead>
<tr>
<th>VIRUS TYPES</th>
<th>% OF CASES</th>
<th>VACCINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer-causing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV 16 or 18</td>
<td>64%</td>
<td>Cervarix®, Gardasil® 4-valent</td>
</tr>
<tr>
<td>HPV 31, 33, 35, 52 and 58</td>
<td>10%</td>
<td>Gardasil 9®</td>
</tr>
<tr>
<td>Anogenital warts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV 6 or 11</td>
<td>90%</td>
<td>Gardasil 4-valent, Gardasil 9®</td>
</tr>
</tbody>
</table>

www.cdc.gov/mmwr/pdf/rr/rr6305.pdf

### Current Vaccines

<table>
<thead>
<tr>
<th>Virus types</th>
<th>Bivalent 2vHPV</th>
<th>Quadrivalent 4vHPV</th>
<th>9-Valent 9vHPV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cervarix®</td>
<td>Gardasil®</td>
<td>Gardasil 9®</td>
</tr>
<tr>
<td>16, 18</td>
<td>6, 11, 16, 18</td>
<td>6, 11, 16, 18, 31, 33, 45, 52, 58</td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>GSK</td>
<td>Merck</td>
<td>Merck</td>
</tr>
<tr>
<td>Licensed age groups</td>
<td>Females 9 – 25 yrs</td>
<td>Females 9 – 26 yrs</td>
<td>Females 9 – 26 yrs</td>
</tr>
<tr>
<td></td>
<td>Males 9 – 26 yrs</td>
<td>Males 9 – 15 yrs</td>
<td>Males 16 – 26 yrs is off-label</td>
</tr>
</tbody>
</table>

### Vaccine News

- **4vHPV**
  - 99% administered in U.S. in 2014
  - Merck intends to maintain supply until
  - 9vHPV FDA-approved in males 16 – 26 yrs
  - For additional 6 months to allow for series completion with 4vHPV
  - Probably mid-2016

- **9vHPV**
  - Vaccines for Children
  - May 2015 - >50% of awardees placed orders that included 9vHPV
  - Managed care plans
  - June 2015 - >85% decided to cover
**ACIP Vote – APPROVED!**

- February 2015 updated recommendations
  - Routine vaccination at age 11 or 12 years with a 3-dose series. (Series can be started at age 9)
  - Vaccination recommended through age 26 for females and through age 21 for males not previously vaccinated
  - Vaccination recommended for men who have sex with men and immunocompromised men (including HIV-infected) through age 26
  - Vaccination of females is recommended with 2vHPV, 4vHPV (as long as this formulation is available), or 9vHPV
  - Vaccination of males is recommended with 4vHPV (as long as this formulation is available) or 9vHPV

**ACIP Vote- APPROVED!**

- February 2015 updated recommendations (cont)
  - “If vaccination providers do not know or do not have available the HPV vaccine product previously administered, or are in settings transitioning to 9VHPV, for protection against HPV 16 and 18, any HPV vaccine product may be used to continue or complete the series for females; 4vHPV or 9vHPV may be used to continue or complete the series for males.”

**Additional 9vHPV Doses**

- Use the current recommended schedule
  - Second dose is 2 months after the first dose
  - Third dose is 4 months after the second dose (6 months after the first dose)
- No current recommendation for additional 9vHPV doses if series completed with 2vHPV or 4vHPV
- Work group members not in favor of routine additional 9vHPV vaccination at this time

**Safety Errors**

- 8% of all reports in all settings
- Storage at incorrect temperature
- Not familiar with product

**Outbreaks**

- Since January 1, 2015
  - 169 people in 20 states
  - Five separate outbreaks
  - Majority were unvaccinated
  - Largest
    - Linked to Disneyland, California
    - Multi-state
    - Suspected source – oversees traveler who visited park while infectious
  - 110 California patients
    - 45% unvaccinated
    - 12% had not completed series
    - 43% unknown vaccination status

---

**Measles**

**ISMP National Vaccine Errors Reporting Program report, December 4, 2014**

**ISMP National Vaccine Errors Reporting Program report, December 4, 2014**

California Law

- Current law allows parents to opt out of vaccines for almost any reason using the “personal belief” exemption
- Some schools had more than half the children unvaccinated
- 2014 – 6,951 cases of Pertussis per CDC provisional surveillance report dated Jan 9, 2015
- January 2015 measles outbreak – worst in 20 years and spread mainly through unvaccinated children
- June 2015 - SB277 was passed to remove personal and religious exemptions. Signed by Gov. Brown.

ACIP Recommendations Changes

- None at this time

Schedule Changes

- Purple bar added to childhood schedule to reflect recommendation to vaccinate children aged 6-11 months if they are going to travel or live abroad. It refers you to the footnote.

Footnote Changes - Childhood

- Footnote changes to reflect recommendations on traveling abroad

9. Measles, mumps, and rubella (MMR) vaccine. (Minimum age: 12 months for routine vaccination)
   - Routine vaccination:
     - Administer a 2-dose series of MMR vaccine at ages 12 through 15 months and 4 through 6 years. The
       second dose may be administered before age 4 years, provided at least 4 weeks have elapsed since the
       first dose.
     - Administer 1 dose of MMR vaccine in infants aged through 11 months before departure from the United
       States for international travel. These children should be revaccinated with 2 doses of MMR vaccine, the first
       at age 12 through 15 months; 2 months before departure. The second dose may be administered before
       age 4 years.
   - Administer 2 doses of MMR vaccine to children aged 12 months and older before departure from the
     United States for international travel. The first dose should be administered on or after age 12 months
     and the second dose at least 4 weeks later.
   - Ensure that all school-aged children and adolescents have had 2 doses of MMR vaccine; the minimum
     interval between the 2 doses is 4 weeks.

Microneedle Patch

<table>
<thead>
<tr>
<th>Size</th>
<th>1 square centimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition</td>
<td>100 solid, conical microneedles made of polymer, sugar and vaccine – fraction of a millimeter long</td>
</tr>
<tr>
<td>Administration</td>
<td>Apply patch and press with thumb. The microneedles press into the upper layers of the skin and dissolve in a few minutes → vaccine released.</td>
</tr>
<tr>
<td>Logistics</td>
<td>More stable at varying temperatures</td>
</tr>
<tr>
<td></td>
<td>Takes up less space</td>
</tr>
<tr>
<td></td>
<td>Minimal supplies needed</td>
</tr>
<tr>
<td></td>
<td>No Sharps</td>
</tr>
<tr>
<td></td>
<td>Cost comparable to current supply</td>
</tr>
<tr>
<td></td>
<td>No accidental needlesticks</td>
</tr>
<tr>
<td>Training needed</td>
<td>Minimal</td>
</tr>
<tr>
<td>Status</td>
<td>Human clinical trials set for 2017 – collaboration of CDC and Georgia Tech</td>
</tr>
</tbody>
</table>

IsMP National Vaccine Errors Reporting Program report, December 4, 2014

CDC Press release: Microneedle Patch for Measles Vaccination Could Be a Game Changer; April 27, 2015

6% of all reports in all settings
- Not familiar with indicated age groups
- Similar packaging
- Products stored incorrectly
Serogroup B Vaccines

Two new licensed vaccines for Neisseria meningitidis serogroup B

- **Trumenba®** by Pfizer
  - MenB-FHbp – factor H binding protein
  - Approved October 29, 2014
  - 4 different strains
  - Ages 10 through 25 yrs
  - Three dose series at 0, 2, and 6 month schedule (0.5mls)
- **Bexsero®** by Novartis
  - MenB-4C
  - Approved January 23, 2015
  - 3 different strains + Outer Membrane Vesicles (OMV) to mediate vesicle formation
  - Ages 10 through 25 yrs
  - Two dose series at least one month apart (0.5mls)

- Both approved on accelerated fast track so there is missing data
- Duration of coverage
- Herd immunity
- Strain coverage in U.S. – what are all of the circulating strains?
- Safety

February 2015 Vote – APPROVED!

- **Eligible Persons** - People aged 10 and older who are at increased risk of disease should receive either series. Those at increased risk include:
  - Those with persistent complement component deficiencies, including inherited or chronic deficiencies in C3, C5-9, properdin, factor D, factor H, or taking eculizumab
  - Those with anatomic or functional asplenia, including sickle cell disease
  - Microbiologists routinely exposed to isolates
  - During meningococcal outbreak

June 2015 Vote

- **June 2015 Considerations**:
  - From 2009 to 2013
    - Five deaths from 36 total cases in 18 – 23 yr olds
    - Three deaths were in non-college attending persons
    - Incidence of disease has declined for all meningococcal serogroups, including MenB
  - Data suggests:
    - Short-term efficacy with antibodies waning within 6 months and stabilizing months 6 – 48
    - Carriage effects – No significant changes shown
    - Vaccines do not cover all circulating MenB strains
  - Ages 16 – 18 yrs preferable, but there is no consistent platform to deliver vaccines to this age group
  - Prefer Category B recommendation due to low burden of disease and additional data needed
June 2015 Vote – APPROVED!

- “A serogroup B meningococcal (MenB) vaccine series may be administered to adolescents and young adults 16 through 23 years of age to provide short term protection against most strains of serogroup B meningococcal disease. The preferred age for MenB vaccination is 16 through 18 years of age.” (Category B)

VFC Resolution – APPROVED!

- “Children aged 16 through 18 years without high risk conditions may also be vaccinated”

Footnote Changes - Childhood

- The meningococcal conjugate vaccine footnote was revised to more clearly present recommendations for use of MenACWY-CRM, MenACWY-D, and Hib-MenCY-TT in children aged 2 months and older with anatomic or functional asplenia, or with persistent complement deficiencies.

CDC MMWR Vol. 64 / No. 4, February 6, 2015

Hepatitis
**Vaccination Coverage**

<table>
<thead>
<tr>
<th>HEPATITIS A - AGE / SPECIAL CONDITION</th>
<th>COVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 to 49 yrs – Total</td>
<td>12.3</td>
</tr>
<tr>
<td>19 to 49 yrs – Had traveled outside U.S. since 1995</td>
<td>18.8</td>
</tr>
<tr>
<td>19 to 49 yrs – Chronic liver condition, overall</td>
<td>14.5</td>
</tr>
<tr>
<td>≥ 50 yrs – Total</td>
<td>5.4</td>
</tr>
<tr>
<td>≥ 50 yrs – Had traveled outside U.S. since 1995</td>
<td>11.8</td>
</tr>
<tr>
<td>≥ 50 yrs – Chronic liver condition, overall</td>
<td>12.7</td>
</tr>
</tbody>
</table>

**Hepatitis A – 12% of reports in all settings**
- Formula given to wrong age group
- Not familiar with dosing
- Not verifying patient information and previous doses

 CDC MMWR Vaccination Coverage Among Adults report, February 6, 2015 / 64(04);95-102

**Vaccination Coverage**

<table>
<thead>
<tr>
<th>HEPATITIS B - AGE / SPECIAL CONDITION</th>
<th>COVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 to 49 yrs – Total</td>
<td>32.6</td>
</tr>
<tr>
<td>19 to 49 yrs – Had traveled outside U.S. since 1995</td>
<td>39.7</td>
</tr>
<tr>
<td>19 to 49 yrs – Chronic liver condition, overall</td>
<td>39.5</td>
</tr>
<tr>
<td>≥ 50 yrs – Total</td>
<td>16.1</td>
</tr>
<tr>
<td>≥ 50 yrs – Had traveled outside U.S. since 1995</td>
<td>23.3</td>
</tr>
<tr>
<td>≥ 50 yrs – Chronic liver condition, overall</td>
<td>31.3</td>
</tr>
<tr>
<td>19 to 59 yrs – Diabetics</td>
<td>26.3</td>
</tr>
<tr>
<td>≥ 60 yrs – Diabetics</td>
<td>13.9</td>
</tr>
<tr>
<td>≥ 19 yrs – Healthcare Personnel, Total</td>
<td>61.7</td>
</tr>
</tbody>
</table>

**ACIP Recommendations Changes**

- None at this time

 CDC MMWR Vaccination Coverage Among Adults report, February 6, 2015 / 64(04);95-102

**Safety Errors**

- Hepatitis A – 12% of reports in all settings
  - Formula given to wrong age group
  - Not familiar with dosing
  - Not verifying patient information and previous doses
- Hepatitis B – 6% of reports in all settings
  - Formula given to wrong age group
  - Not familiar with dosing
  - Similar product packaging and labeling

 ISMP National Vaccine Errors Reporting Program report, December 4, 2014

**Vaccination Coverage**

<table>
<thead>
<tr>
<th>AGE / SPECIAL CONDITION</th>
<th>COVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 60 yrs – Total</td>
<td>24.2</td>
</tr>
<tr>
<td>≥ 60 yrs – Hispanic</td>
<td>9.5</td>
</tr>
<tr>
<td>≥ 60 yrs – Black</td>
<td>10.7</td>
</tr>
<tr>
<td>≥ 60 yrs – Asian</td>
<td>22.6</td>
</tr>
</tbody>
</table>

 CDC MMWR Vaccination Coverage Among Adults report, February 6, 2015 / 64(04);95-102

**Zoster**

None at this time

 ISMP National Vaccine Errors Reporting Program report, December 4, 2014
Zoster Facts
- ~1 million cases in U.S. annually
- Lifetime risk of HZ - ~30%
- Medicare Part D coverage is sporadic since federal insurance plans do not have to follow same ACA regulations that other insurance plans do
- ACIP has no new recommendations at this time
  - Ongoing studies to evaluate duration of vaccine and degree of protection provided by 2nd dose

HZ/su Vaccine
- HZ/su – Herpes Zoster adjuvanted subunit vaccine
- GSK vaccine
- Components
  - Antigen – Varicella-zoster virus glycoprotein E
  - Adjuvant – Adjuvant System 01B
    - Contains two immunostimulants to enhance cellular and humoral immune responses
- Two-dose series (2 months apart)
- IM administration
- Submission time to FDA unknown

HZ/su Vaccine
- Efficacy studies to date
  - Ages 50 to 59 – 96.6%
  - Ages 60 to 69 – 97.4%
  - ≥ 70 yrs of age – 97.9% (appears to be age-independent and fully preserved in ≥ 70 yrs of age)
  - Overall ≥ 50 yrs of age = 97.2%
- Durability studies to date
  - No apparent waning during Years 1 through 4
- Reactogenicity studies to date – Median duration
  - One day – Fever, shivering, pain at injection site
  - Two days – Fatigue, GI, HA, myalgia, redness & swelling at injection site

Safety Errors
- 20% of all reports in community pharmacies
  - Wrong diluent used – Do not freeze
  - Wrong product used – varicella versus zoster
  - Wrong site – IM instead of SQ

Feb 2015
ACIP Vote – APPROVED!
- For Most Travelers:
  - “A single dose of yellow fever vaccine provides long-lasting protection and is adequate for most travelers.”
    (Recommendation category A)

Yellow Fever
February 2015 ACIP meeting minutes

**Feb 2015 ACIP Vote – APPROVED!**

**Recommendations for Certain Populations**

- Additional doses of yellow fever vaccine are recommended for certain travelers, including:
  - Women pregnant when they received their initial dose of yellow fever vaccine should receive one additional dose of yellow fever vaccine prior to their next travel that puts them at risk for yellow fever virus infection.
  - Individuals who received a hematopoietic stem cell transplant after receiving a dose of YF vaccine who are sufficiently immunocompetent to be safely vaccinated should be revaccinated prior to their next travel that puts them at risk for yellow fever virus infection.
  - Individuals who were HIV-infected when they received their last dose of yellow fever vaccine should receive a dose every 10 years if they continue to be at risk for yellow fever virus infection.

Persons being considered for additional doses of yellow fever vaccine should be assessed for contraindications or precautions. *( Recommendation category A)*

February 2015 ACIP meeting minutes

**Feb 2015 ACIP Vote – APPROVED!**

**Recommendations for High-Risk Settings**

- A booster dose may be considered for travelers who received their last dose of YF vaccine at least 10 years previously and who will be in a higher-risk setting based on season, location, activities, and duration of their travel. This would include travelers who plan to spend a prolonged period of time in endemic areas or those traveling to highly endemic areas such as rural West Africa during peak transmission season or areas with ongoing outbreaks. *( Recommendation category B)*

February 2015 ACIP meeting minutes

---

**Japanese Encephalitis**

- **JE-VC®**
  - Inactivated Vero cell culture-derived JE vaccine
  - Manufactured by Valneva and distributed in U.S. by Novartis
  - Only vaccine available in U.S. now
  - New data available
  - Single primary dose for patients who previously received JE-MB®
  - Increased/decreased intervals between two primary series doses (usually 28 days apart)
  - Co-administration with meningococcal and rabies vaccines
  - Duration of protection – additional booster doses needed?

---

**Japanese Encephalitis**

- Meeting with FDA requested for proposed label changes in 2016
- **October 2015 or February 2016**
- Additional votes and policy notes may be voted on per new FDA-approved indications
Numerous laboratory-acquired occurrences have been observed vaccine provides cross-protection against all orthopoxviruses monkeypox vaccinia cowpox vaccine acam2000® – licensed in 2007 replaces dryvax®

acip vote – approved!
- change “worker” to “personnel” in policy note to be more inclusive
- add following statement:
  “persons with an orthopoxvirus exposure should be evaluated by a healthcare provider and clinical management decisions including postexposure smallpox vaccination should be made on a case-by-case basis in consultation with public health authorities.”

acip vote – approved!
- revised healthcare workers recommendation
  “health-care personnel (e.g., physicians and nurses) that currently treat or anticipate treating patients with vaccinia virus infections whose contact with replication-competent vaccinia viruses is limited to contaminated materials (e.g., dressings) and persons administering acam2000 smallpox vaccine who adhere to appropriate infection prevention measures can be offered vaccination with acam2000 (recommendation category:b, evidence type 2).”

acip vote – approved!
- add to revaccination section
  “public health and health care volunteers who were vaccinated as responders in the us civilian smallpox preparedness and response program should refer to october, 2008 cdc interim guidance for revaccination of eligible persons who participated in the us civilian smallpox preparedness and response program which can be found at http://www.bt.cdc.gov/agent/smallpox/revaxmemo.asp

typhoid
Typhoid Vaccines

CDC's Updated Recommendations for the Use of Typhoid Vaccine; MMWR Weekly, Volume 64, No.11: March 27, 2015

FDA-approved March 24, 2015
• Sanofi Pasteur
• Children 4 through 6 yrs
• Indications
  • Fifth dose in DTaP series
  • Fourth or fifth dose in IPV series
  • In children who have received 4 doses of Pentacel® or Daptacel®

Quadracel® DTaP IPV – APPROVED!

Combination Vaccines

Pediatric Hexavalent
• Sanofi Pasteur and Merck
• Components
  • DTaP
  • IPV
  • Hib
  • Hepatitis B
• 3-dose series (2, 4 and 6 months of age)
• Fall 2015 – FDA approval expected
• October 2015 – ACIP vote

General Recommendations
General Recommendation Votes – All APPROVED!

- Altered Immunocompetence
- Special Situations
- Vaccination Records
- Vaccination Programs
- Vaccine Information Sources

Altered Immunocompetence

- The following conditions or medications were added:
  - Conditions
    - Interferon gamma/interleukin 12 axis deficiency
    - Interferon alpha deficiency
    - Interferon gamma deficiency
    - Phagocyte function disorders (e.g., Chediak-Higashi syndrome)
  - Medications
    - Induction/consolidation chemotherapy
    - Anti-B cell antibodies
  - Combination medication/conditions
    - Patients with major antibody deficiencies receiving immunoglobulins

Altered Immunocompetence Recommendations

- Withhold live bacterial vaccines only
  - Interferon gamma/interleukin 12 axis deficiency
- Withhold both live bacterial and live viral vaccines
  - Interferon alpha deficiency
  - Interferon gamma deficiency
  - Some phagocytic deficiency disorders
    - Leukocyte adhesion defect
    - Myeloperoxidase deficiency
    - Chediak-Higashi syndrome

Altered Immunocompetence Recommendations

- Withhold both live and inactivated vaccines
  - Induction/consolidation chemotherapy
  - Patients with major antibody deficiencies receiving immunoglobulins
  - “High-level immunosuppression”
    - Cancer chemotherapy
    - Radiation therapy
    - Solid organ transplantation
    - HIV infection with immunosuppressive parameters
    - Receiving high-dose immunosuppressive corticosteroid therapy
    - Biologic immune modulators

Altered Immunocompetence Recommendations

<table>
<thead>
<tr>
<th>SITUATION</th>
<th>INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>“High-level immunosuppression”</td>
<td></td>
</tr>
<tr>
<td>• Medicine to vaccine</td>
<td>3 months</td>
</tr>
<tr>
<td>• Zoster – per ACIP vaccine-specific statement</td>
<td>1 month</td>
</tr>
<tr>
<td></td>
<td>(Zoster)</td>
</tr>
<tr>
<td>• Live vaccine to medicine</td>
<td>1 month</td>
</tr>
<tr>
<td>• Inactivated vaccine to medicine</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Exceptions:</td>
<td></td>
</tr>
<tr>
<td>• Anti-B-cell antibodies to vaccine</td>
<td>6 months</td>
</tr>
<tr>
<td>• Solid organ transplant rejection</td>
<td>2 months</td>
</tr>
<tr>
<td>therapy to vaccine</td>
<td></td>
</tr>
</tbody>
</table>

Exceptions:
- Anti-B-cell antibodies to vaccine
- Solid organ transplant rejection therapy to vaccine

Post Hematopoietic Cell Transplant

- Revaccination Recommendations
  - Recommend: DTaP, PCV13, PPSV23, Hib, HepA, HepB, meningococcal, IPV, IIV, HPV, Varicella, MMR
  - Not recommended: BCG, LAIV, Typhoid, rotavirus, zoster
  - Inactivated vaccines – Recommend first dose 3 to 6 months post-HCT
  - Live vaccines – Recommend first dose 24 months post-HCT
Special Situations

- Breastfeeding Women – Harmonized Yellow Fever vaccine recommendations with Infectious Disease Society of America (IDSA)
- Pregnancy – IDSA recommendations harmonized with Tdap ACIP recommendations
- Bleeding disorders – Leave this as a physician determination to vaccinate via IM route if bleeding risk is acceptable

Patient Records

- Immunization Information System (IIS)
  - Support a fully operational IIS to prevent duplication, determine current immunization status and others
- Electronic Health Records (EHR)
  - EHRs should maintain interoperability with IIS’s to improve quality of care

National Vaccine Adult Standards

- All healthcare providers should
  - Incorporate immunization needs assessment into every clinical encounter
  - Strongly recommend needed vaccine(s)
  - Administer vaccine(s) or refer to provider who can administer needed vaccine(s)
  - Stay up-to-date on vaccine recommendations and be able to educate public
  - Implement systems to incorporate vaccine assessment into routine clinical care
  - Know how to access IIS’s

Insurance Coverage

- “The Affordable Care Act (ACA) requires insurance companies to cover all immunizations that are included on the immunization schedule with no copay and no deductible.” (Internal CDC suggested change)

Vaccine Information Sources

- List updated
- Removed “National Network for Immunization Information”
  - Formerly affiliated with a number of different entities
  - Under new direction, but unclear who is parent organization

Top Three Vaccine Errors

- Wrong vaccine administered
  - Varicella ↔ Herpes Zoster
  - DTaP ↔ Tdap
  - IIV3 vaccines with different age indications
    - PCV ↔ PPS
    - Hepatitis A ↔ Hepatitis B

Natl Adult and Influenza Immunization Summit – May 12, 2015
Schedule Changes

- Figure 2, Catch-Up Immunization Schedule: Haemophilus influenzae type b (Hib) conjugate vaccine, pneumococcal conjugate vaccine, and tetanus, diphtheria, acellular pertussis (Tdap), and varicella vaccine catch-up schedules were updated to provide more clarity. Minimum ages were noted as “not-applicable” for children aged 7 years and older for hepatitis A and B, polio, meningococcal, MMR, and varicella vaccines.

Footnote Changes

- Pages 4 through 6 contain combined footnotes for each vaccine related to routine vaccination, catch-up vaccination and vaccination of persons with high-risk medical conditions or special circumstances.
- Standardized formatting is used for footnotes for each vaccine to reflect the number of vaccine doses in a particular series.

Job Aids

Catch-up Schedule - Child

- No longer a schedule format. Now in table format.

To Summarize...

6. Pneumococcal vaccines. (Minimum age: 6 weeks for PCV13, 2 years for PPSV23)
   - Routine vaccination with PCV13:
     - Administer a 4-dose series of PCV13 vaccine at ages 2, 4, and 6 months and at age 12 through 15 months.
     - For children aged 14 through 15 months who have received an age-appropriate series of 7-valent PCV (PCV7), administer a single supplemental dose of 15-valent PCV (PCV13).
   - Catch-up vaccination with PCV13:
     - Administer PCV13 to all healthy children aged 24 through 15 months who are not completely vaccinated for their age.
     - For older catch-up guidelines, see Figure 3.
   - Vaccination of persons with high-risk conditions with PCV13 and PPSV23:
     - All recommended PCV13 doses should be administered prior to PPSV23 vaccination if possible.
     - For children 2 through 5 years of age with any of the following conditions: chronic heart disease (including cyanotic congenital heart disease and cardiac failure); chronic lung disease (including asthma); immunocompromising conditions (including malignancies, HIV infection, chronic renal failure, nephrotic syndrome); diabetes mellitus; and other hematologic/oncologic events or functional abnormalities.
     - For children 6 through 18 years of age with any of the conditions listed above.
     - For children 6 through 18 years of age with any of the conditions listed above.
October Votes

- Japanese Encephalitis
  - New FDA-approved indications
  - May be referred to Feb 2016
- Pediatric Hexavalent vaccine
  - Add to childhood schedule with dosing recommendations

Under Consideration

- High Dose versus Standard Dose influenza vaccine
- Pneumococcal
  - Time intervals on sequential use of PCV13 and PPSV23 in children
- 9vHPV
  - Additional doses if completed 2v or 4v series
- Zoster
  - Duration and degree of protection
  - Booster dose needed?

Status of Ebola

**October 6 & 7, 2014**
- WHO Emergency Committee unanimously agreed that conditions for Public Health Emergency of International Concern had been met for the Ebola outbreak in West Africa.

**September 20, 2014**
- First lab-confirmed case in man traveling from Liberia to Dallas
  - Developed symptoms 4 days after arriving in U.S.
  - Passed away on October 8, 2014
  - All close contacts completed 21-day monitoring period

**October 10, 2014**
- Healthcare worker providing for original patient tested positive for Ebola
- Worker was isolated and moved to NIH Clinical Center
- Recovered and discharged October 24, 2014

**October 15, 2014**
- Second healthcare worker tested positive for Ebola
- Traveled from Cleveland and back Oct 10 – 13
- Recovered and discharged October 28, 2014
- All passengers on plane completed 21-day monitoring period

**May 9, 2015**
- WHO declared end of Ebola outbreak in Liberia

**June 17, 2015**
- Entry screening modified for travelers coming from Liberia to U.S.
Status of Ebola


Vaccines in Development

Vaccine Status

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>VACCINE</th>
<th>TYPE OF VACCINE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSK &amp; NIH</td>
<td>cAd3-ZEBOV</td>
<td>Uses chimpanzee-derived virus that houses single ebolavirus gene</td>
<td>Human trials have begun</td>
</tr>
<tr>
<td>Merck and NewLink Genetics</td>
<td>VSV-ZEBOV</td>
<td>Uses weakened vesicular stomatitis virus as a container for Ebola proteins. Using non-Ebola manipulated virus to express one of the proteins of Ebola.</td>
<td>Human trials have begun</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td></td>
<td></td>
<td>Trial scheduled to begin January 2015</td>
</tr>
<tr>
<td>University of Texas</td>
<td></td>
<td>Inhaled vaccine – improved survival in monkeys from 67% to 100%; 50% survival with IM dose. Tend-on-the-tongue film to be tested soon.</td>
<td>Going into Phase I human trials</td>
</tr>
<tr>
<td>Novavax</td>
<td>EBOV GP</td>
<td>Recombinant glycoprotein (GP) nanoparticle vaccine + Matrix-M adjuvant</td>
<td>Phase I trial began Dec 2014</td>
</tr>
</tbody>
</table>

Fierce Vaccines website at www.fiercevaccines.com

Global Health Vaccines

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>PHASE I</th>
<th>PHASE II</th>
<th>PHASE III</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chikungunya</td>
<td>Preclinical research being conducted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dengue</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Ebola</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>HIV</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Leishmaniasis</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Malaria</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Marburg/Plague (other hemorrhagic fevers)</td>
<td>Preclinical research being conducted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MERS</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Pandemic Influenza</td>
<td>14</td>
<td>3</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Typhoid fever</td>
<td>Preclinical research being conducted</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New Disease Areas

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>PHASE I</th>
<th>PHASE II</th>
<th>PHASE III</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cytomegalovirus (CMV)</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>E. Coli</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Group B Streptococcal</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>3</td>
<td>3</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Herpes Simplex virus (HSV)</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Norovirus</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Respiratory Syncytial virus (RSV)</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Presented at National Adult and Influenza Immunization Summit - May 12, 2015. Information source: BioMed Tracker from Sagient Research
**Healthcare and Community-Acquired Infections**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candida</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Clostridum Difficile</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E Coli</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Group B Streptococcus</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mycobacterium tuberculosis</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Neisseria meningitidis</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Salmonella typhi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Streptococcus pneumoniae</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Vibrio cholera</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Presented at National Adult and Influenza Immunization Summit - May 12, 2015. Information source: BioMed Tracker from Sagient Research

---

**Smoking Cessation**

- NicVAX
  - Contains a nicotine derivative that is chemically bound to a protein carrier
  - Body’s immune system generates antibodies to nicotine
  - Antibodies bind to nicotine molecules and make them too large to cross the blood brain barrier where it causes addiction. This would diminish the pleasure of smoking.
  - Conducted three studies compared to placebo
  - NIC002
    - One study compared to placebo
    - No studies showed statistically significant difference in long-term cessation rates
    - Well-tolerated mild to moderate side effects
    - Both have discontinued clinical trials due to lack of efficacy.
    - Significant changes to vaccines expected for future studies


The NicVAX Nicotine Vaccine, Terry Martin. [http://quitsmoking.about.com/od/quitsmokingaids/a/nicvaccine.htm](http://quitsmoking.about.com/od/quitsmokingaids/a/nicvaccine.htm)


---

**Alzheimer’s**

- CAD106
  - Triggers body’s immune response to harmful beta-amyloid.
  - Amyloid precursor protein resides in outer membrane of nerve cells
  - Forms beta-amyloid which accumulates as plaque and kills brain cells
  - Preliminary studies by Karolinska Institute in Sweden showed 80% of patients developing own protective antibodies
  - Larger trials to be conducted.


---

**Existing Vaccines Present**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Herpes Zoster</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>HPV</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pertussis (Usually with DT)</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Seasonal Influenza</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>13</td>
</tr>
</tbody>
</table>

Presented at National Adult and Influenza Immunization Summit - May 12, 2015. Information source: BioMed Tracker from Sagient Research

---

**Seasonal Influenza R & D**

- Cell-culture vaccine – Quadrivalent and pediatric populations
- Adjuvanted vaccine for ≥ 65 years of age
- FluBlok®
  - Quadrivalent formula – 2016-17 season
  - Pediatric population – 2017-18 season
  - Extended shelf life to 1 yr – Supporting data ready for submission
  - Room temperature stable product
  - Modification of non-immunogenic portion of HA antigen allows storage at ≥ 90° for over 6 months

National Adult and Influenza Immunization Summit – May 2015

---

**Why New Vaccines when Some Exist?**

- Novel technologies in development, production or delivery
- Adjuvants
- Dosing delivery – Patches, nasal
- Storage and stability
- Target-specific
  - Population, including maternal recommendations and additional age categories
- Additional strains
- Pandemic/outbreak
Questions?
This schedule includes recommendations in effect as of January 1, 2015. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/hcp/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967).
Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2015.

(For those who fall behind or start late, see the catch-up schedule [Figure 2]).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

<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>16–18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</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>
<tr>
<td>Rotavirus (RV) (RV1 (2-dose series); RVS (3-dose series))</td>
<td>1st dose</td>
<td>2nd dose</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>
<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP: &lt;7 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</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>
<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap: ≥7 yrs)</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>
<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td>1st dose</td>
<td>2nd dose</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>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</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>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</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>
<tr>
<td>Inactivated poliovirus (IPV; &lt;18 yrs)</td>
<td>1st dose</td>
<td>2nd dose</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>
<tr>
<td>Influenza (IV; LAIV) 2 doses for some: See footnote 8</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>
<tr>
<td>Measles, mumps, rubella (MMR)</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>
<tr>
<td>Varicella (VAR)</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>
<tr>
<td>Hepatitis A (HepA)</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>
<tr>
<td>Human papillomavirus (HPV2: females only; HPV4: males and females)</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>
<tr>
<td>Meningococcal (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥ 2 mos)</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>

NOTE: The above recommendations must be read along with the footnotes of this schedule.

This schedule includes recommendations in effect as of January 1, 2015. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/hcp/acip-recs/index.html. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines/recs/vac-admin/contraindications.htm) or by telephone (800-CDC-INFO [800-232-4636]).

This schedule is approved by the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/acip), the American Academy of Pediatrics (http://www.aap.org), the American Academy of Family Physicians (http://www.aafp.org), and the American College of Obstetricians and Gynecologists (http://www.acog.org).
FIGURE 2. Catch-up immunization schedule for persons aged 4 months through 18 years who start late or who are more than 1 month behind — United States, 2015.

The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. Always use this table in conjunction with Figure 1 and the footnotes that follow.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age for Dose 1</th>
<th>Minimum Interval Between Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose 1 to Dose 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose 2 to Dose 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose 3 to Dose 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose 4 to Dose 5</td>
</tr>
<tr>
<td>Hepatitis B¹</td>
<td>Birth</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>
|                                       |                        | 8 weeks and at least 16 weeks after first dose.
|                                       |                        | Minimum age for the final dose is 24 weeks. |
| Rotavirus²                            | 6 weeks                | 4 weeks                       |
|                                       |                        |                               |
| Diphtheria, tetanus, and acellular pertussis² | 6 weeks                | 4 weeks                       |
|                                       |                        |                               |
| Haemophilus influenza type b²         | 6 weeks                | 4 weeks                       |
|                                       | if first dose was administered before the 1st birthday.  |
|                                       | 8 weeks (as final dose) | if first dose was administered at age 12 through 14 months.  |
|                                       | No further doses needed | if first dose was administered at age 15 months or older.  |
| Pneumococcal²                        | 6 weeks                | 4 weeks                       |
|                                       | if current age is younger than 12 months and first dose was administered at younger than age 7 months, and at least 1 previous dose was PRP-T (ActHib, Pentacel) or unknown.  |
|                                       | 8 weeks and age 12 through 59 months (as final dose)²  |
|                                       | • if current age is younger than 12 months and first dose was administered at age 12 through 59 months.  |
|                                       | • if current age is 12 months or older and at least 1 dose was given before age 12 months.  |
|                                       | No further doses needed | if previous dose was administered at age 15 months or older.  |
| Inactivated poliovirus²              | 6 weeks                | 4 weeks²                      |
|                                       | if first dose of DTaP/DT was administered before the 1st birthday.  |
|                                       | 6 months (as final dose) | if first dose of DTaP/DT was administered at or after the 1st birthday.  |
| Meningococcal¹                       | 6 weeks                | 8 weeks                       |
|                                       | see footnote 13         |                               |
| Measles, mumps, rubella³              | 12 months              | 4 weeks                       |
| Varicella¹                           | 12 months              | 3 months                      |
| Hepatitis A¹                          | 12 months              | 6 months                      |

### Children and adolescents age 7 through 18 years

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age for Dose 1</th>
<th>Minimum Interval Between Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose 1 to Dose 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose 2 to Dose 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose 3 to Dose 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dose 4 to Dose 5</td>
</tr>
<tr>
<td>Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis²</td>
<td>7 years²</td>
<td>4 weeks</td>
</tr>
<tr>
<td></td>
<td>4 weeks</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus²</td>
<td>9 years</td>
<td>Routine dosing intervals are recommended.¹⁰</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A¹</td>
<td>Not applicable (N/A)</td>
<td>6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B¹</td>
<td>N/A</td>
<td>4 weeks</td>
</tr>
<tr>
<td></td>
<td>8 weeks and at least 16 weeks after first dose.</td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus²</td>
<td>N/A</td>
<td>4 weeks²</td>
</tr>
<tr>
<td></td>
<td>6 months²</td>
<td></td>
</tr>
<tr>
<td>Meningococcal¹</td>
<td>N/A</td>
<td>8 weeks³</td>
</tr>
<tr>
<td></td>
<td>6 months²</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella³</td>
<td>N/A</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Varicella¹</td>
<td>N/A</td>
<td>3 months if younger than age 13 years.</td>
</tr>
<tr>
<td></td>
<td>4 weeks if age 13 years or older.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The above recommendations must be read along with the footnotes of this schedule.
Footnotes — Recommended immunization schedule for persons aged 0 through 18 years—United States, 2015

For further guidance on the use of the vaccines mentioned below, see: [http://www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html). For vaccine recommendations for persons 19 years of age and older, see the Adult Immunization Schedule.

### Additional information
- For contraindications and precautions to use of a vaccine and for additional information regarding that vaccine, vaccination providers should consult the relevant ACIP statement available online at [http://www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html).
- For purposes of calculating intervals between doses, 4 weeks = 28 days. Intervals of 4 months or greater are determined by calendar months.
- Vaccine doses administered 4 days or less before the minimum interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum interval or minimum age should not be counted as valid doses and should be repeated as age-appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval. For further details, see [MMWR, General Recommendations on Immunization and Reports / Vol. 60 / No. 2; Table 1. Recommended and minimum ages and intervals between vaccine doses available online at http://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf](http://www.cdc.gov/mmwr/pdf/rr/rr6002.pdf).

### 1. Hepatitis B (HepB) vaccine. (Minimum age: birth)

**Routine vaccination:**
- **At birth:**
  - Administer monovalent HepB vaccine to all newborns before hospital discharge.
- **For infants born to hepatitis B surface antigen (HBsAg)-positive mothers:**
  - Administer HepB vaccine and 0.5 mL of hepatitis B immune globulin (HBIG) within 12 hours of birth. These infants should be tested for HBAg and antibody to HBsAg (anti-HBs) 1 to 2 months after completion of the HepB series at age 9 through 18 months (preferably at the next well-child visit).
  - If mother’s HBsAg status is unknown, within 12 hours of birth administer HepB vaccine regardless of birth weight. For infants weighing less than 2,000 grams, administer HBIG in addition to HepB vaccine within 12 hours of birth. Determine mother’s HBsAg status as soon as possible and, if mother is HBsAg-positive, also administer HBIG for infants weighing 2,000 grams or more as soon as possible, but no later than age 7 days.

**Doses following the birth dose:**
- The second dose should be administered at age 1 or 2 months. Monovalent HepB vaccine should be used for doses administered before age 6 weeks.
- Infants who did not receive a birth dose should receive 3 doses of a HepB-containing vaccine on a schedule of 0, 1 to 2 months, and 6 months starting as soon as feasible. See Figure 2.
- Administer the second dose 1 to 2 months after the first dose (minimum interval of 4 weeks), administer the third dose at least 8 weeks after the second dose AND at least 16 weeks after the first dose. The final (third or fourth) dose in the HepB vaccine series should be administered no earlier than age 24 weeks.
- Administration of a total of 4 doses of HepB vaccine is permitted when a combination vaccine containing HepB is administered after the birth dose.

**Catch-up vaccination:**
- Unvaccinated persons should complete a 3-dose series.
- A 2-dose series (doses separated by at least 4 months) of adult formulation Recombivax HB is licensed for use in children aged 11 through 15 years.
- For other catch-up guidance, see Figure 2.

### 2. Rotavirus (RV) vaccines. (Minimum age: 6 weeks for both RV1 [Rotarix] and RV5 [RotaTeq])

**Routine vaccination:**
- Administer a series of RV vaccine to all infants as follows:
  1. If Rotarix is used, administer a 2-dose series at 2 and 4 months of age.
  2. If RotaTeq is used, administer a 3-dose series at ages 2, 4, and 6 months.
  3. If any dose in the series was RotaTeq or vaccine product is unknown for any dose in the series, a total of 3 doses of RV vaccine should be administered.

**Catch-up vaccination:**
- The maximum age for the first dose in the series is 14 weeks, 6 days; vaccination should not be initiated for infants aged 15 weeks, 0 days or older.
- The maximum age for the final dose in the series is 8 weeks, 0 days.
- For other catch-up guidance, see Figure 2.

### 3. Diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine. (Minimum age: 6 weeks. Exception: DTaP-IPV [Kinrix]: 4 years)

**Routine vaccination:**
- Administer a 5-dose series of DTaP vaccine at ages 2, 4, 6, 15 through 18 months, and 4 through 6 years.
- The fourth dose may be administered as early as age 12 months, provided at least 6 months have elapsed since the third dose. However, the fourth dose of DTaP need not be repeated if it was administered at least 4 months after the third dose of DTaP.

### 4. Tetanus and diphtheria toxoids and acellular pertussis (Tdap) vaccine. (Minimum age: 10 years for bothBoostrix and Adacel)

**Routine vaccination:**
- Administer 1 dose of Tdap vaccine to all adolescents aged 11 through 12 years.
- Tdap may be administered regardless of the interval since the last tetanus and diphtheria toxoid-containing vaccine.
- Administer 1 dose of Tdap vaccine to pregnant adolescents during each pregnancy (preferred during 27 through 36 weeks’ gestation) regardless of time since prior Td or Tdap vaccination.

**Catch-up vaccination:**
- Persons aged 7 years and older who are not fully immunized with Tdap vaccine should receive Tdap vaccine as 1 dose (preferably the first) in the catch-up series; if additional doses are needed, use Td vaccine. For children 7 through 10 years who receive a dose of Tdap as part of the catch-up series, an adolescent Tdap vaccine dose at age 11 through 12 years should NOT be administered. Td should be administered instead 10 years after the Tdap dose.
- Persons aged 11 through 18 years who have not received Tdap vaccine should receive a dose followed by tetanus and diphtheria toxoid (Td) booster doses every 10 years thereafter.
- Inadvertent doses of Tdap vaccine:
  - If administered inadvertently to a child aged 7 through 10 years may count as part of the catch-up series. This dose may count as the adolescent Tdap dose, or the child can later receive a Tdap booster dose at age 11 through 12 years.
  - If administered inadvertently to an adolescent aged 11 through 18 years, the dose should be counted as the adolescent Tdap booster.
- For other catch-up guidance, see Figure 2.

### 5. Haemophilus influenzae type b (Hib) conjugate vaccine. (Minimum age: 6 weeks for PRP-T [ACTHIB, DTaP-IPV/Hib (Pentacel) and Hib-MenCY (MenHibrix)], PRP-OOMP [PvedxHIB or COMVAX], 12 months for PRP-T [Hiberix])

**Routine vaccination:**
- Administer a 2- or 3-dose Hib vaccine primary series and a booster dose (dose 3 or 4 depending on vaccine used in primary series) at age 12 through 15 months to complete a full Hib vaccine series.
- The primary series with ActHIB, MenHibrix, or Pentacel consists of 3 doses and should be administered at 2, 4, and 6 months of age. The primary series with PvedxHIB or COMVAX consists of 2 doses and should be administered at 2 and 4 months of age; a dose at age 6 months is not indicated.
- One booster dose (dose 3 or 4 depending on vaccine used in primary series) of any Hib vaccine should be administered at age 12 through 15 months. An exception is Hibermix vaccine. Hibermix should only be used for the booster (final) dose in children aged 12 months through 4 years who have received at least 1 prior dose of Hib-containing vaccine.
- For recommendations on the use of MenHibrix in patients at increased risk for meningococcal disease, please refer to the meningococcal vaccine footnotes and also to [MMWR February 28, 2014 / 63(RR01);1-13, available at http://www.cdc.gov/mmwr/PDF/rr/rr6301.pdf](http://www.cdc.gov/mmwr/PDF/rr/rr6301.pdf).
5. **Haemophilus influenzae type b (Hib) conjugate vaccine (cont’d)**

**Catch-up vaccination:**
- If dose 1 was administered at ages 12 through 14 months, administer a second (final) dose at least 8 weeks after dose 1, regardless of Hib vaccine used in the primary series.
- If both doses of PRP-OMP (PreFlobrix II or COMVAX), and were administered before the first birthday, the third (and final) dose should be administered at age 12 through 59 months and at least 8 weeks after the second dose.
- If the first dose was administered at age 7 through 11 months, administer the second dose at least 4 weeks later and a third (and final) dose at age 12 through 15 months and 8 weeks after second dose, whichever is later.
- If first dose is administered before the first birthday and second dose administered at younger than 15 months, a third (and final) dose should be given 8 weeks later.
- For unvaccinated children aged 15 months or older, administer only 1 dose.
- For routine catch-up guidance, see Figure 2. For catch-up guidance related to MenHibrix, please see the meningococcal vaccine footnotes and also MMWR February 28, 2014 / 63(RR01);1-13, available at http://www.cdc.gov/mmwr/PDF/rr/rr6301.pdf.

**Vaccination of persons with high-risk conditions:**
- Children aged 12 through 59 months who are at increased risk for Hib disease, including chemotherapy recipients and those with anatomic or functional asplenia (including sickle cell disease), human immunodeficiency virus (HIV) infection, immunoglobulin deficiency, or early component complement deficiency, who have received either no doses or only 1 dose of Hib vaccine before 12 months of age, should receive 2 additional doses of Hib vaccine 8 weeks apart; children who received 2 or more doses of Hib vaccine before 8 weeks of age do not receive an additional dose.
- For patients younger than 5 years of age undergoing chemotherapy or radiation treatment who received a Hib vaccine dose(s) within 14 days of starting therapy or during therapy, repeat the dose(s) at least 3 months following therapy completion.
- Recipients of hematopoietic stem cell transplant (HSCT) should be revaccinated with a 3-dose regimen of Hib vaccine starting 6 to 12 months after successful transplant, regardless of vaccination history; doses should be administered at least 4 weeks apart.
- A single dose of any Hib-containing vaccine should be administered to unimmunized* children and adolescents 15 months of age and older undergoing an elective splenectomy; if possible, vaccine should be administered at least 14 days before procedure.
- Hib vaccine is not routinely recommended for patients 5 years or older. However, 1 dose of Hib vaccine should be administered to unimmunized* persons aged 5 years or older who have anatomic or functional asplenia (including sickle cell disease) and unvaccinated persons 5 through 18 years of age with human immunodeficiency virus (HIV) infection.
- *Patients who have not received a primary series and booster dose or at least 1 dose of Hib vaccine after 14 months of age are considered unimmunized.

6. **Pneumococcal vaccines. (Minimum age: 6 weeks for PCV13, 2 years for PPSV23)**

**Routine vaccination with PCV13:**
- Administer a 4-dose series of PCV13 vaccine at ages 2, 4, and 6 months and at age 12 through 15 months.
- For children aged 12 through 59 months who have received an age-appropriate series of 7-valent PCV (PCV7), administer a single supplemental dose of 13-valent PCV (PCV13).

**Catch-up vaccination with PCV13:**
- Administer 1 dose of PCV13 to all healthy children aged 24 through 59 months who are not completely vaccinated for their age.
- For other catch-up guidance, see Figure 2.

**Vaccination of persons with high-risk conditions with PCV13 and PPSV23:**
- All recommended PCV13 doses should be administered prior to PPSV23 vaccination if possible.
- For children 2 through 5 years of age with any of the following conditions: chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure contributing to right heart lung disease (including asthma if treated with high-dose oral corticosteroid therapy); diabetes mellitus; cerebrospinal fluid leak; cooley's anemia; sickle cell disease and other hemoglobinopathies; anatomic or functional asplenia; HIV infection; chronic renal failure; nephrotic syndrome; diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin's disease; multiple myeloma; or congenital immunodeficiencies; HIV infection; chronic renal failure; nephrotic syndrome; diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin's disease; generalized malignancy; solid organ transplantation; or multiple myeloma:
  1. If neither PCV13 nor PPSV23 has been received previously, administer 1 dose of PCV13 now and 1 dose of PPSV23 at least 8 weeks later.
  2. If PCV13 has been received previously but PPSV23 has not, administer 1 dose of PPSV23 at least 8 weeks after the most recent dose of PCV13.
  3. If PPSV23 has been received but PCV13 has not, administer 1 dose of PCV13 at least 8 weeks after the most recent dose of PPSV23.
- For children aged 6 through 18 years with chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure), chronic lung disease (including asthma if treated with high-dose oral corticosteroid therapy), diabetes mellitus, alcoholism, or chronic liver disease, who have not received PPSV23, administer 1 dose of PPSV23. If PCV13 has been received previously, then PPSV23 should be administered 8 weeks after any prior PCV13 dose.
- A single revaccination with PPSV23 should be administered 5 years after the first dose to children with sickle cell disease or other hemoglobinopathies; anatomic or functional asplenia; congenital or acquired immunodeficiencies; HIV infection; chronic renal failure; nephrotic syndrome; diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin's disease; generalized malignancy; solid organ transplantation; or multiple myeloma.

7. **Inactivated poliovirus vaccine (IPV). (Minimum age: 6 weeks)**

**Routine vaccination:**
- Administer a 4-dose series of IPV at ages 2, 4, 6 through 18 months, and 4 through 6 years. The final dose in the series should be administered on or after the fourth birthday and at least 6 months after the previous dose.

**Catch-up vaccination:**
- In the first 6 months of life, minimum age and minimum intervals are only recommended if the person is at risk of imminent exposure to circulating poliovirus (i.e., travel to a polio-endemic region or during an outbreak).
- If 4 or more doses are administered before age 4 years, an additional dose should be administered at age 4 through 6 years and at least 6 months after the previous dose.
- A fourth dose is not necessary if the third dose was administered at age 4 years or older and at least 6 months after the previous dose.
- If both OPV and IPV were administered as part of a series, a total of 4 doses should be administered, regardless of the child's current age. IPV is not routinely recommended for U.S. residents aged 18 years or older.
- For other catch-up guidance, see Figure 2.

8. **Influenza vaccines. (Minimum age: 6 months for inactivated influenza vaccine [IIV], 2 years for live, attenuated influenza vaccine [LAIV])**

**Routine vaccination:**
- Administer influenza vaccine annually to all children beginning at age 6 months. For most healthy, nonpregnant persons aged 2 through 49 years, either LAIV or IIV may be used. However, LAIV should NOT be administered to some persons, including 1) persons who have experienced severe allergic reactions to LAIV, any of its components, or to a previous dose of any other influenza vaccine; 2) children 2 through 17 years receiving aspirin or aspirin-containing products; 3) persons who are allergic to eggs; 4) pregnant women; 5) immunosuppressed persons; 6) children 2 through 4 years of age with asthma or who had wheezing in the past 12 months; or 7) persons who have taken influenza antiviral medications in the previous 48 hours. For all other contraindications and precautions to use of LAIV, see MMWR August 15, 2014 / 63(32);691-697 [40 pages] available at http://www.cdc.gov/mmwr/pdf/wk/mm6332.pdf.

For children 6 months through 8 years:
- For the 2014–15 season, administer 2 doses (separated by at least 4 weeks) to children who are receiving influenza vaccine for the first time. Some children in this age group who have been vaccinated previously will also need 2 doses. For additional guidance, follow dosing guidelines in the 2014–15 ACIP influenza vaccine recommendations, MMWR August 15, 2014 / 63(32);691-697 [40 pages] available at http://www.cdc.gov/mmwr/pdf/wk/mm6332.pdf.
- For the 2015–16 season, follow dosing guidelines in the 2015 ACIP influenza vaccine recommendations.

**For persons aged 9 years and older:**
- Administer 1 dose.
9. Measles, mumps, and rubella (MMR) vaccine. (Minimum age: 12 months for routine vaccination)

   Routine vaccination:
   - Administer a 2-dose series of MMR vaccine at ages 12 through 15 months and 4 through 6 years. The second dose may be administered before age 4 years, provided at least 4 weeks have elapsed since the first dose.
   - Administer 1 dose of MMR vaccine to infants aged 6 through 11 months before departure from the United States for international travel. These children should be revaccinated with 2 doses of MMR vaccine, the first at age 12 through 15 months (12 months if the child remains in an area where disease risk is high), and the second dose at least 4 weeks later.
   - Administer 2 doses of MMR vaccine to children aged 12 months and older before departure from the United States for international travel. The first dose should be administered on or after age 12 months and the second dose at least 4 weeks later.

   Catch-up vaccination:
   - Ensure that all school-aged children and adolescents have had 2 doses of MMR vaccine; the minimum interval between the 2 doses is 4 weeks.

10. Varicella (VAR) vaccine. (Minimum age: 12 months)

   Routine vaccination:
   - Administer a 2-dose series of VAR vaccine at ages 12 through 15 months and 4 through 6 years. The second dose may be administered before age 4 years, provided at least 3 months have elapsed since the first dose. If the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.

   Catch-up vaccination:
   - For any person aged 7 through 18 years without evidence of immunity (see MMWR 2007 / 56 [No. RR-4], available at http://www.cdc.gov/mmwr/pdf/rr/rr5604.pdf) have 2 doses of varicella vaccine. For children aged 7 through 12 years, the recommended minimum interval between doses is 3 months (if the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid); for persons aged 13 years and older, the minimum interval between doses is 4 weeks.

11. Hepatitis A (HepA) vaccine. (Minimum age: 12 months)

   Routine vaccination:
   - Initiate the 2-dose HepA vaccine series at 12 through 23 months; separate the 2 doses by 6 to 18 months.
   - Children who have received 1 dose of HepA vaccine before age 24 months should receive a second dose 6 to 18 months after the first dose.
   - For any person aged 2 years and older who has not already received the HepA vaccine series, 2 doses of HepA vaccine separated by 6 to 18 months may be administered if immunity against hepatitis A virus infection is desired.

   Catch-up vaccination:
   - The minimum interval between the two doses is 6 months.

   Special populations:
   - Administer 2 doses of HepA vaccine at least 6 months apart to previously unvaccinated persons who live in areas where vaccination programs target older children, or who are at increased risk for infection. This includes persons traveling to or working in countries that have high or intermediate endemicity of infection; men having sex with men; users of injection and non-injection illicit drugs; persons who work with HAV-infected primates or with HAV in a research laboratory; persons with clotting-factor disorders; persons with chronic liver disease; and persons who anticipate close personal contact (e.g., household or regular babysitting) with an international adoptee during the first 60 days after arrival in the United States from a country with high or intermediate endemicity. The first dose should be administered as soon as the adoption is planned, ideally 2 or more weeks before the arrival of the adoptee.

12. Human papillomavirus (HPV) vaccines. (Minimum age: 9 years for HPV2 [Cervarix] and HPV4 [Gardasil])

   Routine vaccination:
   - Administer a 3-dose series of HPV vaccine on a schedule of 0, 1-2, and 6 months to all adolescents aged 11 through 12 years. Either HPV4 or HPV2 may be used for females, and only HPV4 may be used for males.
   - The vaccine series may be started at age 9 years.
   - Administer the second dose 1 to 2 months after the first dose (minimum interval of 4 weeks); administer the third dose 24 weeks after the first dose and 16 weeks after the second dose (minimum interval of 12 weeks).

   Catch-up vaccination:
   - Administer the vaccine series to females (either HPV2 or HPV4) and males (HPV4) at age 13 through 18 years if not previously vaccinated.
   - Use recommended routine dosing intervals (see Routine vaccination above) for vaccine series catch-up.

13. Meningococcal conjugate vaccines. (Minimum age: 6 weeks for Hib-MenCY [MenHibrix], 9 months for MenACWY-D [Menactra], 2 months for MenACWY-CRM [Menveo])

   Routine vaccination:
   - Administer a single dose of Menactra or Menveo vaccine at age 11 through 12 years, with a booster dose at age 16 years.
   - Adolescents aged 11 through 18 years with human immunodeficiency virus (HIV) infection should receive a 2-dose primary series of Menactra or Menveo with at least 8 weeks between doses.
   - For children aged 2 months through 18 years with high-risk conditions, see below.

   Catch-up vaccination:
   - Administer Menactra or Menveo vaccine at age 13 through 18 years if not previously vaccinated.
   - If the first dose is administered at age 13 through 15 years, a booster dose should be administered at age 16 through 18 years with a minimum interval of at least 8 weeks between doses.
   - If the first dose is administered at age 16 years or older, a booster dose is not needed.
   - For other catch-up guidance, see Figure 2.

   Vaccination of persons with high-risk conditions and other persons at increased risk of disease:
   - Children with anatomic or functional asplenia (including sickle cell disease):
     1. Menveo
        - Children who initiate vaccination at 8 weeks through 6 months: Administer doses at 2, 4, 6, and 12 months of age.
        - Unvaccinated children 7 through 23 months: Administer 2 doses, with the second dose at least 12 weeks after the first dose AND after the first birthday.
        - Children 24 months and older who have not received a complete series: Administer 2 primary doses at least 8 weeks apart.
     2. MenHibrix
        - Children 6 weeks through 18 months: Administer doses at 2, 4, 6, and 12 through 15 months of age.
        - If the first dose of MenHibrix is given at or after 12 months of age, a total of 2 doses should be given at least 8 weeks apart to ensure protection against serogroups C and Y meningococcal disease.
     3. Menactra
        - Children 24 months and older who have not received a complete series: Administer 2 primary doses at least 8 weeks apart. If Menactra is administered to a child with asplenia (including sickle cell disease), do not administer Menactra until 2 years of age and at least 4 weeks after the completion of all PCV13 doses.
        - Children with persistent complement component deficiency:
          1. Menveo
             - Children who initiate vaccination at 8 weeks through 6 months: Administer doses at 2, 4, 6, and 12 months of age.
             - Unvaccinated children 7 through 23 months: Administer 2 doses, with the second dose at least 12 weeks after the first dose AND after the first birthday.
             - Children 24 months and older who have not received a complete series: Administer 2 primary doses at least 8 weeks apart.
          2. MenHibrix
             - Children 6 weeks through 18 months: Administer doses at 2, 4, 6, and 12 through 15 months of age.
             - If the first dose of MenHibrix is given at or after 12 months of age, a total of 2 doses should be given at least 8 weeks apart to ensure protection against serogroups C and Y meningococcal disease.
          3. Menactra
             - Children 9 through 23 months: Administer 2 primary doses at least 12 weeks apart.
             - Children 24 months and older who have not received a complete series: Administer 2 primary doses at least 8 weeks apart.
   - For children who travel to or reside in countries in which meningococcal disease is hyperendemic or epidemic, including countries in the African meningitis belt or the Hajj, administer an age-appropriate formulation and series of Menactra or Menveo for protection against serogroups A and W meningococcal disease. Prior receipt of MenHibrix is not sufficient for children traveling to the meningitis belt or the Hajj because it does not contain serogroups A or W.
   - For children at risk during a community outbreak attributable to a vaccine serogroup, administer or complete an age- and formulation-appropriate series of MenHibrix, Menactra, or Menveo.
   - For booster doses among persons with high-risk conditions, refer to MMWR 2013 / 62(RR02);1-22, available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6202a1.htm.

   For other catch-up recommendations for these persons, and complete information on use of meningococcal vaccines, including guidance related to vaccination of persons at increased risk of infection, see MMWR March 22, 2013 / 62(RR02);1-22, available at http://www.cdc.gov/mmwr/pdf/rr/rr6202.pdf.

For further guidance on the use of the vaccines mentioned below, see: http://www.cdc.gov/vaccines/hcp/acip-recs/index.html.
The 2015 Adult Immunization Schedule was approved by the Centers for Disease Control and Prevention’s (CDC) Advisory Committee on Immunization Practices (ACIP), American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), the American College of Obstetricians and Gynecologists (ACOG), and the American College of Nurse-Midwives (ACNM). On February 3, 2015, the adult immunization schedule and a summary of changes from 2014 were published in the *Annals of Internal Medicine*, and a summary of changes was published in the *Morbidity and Mortality Weekly Report (MMWR)* on February 5, 2015.

All clinically significant postvaccination reactions should be reported to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.

Additional details regarding ACIP recommendations for each of the vaccines listed in the schedule can be found at www.cdc.gov/vaccines/hcp/acip-recs/index.html.

American Academy of Family Physicians (AAFP)
www.aafp.org/

American College of Physicians (ACP)
www.acponline.org/

American College of Obstetricians and Gynecologists (ACOG)
www.acog.org/

American College of Nurse-Midwives (ACNM)
www.midwife.org/
**Recommended Adult Immunization Schedule—United States - 2015**

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

### Figure 1. Recommended adult immunization schedule, by vaccine and age group

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flu</td>
<td>22-26 years</td>
<td>1 dose annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td>22-26 years</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
</tr>
<tr>
<td>Varicella</td>
<td>2 doses</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>3 doses</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>3 doses</td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td>1 dose</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>1 or 2 doses</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>1 or 2 doses</td>
<td>1-time dose</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>1 dose</td>
<td></td>
</tr>
<tr>
<td>Meningococcal</td>
<td>1 or more doses</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>2 doses</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>3 doses</td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib)</td>
<td>1 or 3 doses</td>
<td></td>
</tr>
</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

---

**Figure 2. Vaccines that might be indicated for adults based on medical and other indications**

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>INDICATION</th>
<th>ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flu</td>
<td>Pregnancy</td>
<td>1 dose IIV annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td>Contraindicated</td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td>2 doses</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>3 doses through age 26 yrs</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>3 doses through age 26 yrs</td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td>Contraindicated</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>1 dose</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>Contraindicated</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>1 dose</td>
<td></td>
</tr>
<tr>
<td>Meningococcal</td>
<td>1 or more doses</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>2 doses</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>3 doses</td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b (Hib)</td>
<td>1 dose</td>
<td></td>
</tr>
</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

---

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly recommended for adults 19 years and older as of February 1, 2015. For all vaccines being recommended on the Adult Immunization Schedule: a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers’ package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/acip/recs/). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.
1. Additional information

- Additional guidance for the use of the vaccines described in this supplement is available at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
- Information on vaccination recommendations when vaccination status is unknown and other general immunization information can be found in the General Recommendations on Immunization at www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm.
- Information on travel vaccine requirements and recommendations (e.g., for hepatitis A and B, meningococcal, and other vaccines) is available at wwwnc.cdc.gov/travel/destinations/list.
- Additional information and resources regarding vaccination of pregnant women can be found at www.cdc.gov/vaccines/adults/rec-vac/pregnant.html.

2. Influenza vaccination

- Annual vaccination against influenza is recommended for all persons aged 6 months or older.
- Persons aged 6 months or older, including pregnant women and persons with hives-only allergy to eggs can receive the inactivated influenza vaccine (IIV). An age-appropriate IIV formulation should be used.
- Adults aged 18 years or older can receive the recombinant influenza vaccine (RIV) (Fluarix, Fluvax), RIV does not contain any egg protein and can be given to age-appropriate persons with egg allergy of any severity.
- Healthy, nonpregnant persons aged 2 to 49 years without high-risk medical conditions can receive either intranasally administered live, attenuated influenza vaccine (LAIV) (Flumist) or IIV.
- Health care personnel who care for severely immunocompromised persons who require care in a protected environment should receive IIV or RIV; health care personnel who receive LAIV should avoid providing care for severely immunocompromised persons for 7 days after vaccination.
- The intramuscularly or intradermally administered IIV are options for adults aged 18 through 64 years.
- Adults aged 65 years or older can receive the standard-dose IIV or the high-dose IIV (Fluzone High-Dose).
- A list of currently available influenza vaccines can be found at www.cdc.gov/flu/protect/vaccine/vaccines.htm.

3. Tetanus, diphtheria, and acellular pertussis (Td/Tdap) vaccination

- Administer 1 dose of Tdap vaccine to pregnant women during each pregnancy (preferably between 27 and 36 weeks’ gestation) regardless of interval since prior Td or Tdap vaccination.
- Persons aged 11 years or older who have not received Tdap vaccine or for whom vaccine status is unknown should receive a dose of Tdap followed by tetanus and diphtheria toxoids (Td) booster 6 to 12 months thereafter. Tdap can be administered regardless of interval since the most recent tetanus or diphtheria-toxoid-containing vaccine.
- Adults with an unknown or incomplete history of completing a 3-dose primary vaccination series withTd-containing vaccines should begin or complete a primary vaccination series including a Tdap dose.
- For unvaccinated adults, administer the first 2 doses at least 4 weeks apart and the third dose 6 to 12 months after the second.
- For incompletely vaccinated (i.e., less than 3 doses) adults, administer remaining doses.
- Refer to the ACIP statement for recommendations for administering Td/Tdap as prophylaxis in wound management (see footnote 1).

4. Varicella vaccination

- All adults without evidence of immunity to varicella (as defined below) should receive 2 doses of single-antigen varicella vaccine or a second dose if they have received only 1 dose.
- Vaccination should be emphasized for those who have close contact with persons at high risk for serious disease (e.g., health care personnel and family contacts of persons with immunocompromising conditions) or are at high risk for exposure or transmission (e.g., teachers; child care employees; residents and staff members of institutional settings, including correctional institutions; college students; military personnel; adolescents and adults living in households with children; nonpregnant women of childbearing age; and international travelers).
- Pregnant women should be assessed for evidence of varicella immunity.
- Women who do not have evidence of immunity should receive the first dose of varicella vaccine upon completion or termination of pregnancy and before discharge from the health care facility. The second dose should be administered 4 to 8 weeks after the first dose.
- Evidence of immunity to varicella in adults includes any of the following:
  - documentation of 2 doses of varicella vaccine at least 4 weeks apart.
  - TUS born before 1980, except health care personnel and pregnant women.
  - history of varicella based on diagnosis and verification of varicella disease by a health care provider;
  - history of herpes zoster based on diagnosis or verification of herpes zoster disease by a health care provider;
  - laboratory evidence of immunity or laboratory confirmation of disease.

5. Human papillomavirus (HPV) vaccination

Two vaccines are licensed for use in males. Bivalent HPV vaccine (HPV2) and quadrivalent HPV vaccine (HPV4), and one HPV vaccine for use in males (HPV4).
- For females, either HPV4 or HPV2 is recommended in a 3-dose series for routine vaccination at age 11 or 12 years and for those aged 13 through 26 years, if not previously vaccinated.
- For males, HPV4 is recommended in a 3-dose series for routine vaccination at age 11 or 12 years and for those aged 13 through 21 years, if not previously vaccinated.
- HPV4 is recommended for men who have sex with men through age 26 years for those who did not get any or all doses when they were younger.
- Vaccination is recommended for immunocompromised persons (including those with HIV infection) through age 26 years for those who did not get any or all doses when they were younger.
- A complete series for either HPV4 or HPV2 consists of 3 doses. The second dose should be administered 4 to 8 weeks (minimum interval of 4 weeks) after the first dose; the third dose should be administered 24 weeks after the first dose and 16 weeks after the second dose (minimum interval of at least 12 weeks).
- HPV vaccines are not recommended for use in pregnant women. However, pregnancy testing is not needed before vaccination. If a woman is found to be pregnant after initiating the vaccination series, no intervention is needed; the remainder of the 3-dose series should be delayed until completion or termination of pregnancy.
- When indicated, only a single dose of PCV13 is recommended for adults.
- When both PCV13 and PPSV23 are indicated, PCV13 should be administered before PPSV23.
- Mumps vaccine is recommended for those who did not get any or all doses when they were younger.
- Pts aged 60 years or older regardless of whether they report a prior episode of herpes zoster.
- Although the vaccine is licensed by the U.S. Food and Drug Administration for use among and can be administered to persons aged 50 years or older, ACIP recommends that vaccination begin at age 60 years.
- Persons aged 60 years or older with chronic medical conditions may be vaccinated unless their condition constitutes a contraindication, such as pregnancy or severe immunodeficiency.

6. Zoster vaccination

- A single dose of zoster vaccine is recommended for adults aged 60 years or older regardless of whether they report a prior episode of herpes zoster.
- Although the vaccine is licensed by the U.S. Food and Drug Administration for use among and can be administered to persons aged 50 years or older, ACIP recommends that vaccination begin at age 60 years.
- Persons aged 60 years or older with chronic medical conditions may be vaccinated unless their condition constitutes a contraindication, such as pregnancy or severe immunodeficiency.

7. Measles, mumps, rubella (MMR) vaccination

- Adults born before 1957 are generally considered immune to measles and mumps. All adults born in 1957 or later should have documentation of 1 or more doses of MMR vaccine unless they have a medical contraindication to the vaccine or laboratory evidence of immunity to each of the three diseases.
- Documentation of provider-diagnosed disease is not considered acceptable evidence of immunity for measles, mumps, or rubella.

8. Pneumococcal (13-valent pneumococcal conjugate vaccine [PCV13] and 23-valent pneumococcal polysaccharide vaccine [PPSV23]) vaccination

- General information
  - When indicated, only a single dose of PCV13 is recommended for adults. No additional dose of PPSV23 is indicated for adults vaccinated with PPSV23 at or after age 65 years.
  - When both PCV13 and PPSV23 are indicated, PCV13 should be administered first; PCV13 and PPSV23 should not be administered during the same visit.
  - When indicated, PCV13 and PPSV23 should be administered to adults whose pneumococcal vaccination history is incomplete or unknown.
- Adults aged 65 years or older who
  - Have not received PCV13 or PPSV23: Administer PCV13 followed by PPSV23 in 6 to 12 months.
  - Have not received PCV13 but have received a dose of PPSV23 at age 65 years or older: Administer PCV13 at least 1 year after the dose of PPSV23 received at age 65 years or older.

(Continued on next page)
Footnotes—Recommended Immunization Schedule for Adults Aged 19 Years or Older: United States, 2015

8. Pneumococcal vaccination (continued)

- Have not received PCV13 but have received 1 or more doses of PPSV23 before age 65: Administer PCV13 at least 1 year after the most recent dose of PPSV23; administer a dose of PPSV23 6 to 12 months after PCV13, or as soon as possible if this time window has passed, and at least 5 years after the most recent dose of PPSV23.

- Have received PCV13 but not PPSV23 before age 65 years: Administer PPSV23 6 to 12 months after PCV13, or as soon as possible if this time window has passed.

- Have received PCV13 and 1 or more doses of PPSV23 before age 65 years: Administer PCV13 at least 1 year after the most recent dose of PPSV23; administer a dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the most recent dose of PPSV23.

- Have not received PCV13 but have received 1 dose of PPSV23: Administer PCV13 at least 1 year after the PPSV23; administer a second dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the first dose of PPSV23.

- Administer PCV13 at least 1 year after the most recent dose of PPSV23.

- Have received PCV13 but not PPSV23: Administer PCV13 at least 8 weeks after PCV13; administer a second dose of PPSV23 at least 5 years after the first dose of PPSV23.

- Have received PCV13 and 1 dose of PPSV23: Administer a second dose of PPSV23 at least 5 years after the first dose of PPSV23.

- Adults aged 19 through 64 years with immunocompromising conditions or anatomical or functional asplenia (defined below) who have not received PCV13 or PPSV23: Administer PCV13 followed by PPSV23 at least 8 weeks after PCV13; administer a second dose of PPSV23 at least 5 years after the first dose of PPSV23; have not received PCV13 but have received 1 dose of PPSV23: Administer PCV13 at least 1 year after the PPSV23; administer a second dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the first dose of PPSV23.

- Have not received PCV13 but have received 2 doses of PPSV23: Administer PCV13 at least 1 year after the most recent dose of PPSV23.

- Adults aged 19 through 64 years with cerebrospinal fluid leaks or cochlear implants: Administer PCV13 followed by PPSV23 at least 8 weeks after PCV13.

- Adults aged 19 through 64 years with chronic heart disease (including congenital heart failure and cardiomyopathies, excluding hypertension), chronic lung disease (including chronic obstructive lung disease, emphysema, and asthma), and chronic liver disease (including cirrhosis), alcoholism, or diabetes mellitus: Administer PPSV23.

- Adults aged 19 through 64 years who smoke cigarettes or reside in nursing home or long-term care facilities: Administer PPSV23.

- Routine pneumococcal vaccination is not recommended for American Indian/Alaska Native or other adults unless they have the indications as above; however, public health authorities may consider recommending the use of pneumococcal vaccines for American Indian/Alaska Native or other adults who live in areas with increased risk for invasive pneumococcal disease.

- Immunocompromising conditions that are indications for pneumococcal vaccination are: Congenital or acquired immunodeficiency (including B- or T-lymphocyte deficiency, complement deficiencies, and phagocytic disorders excluding chronic granulomatous disease), HIV infection, chronic renal failure, nephrotic syndrome, leukemia, lymphoma, Hodgkin disease, generalized malignancy, multiple myeloma, solid organ transplant, and iatrogenic immunosuppression (including long-term systemic corticosteroids and radiation therapy).

- Anatomical or functional asplenia that are indications for pneumococcal vaccination are: Sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, splenic dysfunction, and splenectomy. Administer pneumococcal vaccines at least 2 weeks before immunosuppressive therapy or an elective splenectomy, and as soon as possible to adults who are newly diagnosed with asymptomatic or symptomatic HIV infection.

9. Meningococcal vaccination

- Administer 2 doses of quadrivalent meningococcal conjugate vaccine (MenACWY [Menactra, Menevo]) at least 2 months apart to adults of all ages with anatomical or functional asplenia or persistent complement component deficiencies. HIV infection is not an indication for routine vaccination with MenACWY. If an HIV-infected person of any age is vaccinated, 2 doses of MenACWY should be administered at least 2 months apart.

- Administer a single dose of meningococcal vaccine to microbiologists routinely exposed to isolates of Neisseria meningitidis, military recruits, persons at risk during an outbreak attributable to a vaccine serogroup, and persons who travel or live in countries in which meningococcal disease is hyperendemic or epidemic.

- First-year college students up through age 21 years who are living in residence halls should be vaccinated if they have not received a dose on or after their 16th birthday.

- MenACWY is preferred for adults with any of the preceding indications who are aged 55 years or younger as well as for adults aged 56 years or older who a) were vaccinated previously with MenACWY and are recommended for revaccination, or b) for whom multiple doses are anticipated. Meningococcal polysaccharide vaccine (MPSV4 [Menomune]) is preferred for adults aged 56 years or older who have not received MenACWY previously and who require a single dose only (e.g., travelers).

- Revaccination with MenACWY every 5 years is recommended for adults previously vaccinated with MenACWY or MPSV4 who remain at increased risk for infection (e.g., adults with anatomical or functional asplenia, persistent complement component deficiencies, or microbologists).

10. Hepatitis A vaccination

- Vaccinate any person seeking protection from hepatitis A virus (HAV) infection

- Nine persons with any of the following conditions:

  - Men who have sex with men and persons who use injection or noninjection illicit drugs;
  - Persons working with HAV-infected primates or with HAV in a research laboratory setting;
  - Persons with chronic liver disease and persons who receive clotting factor concentrates;
  - Persons traveling to or working in countries that have high or intermediate endemicity of hepatitis A;
  - Unvaccinated persons who anticipate close personal contact (e.g., household or regular babysitting) with an international adoptee during the first 60 days after arrival in the United States from a country with high or intermediate endemicity. (See footnote 1 for more information on travel recommendations.) The first dose of the 2-dose hepatitis A vaccine series should be administered as soon as adoption is planned, ideally 2 or more months before travel.

- Single-antigen vaccine formulations should be administered in a 2-dose schedule at either 0 and 6 to 12 months (Havrix), or 0 and 6 to 18 months (Vaqta). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, administer 2 doses of each at 0, 1, and 6 months; alternatively, a 4-dose schedule may be used, administered on days 0, 7, and 21 to 30 followed by a booster dose at month 12.

11. Hepatitis B vaccination

- Vaccinate persons with any of the following indications and any person seeking protection from hepatitis B virus (HBV) infection:
  - Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than 1 sex partner during the previous 6 months); persons seeking evaluation or treatment for a sexually transmitted disease (STD); current or recent injection drug users; and men who have sex with men;
  - Health care personnel and public safety workers who are potentially exposed to blood or other bodily fluids from infected persons; and persons with diabetes who are younger than age 60 years as soon as feasible after diagnosis; persons with diabetes who are age 60 years or older at the discretion of the treating clinician based on the likelihood of acquiring HBV infection, including the risk posed by an increased need for assisted blood glucose monitoring in long-term care facilities, the likelihood of experiencing chronic sequelae if infected with HBV, and the likelihood of immune response to vaccination;
  - Persons with end-stage renal disease, including patients receiving hemodialysis, persons with HIV infection, and persons with chronic liver disease;
  - Household contacts and sex partners of hepatitis B surface antigen–positive persons, clients and staff members of institutions for persons with developmental disabilities, and international travelers to countries with high or intermediate endemicity of hepatitis B virus infection; and
  - All adults in the following settings: STD treatment facilities; HIV testing and treatment facilities; providing drug abuse treatment and prevention services, health care settings targeting services to injection drug users or men who have sex with men, correctional facilities, end-stage renal disease programs and facilities for chronic hemodialysis patients, and institutions and nonresidential day care facilities for persons with developmental disabilities.

- Administer missing doses to complete a 3-dose series of hepatitis B vaccine to those persons not vaccinated or not completely vaccinated. The second dose should be administered at least 4 weeks after the first dose; the third dose should be given at least 2 months after the second dose (and at least 4 months after the first dose). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, give 3 doses at 0, 1, and 6 months; alternatively, a 4-dose Twinrix schedule, administered on days 0, 7, and 21 to 30 followed by a booster dose at month 12 may be used.

- Adult patients receiving hemodialysis or with other immunocompromising conditions should receive 1 dose of 40 mcg/mL (Recombivax HB) administered on a 3-dose schedule at 0, 1, and 6 months or 2 doses of 20 mcg/mL (Engerix-B) administered simultaneously on a 4-dose schedule at 0, 1, 2, and 6 months.

12. Haemophilus influenzae type b (Hib) vaccination

- One dose of Hib vaccine should be administered to persons who have anatomical or functional asplenia or sickle cell disease or are undergoing elective splenectomy if they have not previously received Hib vaccine. Hib vaccination 14 or more days before splenectomy is suggested.

- Recipients of a hematopoietic stem cell transplant (H SCT) should be vaccinated with a 3-dose regimen 6 to 12 months after a successful transplant, regardless of vaccination history; at least 4 weeks should separate doses.

- Hib vaccine is not recommended for adults with HIV infection since their risk for Hib infection is low.

13. Immunocompromising conditions

- Inactivated vaccines generally are acceptable (e.g., pneumococcal, meningococcal, and inactivated influenza vaccine) and live vaccines generally are avoided in persons with immunocompromising conditions. Information on specific conditions is available at www.cdc.gov/vaccines/hcp/acip-recs/index.html.
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Contraindications</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza, inactivated (IIV)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine; or to a vaccine component, including egg protein</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Influenza, recombinant (RIV)</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after previous dose of RIV or to a vaccine component. RIV does not contain any egg protein&lt;sup&gt;2&lt;/sup&gt;</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Influenza, live attenuated (LAIV)&lt;sup&gt;3,4&lt;/sup&gt;</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine, or to a previous dose of any influenza vaccine.&lt;br&gt;• History of Guillain-Barré Syndrome within 6 weeks of previous influenza vaccination</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Varicella&lt;sup&gt;4&lt;/sup&gt;</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with human immunodeficiency virus (HIV) infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)&lt;br&gt;• Moderate or severe acute illness with or without fever&lt;br&gt;• Pregnancy</td>
</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, or long-term immunosuppressive therapy)&lt;br&gt;• Pregnant&lt;br&gt;• History of severe allergy (e.g., anaphylaxis) after a previous dose or to a previous dose of any influenza vaccine&lt;br&gt;• Moderate or severe acute illness with or without fever&lt;br&gt;• Pregnancy</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with HIV infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever&lt;br&gt;• Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product)&lt;br&gt;• History of severe allergy (e.g., anaphylaxis) after a previous dose or to a previous dose of any influenza vaccine&lt;br&gt;• Moderate or severe acute illness with or without fever&lt;br&gt;• Pregnancy</td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component, including to any vaccine containing diphtheria toxoid&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, or long-term immunosuppressive therapy)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with HIV infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Meningococcal, conjugate (MenACWY); meningococcal, polysaccharide (MPSV4)</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with HIV infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with HIV infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with HIV infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
<tr>
<td>Haemophilus influenzae Type b (HiB)</td>
<td>• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component&lt;br&gt;• Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy,&lt;sup&gt;5&lt;/sup&gt; or patients with HIV infection who are severely immunocompromised)&lt;br&gt;• Pregnancy</td>
<td>• Moderate or severe acute illness with or without fever</td>
</tr>
</tbody>
</table>

**TABLE. Contraindications and precautions to commonly used vaccines in adults**

1. Vaccine package inserts and the full ACIP recommendations for these vaccines should be consulted for additional information on vaccine-related contraindications and precautions and for more information on vaccine exipients. Events or conditions listed as precautions should be reviewed carefully. Benefits of and risks for administering a specific vaccine to a person under these circumstances should be considered. If the risk from the vaccine is believed to outweigh the benefit, the vaccine should not be administered. If the benefit of vaccination is believed to outweigh the risk, the vaccine should be administered. A contraindication is a condition in a recipient that increases the chances of a serious adverse reaction. Therefore, a vaccine should not be administered when a contraindication is present.

2. For more information on the use of influenza vaccines among persons with egg allergies and a complete list of conditions that CDC considers to be reasons to avoid receiving LAIV, see CDC. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP) — United States, 2014–15 Influenza Season. MMWR 2014;63(32):691–97.

3. LAIV, MMR, varicella, or zoster vaccines can be administered on the same day. If not administered on the same day, live vaccines should be separated by at least 28 days.

4. Immunosuppressive steroid dose is considered to be ≥2 weeks of daily receipt of 20 mg of prednisone or the equivalent. Vaccination should be deferred for at least 1 month after discontinuation of such therapy. Providers should consult ACIP recommendations for complete information on the use of specific live vaccines among persons on immune-suppressing medications or with immune suppression because of other reasons.

5. Vaccine should be deferred for the appropriate interval if replacement immune globulin products are being administered. See CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2011;60(No.RR-2). Available at www.cdc.gov/vaccines/pubs/pinkbook/index.html.

6. Measles vaccination might suppress tuberculin reactivity temporarily. Measles-containing vaccine may be administered on the same day as tuberculin skin testing. If testing cannot be performed until after the day of MMR vaccination, the test should be postponed for at least 4 weeks after the vaccination. If an urgent need exists to skin test, do so with the understanding that reactivity might be reduced by the vaccine.


<sup>2</sup> Regarding latex allergy, consult the package insert for any vaccine administered.