Update on COID and ACIP Vaccine Recommendations

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April 28-May 1, 2011
Destin, Florida
FINANCIAL DISCLOSURE:
Larry K. Pickering, M.D., F.A.A.P.

In the past 12 months, I have not had a financial interest or other relationship with manufacturer(s) of product(s) or provider(s) of service(s) that will be discussed in this presentation.
Learning Objectives

• To review recent immunization recommendations from the ACIP and COID
• To summarize new information in the 2011 General Recommendations on Immunization
• To discuss changes to the childhood and adult immunization schedules for 2011
• To highlight new information dealing with pneumococcal, meningococcal, and pertussis vaccines
Development of vaccine recommendations and policies

## Structure of Advisory Committee on Immunization Practices

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members</td>
<td>15</td>
</tr>
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<td>Liaison organizations</td>
<td>30</td>
</tr>
<tr>
<td>Consultants</td>
<td>0</td>
</tr>
<tr>
<td>Ex officio Members</td>
<td>8</td>
</tr>
<tr>
<td>Reports to</td>
<td>CDC Director</td>
</tr>
<tr>
<td>Meetings per year</td>
<td>3 (Webcast)</td>
</tr>
<tr>
<td>Vaccine Recommendations</td>
<td>All ages</td>
</tr>
</tbody>
</table>

[http://www.cdc.gov/vaccines/recs/acip/](http://www.cdc.gov/vaccines/recs/acip/)  
Ann Intern Med 2009; 150:45-49
General Recommendations on Immunization
Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Continuing Education Examination available at http://www.cdc.gov/mmwr/cme/content.html

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
Helpful Tables in the General Recommendations*

- FDA licensed combination vaccines
- Spacing of live and inactivated antigens
- Contraindications and precautions (and conditions misperceived as contraindications)
- Needle length
- Vaccination for primary and secondary immunodeficiencies

*15 Tables and 6 Figures
<table>
<thead>
<tr>
<th>Vaccination of People With Immunodeficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary</strong></td>
</tr>
<tr>
<td>B-lymphocyte</td>
</tr>
<tr>
<td>T-lymphocyte</td>
</tr>
<tr>
<td>Complement</td>
</tr>
<tr>
<td>Phagocytic</td>
</tr>
<tr>
<td><strong>Secondary</strong></td>
</tr>
<tr>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>Malignant neoplasms</td>
</tr>
<tr>
<td>Transplantation</td>
</tr>
<tr>
<td>Radiation therapy</td>
</tr>
<tr>
<td>Immunosuppression</td>
</tr>
<tr>
<td>Asplenia</td>
</tr>
<tr>
<td>Chronic renal failure</td>
</tr>
</tbody>
</table>

Gen. Recs 2011, page 48
Red Book 2009, page 74-75
2011 ACIP Recommendations

- Updated recommendations for use of Tdap
  - MMWR 2011; 60:13-15
- Updated recommendations for use of MCV4
  - MMWR 2011; 60:72-76
- General Recommendations MMWR 2011; 60:(RR02):1-60
- Adult Immunization schedule MMWR 2011; 60(4):1-4
- Childhood Immunization Schedules MMWR 2011;60(5):1-4
- ACIP Immunization of Health Care Providers Document (May 2011)
  - MMR: Evidence of Immunity Requirements for Health Care Personnel MMWR 2010; 59(RR03):1-12
Summary of New MMR Recommendations for Health Care Personnel

- Documented administration of two doses of measles and mumps vaccine and one dose of rubella vaccine
  - OR
- Laboratory evidence of immunity or laboratory confirmation of disease (measles, mumps and rubella)
  - OR
- Born before 1957 (measles, mumps and rubella)

http://www.cdc.gov/vaccines/recs/acip/
## Table 1: Status of Recently Submitted, Licensed, and Recommended Vaccines

General Recommendations on Immunization from ACIP - [cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm](http://aapredbook.aappublications.org/news/vaccstatus.dtl)

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Manufacturer</th>
<th>BLA submitted to FDA</th>
<th>BLA age indications**</th>
<th>FDA licensure</th>
<th>Table 1: Status of AAP/CDC recommendations***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hib (Hiberix®)</td>
<td>GlaxoSmithKline (GSK)</td>
<td>Mar–2009</td>
<td>Booster dose in children 15 months through 4 years of age</td>
<td>Licensed 19–Aug–09</td>
<td>CDC: <a href="http://aapredbook.aappublications.org/news/vaccstatus.dtl">cdc.gov/mmwr/preview/mmwrhtml/mm5836a5.htm</a></td>
</tr>
<tr>
<td>HPV4 (GARDASIL®)</td>
<td>Merck</td>
<td>Dec–2005</td>
<td>Females 9 through 26 years of age</td>
<td>Licensed 8–Jun–06</td>
<td>CDC: <a href="http://aapredbook.aappublications.org/news/vaccstatus.dtl">cdc.gov/mmwr/preview/mmwrhtml/rr56e312a1.htm</a> CDC: <a href="http://aapredbook.aappublications.org/news/vaccstatus.dtl">cdc.gov/mmwr/preview/mmwrhtml/mm5920a5.htm</a></td>
</tr>
</tbody>
</table>
Recommended Immunization Schedules for People in the United States

**Pediatric and Adolescent**
- 0 through 6 years of age
- 7 through 18 years of age
- Catch-up schedule for children
  - 4 months through 6 years of age
  - 7 through 18 years of age

**Adult**
- Age ranges
- Medical and other indications

[http://www.cdc.gov/vaccines/recs/schedules/default.htm](http://www.cdc.gov/vaccines/recs/schedules/default.htm)
Immunization Policy

Recommending Bodies

- Advisory Committee on Immunization Practices
- American Academy of Family Physicians
- American Academy of Pediatrics
- Committee on Infectious Diseases
- American College of Physicians
- American College of Obstetricians and Gynecologists
### Recommended Immunization Schedule for Persons Aged 0 Through 6 Years—United States • 2011
For those who fall behind or start late, see the catch-up schedule

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age</th>
<th>Birth</th>
<th>1 month</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
<th>12 months</th>
<th>15 months</th>
<th>18 months</th>
<th>19–23 months</th>
<th>2–3 years</th>
<th>4–6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td></td>
<td>HepB</td>
<td></td>
<td></td>
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<tr>
<td>Rotavirus</td>
<td></td>
<td>RV</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Diphtheria, Tetanus, Pertussis</td>
<td></td>
<td>DTaP</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><em>Haemophilus influenzae</em> type b</td>
<td></td>
<td>Hib</td>
<td></td>
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<tr>
<td>Pneumococcal</td>
<td></td>
<td>PCV</td>
<td></td>
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</tr>
<tr>
<td>Inactivated Poliovirus</td>
<td></td>
<td>IPV</td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Influenza</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, Mumps, Rubella</td>
<td></td>
<td>MMR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Varicella</td>
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<tr>
<td>Hepatitis A</td>
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<tr>
<td>Meningococcal</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Recommended Immunization Schedule for Persons Aged 7 Through 18 Years—United States • 2011
For those who fall behind or start late, see the schedule below and the catch-up schedule

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age</th>
<th>7–10 years</th>
<th>11–12 years</th>
<th>13–18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetanus, Diphtheria, Pertussis</td>
<td></td>
<td>Tdap</td>
<td></td>
<td>Tdap</td>
</tr>
<tr>
<td>Human Papillomavirus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal</td>
<td></td>
<td>MCV4</td>
<td></td>
<td>MCV4</td>
</tr>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td></td>
<td></td>
<td></td>
<td>HepA Series</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td></td>
<td></td>
<td></td>
<td>Hep B Series</td>
</tr>
<tr>
<td>Inactivated Poliovirus</td>
<td></td>
<td></td>
<td></td>
<td>IPV Series</td>
</tr>
<tr>
<td>Measles, Mumps, Rubella</td>
<td></td>
<td></td>
<td></td>
<td>MMR Series</td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
<td></td>
<td></td>
<td>Varicella Series</td>
</tr>
</tbody>
</table>
Changes to the Childhood and Adolescent Immunization Schedule

- Hepatitis B: Administer third (or fourth) dose no earlier than 24 weeks of age
- PCV13 added to replace PCV7
- Influenza vaccine: number of doses for children 6 months through 8 years of age
- Tdap changes added
- MCV4 changes added
- HPV footnotes condensed
### Adult Immunization Schedule

#### FIGURE 1. Recommended adult immunization schedule, by vaccine and age group — United States, 2011

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>19–26 years</th>
<th>27–49 years</th>
<th>50–59 years</th>
<th>60–64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza*</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)*</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 years</td>
<td>Td booster every 10 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella*</td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV)*</td>
<td>3 doses (females)</td>
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</tr>
<tr>
<td>Zoster*</td>
<td>1 dose</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)*</td>
<td>1 or 2 doses</td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal (polysaccharide)*</td>
<td>1 or 2 doses</td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MeningococcalA</td>
<td>1 or more doses</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Hepatitis A*</td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B*</td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have other risk factors present (e.g., based on medical, occupational, lifestyle).

Recommended if some other risk factor is present (e.g., based on medical, occupational, lifestyle).

No recommendation

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#### FIGURE 2. Vaccines that might be indicated for adults, based on medical and other indications — United States, 2011

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>VACCINE</th>
<th>Pregnancy</th>
<th>Immune-compromising conditions (excluding human immunodeficiency virus [HIV])</th>
<th>HIV infection ≤ 200 cells/µL</th>
<th>CD4+ T lymphocyte count</th>
<th>Diabetes, heart disease, chronic lung disease, chronic alcoholism</th>
<th>Asplenia* (including elective splenectomy) and persistent complement deficiencies</th>
<th>Chronic liver disease</th>
<th>Kidney failure, end-stage renal disease, receipt of hemodialysis</th>
<th>Health-care personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza*</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
<td>1 dose IV annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)*</td>
<td>Td</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 years</td>
<td>Td booster every 10 years</td>
<td>Td booster every 10 years</td>
<td>Td booster every 10 years</td>
<td>Td booster every 10 years</td>
<td>Td booster every 10 years</td>
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</tr>
<tr>
<td>Varicella*</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV)*</td>
<td>3 doses through age 26 years</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster*</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella*</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal (polysaccharide)*</td>
<td>1 or 2 doses</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MeningococcalA</td>
<td>1 or more doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A*</td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Hepatitis B*</td>
<td>3 doses</td>
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<td></td>
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</tr>
</tbody>
</table>
Changes to the Adult Immunization Schedule

- Age based table
  - List of vaccines re-ordered to keep all universally-recommended vaccines together (Influenza, Td/Tdap, VAR, HPV, ZOS)
- Expanded coverage for seasonal influenza
- Tdap ≥ 65 years of age and no interval since Td
- 2 doses MCV4 in high risk
- Vaccine series does not need to be restarted regardless of time elapsed between doses
- Footnotes clarified
Overall Incidence of Invasive Pneumococcal Disease by Age Group, 1998-2009

ABCs unpublished data, continuous sites
Distribution of Most Common Serotypes causing IPD among Children <5 years old, ABCs, 2009

ABCs unpublished data, all sites
On February 24, 2010, a 13-valent pneumococcal conjugate vaccine (PCV13 [Prevnar 13, Wyeth Pharmaceuticals Inc., a subsidiary of Pfizer Inc.]) was licensed by the Food and Drug Administration (FDA) for prevention of invasive pneumococcal disease (IPD) caused by the 13 serotypes covered by the vaccine and for prevention of otitis media caused by serotypes in the conjugate. PCV13 is approved for use among children 2 to 59 months of age. The Advisory Committee on Immunization Practices (ACIP) reviewed available data on the immunogenicity, safety, and cost-effectiveness of the vaccine-preventable pneumococcal disease burden. The working group then presented policy options for consideration of the full ACIP. This report summarizes recommendations approved by ACIP on February 24, 2010, for 1) routine vaccination of all children aged 2—59 months with PCV13, 2) vaccination with PCV13 of children aged 60—71 months with underlying medical conditions that increase their risk for pneumococcal disease or complications, and 3) PCV13 vaccination of children who previously received 1 or more doses of PCV7 (1). CDC guidance for vaccination providers regarding transition from PCV7 to the PCV13 immunization program also is included.
Recommendations for use of PCV13

- Routine use
  - Infants and children not previously given PCV7 or PCV13 (2, 4, 6 and 12-15 months schedule)
- Transition from PCV7 to PCV13 to complete series
- “Serotype catch-up” for children fully vaccinated with PCV7: 1 “supplemental” dose PCV13 for
  - All children <5 years
  - Children with underlying medical conditions <6 years
  - Immunocompromised (e.g., HIV, sickle cell) <19 years
- PPSV23 after PCV13
  - Children >2 years of age with underlying medical conditions including cochlear implant
<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunocompetent children</td>
<td>Chronic heart disease, Chronic lung disease, Diabetes mellitus, Cerebrospinal fluid leaks, Cochlear implant</td>
</tr>
<tr>
<td>Children with functional or anatomic asplenia</td>
<td>Sickle cell disease and other hemoglobinopathies</td>
</tr>
<tr>
<td></td>
<td>Congenital or acquired asplenia, or splenic dysfunction</td>
</tr>
<tr>
<td>Children with immunocompromising conditions</td>
<td>HIV infection</td>
</tr>
<tr>
<td></td>
<td>Chronic renal failure and nephrotic syndrome</td>
</tr>
<tr>
<td></td>
<td>Diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas, and Hodgkin disease; or solid organ transplantation</td>
</tr>
<tr>
<td></td>
<td>Congenital immunodeficiency</td>
</tr>
</tbody>
</table>

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5909a2.htm
Summary: Meningococcal Disease Incidence, United States, 1970-2008

1921-1996 NNDSS data, 1997-2008 ABCs data projected to U.S. population
2005 Meningococcal Vaccination Recommendations

- **Goal:** Protect teens through peak in disease seen in 16-21 year-olds

- **Assumptions:** Vaccine would protect most adolescents for 10 years

- **Vaccination at 11-12 years of age preferred**
  - High coverage prior to increased period of risk
  - Adolescent vaccination platform
MCV4 Recommendations

2005  Prevention and control of meningococcal disease

2007  Use in 2 through 10 year old children at increased risk

2008  Not recommended for routine use in 2 through 10 year old children

2009  Use in people at prolonged increased risk

2010  Second MCV4 vaccine (Menveo) licensed

2011  Second dose of MCV4 for adolescents and high risk groups
# Mechanisms for long-term protection with conjugate vaccines

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Verdict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistence of functional antibodies</td>
<td>Proportion of vaccinated people with accepted correlates of protection declines with time since vaccination</td>
</tr>
<tr>
<td>Memory</td>
<td>Invasive disease develops rapidly, can not rely on memory alone for protection</td>
</tr>
<tr>
<td>Herd immunity</td>
<td>Can not rely on herd immunity for protection in adolescents</td>
</tr>
</tbody>
</table>
Options to Address Waning Immunity

1. No longer vaccinate against meningococcal disease
2. Make no changes to recommendations, continue to vaccinate at age 11-12 years
3. Move recommended age of vaccination to 15 years, to protect through period of increased risk
4. Maintain primary dose at age 11-12 years, add a booster dose at age 16 years
Updated Recommendations for Use of Meningococcal Conjugate Vaccines — Advisory Committee on Immunization Practices (ACIP), 2010

On October 27, 2010, the Advisory Committee on Immunization Practices (ACIP) approved updated recommendations for the use of quadrivalent (serogroups A, C, Y, and W-135) meningococcal conjugate vaccines (Menveo, Novartis; and Menactra, Sanofi Pasteur) in adolescents and persons at high risk for meningococcal disease. These recommendations supplement the previous ACIP recommendations for meningococcal vaccination (1,2). The Meningococcal Vaccines Work Group of ACIP reviewed available data on immunogenicity in high-risk groups, best practice implementation of meningococcal disease, and persistence after immunization. The Work Group then presented two new recommendations approved by ACIP: 1) routine vaccination of adolescents, preferably at age 11 or 12 years, with a booster dose at age 16 years and 2) a 2-dose primary series administered 2 months apart for persons aged 2 through 54 years with persistent complement component deficiency (C1q, C4, C2, or C3; see Advisory Committee on Immunization Practices (ACIP) report, 2009 National Immunization Program) (3). Of the 83% of adolescents aged 13 through 17 years who had received a dose of meningococcal vaccine from 2000–2004 to 2005–2009, the estimated annual number of cases of serogroups C and Y meningococcal disease decreased 74% among persons aged 11 through 14 years but only 27% among persons aged 15 through 18 years. Cases of meningococcal disease caused by serogroups C and Y among persons who were vaccinated with meningococcal conjugate vaccine have been reported. An early VE analysis that modeled expected cases of disease in vaccinated persons estimated a VE of 80%–85% up to 3 years after vaccination (4). In 2010, CDC received 12 reports of serogroup C or Y meningococcal disease among persons who had received a meningococcal conjugate vaccine. Three cases of disease occurred in 18–23-year-old persons who had received 2 doses of meningococcal vaccine (5). Two dose series of MCV4 recommended for adolescents.
Routine vaccination of people with quadrivalent meningococcal conjugate vaccine at age 11 or 12 years, with a booster dose at 16 years of age.

For adolescents who receive the first dose at age 13 through 15 years, a one-time booster dose should be administered, preferably at age 16 through 18 years, before the peak in increased risk.

People who receive their first dose of meningococcal conjugate vaccine at or after age 16 years do not need a booster dose.
Categories of MCV4 Recommendations

**Age**

- **0-2 years**: None licensed
- **2-10 years**: Immunocompetent, High risk groups
- **Adolescents**: All with two doses
- **Adults through 55 years**: High risk groups
People at Prolonged Risk for Meningococcal Disease

At risk:

- Persistent complement component deficiencies
- Anatomic or functional asplenia
- HIV infected
- Prolonged exposure to organism (microbiologists)
- Travelers to epidemic areas

Revaccinate if previous vaccination:

- ≥7 years of age → 5 years later
- 2-6 years of age → 3 years later

MMWR 2009; 58:1042-43
Estimated Annual Number of Cases of Meningococcal Disease, United States: Age 0 - 21 years

Serogroup B - Blue
Serogroups A,C,Y,W-135 - Yellow

ABCs cases from 1996-2005 and projected to the U.S. population
Infant Vaccination Discussion

• Amount of potentially preventable disease in infants is low
  – Historic low in disease incidence
  – Low proportion of serogroup C+Y disease
  – Declining incidence after 6-8 months of age
• Morbidity and mortality in infants is lower than in other age groups
• High coverage in adolescents may protect infants through herd immunity
Hospital-Acquired Pertussis Among Newborns --- Texas, 2004

On July 10, 2004, staff members at a children's hospital in Texas noted that six infants with pertussis diagnosed by clinical symptoms and confirmed by polymerase chain reaction (PCR) testing had all been born during June 4--16 at the same area general hospital. The infants had clinical symptoms of pertussis, including cough, congestion, cyanosis, emesis, or apnea. Infection-control practitioners from the Texas Department of State Health Services (TSDHS, hospital A), and the county health department (hospital B), and a TSDHS epidemiologist were consulted to conduct the outbreak investigation and highlights the importance of following pertussis vaccination guidelines. The identify HCW A as a common contact of the infants.

Immediately after identification of the six infants with pertussis at children's hospital A, hospital staff members reviewed newborn nursery charts at general hospital A. One staff member (HCW A) was identified as having directly cared for all six infants during their stay in the newborn nursery. Review of work logs for all shifts identified four additional hospital workers who had been present while the six infants were in the newborn nursery.
Hospital Acquired Pertussis

- 6 infants born at hospital A in June 2004 developed pertussis
- Investigation found 5 more cases
- All 11 infants exposed to HCW (24 years old) who worked with cough, post-tussive emesis and dyspnea from mid June to July when she was furloughed. Husband had similar symptoms
- During this time, cared for 113 infants (10% attack rate)
- 11 infants treated and all recovered (5 admitted to PICU, 4 to pediatric floor)

MMWR 2008; 57:600-603.
Health Care Professionals Can Transmit Infections to Patients

- Pertussis
- Influenza
- Hepatitis B
- Measles
- Hepatitis A
Brief Report: Fatal Case of Pertussis in an Infant --- West Virginia, 2004

In December 2004, an infant aged 29 days in West Virginia died from pertussis after exposure to adult family members with probable undiagnosed pertussis. Pertussis (i.e., whooping cough) is a prolonged respiratory illness caused by the bacterium *Bordetella pertussis* and characterized by a violent cough, inspiratory whoop, and posttussive vomiting. The cough often lasts from several weeks to up to 3 months. However, adolescents and adults, who are not vaccinated as children, often have disease not recognized as pertussis, leading to intrafamilial and nosocomial transmission of the disease. Infants younger than 6 months are at the highest risk for severe illness or death from pertussis because immunity from maternal antibody wanes after 6 months of age (1). This report summarizes results of the West Virginia fatality event and illustrates the need to prevent pertussis in infants. 

On December 29, the infant was taken to an emergency department (ED) with difficulty breathing. The infant had been coughing for approximately 2 weeks, with increasing frequency, increasing in posttussive vomiting and several choking episodes. At presentation, the infant was lethargic, and examination revealed tachycardia and mild fever (99.5°F [37.5°C]). Before intubation and oxygen supplementation, the infant had thick, foamy mucus coming from her mouth, appeared cyanotic, and had an O₂ saturation of 70% by pulse oximetry. Seizure activity was noted during intubation. Laboratory results revealed severe leukocytosis (white blood cell count: 104,100/µL; normal: 5,000--19,500/µL), severe lymphocytosis (26,600/µL; normal: 2,500--16,500/µL), and a nasopharyngeal swab was positive for respiratory syncytial virus (RSV) by rapid immunoassay alone. A chest radiograph revealed right upper lobe and perihilar infiltrates, and an electrocardiogram indicated supraventricular tachycardia. Three hours after arrival at the ED, the infant was transferred to a pediatric intensive care unit (PICU) with diagnoses of pneumonia and respiratory failure.
Pertussis in an Infant: Warning Signs

- 29 day old infant died from pertussis 30 hours following ICU hospitalization
  - 5 days of cough
  - Respiratory distress
  - WBC count 104,100 cells/uL
  - NP swab positive for *B. pertussis* by PCR

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MMWR 2005; 54(03) 71-72.
Pertussis in an Infant: Warning Signs

• 20 year old mother had a prolonged paroxysmal cough with post-tussive vomiting. Given cough syrup
• 58 year old grandmother had cough and vomiting. Given azithromycin for sinusitis
• 22 year old father had a paroxysmal cough for > 3 weeks
• 4 additional close contacts (2 cousins, paternal grandmother and great grandmother) had 3-8 week cough
• 30 birth hospital and 11 ED employees identified as potential contacts
Pertussis Cases in California  
(3/09/2011)

• 9,477 confirmed, probable and suspect cases, 24.2 cases/100,000 in 2010 (514 cases in 2011)  
• This is the most cases reported in 65 years  
• 10 deaths to date  
  • 9 infants<2 months; no DTaP doses  
  • 1 premature infant, age 2 months: 1 DTaP  
  • Cough illness common in parents or sibs rates highest in infants <6 months of age (418 cases/100,000)
Figure 1. Pertussis cases by month of onset -- California, January 2005 through February 2011*

http://www.cdph.ca.gov/programs/immunize/Pages/PertussisSummaryReports.aspx
Incidence of Pertussis Cases by race/ethnicity and age—California 2010

Figure 4. Pertussis cases by age and race/ethnicity -- California, 2010*

http://www.cdph.ca.gov/programs/immunize/Pages/PertussisSummaryReports.aspx
Tdap Coverage Rates in California

- Adolescents 13 through 17 years: 53%¹
- Adults 18 through 64 years: 6%²
- Proportion of tetanus vaccines given to adults as Tdap: 21%
- ≥1 dose Tdap (2009) in US: 56%³

1) 2009 NIS Data for CA:
   [www.cdc.gov/mmwr/preview/mmwrhtml/mm5932a3.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5932a3.htm)
   (NIS-Teen, MMWR 2010; 59:1018)

2) 2008 data:

3) 2008: 41%
Adverse Events After DTaP

• Swelling involving the entire thigh or upper arm has been reported in 2% of vaccinees after fourth and fifth doses.
• Condition resolves and has no sequelae.
• Pathogenesis unknown.
• Swelling after dose 4 does not portend to an increased reaction after dose 5 and is not a contraindication to further immunization.

Red Book 2009; pg 511
Tdap Recommendations

- Use of Tdap for children 7 through 9 years of age who are underimmunized
- Use of Tdap in people ≥65 years of age
- No minimum interval between Td and Tdap

MMWR 2011, 60:13-15
February 23-24, 2011
Discussion at the ACIP Meeting

- Tdap in HCP
- Japanese encephalitis-second dose
- Immunization of HCP document
- Influenza
- Zoster vaccine: 50 through 59 years of age
- HPV for anal cancer
- PCV13 in adults
- Febrile seizures and vaccination
Recommendations Made at the ACIP Meeting

- Tdap vaccine for HCP
- Post exposure antimicrobial prophylaxis for HCP who have unprotected exposure to pertussis
- Booster dose of Japanese virus encephalitis vaccine following two dose primary series
- Revision of HCP immunization document