Update on Vaccine Recommendations

New Horizons in Pediatrics
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Objectives

• Discuss vaccine changes made to the 2017 immunization schedule

• Highlight recent changes to childhood immunization

• Discuss current immunization challenges

Childhood Immunization Schedule At the Turn of the Century
This chart takes into account General Recommendations on Immunization, recommendations for health care professionals, the annual recommended childhood immunization schedule (1995–present), the annual recommended adult immunization schedule, and recommendations pertaining to vaccines such as those for rabies, yellow fever, smallpox, and Japanese encephalitis that are not part of any routine immunization schedule in the United States.

### Number of ACIP Vaccine Recommendations, By Year, Since 1965*

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>102</td>
</tr>
<tr>
<td>1970</td>
<td>113</td>
</tr>
<tr>
<td>1975</td>
<td>120</td>
</tr>
<tr>
<td>1980</td>
<td>130</td>
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<td>1985</td>
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<td>1990</td>
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<tr>
<td>1995</td>
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<tr>
<td>2000</td>
<td>185</td>
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<tr>
<td>2005</td>
<td>200</td>
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<tr>
<td>2010</td>
<td>215</td>
</tr>
<tr>
<td>2015</td>
<td>230</td>
</tr>
<tr>
<td>2017</td>
<td>245</td>
</tr>
</tbody>
</table>

*This chart includes recommendations for immunization, recommendations for health care professionals, and recommendations for vaccines such as those for rabies, yellow fever, smallpox, and Japanese encephalitis that are not part of any routine immunization schedule in the United States.

### 2017 Childhood and Adolescent Immunization Schedule

- Schedules are revised and approved annually by several organizations: ACIP (CDC), AAP, AAFP, ACOG.
- The schedule reflects recommendations for use of vaccines licensed by the FDA.

### Major Changes to the 2017 Vaccine Schedule

- Two dose 9vHPV
- HBV vaccine to newborns in first 24 hours
- Meningococcal ACWY for HIV infected
Three Major Parts to the 2017 Immunization Schedule for Children 0 through 18 Years of Age

- Schedule for people 0 through 18 years of age
- Schedule for people 0 through 18 years of age based on medical conditions
- Footnotes: three exciting pages which are single spaced and displayed in very small font.

Contains 3 figures plus footnotes:

- Figure 1 (recommended schedule) is similar to 2016 schedule
- Figure 2 (catch up) is similar to 2016 schedule
- Figure 3 is new and contains vaccines indicated for children and adolescents through 18 years of age based on specific medical indications
- Revised footnotes for 8 vaccines
- Footnotes are riveting
Newly Added Figure 3 Includes:

- Pregnancy
- Immunocompromised conditions including HIV
- Renal and heart disease
- CSF leaks and cochlear implants
- Spleen and complement deficiencies
- Chronic liver disease
- Diabetes mellitus
Vaccines of the Past

- LAIV removed from the 2017 schedule
- Three dose HPV vaccine is gone for younger age group
- 2vHPV and 4vHPV vaccines are gone
- PCV7 is off the market, replaced by PCV13
- Meningococcal polysaccharide (MPSV4) is gone
- HibMenCY (MenHibrix) will be gone

New Vaccine Recommendations
HPV Vaccine Recommendation

- CDC recommends routine vaccination at age 11 or 12 years to prevent HPV cancers
- The vaccination series can be started at age 9 years
- Two doses of vaccine are recommended
- The second dose of the vaccine should be administered 6 to 12 months after the first dose.
- Prevalence of genital HPV in adults aged 18-69:
  - Any strain: 41.2% (males) and 29.0% (females)
  - High risk strains: 21.3% (males) and 20.4% (females)
- Prevalence of oral HPV in adults aged 18-69:
  - Any strain: 11.5% (males) and 3.3% (females)
  - High risk strains: 6.8% (males) and 1.2% (females)

Evidence Supports Importance of Strong Recommendation from Clinicians

- Younger adolescents less likely to receive a strong recommendation
- Boys are less likely to receive a strong recommendation
- Parents value the HPV vaccine
- Clinicians underestimate the value that parents place on HPV vaccine

Incidence of Meningococcal Disease by Age and Serogroup: 2005–2012
ACIP Recommendations for Use of Serogroup B Meningococcal Vaccines

- Routine immunization of persons aged 10 years and older at "increased risk"
  - Complement deficiency (including eculizumab users)
  - Functional/anatomic asplenia
  - Microbiologists routinely exposed to the organism
  - Outbreak response
- No serogroup B vaccine preference
- This is a Category A or routine recommendation for all persons designated at "increased risk"
- Targets persons at increased risk, small populations

ACIP Recommendations for Use of Serogroup B Meningococcal Vaccines: Adolescents

- Very low disease burden in 18–23 year olds
  - Estimated 30–50 cases (6–7 deaths) per year currently
  - More cases in non-college than college students
- Many unknowns about the vaccines (i.e., effect on carriage; duration of protection; strain coverage)
- MenB may be administered to healthy adolescents and young adults 16 through 23 years of age (preferred ages are 16 through 18 years) to provide short-term protection against most strains of serogroup B meningococcal disease
  - Discussion with healthcare provider and parent
  - Same vaccine for all doses
  - VFC (up to age 19 years) or insurance will cover cost
- This is a Category B recommendation that leaves vaccination up to individual clinical decision making: “Non-routine”

Maternal Tdap

- Tdap vaccine (updated guidance Oct 2016):
  - Tdap should be administered between 27 and 36 weeks gestation, although it may be given at any time during pregnancy
  - Vaccinating earlier in the 27 through 36 week window will maximize passive pertussis antibody transfer to the infant

a December 2016 meeting of the Advisory Committee on Immunization Practices
Active Evaluation: Evaluating Safety of Tdap During Every Pregnancy

Clinical Study of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine (Tdap) Safety in Pregnant Women

- Active evaluation of the recommendation to vaccinate with Tdap during every pregnancy
- Rapid safety evaluation supports ongoing use of Tdap during every pregnancy

Rates of Moderate+Severe Reactions Among Pregnant Women With and Without Prior Tdap Receipt within 7 days after vaccination

All comparisons for moderate/severe or severe reactions met non-inferiority criteria

Immunization Challenges
**Childhood Immunization Disparities**

- In spite of high national childhood immunization coverage rates, there are still concerning disparities.
- Children living below the poverty level continue to have lower coverage with rotavirus, PCV, Hib, and DTaP vaccines.
- Children living in more rural areas have lower coverage with DTaP, polio, varicella, PCV, hepatitis A, and rotavirus vaccines.
- CDC is currently working to identify reasons for disparities and evidence-based interventions.

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**Measles Cases in the U.S.**

- The majority of people who got measles were unvaccinated.
- Measles is still common in many parts of the world including some countries in Europe, Asia, the Pacific, and Africa.
- Travelers with measles continue to bring the disease into the U.S.
- Measles can spread when it reaches a community in the U.S. where groups of people are unvaccinated.

*Table of measles cases by year since 2000.*

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>61</td>
</tr>
<tr>
<td>2011</td>
<td>229</td>
</tr>
<tr>
<td>2012</td>
<td>55</td>
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<tr>
<td>2013</td>
<td>187</td>
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<tr>
<td>2014</td>
<td>68</td>
</tr>
<tr>
<td>2015</td>
<td>509</td>
</tr>
<tr>
<td>2016*</td>
<td>76</td>
</tr>
<tr>
<td>2017**</td>
<td>7</td>
</tr>
</tbody>
</table>

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**Measles, U.S. 2016 and 2017**

- Provisional total for 2016: 69 cases reported by 15 states.
  - 29 cases in Arizona
  - Total of 4 outbreaks reported in 2016 (defined as 3 or more linked cases)
  - 72% of cases reported were outbreak-related.
- So far in 2017:
  - 21 cases reported in first 8 weeks of the year by 6 states (CA, CO, FL, NJ, NY, PA, UT)
  - 2 outbreaks reported
  - 48% of cases are outbreak related.
Mumps Summary

- Use of the mumps vaccine reduced disease levels ~99% versus pre-vaccine era in the United States
- Since 2006, mumps outbreaks have occurred in highly 2-dose vaccinated
- Current 2-dose schedule is sufficient for mumps control in the general population
- Intense exposure settings and waning immunity appear to be risk factors for secondary vaccine failure
- The benefit of a 3rd MMR dose still needs to be assessed
- The Advisory Committee on Immunization Practices (ACIP) has established a Mumps Working Group
Pertussis Trends

- Pertussis cases have steadily increased in recent decades
- More than 20,000 cases per year in recent years:
  - 20,762 cases in 2015
  - 32,971 cases in 2014
  - 28,639 cases in 2013
  - 48,277 cases in 2012
- 580 cases in Arizona in 2015
- For U.S. infants under 1 year old:
  - 2,709 cases in 2015
  - 3 deaths in 2015

Pertussis Summary – “It’s Complicated!”

- Pertussis incidence has increased since 1980s
- Resurgence of childhood disease despite high DTaP coverage
  - Young infants at risk
  - Excellent initial vaccine effectiveness
  - Moderate and immediate waning of immunity
- Re-emergence of adolescent disease
  - Tdap effectiveness about 70%\(^1,2\), duration of protection unknown
  - Tdap boost in DTaP recipients may wane more quickly\(^3\)
- Switch to acellular pertussis vaccines is changing epidemiology
  - Waning immunity driving disease incidence
  - Contribution of pertactin deficient strains

Low Maternal Vaccination Rates

- Coverage of recommended vaccines for pregnant women remains low—leaving a number of pregnant women and their infants at risk for complications from vaccine-preventable diseases
- Only 50.3% of women received influenza vaccination before or during pregnancy in 2014-2015\(^4\)
- Only 41.7% of pregnant women received Tdap vaccination from 2007-2013\(^5\)
Impact of the Immunization Schedule

Impact of 7-valent Pneumococcal Conjugate Vaccine on Rate of Invasive Pneumococcal Disease, United States

Pilishvili T et al. J Infect Dis 2010;201:32
Rates of Serogroup C, Y, and W Meningococcal Disease in the United States

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate per 100,000 (95% confidence intervals)</th>
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</thead>
<tbody>
<tr>
<td>2004 and 2005</td>
<td>0.27 (0.17, 0.39)</td>
</tr>
<tr>
<td>2006 and 2007</td>
<td>0.31 (0.21, 0.45)</td>
</tr>
<tr>
<td>2008 and 2009</td>
<td>0.15 (0.08, 0.26)</td>
</tr>
<tr>
<td>2012 and 2013</td>
<td>0.07 (0.05, 0.12)</td>
</tr>
</tbody>
</table>

* Cohn AC et al. MMWR 2013;62(RR02):1-22

Decreasing incidence in 11–19 year olds

Number of HPV-Attributable Cancers Averted over 100 Years of 9-Valent HPV Vaccination Program

Total US population

- 2014 coverage (Females 39.7%, Males 21.6%)
- Higher male and female coverage (80%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of HPV-attributable cancers averted (excluding herd immunity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>709,000</td>
</tr>
<tr>
<td>2024</td>
<td>1.23 million</td>
</tr>
<tr>
<td>2044</td>
<td>1.56 million</td>
</tr>
</tbody>
</table>

* Estimates calculated using published model (Chesson et al., Hum Vaccin Immunother 2016), with modified coverage assumptions. Coverage levels shown (39.7%, 21.6%, and 80%) refer to coverage among ages 13–17. For females, the annual probability of vaccination in the current coverage scenario was modeled as 20.9% for age 12, 8.9% for ages 13 to 18, and 0.89% for those 19 and older. For males, these values were 10.5%, 4.4%, and 0.44% (through age 21), respectively. In the 80% coverage scenario, the annual probability of vaccination was 73.8% for age 12, 8.9% for ages 13 to 18, and 0.89% for ages 19 and older. In all cases, the annual probability of vaccination was modeled as 0% for those 26 and older.

Childhood Immunization Provides Big Savings

CDC estimates that vaccination of children born between 1994 and 2016 will:

- Prevent 381 million illnesses
- Prevent 24.5 million hospitalizations
- Help avoid 855,000 early deaths
- Save nearly $360 billion in direct costs and $1.65 trillion in total society costs

* Updated data from previous benefits from immunization during infancy for Vaccine Program – United States. MMWR 2013;62(RR02):1-22
Thank you!

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