Immunization Update 2016

Stephan L. Foster, Pharm.D, FAPhA
Professor
University of Tennessee

Jeff Goad, Pharm.D., M.P.H., FAPhA
Professor and Chair
Chapman University

Disclosures

• Jeff Goad
  • Speakers Bureau – Merck Vaccine
• Stephan Foster
  • Speakers Bureau – Merck Vaccine, sanofi-pasteur, Pfizer
  • Advisory Board – Pfizer, Seqirus

The American Pharmacists Association is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education.

Learning Objectives

• Identify important recent changes to the immunization schedules for adults and children in the United States.
• Describe specific immunization recommendations for special groups, including health care professionals, immunocompromised individuals, and pregnant women.
• Discuss the epidemiology of outbreaks of vaccine-preventable diseases in the United States.
• Summarize information about the efficacy and possible adverse effects of recently licensed vaccines.
• List promising new vaccines in the development pipeline.

Self-Assessment Question #1

In the 2014-2015 influenza season, which profession had the highest vaccination rate
A. Pharmacists
B. Physicians
C. Physician Assistants
D. Nurses
Self-Assessment Question #2
A 50 year old patient received the PCV13 vaccine. When this person turns 65 years of age, what vaccine would they get?
A. PCV13 followed 1 year later by PPSV23  
B. PPSV23 followed 1 year later by PCV13  
C. PPSV23 only  
D. PCV13 only

Self-Assessment Question #3
What is the ACIP recommended age group for serogroup B meningococcal (MenB) vaccine?
A. All adolescents aged 16 years and older  
B. 16 through 18 years of age with risk factors  
C. 16 through 23 years of age  
D. Adolescents aged 15 to 25 years

Self-Assessment Question #4
Which vaccine is one of the several meningococcal vaccines recommended for routine use in the Childhood Schedule?
A. Bexsero  
B. Menactra  
C. Menhibrix  
D. Trumemba

Self-Assessment Question #5
Which one of the following is true regarding 9-valent Human Papillomavirus vaccine (HPV9)?
A. If the series is started with HPV4, it can be completed with HPV9.  
B. If a series was completed using HPV4, the series should be repeated using HPV9.  
C. HPV9 is indicated for women only.  
D. HPV9 is indicated for ages 10-25 years.

Key Points
- Adult vaccination rates still below Healthy People targets  
- Meningococcal B vaccines not routinely recommended  
- First adjuvanted influenza vaccine approved  
- Space PCV13 and PPSV23 by 1 year in 65+ year olds  
- Replace HPV9 for HPV4, but do not revaccinate  
- Tdap is given only once for non-pregnant individuals  
- Accelerated dosing for JE vaccine available

Vaccine-Preventable Diseases

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>209,039</td>
<td>1921</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hib</td>
<td>~20,000</td>
<td>1980</td>
<td>14</td>
<td>30</td>
<td>16</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Measles</td>
<td>884,134</td>
<td>1941</td>
<td>220</td>
<td>55</td>
<td>184</td>
<td>826</td>
<td>188</td>
</tr>
<tr>
<td>Mumps</td>
<td>152,203</td>
<td>1968</td>
<td>404</td>
<td>229</td>
<td>438</td>
<td>1,191</td>
<td>422</td>
</tr>
<tr>
<td>Pertussis</td>
<td>265,209</td>
<td>1934</td>
<td>18,719</td>
<td>46,277</td>
<td>24,231</td>
<td>28,680</td>
<td>13,004</td>
</tr>
<tr>
<td>Rubella</td>
<td>2.5 Million</td>
<td>1964</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>CRS</td>
<td>~30,000</td>
<td>1965</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tetanus</td>
<td>601</td>
<td>1948</td>
<td>36</td>
<td>37</td>
<td>19</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>Varicella</td>
<td>221,983</td>
<td>1964</td>
<td>14,513</td>
<td>13,447</td>
<td>9,067</td>
<td>5,065</td>
<td>5,373</td>
</tr>
</tbody>
</table>
Purpose of Advisory Committee on Immunization Practices

- Review scientific data and vote on vaccine recommendations
- Present findings and discuss vaccine research and scientific data related to vaccine effectiveness and safety, clinical trial results, and manufacturers’ labeling or package insert information
- Outbreaks of vaccine-preventable disease or changes in vaccine supply are reviewed
- Vaccine recommendations include the age(s) when the vaccine should be given, number of doses needed, dosing interval, and precautions and contraindications to administration of vaccines

Current Status

- Under review by CDC
- All sections finalized except Altered Immunocompetence
- Hopefully first-half of 2016

General Recommendations – Altered Immunocompetence

- Guidelines from the Infectious Disease Society of America
- Reason behind delay in publication of General Recs
- A must have reference

Altered Immune Competence

- Asplenia, Cochlear Implants, CSF leaks
- NOT immunocompromised, but increased risk for infectious diseases
- B or T cell dysfunction or absence lead to an immunocompromised state
- Drugs/Biologics that decrease B or T cell function cause immunosuppression or immunodeficiency

http://www.cdc.gov/mmwr/volumes/65/ss/ss6501a1.htm
New Categories of Immunodeficiency

- **Low-level**
  - Low dose corticosteroids
  - Alternate dose corticosteroid therapy
  - Specific medicines described in zoster statement
    - Methotrexate <0.4 mg/kg/week
    - Azathioprine <3.0 mg/kg/day
    - 6-mercaptopurine <1.5 mg/kg/day

- **High-level**
  - Cancer Chemotherapy
  - Two months after solid organ transplant rejection therapy is finished
  - Daily corticosteroid therapy with dose 20 mg or higher prednisone equivalent (or 2 mg/kg or greater) for 14 days or more
  - Receiving immune modulators such as TNF-alpha inhibitors or anti-CD20 cell agents (rituximab)

- **Must be aware of intervals before and after vaccination**


---

Child and Adolescent Immunization Schedule Changes

- **Schedule changes**
  - Order change of vaccines by age of administration
  - Hib to reflect unvaccinated persons with high-risk conditions
  - Add 9vHPV (Gardasil 9)
  - New nomenclature
  - Purple bar for children 9-10 yrs for hx of sexual abuse
  - Revisit Meningooccal (including B)
  - Separate routine and high-risk
  - Addendum bar for individual clinical decision making
  - Utilize same vaccine for series

- **Footnote changes**
  - Footnote catching guidance if OPV used
  - Influenza
  - Guidance for children younger than 9 years
  - Tetanus, Diphtheria, Pertussis (DTaP)
  - Add Quadracel
  - Inadvertent administration if 4th dose too early

---

Recommended Adult Immunization Schedule—United States - 2016

- **PPSV23**
  - Add maximum 3 doses over lifetime
  - Change 19–64 years with immunocompromised to ≥19 years
  - Clarify to evaluate those in nursing homes, not routinely vaccinate

- **PCV13 and PPSV23 intervals**
  - 1 year (remove 6–12 months)

- **Hib**
  - Clarified 1 dose over lifetime
  - 3 doses for post-HSCT (regardless of vaccine hx)
  - 1 dose in unvaccinated with asplenia

- **Available HPV vaccines (2vHPV, 4vHPV, 9vHPV)**
  - Add HPV9

- **Td** – indicated Td for booster

- **Other footnote clarifications**
Meningococcal B Vaccine

- 2 or 3 doses MenB depending on vaccine (Bexsero - MenB-4C) or (Trumenba - MenB)
- Maybe given at same time with other vaccines, different sites
- Both Meningococcal B Vaccines approved for high-risk patients ≥ 10 years*
  - Persons with complement deficiencies
  - Persons that are asplenic
  - Microbiologist
  - Those exposed during outbreaks of disease.
- HIV not a routine indication for MenB or MenACWY
- Men B not routinely recommended for travelers
- Men B: No recommendations for revaccination

*CDC recommends no upper age limit for MenB vaccines in an outbreak

February ACIP Meeting

- Approved for High-Risk Patients
  - Persons with complement deficiencies
  - Persons presentally taking Eculizumab (Soliris®)
  - Persons that are asplenic
  - Microbiologist
  - Those exposed during outbreaks of disease.
  - Ex. 2016 Santa Clara outbreak out at a college campus
- Not considered at this Meeting
  - Routine use in Adolescents
  - Travelers
  - Military Recruits

Meningococcal B Vaccines

- 2 New Meningococcal B vaccines
- Both licensed by FDA for ages 10-25 years
- Trumenba (Pfizer)
  - 3 dose series (0, 2, 6 months)
  - Licensed Oct 29, 2014
- Bexsero (Novartis)
  - 2 dose series (0, 1-6 months)
  - Licensed Jan 23, 2015
  - Licensed in over 30 countries for persons >2 months of age
GRADE Summaries

- MenB-4C (Bexsero)
  - Provides short-term immunogenicity
  - Only short-term studies available
  - 63-94% response rate
  - 68-94% persistence (range of studies 11-24 months)
  - 5 SAEs reported in 3,140 participants
- MenB fHbp (Trumenba)
  - Provides short-term immunogenicity
  - 81-84% at 1 month
  - Persistence 50% at 48 months
  - 7 SAEs reported in 11,338 participants

Estimated Average Annual Cases, Deaths, and Sequelae, 2009-2013

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Serogroup</th>
<th>Cases</th>
<th>Deaths</th>
<th>Sequelae</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 years</td>
<td>B</td>
<td>74-94</td>
<td>7-14</td>
<td>7-19</td>
</tr>
<tr>
<td>11-24 years</td>
<td>All ages</td>
<td>54-67</td>
<td>5-10</td>
<td>5-13</td>
</tr>
<tr>
<td>18-23 years College Students</td>
<td>203-260</td>
<td>20-39</td>
<td>20-52</td>
<td></td>
</tr>
<tr>
<td>18-23 years Non College</td>
<td>14</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-14 years</td>
<td>C &amp; Y</td>
<td>34-43</td>
<td>3-6</td>
<td>3-9</td>
</tr>
<tr>
<td>5-10 years</td>
<td>All ages</td>
<td>62-77</td>
<td>6-12</td>
<td>6-15</td>
</tr>
<tr>
<td>20-39 years</td>
<td>307-393</td>
<td>31-59</td>
<td>31-79</td>
<td></td>
</tr>
</tbody>
</table>

Eighty Percent (80%) of MenB cases in the 11-24 age group occur in ages 16-24 years.

Work Group Summary

- Meningococcal disease is rare, but serious
- Data on MenB vaccines not available
- Many have desire to access vaccines
- Still with problems of second dose of MenACWY in adolescent program
- Risk for disease is low

June ACIP Vote - Passed

- 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)

Challenges

- Cases of MenB that could be prevented with vaccine unknown
  - Limited duration of protection
  - Strain coverage not clinically proven
- Effectiveness data not available
  - Licensure based upon immunological studies
- Impact on carriage unknown
- Impact on circulating strains unknown

Future Direction

- Safety and immunological studies continue
  - Additional data was presented in February 2016 with no safety signals revealed.
- Meningococcal Vaccine (ACYW) in HIV patients
  - Consideration to add to high risk groups
    - Even though response is suboptimal and durations rapidly wanes
  - More analysis by ACIP
Influenza Vaccine Effectiveness 2014-2015 Season

- November 10, 2014-April 10, 2015
- Enrolled 9,707
- 24% influenza positive
- Subtypes
  - 83% A(H3N2)
  - 17% B
    - 85% B Yamagata
    - 15% B Victoria
- Vaccination rate overall 53%
  - 51% Quadrivalent, 49% Trivalent
  - 20% LAIV among age 2-17
  - High-dose Trivalent – 9%
- Effectiveness at age
  - All ages – 13%
  - A(H3N2) – 13%
  - B Yamagata – 55%
  - B Victoria – 63%
- Conclusion
  - Reduced VE due to drifted A(H3N2)
  - Some A(H3N2) were vaccine strain
  - Higher VE for B strains especially for children and adolescents
  - Reduced or non-significant VE against A(H3N2) for LAIV in children and HD and standard dose in >65 years

New Influenza Vaccine

- Fluzone Intradermal Quadrivalent (Sanofi-Pasteur)
  - Approved by FDA June 26, 2015
  - 18 through 64 years
  - 9mcg of hemagglutinin per strain in 0.1ml dose
  - Immunogenic and safe as IIV3
  - Will replace IV intradermal in future
- Fluarix (Novartis) – IIV3
  - Approved Nov. 24, 2015
  - Approved for 65 years and older
  - MF59 Adjuvant
    - Approved in Europe and Canada (30 countries)
    - Enhances immune response
      - Squalene and surfactants
      - Immunological studies non-inferior
      - Generated higher AB titers

Influenza Algorithm for Ages 6 Months Through 8 Years

1. Has the child ever received influenza vaccine?
   - No
   - Yes

2. Did the child receive 2 or more doses of seasonal vaccine since July 2010?
   - No
   - Yes

3. 1 dose

FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

Influenza Positive Tests Reported to CDC by U.S. Public Health Laboratories, National Summary, 2015-2016 Season

© 2016 by the American Pharmacists Association. All rights reserved.
Seasonal Flu Vaccination Coverage, by Age Group and Season, United States, 2009-2015

Influenza Vaccine

**Adult Influenza Vaccination Coverage by High-Risk Condition, 2012-13 season, United States**

- No HR conditions: 33%
- ≥1 HR condition: 45%
- ≥2 HR conditions: 53%
- Pulmonary disease: 44%
- Diabetes: 53%
- Heart disease: 48%
- Cancer: 45%


**Place of flu vaccination (%) for children and adults, United States, early 2015–16 flu season**

- Doctor’s Office: 33.0%
- Hospital, Emergency Department: 10.7%
- Clinic, Health Center or Other Medical Place: 10.0%
- Health Department: 3.5%
- Pharmacy/Store*: 8.2%
- Workplace: 24.8%
- Senior or Community Center: 18.1%
- School, College: 4.5%
- Other Place**: 5.0%

Percentage of receiving vaccination at this type of place

**Influenza Vaccination of Health Care Workers**

- Work setting
  - Hosp
  - LTC

**Influenza Vaccination by Profession 2014-15**

- Pharmacists: 95.3%

**New Recommendations for 2015-2016**

1. Regardless of a recipient’s allergic history, all vaccines should be administered in settings in which personnel and equipment for rapid recognition and treatment of anaphylaxis are available.

2. A previous severe allergic reaction to influenza vaccine, regardless of the component suspected of being responsible for the reaction, is a contraindication to future receipt of the vaccine.

3. Persons with a history of egg allergy who have experienced only hives after exposure to egg should receive influenza vaccine. Any licensed vaccine (i.e., any form of IIV, LAIV, or RIV) that is otherwise appropriate for the recipient’s age and health status may be used.

**Influenza Vaccination of Persons with Egg Allergy**

1. Regardless of a recipient’s allergic history, all vaccines should be administered in settings in which personnel and equipment for rapid recognition and treatment of anaphylaxis are available.

2. A previous severe allergic reaction to influenza vaccine, regardless of the component suspected of being responsible for the reaction, is a contraindication to future receipt of the vaccine.

3. Persons with a history of egg allergy who have experienced only hives after exposure to egg should receive influenza vaccine. Any licensed vaccine (i.e., any form of IIV, LAIV, or RIV) that is otherwise appropriate for the recipient’s age and health status may be used.
Influenza Vaccination of Persons with Egg Allergy

4. Persons who report having had reactions to egg involving symptoms other than hives, such as angioedema, respiratory distress, lightheadedness, or recurrent emesis; or who required epinephrine or another emergency medical intervention, may similarly receive any licensed influenza vaccine (i.e., any form of IIV, LAIV, or RIV) that is appropriate for age and medical conditions. However, the selected vaccine should be administered in a medical setting in which a healthcare provider with experience in the recognition and management of severe allergic conditions is immediately available.

Novel H5N1 Influenza

- New Novel Influenza Workgroup
  - Formed February 2014
- Circulation continues
  - New upsurge in Egypt
  - 165 cases (48 Deaths) Nov 2014-April 2015
  - Significant effect in poultry
- Reports of infected birds in Canada and US
- Other viruses
  - H5N8, H5N2
- New Vaccine
  - Q-Pan available in 2017

Pneumococcal

- Harmonization of recommended intervals
  - Between PCV13 and PPSV23
  - Across age and risk groups
- Current recommendations for both vaccines
  - Adult 65 years and older
  - Ages 2-64 years with:
    - Immunocompromising conditions
    - Functional or anatomical asplenia
    - CSF leaks or cochlear implants
  - Only PPSV23 for patients with other select conditions and risks
    - CV, pulmonary, liver disease
    - Diabetics, smokers, etc

Pneumococcal Vaccines

Age 19-64 Years With Underlying Condition(s)

- Smoking
- Long-term facility resident, or
- Chronic conditions:
  - Heart disease (including hypertension)
  - Lung disease (including bronchiectasis)
  - Diabetes
  - Alcoholism

Pneumococcal Disease

Pronouncing it is hard; getting vaccinated for it is easy

Pneumococcal Vaccine

Age 65 Years or Older

- PCV13 for those with a history of pneumococcal disease
- PPSV23 for those without a history of pneumococcal disease
- PCV13 is preferred for those with a history of pneumococcal disease
- PPSV23 is preferred for those without a history of pneumococcal disease

Pneumococcal Vaccines

- PCV13
  - Age 2-11 years
  - 8 weeks
- PPSV23
  - Age 11-55 years
  - 5 years
- PCV13
  - Age 65 years or older
  - 8 weeks
- PPSV23
  - Age 65 years or older
  - 5 years
ACIP Vote

Adults > 65 years of age with no previous Pneumococcal Vaccine (PCV13 or 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 PCV23 is given earlier than the regular interval, the dose need not be repeated.

HPV Vaccination Coverage (≥1 dose ever), Adults 19-26 years of age by Sex, United States

Data Source: 2014 NHIS

Age at First Dose of HPV Vaccination, Among Adults 19-26 years, United States

Data Source: 2014 NHIS

National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, 2014 – NIS-Teen

* Henry K. Cancer Epidemiol Biomarkers Prev; 1–9, 2016
New HPV Vaccine

- Merck – 9 valent
  - Serotypes 6, 11, 16, 18, 31, 33, 45, 52, 58
  - Virus Like Particle (VLP)
  - Alum Adjuvanted
  - 3 dose series
  - Same target age group
  - Comparable safety
- Increases coverage rates for cervical cancer serotypes to 90%
  - Precancers to 85%
- Still covers 90% of genital warts (types 6 and 11)
- No recommendation to revaccinate HPV4 recipients

Presented in ACIP Meetings last year

- February 2015
  - Concomitant Trials
  - HPV9 to patients post HPV4
  - Recommended for both boys and girls
- June 2015
  - Reviewed status and additional data
- October 2015
  - Reviewed vaccination programs (coverage and impact)

Cost-Analysis

- Cost-savings to use HPV9 instead of HPV4
- Addition of HPV9 to those completed HPV4
  - 117,000-156,000 per QALY
  - Not cost-effective
  - Especially since coverage still so low
- ACIP guidance developed for providers
  - Q and A format

Reasons for Not Getting HPV Vaccine

<table>
<thead>
<tr>
<th>Reason</th>
<th>Parents of Girls</th>
<th>Parents of Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>No need/not necessary</td>
<td>18.3%</td>
<td>18.9%</td>
</tr>
<tr>
<td>Safety concerns/side effects</td>
<td>16.2</td>
<td>18.0</td>
</tr>
<tr>
<td>Lack of knowledge</td>
<td>12.9</td>
<td>13.7</td>
</tr>
<tr>
<td>Not recommended</td>
<td>9.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Not sexually active</td>
<td>8.8</td>
<td>9.9</td>
</tr>
</tbody>
</table>

Human Papillomavirus (HPV) Vaccines

- Safety Profiles
  - Monitoring systems
    - VAERS
    - VSD (CDC and 9 health care systems)
    - CISA - Clinical Immunization Safety Assessment (CDC and 7 academic centers)
  - No increased risk
  - VTE
  - GBS
  - Autoimmune and neurologic diseases
  - SAB or congenital disorders
  - Conclusion
    - No safety concerns observed
    - Monitoring to continue

Conclusions

- high seroconversion after vaccination (90%)
- higher titers than natural infection
- vaccination in younger ages result in higher antibody titer
- the 6 month dose is a booster dose
  - is very important for adequate immunological response

- 2 dose Schedules
  - Approved by W.H.O. in other countries
  - Started before age 15 years
  - HPV2 and HPV4 used in these countries
2 dose regimens

- Vaccine developed as a 3 dose series
- FDA reviewing bridging studies (2016)
  - Studies to be carried out over next 2 years
  - Regimens studied
    - 0, 6 months
    - 0, 12 months
    - 0, 2, 6 months (controls)
    - Booster at 36 months to assess immune memory
- Initial exploratory evaluations
  - non-inferior response at 1 month
  - lower responses in girls with 2 as compared to 3 doses.
- Initial conclusions
  - time interval between dose 1 and 2 is critical
  - completion of series is essential
  - duration of protection has not been assessed
  - More studies planned or ongoing.

Compared to pre-vaccination era
- Decrease in prevalence of HPV4 types in females
  - 64% in Ages 14-19 years
  - 34% in Ages 20-24 years
- No decrease in older groups

Proportion of adults ≥19 years of age who received Tdap vaccine

<table>
<thead>
<tr>
<th>Group</th>
<th>Not Told (%)</th>
<th>Not Recall (%)</th>
<th>Tdap/Td/1d/1d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults, ≥19 years, Overall</td>
<td>51</td>
<td>11</td>
<td>70</td>
</tr>
<tr>
<td>HCP, ≥19 years</td>
<td>35</td>
<td>7</td>
<td>81</td>
</tr>
<tr>
<td>Non-HCP, ≥19 years</td>
<td>53</td>
<td>12</td>
<td>68</td>
</tr>
</tbody>
</table>

*p<0.05 by T test for comparisons between HCP and non-HCP ≥19 years.

Pertussis

- Current recommendations – FDA and CDC
  - One dose of Tdap
  - Exception is every pregnancy
  - To give every 10 years thereafter (June 2013)
- Revaccination of Healthcare Provider
  - Discussed in October 2014
  - No change in recommendation
- Should revaccination of close contacts be considered?
  - Increasing pertussis rates
  - Siblings are primary source of infection
    - Already vaccinated
    - Rate of pregnancy vaccination 13-23%
    - Adult vaccination rates very low
Conclusion of ACIP

- Available evidence does not support a change to current recommendation for close contacts
- Focus on Current Pertussis Programs
  - Maintain high DTaP coverage
  - Sustain Tdap in adolescents
  - Improve adult coverage
  - Vaccinate women during pregnancy

Why are pertussis rates increasing?

- Surveillance bias
  - Increased awareness by providers and public
  - Improved diagnostic tests
- Waning immunity
  - VE decreases to approximately 34% at 2-4 years following Tdap vaccination
- Genetic change to Bordetella pertussis
  - Emergence of pertactin deficient bacteria
    - Vermont 95% of cultures pertactin deficient
    - VE lower but confidence intervals overlapped so significance not demonstrated
    - More studies needed

Herpes Zoster

- Annual Rate increasing
  - 4 cases per 1000 population per year
    - 1 million per year
  - Age adjusted rate is increasing

Vaccine uptake “Sluggish”

- Price
- Storage and handling
- Supply shortages (resolved)
- Medicare Part D reimbursement
- Lower prioritization of adult vaccination
- Fragmented preventive care for seniors

Results – HZ/su vs. HZV

<table>
<thead>
<tr>
<th></th>
<th>HZ/su</th>
<th>HZV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of vaccine</td>
<td>Inactivated</td>
<td>Live</td>
</tr>
<tr>
<td>Adjuvant</td>
<td>Yes (AS01b)</td>
<td>No</td>
</tr>
<tr>
<td>Storage</td>
<td>Refrigerate</td>
<td>Frozen</td>
</tr>
<tr>
<td>Regimen</td>
<td>2 doses (2 mos apart)</td>
<td>1 dose</td>
</tr>
<tr>
<td>Efficacy</td>
<td>97% ±50 yrs</td>
<td>51.3% (varies by age)</td>
</tr>
<tr>
<td>Duration</td>
<td>3.2 yrs</td>
<td>5 yrs</td>
</tr>
<tr>
<td>SAE/ADRs</td>
<td>1.1% / 84.4% (17% Grade 3)</td>
<td>1.9% / 48.3%</td>
</tr>
</tbody>
</table>
HZ/su – Current and Future Studies

- Continue on-going studies in patients over 70 years
- Efficacy in select immunocompromised patients
- Duration of protection
- Boostability at 5 and 10 years
  - Booster after live vaccine
- Impact on daily life
- Comparison study with live vaccine

JE Among Travelers

- For most travelers to Asia
  - Risk of JE is very low
  - Varies based on travel destination, duration, season, and activities
- Incidence
  - Estimated less than 1 case per 1 million travelers
  - Certain factors cause higher risk of JE virus exposure
- 1973–2014
  - 20 JE cases among U.S. travelers or expatriates
  - 9 cases since 1992 following JE Vax approval

Japanese Encephalitis Vaccine

- JE-VC (Ixiaro) only licensed vaccine in U.S.
- Work group reformed March 2015
- Manufacturer new data
  - Accelerated dosing schedule
    - Approved 0 and 28 days
    - Studied 0 and 7 days
  - Concomitant use with rabies vaccine
  - Booster dose at 12 months following primary series
    - May need every 10 years, however no data available for FDA review
    - Company has no plans to study

Accelerated Dosing and Use with Rabies Vaccine

- Only 50% travelers present with time to receive 2 doses 28 days apart
- 1 week interval between doses studied
  - Short-term immunological response non-inferior
  - Titer higher at 6 months and 1 year
  - Administration with rabies vaccine safe and immunogenic
- Approved in Europe
  - Adults over 65 years – recommended booster dose
  - Accelerated schedule (0 and 7 days with booster at 12 months)
- Waiting for FDA label changes

Combination Vaccines

- Quadracel DTaP-IPV vaccine (Sanofi Pasteur)
  - 4-6 year-old group
  - 5th dose of DTaP
  - 4th or 5th dose of IPV
- DTaP-IPV-Hib-HepB (Merck and Sanofi Pasteur)
  - Merck
    - PedvaxHib (Haemophilus influenzae type B)
    - Recombivax (Hepatitis B)
  - Sanofi Pasteur
    - Daptacel (DTaP)
    - Ipol (Polio)
  - Indicated 2, 4, and 6 months
  - Immunogenicity and safety studies acceptable
  - Under review by FDA
**Vaccines on the horizon**

- **Ebola**
  - Live-attenuated recombinant vesicular stomatitis virus vaccine expressing the glycoprotein of Zaire Ebola virus
  - 100% efficacy (Guinea trial)
  - Single dose, stored at -80°C
- **Dengue**
  - Dengvaxia (Sanofi) – CYD-TDV live recombinant tetravalent
  - Licensed in Mexico; 79% pooled efficacy against severe dengue
- **Cholera**
  - 2 vaccines (Netherlands, India)
  - FDA will review 2016
- **Zika**
  - 21 vaccine candidates
  - 1 in preclinical development

---

**Self-Assessment Question #1**

In the 2014-2015 influenza season, which profession had the highest vaccination rate?

A. Pharmacists  
B. Physicians  
C. Physician Assistants  
D. Nurses

---

**Self-Assessment Question #2**

A 50 year old patient received the PCV13 vaccine. When this person turns 65 years of age, what vaccine would they get?

A. PCV13 followed 1 year later by PPSV23  
B. PPSV23 followed 1 year later by PCV13  
C. PPSV23 only  
D. PCV13 only

---

**Self-Assessment Question #3**

What is the ACIP recommended age group for serogroup B meningococcal (MenB) vaccine?

A. All adolescents aged 16 years and older  
B. 16 through 18 years of age with risk factors  
C. 16 through 23 years of age  
D. Adolescents aged 15 to 25 years

---

**Self-Assessment Question #4**

Which vaccine is one of the several meningococcal vaccines recommended for routine use in the Childhood Schedule?

A. Bexsero  
B. Menactra  
C. Menhibrix  
D. Trumebma

---

**Self-Assessment Question #5**

Which one of the following is true regarding 9-valent Human Papillomavirus vaccine (HPV9)?

A. If the series is started with HPV4, it can be completed with HPV9.  
B. If a series was completed using HPV4, the series should be repeated using HPV9.  
C. HPV9 is indicated for women only.  
D. HPV9 is indicated for ages 10-25 years.