Vaccine Update 2019-2020

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7 November 2019
Spokane, WA
Planner & Faculty Disclosures

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- Matthew Hollon, MD, MPH, FACP

Relevant commercial relationships appear in italics below each individual’s name. All others have nothing to disclose.
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Adult Immunization Resource Hub

- Developed as part of ACP’s *I Raise the Rates* initiative.
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Shireesha Dhanireddy, MD

Dr. Dhanireddy, MD is a Professor of Medicine at the University of Washington and medical director of UW Medicine Harborview Medical Center Infectious Diseases & Travel Clinic and the Madison Clinic, the largest HIV clinic in the Pacific Northwest. Dr. Dhanireddy is board certified in Internal Medicine and Infectious Diseases. She serves as an expert HIV consultant for the Mountainwest AIDS Education and Training Program Project ECHO. She conducts research on improving care of people living with HIV as well as people who inject drugs. In addition to research and education, she has co-authored national immunization guidelines.
Vaccine Update 2019-2020

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7 November 2019
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No financial disclosures
Objectives

• General vaccine facts/principles
• Review ACIP recommendations for routine immunizations
• Review vaccines in special populations
22 year old man with h/o egg allergy and no prior influenza vaccine presents for routine visit. He states he has had hives after eating eggs. No h/o anaphylaxis. Which of the following is recommended?

A. Defer vaccination and refer to an allergist for testing
B. Vaccinate with any inactivated influenza vaccine without monitoring
C. Vaccinate and monitor for 30 minutes after receiving any inactivated influenza vaccine
D. Vaccinate with only live attenuated influenza vaccine
Egg Allergy – ACIP Recommendations

• Egg allergy
  – 1.3% of children
  – 0.2% of adults

• Ok to get influenza vaccine if the following:
  – No reaction with cooked eggs
  – Only hives after exposure

• If have anaphylaxis, angioedema, respiratory distress or required epinephrine
  – CAN STILL RECEIVE VACCINE – but should be given by a provider who can recognize allergic reactions
  – 33 cases of anaphylaxis out of 25.1 million doses
  – 8/33 had sx within 30 min
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A. Defer vaccination and refer to an allergist for testing

B. Vaccinate with any inactivated influenza vaccine without monitoring

C. Vaccinate and monitor for 30 minutes after receiving any inactivated influenza vaccine

D. Vaccinate with only live attenuated influenza vaccine
67 year old man with moderate COPD presents for his routine visit in the fall.
Which of the following is most appropriate regarding immunization against influenza?

A. Live attenuated vaccine should be given as it has been found to be more effective than the inactivated vaccine.
B. High-dose, trivalent, inactivated vaccine should be administered.
C. Standard-dose, trivalent, inactivated vaccine should be administered
D. Standard-dose, quadrivalent, inactivated vaccine should be administered
Influenza

- > 30,000 deaths in US per year
- Never too late to vaccinate
- Greatest mortality risk in elderly, immunosuppressed, obese, pregnant
- Everyone age >6 months old should be vaccinated!!
Prevention: High-dose Trivalent Influenza Vaccine


Sponsored by manufacturer

Double the cost
Fluzone High-Dose Vaccine Efficacy Study

- Randomized, blinded study in US, Canada (N = 32,000)
- 2011-12 (mild) & 2012-13 (moderately severe) seasons
- Lab confirmed influenza: 1.43% HD vs. 1.89% SD
  - Relative efficacy 24.2% (9.7, 36.5)
  - OR: 4-5 fewer cases/1000 vaccinated
  - 217 vaccinations to prevent one additional case
Influenza and Parotitis

• 2014-2015 – several 100 cases of confirmed influenza with parotitis
  – Mostly in school-aged children and men
  – More likely with influenza A (H3N2)

• CDC recommends clinicians to evaluate patients with acute parotitis (not associated with mumps outbreak) to consider influenza
67 year old man with moderate COPD presents for his routine visit in the fall. Which of the following is most appropriate regarding immunization against influenza?

A. Live attenuated vaccine should be given as it has been found to be more effective than the inactivated vaccine.

B. High-dose, trivalent, inactivated vaccine should be administered.

C. Standard-dose, trivalent, inactivated vaccine should be administered.

D. Standard-dose, quadrivalent, inactivated vaccine should be administered.
Question: Measles Vaccine

71 year old man underwent unrelated HSCT for MDS AML 12 years ago which was relatively uncomplicated without GVHD and he has been off immunosuppression for 2 years. His primary care provider checks a rubeola serology as there is an outbreak in the community and patient is concerned regarding risk. The serology is negative. Which of the following do you recommend?

A. Vaccine is not recommended as it is live and there is risk of vaccine related disease
B. One dose of MMR vaccine recommended
C. Two doses of MMR vaccine recommended
Measles: Clinical Presentation

- High fever, cough, conjunctivitis, coryza (3 Cs)
- +/- Koplik spots
- Rash
  - Top to bottom
  - 4 days after symptoms start

- Potential serious complications
  - Encephalitis (1/1000)
  - Pneumonia (1/20)
  - Subacute sclerosing panencephalitis (SSPE) (1/1000)
  - Death (1-2/1000)
Incubation period 7-21 days
Contagious 4 days before to 4 days after the rash appears
9/10 susceptible people with close contact develop measles
Spread by direct or airborne contact with infectious droplets
Measles virus can remain infectious on surfaces and in the air for up to 2 hours after an infected person leaves an area
Measles: Immunization & Efficacy

- Licensed in 1963
  - Inactivated vaccination from 1963-1967 ➔ live attenuated
  - Revaccinate those who received inactivated (killed) vaccine
- Usually administered as MMR or MMRV
- One dose of MMR: approximately 93% effective
- Two doses of MMR: approximately 97% effective
- Two doses recommended since 1989
2019 Measles Outbreak: Epidemiology, Washington

- 73 cases in Clark County, WA
- 1 case in King County

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Clark County DOH
2019 Measles Outbreak: Epidemiology

NUMBER OF MEASLES CASES REPORTED BY YEAR
2010–2019** (as of April 19, 2019)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>63</td>
</tr>
<tr>
<td>2011</td>
<td>220</td>
</tr>
<tr>
<td>2012</td>
<td>55</td>
</tr>
<tr>
<td>2013</td>
<td>187</td>
</tr>
<tr>
<td>2014</td>
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</tr>
<tr>
<td>2015</td>
<td>188</td>
</tr>
<tr>
<td>2016</td>
<td>86</td>
</tr>
<tr>
<td>2017</td>
<td>120</td>
</tr>
<tr>
<td>2018*</td>
<td>372</td>
</tr>
<tr>
<td>2019**</td>
<td>626</td>
</tr>
</tbody>
</table>

2019 Measles Outbreak: Transmission

- 9 in 10 exposed will contract
- Direct contact with droplets
- Airborne spread – up to 2hrs

Most infectious:
- 4 days BEFORE
- 4 days after symptoms start

>90% vaccination to stop spread
2019 Measles Outbreak

- **People at high risk**
  - Infants and children <5yrs
  - Adults over 20ys
  - Pregnant women
  - Immunocompromised

- **Complications**
  - 1 in 4: hospitalization
  - 1 in 1000: acute encephalitis
  - 1-2 in 1000: death from respiratory and neuro complications
  - Sub-acute sclerosing panencephalitis (SSPE)
    - Fatal neurodegeneration
    - 7-10 years after infection

https://www.cdc.gov/measles/hcp/index.html
2019 Measles Outbreak: Vaccine Facts

- **MMR or MMRV** – live virus vaccine
- **Give at 12mos**
  - If given younger, revaccinate at 12mos

**Effectiveness**
- Immunity is lifelong*

**Contraindications to vaccination**
- Known pregnancy
- CD4 <200 cells/μL
- Known severe immunodeficiency

https://www.cdc.gov/vaccines/vpd/mmr/hcp/recommendations.html
Do I need to have my titer checked?

- Not if you were vaccinated

Evidence of presumptive immunity

- Written documentation of adequate vaccination
  - 1+ doses of vaccine at ≥12mos
    - Pre-school age
    - Adults not at high risk
  - 2 doses
    - School age children
    - College students
    - Healthcare personnel
    - International travelers
- Lab evidence of immunity
- Lab confirmation of measles disease
- Birth prior to 1957

https://www.cdc.gov/measles/hcp/index.html
Who doesn’t need vaccine:
- Adults born before 1957 (except HCW – should receive during an outbreak)
- Those with laboratory evidence of immunity

Who needs 1 dose:
- Adults born after 1957 considered low risk without documented vaccine and no lab evidence of immunity or prior infection

Who needs 2 doses:
- Healthcare workers
- International travelers born in 1957 or later
- Persons attending colleges or post-high school educational institutions
Measles Vaccine

Post transplant

- 2 years post transplant
- No active GVHD
- At least 1 year off immunosuppressive medications
71 year old man underwent unrelated HSCT for MDS AML 12 years ago which was relatively uncomplicated without GVHD and he has been off immunosuppression for 2 years. His primary care provider checks a rubeola serology as there is an outbreak in the community and patient is concerned regarding risk. The serology is negative. Which of the following do you recommend?

A. Vaccine is not recommended as it is live and there is risk of vaccine related disease
B. One dose of MMR vaccine recommended
C. Two doses of MMR vaccine recommended
An 24 year old healthy male presents for routine clinic visit. He is not on any medications. He smokes cigarettes. He is sexually active with both men and women and uses condoms consistently. Which of the following is correct regarding HPV vaccine?

A. He should receive 2 doses of HPV-9 spaced 6 months apart  
B. He should receive 3 doses of HPV-9 at 0, 1, and 6 months  
C. He does not need HPV vaccine as he is already sexually active  
D. HPV vaccination is only recommended in males through age 21
As of late 2016, only the nonavalent (9vHPV) vaccine is being distributed in the US.

**Nonavalent: Merck Gardasil 9®**
- Types 6, 11, 16, 18, 31, 33, 45, 52, 58
- FDA-approved for females and males 9-45* yrs
- Cost per dose $133/$193
Prevalence of HPV 6,11,16,18* in cervicovaginal swabs, by age group
NHANES, 2003-2006 and 2009-2012

Markowitz, et al. Pediatrics, 2016  *weighted prevalence
“Near Disappearance of Warts” in Australia

- National HPV vaccination program in Australia since 2007
  - FREE vaccination to women 12-26 yo, 70% coverage
- Prevalence of warts evaluated in large STD Clinic 2004-2011
- Wart prevalence decreased dramatically

<table>
<thead>
<tr>
<th></th>
<th>2007-2008</th>
<th>2010-2011</th>
<th>aOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women &lt;21 yo</td>
<td>18.6%</td>
<td>1.9%</td>
<td>0.44</td>
</tr>
<tr>
<td>Heterosexual men &lt;21 yo</td>
<td>22.9%</td>
<td>2.9%</td>
<td>0.42</td>
</tr>
</tbody>
</table>

- But no change in heterosexual women or men >30 yo, MSM, or non-residents

Read TR, STI 2011
HPV Vaccine Recommendations

• Routine vaccination at age 11 or 12 years*

• Recommended through age 26 for females and males through age 26 not previously vaccinated

• Recommended for MSM and immunocompromised men (including persons with HIV infection) through age 26

* Vaccination series can be started at 9 years of age

MMWR 2015;64:300-4
What about age 27-45?

**ACIP guidance** “For adults aged 27 through 45 years, public health benefit of HPV vaccination in this age range is minimal; shared clinical decision-making is recommended because some persons who are not adequately vaccinated might benefit”
Now 2 Doses Adequate in Some Populations

• For boys and girls age 9-14:
  – 2 dose schedule: 0, 6-12 months

• For those who are >14 or immunocompromised:
  – 3 dose schedule: 0, 1-2, 6 months
  – 2 dose schedule not yet tested in this group, stay tuned

• Hope to reduce costs and increase uptake!

Meites et al, MMWR 2016: 65(49); 1405-1408.
Iversen et al, JAMA 2016: 316(22); 2411-2421.
An 24 year old healthy male presents for routine clinic visit. He is not on any medications. He smokes cigarettes. He is sexually active with both men and women and uses condoms consistently. Which of the following is correct regarding HPV vaccine?

A. He should receive 2 doses of HPV-9 spaced 6 months apart

B. He should receive 3 doses of HPV-9 at 0, 1, and 6 months

C. He does not need HPV vaccine as he is already sexually active

D. HPV vaccination is only recommended in males through age 21
A 65 year old man presents to the clinic for routine care. He has not been vaccinated against for pneumonia. Which of the following is most accurate?

A. He does not need vaccination unless he has other risk factors
B. He needs a PCV13 alone
C. He needs a PCV13 followed 1 year later by a PPSV23
D. He needs a PPSV23 alone
Pneumococcal Disease

- 4 million cases/year in US
- 445,000 hospitalizations/year
- 22,000 deaths/year

Cox CM. CDC Manual for the Surveillance of Vaccine Preventable Diseases
### Pneumococcal Disease

<table>
<thead>
<tr>
<th>Age</th>
<th>Disease Incidence Cases/100,00 (number of cases)</th>
<th>Death Rate Deaths/100,000 (number of deaths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>31.4 (142)</td>
<td>0.22 (1)</td>
</tr>
<tr>
<td>1</td>
<td>24.6 (112)</td>
<td>0.22 (1)</td>
</tr>
<tr>
<td>2-4</td>
<td>12.6 (171)</td>
<td>0.15 (2)</td>
</tr>
<tr>
<td>5-17</td>
<td>2.2 (111)</td>
<td>0.02 (1)</td>
</tr>
<tr>
<td>18-34</td>
<td>3.7 (261)</td>
<td>0.26 (18)</td>
</tr>
<tr>
<td>35-49</td>
<td>10.3 (670)</td>
<td>0.65 (42)</td>
</tr>
<tr>
<td>50-64</td>
<td>19.5 (1,068)</td>
<td>1.86 (102)</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>37.0 (1,291)</td>
<td>5.61 (196)</td>
</tr>
<tr>
<td>Total</td>
<td>12.9 (3,828)</td>
<td>1.22 (363)</td>
</tr>
</tbody>
</table>
Pneumococcal Vaccine in Adults: Who needs it?

• Persons $\geq$ 65 years of age

• Persons age 19-64 with:
  – Chronic lung disease (asthma or COPD)
  – Chronic heart disease (except HTN)
  – Chronic liver disease
  – CSF leak
  – Smokers
  – Diabetes
  – Alcoholism
  – Functional or anatomic asplenia
  – Immunocompromising conditions
Pneumococcal Vaccine Efficacy

- Direct effects of PPSV23 vaccination in the elderly controversial
- Cochrane Review
  - Strong evidence for PPSV23 efficacy against invasive disease
  - Inconclusive efficacy for pneumonia
    - In patients with COPD, decreased likelihood of exacerbations
  - Not associated with significant decrease in mortality

Cochrane Review. 2013, 2017
Pneumococcal Vaccine (PPSV23): Revaccination

- Not recommended for most persons
- Who should be revaccinated?
  - Persons aged 19-64 with
    - Functional or anatomic asplenia
    - Immunocompromising conditions
- Multiple vaccinations not recommended

MMWR 2010. 59(34):1102-1106
PPSV23 vs PCV13

- PPSV23 – contains polysaccharide antigens
- PCV13 – contains immunogenic proteins conjugated to pneumococcal polysaccharides

- PCV13 recommended for some immunocompromised (HIV) adults age < 65
- What about PCV13 for persons ≥ 65 years?
Recommendation Change for PCV13 in Adults ≥ 65 years

- All individuals 65 and over should receive PPSV23
- In 2014, ACIP recommended PCV13 (for those who have not received in adulthood) AND PPSV23 to be given 1 year apart in person ≥ 65 years
- In June 2019, ACIP recommends PCV13 based on shared decision-making for adults ≥ 65 years who do not have an immunocompromising condition
Epidemiology of Invasive Pneumococcal Disease Among High-Risk Adults Since the Introduction of Pneumococcal Conjugate Vaccine for Children


Background. Certain chronic diseases increase risk for invasive pneumococcal disease (IPD) and are indications for receipt of 23-valent pneumococcal polysaccharide vaccine (PPV23). Since the pediatric introduction of 7-valent pneumococcal conjugate vaccine (PCV7) in 2000, incidence of IPD among adults has declined. The relative magnitude of these indirect effects among persons with and without PPV23 indications is unknown.

Methods. We evaluated IPD incidence among adults with and without PPV23 indications using population- and laboratory-based data collected during 1998–2009 and estimates of the PPV23 indications from the National Health Interview Survey. We compared rates before and after PCV7 use by age, race, PPV23 indication, and serotype.

Results. The proportion of adult IPD cases with PPV23 indications increased from 51% before to 61% after PCV7 introduction (P < .0001). PCV7-serotype IPD declined among all race, age, and PPV23 indication strata, with declines of 41% (P = .01) among white adults, 52% (P = .0004) among black adults, 59% (P < .0001) among adults aged 60 years or older, 32% (P = .0001) among adults 31–59 years old, 20% (P = .0006) among adults aged 20–30 years, and 15% (P = .03) among younger adults. These reductions in IPD occurred with and without controlling for other factors.

Indirect effects: Pneumococcal conjugate vaccine introduction

**FIGURE 1. Rate* of vaccine-type (VT) invasive pneumococcal disease (IPD) before and after introduction of pneumococcal conjugate vaccine (PCV7), by age group and year — Active Bacterial Core surveillance, United States, 1998–2003**

- **PCV7 target population**
- **Rate**
- **Age group (yrs)**: <5, 5–17, 18–39, 40–64, ≥65

* Per 100,000 population.
† For each age group, the decrease in VT IPD rate for 2003 compared with the 1998–1999 baseline is statistically significant (p<0.05).
Vaccine prevented more than twice as many IPD cases in 2003 through indirect effects on pneumococcal transmission.

Replacement disease minor in comparison to disease prevented.
A 65 year old man presents to the clinic for routine care. He has not been vaccinated against for pneumonia. Which of the following is most accurate?

A. He does not need vaccination unless he has other risk factors
B. He needs a PCV13 alone
C. He needs a PCV13 followed 1 year later by a PPSV23
D. He needs a PPSV23 alone
A 62 year old woman with a self-reported history of shingles 10 years ago and type II diabetes presents to clinic. She received the live-attenuated zoster vaccine (ZVL) 2 years ago. What do you recommend regarding the zoster vaccine?

A. Vaccine not indicated given her history of zoster
B. Vaccine not indicated as she has received ZVL
C. Check VZV titer to confirm history. If negative, proceed with vaccination
D. Recommend recombinant zoster vaccine
Zoster Vaccines

Varicella-Zoster Virus

Live Attenuated Vaccine
**VZL**

Recombinant Subunit Vaccine (Hz/su)
**RZV**

Glycoprotein E
AS01 Adjuvant System
ACIP Recommendations for Zoster Vaccine

• RZV is preferred over ZVL
• Healthy adults ≥ 50 years
  – Regardless of prior h/o HZ
  – No need to wait any specific period of time after HZ to give RZV (just not during acute episode)
• 2 doses, 2-6 months apart
• Wait a minimum of 8 weeks after giving ZVL to give RZV
• ACIP not recommending use in immunocompromised persons (except low-dose immunosuppression)
RZV (Shingrix®) Efficacy Against First Episode of Zoster in Immunocompetent Patients

• Background
  - Randomized, Controlled, Phase 3 trial
  - Multicenter, International; n = 15,411
  - Adults aged ≥50
  - Safety and efficacy of herpes zoster subunit (HZ/su) vaccine
  - Excluded those with prior h/o zoster or immunosuppressed
  - Excluded if previously vaccinated against varicella or zoster
  - Median follow-up 3.2 years

• Study Arms (two doses one month apart)
  - Zoster Subunit Vaccine (n = 7,698)
  - Placebo (n = 7,713)
RZV Efficacy Against First Episode of Zoster in Immunocompetent Patients \( \geq 50 \)
RZV Efficacy Against First Episode of Zoster in Immunocompetent Patients >50

A 62 year old woman with a self-reported history of shingles 10 years ago and type II diabetes presents to clinic. She received the live-attenuated zoster vaccine (VZL) 2 years ago. What do you recommend regarding the zoster vaccine?

A. Vaccine not indicated given her history of zoster
B. Vaccine not indicated as she has received ZVL
C. Check VZV titer to confirm history. If negative, proceed with vaccination
D. Recommend recombinant zoster vaccine
A 11 year old otherwise healthy child presents for routine vaccinations. Which of the following is the most accurate regarding meningococcal vaccination?

A. Not needed at this age
B. Give meningococcal conjugate vaccine (MCV4)
C. Give meningococcal polysaccharide vaccine (MPSV4)
D. Give meningococcal B vaccine only
E. Give both MCV4 and meningococcal B vaccines
Meningococcal Quadrivalent Vaccines
Serogroups Included in Vaccine: A, C, Y, W-135
Meningococcal Quadrivalent Vaccines
Serogroups Included in Vaccine: A, C, Y, W-135

• *Menactra (MCV4)*
  - Conjugate vaccine
  - FDA-Approved in 2005
  - Approved for ages 9 months to 55 years

• *Menveo (MCV4)*
  - Conjugate vaccine
  - FDA-Approved in 2010
  - Approved for ages 2 months to 55 years
Meningococcal B Vaccines
Meningococcal Group B Vaccines
Serogroups Included in Vaccine: B

- **MenB-4C** (*Bexsero*)
  - Recombinant vaccine
  - FDA-Approved in 2015 for ages 10 to 25 years
  - 2 dose series ≥1 month apart

- **MenB-FHbp** (*Trumenba*)
  - Recombinant vaccine
  - FDA approved in 2014 for ages 10 to 25 years
  - Healthy adolescents and young adults: 2 doses at 0, 6 months
  - Adults at risk for meningococcal disease: 3 doses at 0, 1-2, 6 months
  - Vaccinated during serogroup B meningococcal disease outbreaks: 3 doses at 0, 1-2, 6 months
ACIP Meningococcal B Vaccine Recommendation
Adolescents and Young Adults

- Recommended for people 16-23 years of age at increased risk, preferably 16-18:
  - Meningococcal B outbreak
  - Asplenia
  - Complement deficiency
  - On eculizumab (Soliris)
  - Microbiologist with potential exposure to Neisseria meningitidis
- Same vaccine should be used for all doses

CDC. MMWR. 2015;64:1171-6.
A 11 year old otherwise healthy child presents for routine vaccinations. Which of the following is the most accurate regarding meningococcal vaccination?

A. Not needed at this age
B. Give meningococcal conjugate vaccine (MCV4)
C. Give meningococcal polysaccharide vaccine (MPSV4)
D. Give meningococcal B vaccine only
E. Give both MCV4 and meningococcal B vaccines
A 27 year old pregnant woman presents for her routine obstetrics visit at her 32 week gestation visit. She is G2P1. She has a healthy 2 year daughter at home. Which statement is correct regarding Tdap in pregnancy?

A. She should receive a Tdap today only if she has not had in the past 5 years.
B. She should receive Tdap only if she did not receive during her prior pregnancy
C. She should receive Tdap today
Tdap Recommendations

WHO
- All adolescents aged 11 through 18 years (age 11-12 preferred)
- All adults aged 19 through 64 who have not received a dose
- All adults aged ≥ 65 years (2/2012)
- All pregnant women during each pregnancy

WHAT
- Boostrix preferred for adults ≥ 65 years (but either okay)

WHEN
- Regardless of interval between last Td if has not received Tdap
- During each pregnancy for pregnant women – optimum timing is 3rd trimester (27-34 weeks)

MMWR 2013;62:131-135
A 27 year old pregnant woman presents for her routine obstetrics visit at her 32 week gestation visit. She is G2P1. She has a healthy 2 year daughter at home. Which statement is correct regarding Tdap in pregnancy?

A. She should receive a Tdap today only if she has not had in the past 5 years.
B. She should receive Tdap only if she did not receive during her prior pregnancy
C. She should receive Tdap today
A couple in their 30’s plans to adopt a 2 year old girl from Ethiopia. They have a regular babysitter and another 7 year old child.

Who should receive the Hepatitis A vaccine?

A. Both parents
B. Mother only
C. Both parents and 7 year old child
D. Both parents, 7 year old child, and babysitter
Hepatitis A

• Vaccine recommended for all close personal contacts, including regular babysitters of children adopted from high/intermediate endemic areas

• Timing – ideally at *least 2 weeks prior to arrival* of child but within first 60 days of arrival
Question: Hepatitis A

A couple in their 30’s plans to adopt a 2 year old girl from Ethiopia. They have a regular babysitter and another 7 year old child. Who should receive the Hepatitis A vaccine?

A. Both parents
B. Mother only
C. Both parents and 7 year old child
D. Both parents, 7 year old child, and babysitter
A 50 year old man living homeless is notified by public health that 2 people living in his tent community were diagnosed with hepatitis A in the last week. He does not know if he has been vaccinated but he is not in routine medical care. He denies any symptoms. Which of the following is most appropriate:

A. He does not need vaccine as he is asymptomatic
B. He should receive Hep A vaccine as soon as possible
C. He should receive combination Hep A and Hep B vaccine as he is likely non-immune to both
Hepatitis A Post-Exposure Prophylaxis

- No PEP needed if healthy and previously vaccinated
- PEP should be given immediately (within 14 days of exposure)
- No data available for combination HepA/HepB vaccine for PEP in HAV outbreak setting (contains only half the Hep A antigen compared to HAV vaccine – so not recommended after exposure)
- If non-immune, should complete 2-dose vaccine series (2nd dose at least 6 months after 1st dose)
- Immune globulin + vaccine (at separate sites) for immunocompromised and those with chronic liver disease
- For infants < 12 months, immune globulin only ASAP (within 2 weeks)
A 50 year old man living homeless is notified by public health that 2 people living in his tent community were diagnosed with hepatitis A in the last week. He does not know if he has been vaccinated but he is not in routine medical care. He denies any symptoms. Which of the following is most appropriate:

A. He does not need vaccine as he is asymptomatic

B. **He should receive Hep A vaccine as soon as possible**

C. He should receive combination Hep A and Hep B vaccine as he is likely non-immune to both
Hepatitis A

• RNA virus
• Fecal-oral transmission
• Vaccine is highly effective, >95% protection
• No chronic phase of illness – acute only
• Can lead to fulminant hepatitis
Hepatitis A – clinical manifestations

• Symptoms start usually 4 weeks after exposure (range 2-7 weeks)
• Symptoms include:
  – Fever
  – Fatigue
  – Nausea/Vomiting
  – Diarrhea
  – Clay-colored stools
  – Jaundice
Hepatitis A: On the Rise!

• > 15,000 cases of acute hepatitis A reported to CDC between 2016-2018
• Nearly 300% increase compared to 2013-2015
• Majority of cases seen in people living homeless and PWID

Foster MA et al. MMWR Morb Mortal Wkly Rep 2019
California Outbreak

<table>
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<tr>
<th>Jurisdiction</th>
<th>Cases</th>
<th>Hospitalizations</th>
<th>Deaths</th>
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<tbody>
<tr>
<td>San Diego</td>
<td>576</td>
<td>395</td>
<td>20</td>
</tr>
<tr>
<td>Santa Cruz</td>
<td>76</td>
<td>33</td>
<td>1</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>12</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>24</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>688</strong></td>
<td><strong>449</strong></td>
<td><strong>21</strong></td>
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</table>
What about Washington State?

Hepatitis A outbreak among homeless, drug users hits 4 Wash. counties

by KOMO New Staff | Tuesday, July 30th 2019

https://www.doh.wa.gov/YouandYourFamily/Immunization/DiseasesandVaccines/HepatitisADisease/HepatitisA2019
Hepatitis A: King County Experience

3 of 14 in PWID, homeless
2500 vaccine doses given

Confirmed hepatitis A cases among King County residents, 2014-2019

<table>
<thead>
<tr>
<th>Year</th>
<th>Count</th>
<th>Rate, per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>5</td>
<td>0.25</td>
</tr>
<tr>
<td>2015</td>
<td>9</td>
<td>0.44</td>
</tr>
<tr>
<td>2016</td>
<td>14</td>
<td>0.67</td>
</tr>
<tr>
<td>2017</td>
<td>10</td>
<td>0.46</td>
</tr>
<tr>
<td>2018</td>
<td>14</td>
<td>0.64</td>
</tr>
<tr>
<td>2019*</td>
<td>14</td>
<td>0.64</td>
</tr>
</tbody>
</table>

*2019 as of July 31st, 2019, rates use 2018 population data
Hepatitis A: What can we do?

VACCINATE!!!
Hepatitis A

- Universal vaccination for children since 2006 (between 12-23 months)
- 3 formulations of vaccine available – Havrix, Vaqta, Twinrix (with Hep B vaccine)
  - Havrix and Vaqta are 2 doses 0, and 6-12 months apart
- Duration of protection is unknown but felt to be lifelong
  - No need to check antibody titers after vaccination*
  - Negative titer does not mean lack of immunity
Hepatitis A: Who to Vaccinate

- Experiencing homelessness
- Involved in or exposed to a hepatitis A outbreak
- Traveling or working in countries in which hepatitis A is common
- Working in research with hepatitis A
- In sexual relationship with an infected person
- Have chronic liver disease
- Use illicit drugs
- Men who have sex with men
- Have clotting disorder (ie. hemophilia)
CLEANING TO KILL HEPATITIS A

- ATTENTION: A person living homeless in King County was recently hospitalized with hepatitis A (hep A)
- Hep A is very contagious
- Special cleaning and disinfecting is important to prevent hep A from spreading

DISINFECT SURFACES THAT PEOPLE TOUCH A LOT

- All bathroom surfaces
- All kitchen surfaces
- Anything else people touch a lot

USE BLEACH + WATER TO KILL HEPATITIS A

- Most cleaning products don’t kill hep A
- Bleach kills hep A. Always mix bleach with water

HOW TO USE BLEACH TO DISINFECT FOR HEPATITIS A

1. Protect yourself from the bleach: Wear gloves and a mask
2. Get air flowing: Open windows or use a fan
3. Clean surfaces: Use soapy water
4. Disinfect surfaces:
   - If using 8.25% bleach: mix 1 cup bleach with 1 gallon water.
   - If using 5.25% bleach: mix 1.5 cups bleach with 1 gallon water.
5. Let it sit: Apply bleach mix, leave for 1-2 minutes
6. Rinse with water. Dry with paper towel or air dry

Don’t save your bleach + water mix. It stops working after 24 hours.

To check if a different product kills hep A, read the label. The product label should say “effective against hepatitis A” or “effective against feline calicivirus.” Follow instruction on the label.
25 year old nursing student is being seen in student health clinic for routine visit. She brings medical records indicating that she received her first dose of hepatitis B vaccine 18 months ago and the second vaccine 1 month thereafter. She asks today if she requires additional doses. No other medical problems and she is not on any other medications.

Which of the following is most appropriate?

A. No additional doses of HBV vaccination needed
B. Restart HBV vaccine series
C. Check hepatitis B surface Ab titer to assess immunity
D. Give 3rd dose of HBV vaccine series today
ACIP Recommendations for HBV Vaccine

• Recombivax®: 3 dose series (0, 1, 6 months) 10 µg/mL IM
OR
• Engerix®: 3 dose series (0, 1, 6 months) 20 µg in 1.0 mL IM
OR
• Heplisav®: 2-dose series (0, 1 month) 20 µg in 0.5 mL IM

Anti-HBs should be assessed 1-2 months after completion of series
25 year old nursing student is being seen in student health clinic for routine visit. She brings medical records indicating that she received her first dose of hepatitis B vaccine 18 months ago and the second vaccine 1 month thereafter. She asks today if she requires additional doses. No other medical problems and she is not on any other medications.

Which of the following is most appropriate?

A. No additional doses of HBV vaccination needed
B. Restart HBV vaccine series
C. Check hepatitis B surface Ab titer to assess immunity
D. Give 3rd dose of HBV vaccine series today
Heplisav

- FDA approved 11/2017 for adults 18+ years
- Only 2-dose adjuvanted Hep B vaccine for adults
- Adjuvant is a phosphorothioate oligonucleotide that targets TLR-9 to enhance antibody response
# Heplisav

<table>
<thead>
<tr>
<th>Study</th>
<th>Age range</th>
<th>Sample size</th>
<th>Heplisav-B (95% CI)</th>
<th>Engerix-B (95% CI)</th>
<th>Difference in SPRs (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>18 to 55</td>
<td>Heplisav-B (N=1511) Engerix-B (N=521)</td>
<td>95% (93.9, 96.1)</td>
<td>81.3% (77.8, 84.6)</td>
<td>13.7% (104, 17.5)</td>
</tr>
<tr>
<td>Study 2</td>
<td>40 to 70</td>
<td>Heplisav-B (N=1121) Engerix-B (N=353)</td>
<td>90.1% (88.2, 91.8)</td>
<td>70.5% (65.6, 75.2)</td>
<td>19.6% (14.7, 24.8)</td>
</tr>
<tr>
<td>Study 3</td>
<td>18 to 70</td>
<td>Heplisav-B (N=5592) Engerix-B (N=2782)</td>
<td>90.0% (87.4, 92.2)</td>
<td>65.1% (59.6, 70.3)</td>
<td>24.9% (19.3, 30.7)</td>
</tr>
</tbody>
</table>

- Halperin SA et al. Vaccine 2012
- Heyward WL et al. Vaccine 2013
- Jackson S et al. Vaccine 2017
Concern for Acute MI

- One of the randomized controlled trials showed increased risk of acute MI
  - 0.3% (n=19) with Heplisav-B vs 0.1% (n=3) with Engerix-B
  - All had CV risk factors but more in the Heplisav group at CV risk factors

- Conclusions from FDA
  - Acute MI incidence was expected based on CV risk factors
  - No temporal association with vaccine administration
  - Recommended ongoing surveillance post-marketing
# SPECIAL POPULATIONS

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pregnancy 14</th>
<th>Immuno-compromised (excluding HIV infection)15, 16</th>
<th>HIV infection CD4+ count (cells/µl)16, 17</th>
<th>Asplenia, complement deficiencies18, 19</th>
<th>End-stage renal disease, on hemodialysis20</th>
<th>Heart or lung disease, alcoholism21</th>
<th>Chronic liver disease10</th>
<th>Diabetes 12</th>
<th>Health care personnel10, 22</th>
<th>Men who have sex with men10, 22</th>
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<tbody>
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<td>Influenza11</td>
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<tr>
<td>Tdap2 or Td3</td>
<td>1 dose Tdap each pregnancy</td>
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<td>MMR3</td>
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<td>VAR3</td>
<td>Contraindicated</td>
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<td>RZV4 (preferred) or ZVL5</td>
<td>Contraindicated</td>
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<tr>
<td>HPV-Female23</td>
<td>3 doses through age 26 yrs</td>
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<td>2 or 3 doses through age 26 yrs</td>
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<tr>
<td>HPV-Male23</td>
<td>3 doses through age 26 yrs</td>
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<td>2 or 3 doses through age 21 yrs</td>
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<td>HepA10</td>
<td>2 or 3 doses depending on vaccine</td>
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<td></td>
<td></td>
<td></td>
<td>3 doses</td>
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<tr>
<td>MenACWY10</td>
<td>1 or 2 doses depending on indication, then booster every 5 yrs if risk remains</td>
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<tr>
<td>MenB10</td>
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<td></td>
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<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
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<tr>
<td>Hib11</td>
<td>3 doses HSCT recipients only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
<td></td>
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</tbody>
</table>

1 dose annually

1 dose Tdap, then Td booster every 10 yrs
Vaccinations for Immunocompromised Hosts: Levels of Immunosuppression

**High-level Immunosuppression**
- Combined primary immunodeficiency disorder
- Receiving cancer chemotherapy
- Within 2 months after SOT
- HIV with CD4 count < 200 in adolescents/adults and < 15% in children
- Daily steroid therapy \( \geq 20\text{mg} \) (or \( > 2\text{mg/kg/day} \) for pts < 10kg) of prednisone or equivalent for \( \geq 14 \text{ days} \)
- Certain biologic immune modulators or rituximab
- HSCT (duration of high level immunosuppression variable)

**Low-level immunosuppression**
- Asymptomatic HIV with CD4 count 200-499 for adolescents/adults and 15-24% in children
- Lower doses of steroids
- MTX \( \leq 0.4\text{mg/kg/week} \), azathioprine \( \leq 3\text{mg/kg/day} \), 6-mercaptopurine \( \leq 1.5\text{mg/kg/day} \)
Vaccinations for Persons with HIV

If CD4 count > 200
- Inactivated influenza
- Tdap
- Pneumococcal
- Meningococcal
- HBV
- HPV
- MMR
- Varicella

If CD4 count < 200
- Inactivated influenza
- Tdap
- Pneumococcal
- Meningococcal
- HBV
- HPV
- MMR
- Varicella
Special Recommendations in HIV+ adults

• Meningococcal vaccine
  – 0, 8 weeks; then q5 years thereafter

• Pneumococcal vaccine age 19-64
  – PCV13 once, then PPSV23 at least 8 weeks later
  – Repeat PPSV23 5 years later

• No recommendations for either zoster vaccine
Vaccinations for Asplenic Persons

• Live influenza vaccine contraindicated

• Special recommendations
  – Hib (even as adults if not immunized previously or prior to elective splenectomy)
  – MenACWY (q 5 years) and MenB (no recs for booster doses)
  – PCV13 once as adult, followed by PPSV23 at least 8 weeks later; repeat PPSV23 5 years later

• Above vaccines should be given at least 2 weeks prior to elective splenectomy, if possible
# Vaccines for Healthcare Workers

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| **Hepatitis B**               | If you don’t have documented evidence of a complete hepB vaccine series, or if you don’t have an up-to-date blood test that shows you are immune to hepatitis B (i.e., no serologic evidence of immunity or prior vaccination) then you should  
  - Get the 3-dose series (dose #1 now, #2 in 1 month, #3 approximately 5 months after #2).  
  - Get anti-HBs serologic tested 1–2 months after dose #3. |
| **Flu (Influenza)**           | Get 1 dose of influenza vaccine annually.                                      |
| **MMR (Measles, Mumps, & Rubella)** | If you were born in 1957 or later and have not had the MMR vaccine, or if you don’t have an up-to-date blood test that shows you are immune to measles or mumps (i.e., no serologic evidence of immunity or prior vaccination), get 2 doses of MMR (1 dose now and the 2nd dose at least 28 days later).  
If you were born in 1957 or later and have not had the MMR vaccine, or if you don’t have an up-to-date blood test that shows you are immune to rubella, only 1 dose of MMR is recommended. However, you may end up receiving 2 doses, because the rubella component is in the combination vaccine with measles and mumps.  
For HCWs born before 1957, see the [MMR ACIP vaccine recommendations](#). |
| **Varicella (Chickenpox)**    | If you have not had chickenpox (varicella), if you haven’t had varicella vaccine, or if you don’t have an up-to-date blood test that shows you are immune to varicella (i.e., no serologic evidence of immunity or prior vaccination) get 2 doses of varicella vaccine, 4 weeks apart. |
| **Tdap (Tetanus, Diphtheria, Pertussis)** | Get a one-time dose of Tdap as soon as possible if you have not received Tdap previously (regardless of when previous dose of Td was received).  
  Get Td boosters every 10 years thereafter.  
Pregnant HCWs need to get a dose of Tdap during each pregnancy. |
| **Meningococcal**             | Those who are routinely exposed to isolates of *N. meningitidis* should get one dose. |
Resources

www.cdc.gov/vaccines/recs/ACIP/default.htm
www.immunize.org/acip
THANK YOU
sdhanir@uw.edu