2 – 3pm
Preventive Medicine that Works: Adult Immunization

SPEAKER
Robert Hopkins, Jr., MD, FACP, FAAP

Immunization of Immunodeficient Adults: Avoiding Missed Opportunities to Optimize Care

Robert Hopkins, MD
Professor of Internal Medicine and Pediatrics
Director, Division of General Internal Medicine
University of Arkansas for Medical Sciences

Learning Objectives

• Discuss the current gap between national immunization goals and current immunization rates
• Use the current ACIP guidelines to vaccinate adult patients
• Implement strategies to improve immunization rates in clinician offices
• Review vaccination recommendations for immune compromised patients
  – Cancer
  – Autoimmune diseases/iatrogenic immune suppression
  – Immunodeficiency (Inherited, Acquired)
  – Transplant patients
  – Spleenectomy, Splenic Dysfunction

Influenza Vaccination Coverage among Adults: 2011-12 and 2012-13 Seasons

<table>
<thead>
<tr>
<th>Group</th>
<th>2011-12 (%)</th>
<th>2012-13 (%)</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons ≥ 18 yrs</td>
<td>38.8</td>
<td>41.5</td>
<td>+2.7*</td>
</tr>
<tr>
<td>Persons 18-49 yrs, all</td>
<td>28.6</td>
<td>31.1</td>
<td>+2.5*</td>
</tr>
<tr>
<td>Persons 18-49 yrs, high risk</td>
<td>36.8</td>
<td>39.8</td>
<td>+3.0*</td>
</tr>
<tr>
<td>Persons 50-64 yrs</td>
<td>42.7</td>
<td>45.1</td>
<td>+2.4*</td>
</tr>
<tr>
<td>Persons ≥ 65 yrs</td>
<td>64.9</td>
<td>66.2</td>
<td>+1.3*</td>
</tr>
</tbody>
</table>

* Statistically significant difference, P < 0.05.

Off-Label/Investigational Discussion

In accordance with pmiCME policy, faculty have been asked to disclose discussion of unlabeled or unapproved use(s) of drugs or devices during the course of their presentations.

Presenter Disclosure Information

The following relationships exist related to this presentation:

► Robert H. Hopkins, Jr., MD, FACP, FAAP, has no financial relationships to disclose.

COI Statement

Robert Hopkins, MD
– No financial conflicts
– Nonfinancial conflict
• Strong belief in adult immunization: prev. care value
• Dismay at the underutilization of this set of tools!!
Adult Vaccination Coverage, Selected Vaccines by Age and High-Risk Status, United States

Herpes Zoster (Shingles), ≥60 yrs
- 20.1% (44)
- Healthy People 2020 Target: 90% PPV ≥65 yrs, 60% PPV HR 19-64 yrs, 30% Shingles.

Data Source: 2012 NHIS.

Pneumococcal, HR 19-64 yrs
- 59.0%
- Pneumococcal, ≥65 yrs
- Pneumococcal, 265 yrs

Herpes Zoster (Shingles), 265 yrs
- 20.1% (44)

Healthy People 2020 Targets: 90% PPV ≥65 yrs, 60% PPV HR 19-64 yrs, 30% Shingles.

Data Source: 2012 NHIS.

Non-Influenza Adult Vaccination Coverage: Vaccines with Increases from 2011 to 2012

HPV (≥1 dose), Women 19-26 yrs
- 52.2%
- Tdap, HCP 19-64 yrs
- 63.2%

Herpes Zoster, 265 yrs
- 20.1%
- Tdap, 19-64 yrs

Healthy People 2020 Target: 90% HepB Healthcare Personnel (HCP).

Data Source: 2011-2012 NHIS.

Why Review This Data?

• WE must be strong advocates for vaccination!
• WE need to work with our practice teams to improve vaccination
• ALL of us are needed to make improvements!!
  – Patients
  – Families
  – Primary Care
  – Specialists
  – Public health
  – Pharmacists
  – Team members

Influenza

Vaccine changes annually, Recommend yearly!!
• 1 dose for adults
  – (Children < 9 years, 1st year vaccinated = 2 doses)
• Vaccines: IIV = TIV, QIV, hdIIV, sqIIV, 'egg-free'. LAIV = LQIV
• US ‘Season’: Vaccine avail. >> ‘disease passed’ (Aug/Sept-April)
• Predominant strain types (Dz and Vax) since 1977:
  – A H1N1, A H3N2, B
• 2013-14 Vaccine strains:
  – A/California/7/2009 (H1N1)-like virus
  – A/Victoria/361/2011 H3N2 virus
  – B/Massachusetts/2/2012–like virus
  – B/Brisbane/60/2008–like virus (QUAD Vaccines only)

IIV = Inactivated Influenza vaccine; QIV = Quadrivalent influenza vaccine; hdIIV = high-dose influenza vaccine; sqIIV = Subunit (recombinant) influenza vaccine; LAIV = Live inactivated influenza vaccine (Quadrix/Flu). http://www.cdc.gov/vaccines/recs/acip/downloads/mtg-slides-feb09/04-1-flu.pdf.

Td >> Tdap

- All adults should have (had) a primary Tetanus Series
  - 3 doses of tetanus-containing vaccine over 6+ months
- Tdap Recommendation: All Adults
  - Single dose to replace one dose Td (booster or primary)
  - Including those 65 and older (Added in 2011)
  - May give <10 years following last Td
- Special emphasis: adults with infant contact:
  - HEALTHCARE, Parents, Child Care, etc.
- 2013: Tdap intrapartum with each pregnancy
  - Regardless of interval/prior Tdap (best @ 27-35 weeks)


Pneumococcal Disease and Vaccination

- >2000 Adults/yr 65+ die from invasive Pneumococcal Disease
  - Bacteremia, Sepsis, Meningitis
- PPS23 = ‘adult standard’ vaccine = purified capsular polysaccharide
  - 23 types -> cause of 88% of bacteremic PNC disease
  - PPS23 has 60-70% efficacy vs. invasive disease (IPD)
  - Immunity lasts at least 5 yr following 1 dose
  - Local reactions – only common AE
  - BOOSTER if imm before age 65; NOT ‘routinely’ if immunized @ 65+
- PCV13 = ‘pediatric standard’ vaccine = conjugated to protein
  - 13 types -> ~50% IPD in immunocompromised adults
  - No published efficacy studies in adults (PCV7 data in HIV, reports)
- CAPITA is available in abstract form only
  - ACIP recommends – combined strategy with PPS23 – in adults
  - Details in subsequent slides


Estimated Number of Cases of Invasive Pneumococcal Disease (IPD)* in the US, 2008

- 4,157
- 3,947
- 6,420
- 15,418
- 14,777

*IPD: Bacteremia and meningitis.

Invasive Pneumococcal Disease: Impact in Immune Compromised Patients

<table>
<thead>
<tr>
<th>Population</th>
<th>Risk Factor</th>
<th>IPD Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults 18-64 years</td>
<td>Undifferentiated</td>
<td>3.8/100,000</td>
</tr>
<tr>
<td>Adults 18-64 years</td>
<td>Hematologic Malignancy</td>
<td>186/100,000</td>
</tr>
<tr>
<td>Adults</td>
<td>HIV</td>
<td>173/100,000</td>
</tr>
<tr>
<td>Adults 65+ years</td>
<td>Undifferentiated</td>
<td>36.4/100,000</td>
</tr>
</tbody>
</table>


US Pneumococcal Vaccines:

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Body</th>
<th>Year</th>
<th>Population</th>
<th>Indication</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>PPS14</td>
<td>FDA</td>
<td>1977</td>
<td>High Risk</td>
<td>Prevent IPD</td>
<td>1st lic PNC vax</td>
</tr>
<tr>
<td>PPS23</td>
<td>FDA</td>
<td>1983</td>
<td>High Risk Adult, child</td>
<td>Prevent IPD</td>
<td>Initial then updated recs</td>
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<tr>
<td>PCV7</td>
<td>FDA</td>
<td>2000</td>
<td>Children 6-11 mo</td>
<td>Prevent PNC Infection</td>
<td>New Vaccine</td>
</tr>
<tr>
<td>PCV13</td>
<td>FDA</td>
<td>2010</td>
<td>Children 6-11 mo</td>
<td>Prevent PNC Infection</td>
<td>Changed additional types</td>
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<tr>
<td>ACIP</td>
<td>FDA</td>
<td>2012</td>
<td>High Risk Adults</td>
<td>Prevent IPD</td>
<td>PCV13/PPS</td>
</tr>
<tr>
<td>ACIP</td>
<td>FDA</td>
<td>2012</td>
<td>High Risk Kids &lt;5 yr</td>
<td>Prevent IPD</td>
<td>PCV13/PPS</td>
</tr>
<tr>
<td>ACIP</td>
<td>FDA</td>
<td>2014</td>
<td>Adults 65+</td>
<td>Prevent IPD</td>
<td>Best before PPS23</td>
</tr>
</tbody>
</table>

KEY:FDA only:ACIP only:FDA and ACIP:Recent Change


PPS23 Vaccine Effectiveness

- 7 Meta-Analyses of RCT (Most recent Cochrane 1/2013)
  - Conclusions inconsistent re: cause specific outcomes
  - Agreement: REDUCTION in IPD; NO reduction in ALL CAUSE mortality, pneumonia
- 3 Meta-Analyses of OBS studies
  - Consistent results: vaccine is effective for prevention of IPD
- Recent RCT Results
  - Invasive PNC Dz: Odds ratio (consistent) 0.26 (CI 0.25-0.46)
  - Pneumonia: Odds ratio (signif. heterogeneity) 0.71 (CI 0.52-0.97)
  - Mortality: Odds ratio 0.87 (CI 0.69-1.10)
- Summary
  - Data = PPS prevents IPD, not compelling for Pneumonia, Mortality

PCV13 Adult Vaccine Effectiveness

**CAPiTA**
- PC RCT PCV13 unimm. 65+ aged adults, Netherlands
  - PCV7 in Dutch infants since 6/2006 -> PCV10 in March 2011
- 84,000+ participants PCV13 vs Placebo
- Primary: 1st-bacteremic CAP with vaccine-type PNC
- Secondary: 1st non-bacteremic CAP, Other IPD
- Serologic and Urinary Ag used to identify PNC infection
- Mortality and secondary endpoints, reduced PNC infection
- Presented, considered by ACIP Pneumococcal group in summer 2014; abstract and secondary reports available.
- DID NOT address sequential PCV13/PPSV23 immunization
- FULL STUDY NOT YET PUBLISHED


Pneumococcal Immunization

**PCV + PPSV23**
- **HIGHEST Risk**
  - Immune compromise (IC), ‘Anatomic Risk’,
  - Adults 65+ (NEW 9/2014)

**PPSV23 ONLY**
- INCREASED Risk
  - Smokers, Chronic Medical Conditions – Not Immunocompromised

NO PNEUMOCOCCAL VACCINE
- AVERAGE Risk
  - Young (<65), NO Chronic Medical Conditions

Flowsheet: Pneumococcal Vaccine

**INCREASED RISK**
- Pneumococcal polysaccharide (PPSV23) NOW
- Booster once at 65+ yrs/5+ years later (only if initial dose before 64)

**HIGHEST RISK**
- Pneumococcal (PPSV23) vaccine-naive patients (best practice):
  - PCV13 followed by PPSV23 at least 8 weeks later
  - Booster PPSV23 in 5 yrs AND final PPSV23 at 5+ yrs/65+ yrs
- Previously PPSV23-vaccinated patients:
  - PCV13 – at least 1 year after prior dose PPSV23 – followed by
    - Booster PPSV23 5 yrs after prior PPSV23 (and 5+ wks after PCV13)
    - AND final PPSV23 at 5+ yrs/65+ yrs
  - 65+:
    - PCV13 (if Pneumococcal vaccine-naive) followed 6-12 months later by PPSV23
    - PCV13 at least 1 year after PPSV23 (if any)/Pneumococcal vaccination
    - NO additional booster doses if sole indication is age =65 years

**AVERAGE RISK**
- PCV + PPSV23
- Booster at 5+ yrs/65+ yrs
- Booster 5 yrs after prior PPSV23 (and 8+ wks after PCV13)
- NO additional booster doses if solely indication is age =65 years

Adapted 1/2015.
**HiB Vaccine**

- Haemophilus influenzae, type B
  - Highly contagious Gram-negative bacteria -- common in children until vaccination
  - More common in adults since childhood vaccination routine
  - All children (3-4 doses) since ~1990
  - Adult recommendations (NEW 2014)
    - Hematopoietic Stem Cell Transplant Recipient
    - 3 Dose series @ 6-12 months post transplant
    - Separate doses by minimum 4 weeks
    - Regardless of prior vaccination history
    - NOT Routinely recommended in HIV (Low risk)
    - Spleenectomy (Functional/Anatomic), Hemoglobinopathy
      - 1 dose if not previously vaccinated
      - All at least 14 days prior to spleenectomy

**Meningococcal Vaccine**

- 3 Current vaccines: Types A, C, Y, W-135
  - MPS4: Polysaccharide vaccine (subcut, 1 dose)
    - Available since 1978, fair efficacy; OK if conjugate not available
    - Preferred for primary vaccination >56 years
    - MCV4 (2 brands): Conjugate vaccines (intramuscular, 1 dose)
      - Approved 2005, 2010
      - Preferred for primary vaccination <56 years and boosters
      - Booster recommended @ 5 years if high risk persists
  - 1 Current vaccine: Type B
    - Approved fall 2014
    - Not incorporated into ACIP schedules (as of 2/2015)

**ACIP Adult Hepatitis A, B Indications**

- Hepatitis A
  - Chronic Liver Disease
    - Includes chronic HBV, HCV
  - MSM
  - Injection Drug Users
  - Travel to endemic area
  - Recipients of Clotting factors
  - Lab workers
  - Dialysis HBV
    - High dose vaccine: at ESRD pt

- Hepatitis B
  - Diabetes mellitus (>40 GVE, >60 MAY give)
  - Chronic Liver Disease includes HCV
  - MSM
  - Injection Drug Users
  - Travel to endemic area
  - Recipients of Clotting factors
  - >1 sexual partner/6 mo, STD clinics
  - HEALTHCARE WORKERS
  - HIV
  - Household and sexual contacts of HBV patients
  - Male prison inmates, correction staff
  - Developmental disability facility patients and staff
  - Alaska and pacific island natives
  - Any others that want to prevent HBV

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**HiB Disease: Immune Compromise**

- ...era of universal pediatric immunization against Hib. Healthy adult individuals typically have protective immunity against invasive Hib disease, but over 90% of them have the potential for pathogen carriage. In contrast, we have found a lack of protective immunity against Hib in adults suffering from multiple myeloma and chronic renal failure...

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**Meningococcal Indications: Adult**

- College freshmen who will live in a dormitory
- Asplenia (anatomic or functional)
- Terminal complement deficiencies
- Travelers to ‘at-risk areas’: Sub-Saharan Africa, December-June
  - Required for entry into Saudi Arabia/Mecca during Hajj
- Microbiologists (possible occupational meningococcal contact)
- Prefer Conjugate for persons <56 and revaccination
  - Prefer Polysaccharide for those 56+ and needing only 1 dose
- HIV: NOT AN INDICATION (NEW 2014 -> Low absolute risk)
**Hepatitis A, B**

- Vaccination currently recommended in all US children
- Vaccines
  - HAV (2 manufacturers)
  - HBV (2 manufacturers)
  - Combination HAV/HBV
  - HBV High-Dose (FDA, ACIP-> ESRD, IDSA has additional recommendations)
- Do NOT need to start over if series is delayed
- Multiple approved regimens: individually or in combination
  - HAV: 2 doses @ 6+ month interval
  - HBV: 3 doses @ 0, 1 m, 6 m
  - Dose and alternate regimens are different for Hemodialysis patients
- Combination: 3 doses @ 0, 1 m, 6 m.
- Accelerated Combo: 4 doses @ 0, 7 d, 21-30 d, booster @ 1 yr


**HPV**

- Vaccines:
  - HPV4: Types 6,11,16,18 3 dose series @ 0, 2 m, 6 m
  - HPV2: Types 16,18 3 dose series @ 0, 1-2 m, 6 m
  - HPV: Approved 12/10/2014 (ACIP recommendations PND)
  - Ideally should finish series with same vaccine began, but mix is OK...
  - Effective protection at least 5 years based on published data (ongoing)
  - Effective only for types patient has NOT previously acquired
- HPV4 or HPV2 in Women 11-12 (9-26): Prevent Cervical CA (Pre-CA), Genital Warts, ‘other HPV disease’
- HPV4 in Men 9-26: Prevent anal/penile preCA and CA, Genital Warts other HPV disease
- Contraindications/Cautions:
  - Local reaction, syncope, bronchospasm reported
  - Not recommended in pregnancy- no proven AE (administer after delivery)
- Immunosupression can reduce efficacy
- VACCINE DOES NOT CHANGE CERVICAL CANCER SCREENING REC!

http://www.cdc.gov/mmwr/preview/mmwrhtml/00053391.htm.

**MMR, Varicella**

- 2 doses: immune competent children, selected adults
  - Healthcare workers, In/l adoption, daycare workers, women (nonpregnant)
  - Most born before 1957 have immunity to M, M, R [1980 for V]
- Contraindications:
  - HIGHLY immune compromised
  - Acute/severe illness, allergy to vaccine component
  - Recent transfusion (ANY product which contains Ab)
  - Active untreated TB
  - Pregnancy
- MMR: not pregnant x 3 months after vaccine- prevent NRS
- Varicella: Avoiding all live vaccines (risk lower than MMR)

http://www.cdc.gov/mmwr/preview/mmwrhtml/00053391.htm.

**Zoster**

- Vaccinate HEALTHY 60+ adults
- ACIP: Not immune compromised
  - FDA approved from age 50 (Coverage? Cost/Benefit?)
  - Regardless of prior Zoster (opinion: wait 1 year)
  - No need to test and/or vaccinate for Varicella before administration
- Contraindications
  - Pregnancy
  - Anaphylactic Hypersensitivity to Neomycin, Gelatin
  - No need to defer for ‘at risk contacts’ – transmission risk low
  - No need to defer if recent transfusion, Ab containing products
- Adverse events
  - Occasional mild varicella-like rash @ vaccine site
- 1 DOSE. Frozen vaccine: Give within 60 minutes, 0.65 ml SQ,Deltoid
- Duration of protection: At least 4 years. No booster.

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5705a1.htm.

**Immunodeficiency (ID) Cartoon**

<table>
<thead>
<tr>
<th>Immune Compromise</th>
<th>Humoral</th>
<th>Cellular</th>
<th>Complement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer (-: Cancer Treatment)</td>
<td></td>
<td></td>
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<tr>
<td>Stem Cell Transplant</td>
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<tr>
<td>Spleenectomy/Aplasia (Anatomic, Functional)</td>
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<tr>
<td>Renal Failure/Nephrotic</td>
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<tr>
<td>HIV</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Immunosuppressive Treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inherited Immunodeficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSF Leak/Cochlear Imp</td>
<td></td>
<td>Anatomic Barrier Deficit – Not ID...</td>
<td></td>
</tr>
</tbody>
</table>

- = Impaired Immune Component

**Highly Immunosuppressed**

- Inherited combined immunodeficiency (SCID)
- Currently receiving cancer chemotherapy
- First 2 months after solid organ transplant
- HIV with CD4 <200 cells/mm³ (<15% in kids)
- Prednisone ≥20 mg/d (equivalent) x 14+ days
- Biologic Immunomodulators
  - Anti-B Cell Antibody, TNF-α Blocker, Others
- Variable interval after stem cell transplant (3+ mo)
  - More prolonged for allogeneic than autologous
  - More severe with GVHD, MUD
**Low-Level Immunosuppression**

- Asymptomatic HIV+ CD4 200–499 cells/mm³
- Prednisone <20 mg/d (or equivalent) x 14+ days
  - Includes patients on alternate-day steroids
- Others:
  - Methotrexate <0.4 mg/kg/week
  - Azathioprine <3 mg/kg/d
  - 6-Mercaptopurine <1.5 mg/kg/d
  - Higher doses = Highly (Cancer Chemotherapy)

**General Principles: Vaccination of Immune Compromised Adults**

- Highly immunosuppressed: **NO** Live virus vaccines
  - Balance risk vs benefit in low-level immune suppression
- Evidence-based ‘rules’
  - MMR, VAR given to HIV patients with LOW-LEVEL immunosuppression
  - **NO** OPV in SCID (Proven high VAPP risk)
- Opinion/Theory-based recommendations
  - LAIV not recommended in Immunosuppression
  - Even if risk is low, we have other options!
  - VAR not recommended in Inflammatory Bowel Disease patients on 6-mercaptopurine
  - Theoretic risk of disseminated OKA (Vaccine)-strain varicella

**General Principles: Vaccination of Immune Compromised Adults 2**

- Vaccinate prior to immunosuppression if possible
- Live vaccines
  - Administer ≥ 4 weeks pre-immunosuppression
  - AVOID within 2 weeks of start of immune suppression
- Inactivated vaccines best given >2 weeks prior to immune suppression

**IOM: Vaccines, Adverse Effects 1**

- Evidence shows no causal relationship between onset or exacerbation of
  - MS, SLE, vasculitis, RA, Juvenile Idiopathic Arthritis
- With any of the following:
  - MMR
  - Tetanus (Includes Tdap, DTaP, DT, Tetanus Toxoid…)
  - Influenza
  - Hepatitis A
  - Hepatitis B
  - HPV
- Predominance of evidence
  - Vaccines are not important triggers of disease flares
  - AND should not be withheld

**IOM: Vaccines, Adverse Effects 2**

- Evidence insufficient to support concern vaccines might trigger rejection in solid organ transplants
  - Best data for IVV
- Vaccines are **NOT** important triggers of rejection episodes and should not be withheld to reduce rejection risk

**Vaccine Effectiveness and Safety in Immunocompromised 1**

- Sickle Cell Disease
  - 93% reduction IPD with introduction of PCV
  - Direct benefit +/- herd immunity...
- IV in HIV and in Heart Transplant
  - Reduction in disease
- VAR and reduction in severe varicella disease
  - Kidney and Liver transplants
  - Children with Leukemia and HIV

Vaccine Effectiveness and Safety in Immunocompromised 2

- A number of studies report ‘protective’ post-vaccine antibody levels vs pathogens
  - BUT
    - Many VPD without established ‘protective Ab levels’
      e.g. Pertussis
    - Some immunosuppressed conditions require higher ‘protective Ab levels’ than those established for patients without the condition
      e.g. Splenectomy: Hib, Pneumococci
    - Imperfect correlation Ab levels with protection
    - Ab levels may not correlate with protection from diseases
      e.g. Zoster

VPO = Vaccine-preventable diseases.
Rubin, et al. CID 2014;58 (1Feb).

Cancer and Immunization

Best to vaccinate prior to treatment: Live ≥4 weeks, Inactivated ≥2 weeks

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Prior to (During) Chem</th>
<th>3+ mos CTX</th>
<th>≥6 mos Anti-B-cell Ab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>ACIP Schedule (NOT LAIV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tdap, Td Vaccines</td>
<td>ACIP Schedule (no GA specific recommendation)</td>
<td></td>
<td></td>
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<tr>
<td>Pneumococcal Vax’s</td>
<td>PCV13 + PPSV23 then PPSV</td>
<td>ACIP Schedule (for Non-IC)</td>
<td></td>
</tr>
<tr>
<td>Hib Vaccine</td>
<td>ACIP Schedule (CACTX alone not indication)</td>
<td></td>
<td></td>
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<tr>
<td>Meningococcal Vax’s</td>
<td>ACIP Schedule (CA/CTX alone not indication)</td>
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<tr>
<td>Hep A Vaccine</td>
<td>ACIP Schedule (CA/CTX alone not indication)</td>
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<td></td>
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<tr>
<td>HPV</td>
<td>ACIP Schedule (CA/CTX alone not indication)</td>
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</tr>
<tr>
<td>MMR</td>
<td>NOT RECOMMENDED</td>
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</tr>
<tr>
<td>VAR</td>
<td>NOT RECOMMENDED</td>
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</tr>
<tr>
<td>Zoster</td>
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</table>


HIV

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>ACIP</th>
<th>IDSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>Annual</td>
<td>Annual, NOT LAIV</td>
</tr>
<tr>
<td>Tdap, Td Vaccines</td>
<td>ACIP Schedule (1st series, 1 adult Tdap, q10 year Td, qPreg)</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal Vaccine</td>
<td>PCV13 + PPSV23 then PPSV23 booster in 5 years and at 65+</td>
<td></td>
</tr>
<tr>
<td>Hib Vaccine</td>
<td>Not Recommended</td>
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<tr>
<td>Meningococcal Vaccines</td>
<td>ACIP Schedule (CA/CTX alone not indication)</td>
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<td>Hep B Vaccine</td>
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<tr>
<td>MMR</td>
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<td>VAR</td>
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<tr>
<td>Zoster</td>
<td>NO IF CD4 ≥ 200</td>
<td>Contraindicated</td>
</tr>
</tbody>
</table>


Immunization: Autoimmune Disease with Iatrogenic Immune Suppression

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>BEFORE</th>
<th>LOW-LEVEL Immunosuppression</th>
<th>HIGH-LEVEL Immunosuppression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>ACIP Schedule</td>
<td>Annual using IV</td>
<td>(NO LAIV)</td>
</tr>
<tr>
<td>Tdap, Td Vaccines</td>
<td>ACIP Schedule (1st series, 1 adult Tdap, q10 year Td, qPreg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal Vax’s</td>
<td>PCV13 + PPSV23 then PPSV23 booster in 5 years and at 65+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hib Vaccine</td>
<td>Not recommended</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal Vax’s</td>
<td>ACIP Schedule (Iatrogenic Immunosuppression alone not indication)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hep B Vaccine</td>
<td>ACIP Schedule (Iatrogenic Immunosuppression alone not indication)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hep A Vaccine</td>
<td>ACIP Schedule (Iatrogenic Immunosuppression alone not indication)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV</td>
<td>ACIP Schedule (Iatrogenic Immunosuppression alone not indication)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMR</td>
<td>ACIP Schedule</td>
<td>Contraindicated</td>
<td></td>
</tr>
<tr>
<td>VAR</td>
<td>ACIP Schedule</td>
<td>Nonimmune OK</td>
<td>IDSA Contraindicated</td>
</tr>
<tr>
<td>Zoster</td>
<td>IDSA, ACR Age 50+</td>
<td>Before</td>
<td>Age 50+ OK</td>
</tr>
</tbody>
</table>


Hemoglobinopathy, Asplenia, CSF Leaks and Cochlear Implants

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Hemoglobinopathy, Asplenia</th>
<th>CSF Leaks and Cochlear Implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>Annual</td>
<td>(DSSA, NO LAIV)</td>
</tr>
<tr>
<td>Tdap, Td Vaccines</td>
<td>ACIP Schedule (1st series, 1 adult Tdap, q10 year Td, qPreg)</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal Vaccine</td>
<td>PCV13 + PPSV23 then PPSV23 booster in 5 years and at 65+</td>
<td></td>
</tr>
<tr>
<td>Hib Vaccine</td>
<td>1 dose (74 days pre-splenectomy)</td>
<td>Not Recommended</td>
</tr>
<tr>
<td>Meningococcal Vaccine</td>
<td>ACIP Schedule (Iatrogenic Immunosuppression alone not indication)</td>
<td></td>
</tr>
<tr>
<td>Hep B Vaccine</td>
<td>ACIP Schedule (No specific indication in these IC groups)</td>
<td></td>
</tr>
<tr>
<td>Hep A Vaccine</td>
<td>ACIP Schedule (No specific indication in these IC groups)</td>
<td></td>
</tr>
<tr>
<td>HPV</td>
<td>ACIP Schedule (No specific indication in these IC groups)</td>
<td></td>
</tr>
<tr>
<td>MMR</td>
<td>ACIP Schedule (No specific indication in these IC groups)</td>
<td></td>
</tr>
<tr>
<td>VAR</td>
<td>ACIP Schedule (No specific indication in these IC groups)</td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td>ACIP Schedule (No specific indication in these IC groups)</td>
<td></td>
</tr>
</tbody>
</table>

Solid Organ Transplants, ESRD, Nephrotic Syndrome

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pre-Transplant</th>
<th>Start 2-4 Months Post-TXP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>Annual (IDSA, NO LAIV)</td>
<td>Annual/Outbreak—Immediate</td>
</tr>
<tr>
<td>Pneumococcal Vaccine</td>
<td>ACIP Schedule (1st series, 1 adult Tdap, 11-18 yr Td, q10yr)</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>Hib Vaccine</td>
<td>ACIP Schedule (SOT Alone not indication)</td>
<td>Begin 2 months after TXP</td>
</tr>
<tr>
<td>Varicella</td>
<td>ACIP Schedule (SOT Alone not indication)</td>
<td>Begin 2 months after TXP</td>
</tr>
<tr>
<td>Hep A Vaccine</td>
<td>ACIP (Child Liver only)</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>HPV</td>
<td>ACIP Schedule to age 26 (SOT Alone not indication)</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>MMR</td>
<td>ACIP (total 2 doses &gt;4 wk pre-TXP)</td>
<td>Contraindicated</td>
</tr>
<tr>
<td>VAR</td>
<td>ACIP (total 2 doses &gt;4 wk pre-TXP)</td>
<td>Contraindicated</td>
</tr>
<tr>
<td>Zoster</td>
<td>IDSA: Var immune &gt;50 yr</td>
<td>Contraindicated</td>
</tr>
<tr>
<td></td>
<td>IFF NO IS+C-GVH, VAR</td>
<td>Contraindicated</td>
</tr>
</tbody>
</table>

Influenza Vaccine: ACIP Schedule
Pneumococcal Vaccine: ACIP Schedule (1st series, 1 adult Tdap, q10yr Td, q10yr)
Hib Vaccine: ACIP Schedule (SOT Alone not indication)
Varicella: ACIP Schedule (SOT Alone not indication)
Hep A Vaccine: ACIP (Child Liver only)
HPV: ACIP Schedule to age 26 (SOT Alone not indication)
MMR: ACIP (total 2 doses >4 wk pre-TXP)
VAR: ACIP (total 2 doses >4 wk pre-TXP)
Zoster: IDSA: Var immune >50 yr

Post-Stem Cell Transplant

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendation</th>
<th>Interval AFTER Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>IV Annually (NO LAIV)</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>Pneumococcal Conjugate*</td>
<td>3 doses (4 if Cir-Chir)</td>
<td>Begin 3-6 months after TXP</td>
</tr>
<tr>
<td>Pneumococcal Conjugate*</td>
<td>3 doses (4 if Cir-Chir)</td>
<td>Begin 3-6 months after TXP</td>
</tr>
<tr>
<td>Varicella</td>
<td>1-dose (NOT Chronic GVH)</td>
<td>1 year after Transplant</td>
</tr>
<tr>
<td>Hib Vaccine</td>
<td>3 doses series</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>Meningococcal Vaccines</td>
<td>(11-15 yr only)</td>
<td>2 doses series</td>
</tr>
<tr>
<td>Hep B Vaccine</td>
<td>3-dose series, Var (10-14 yrs)</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>Hep A Vaccine</td>
<td>ACIP Schedule</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>HPV</td>
<td>ACIP Schedule (HPV 4)</td>
<td>Begin 6 months after TXP</td>
</tr>
<tr>
<td>MMR</td>
<td>Pre Tdap, Var immune</td>
<td>2 yr after Tdap, 8 mo afterG</td>
</tr>
<tr>
<td>VAR</td>
<td>Pre Tdap, Var immune</td>
<td>2 yr after Tdap, 8 mo afterG</td>
</tr>
</tbody>
</table>

Zoster: IDSA: Var immune >50 yr

Influenza Vaccine: ACIP Schedule: IIV. LAIV OK Except SCID, new/GV+SCT.
Pneumococcal Vaccine: No HCW Specific Rec. Rec. all women 9-26 yr
Varicella: ACIP Schedule (IC avoid contact if skin lesions)
Zoster: ACIP Schedule (IC avoid contact if skin lesions)
Rotavirus: ACIP Childhood Schedule (IC: Avoid diapers x 4 weeks)
OPV: SHOULD NOT BE ADMINISTERED

Zoster: IDSA: Var immune >50 yr

Healthcare Workers

• Key in implementation of Adult Immunization
  – Education
    • Multiple studies: MD recommendation increases patient Vax uptake
  – Need preventive benefits ‘for themselves’
    – Potential source for disease transmission
    • Patients
    • Other staff
    • Communities
    • Families
    – Potential for VPD to impair patient care
    – Adversely affect efficiency
    – Prevent HCV from working with (their) patients

Pre-Stem Cell Transplants

• Stem cell transplant patients require more thorough 'immunologic ablation' than other transplants
• Stem cell recipient should be ‘ACIP UTD’ for all vaccines
  – Live virus vaccines (if indicated) ≥4 weeks prior to IS
  – NO MMR, VAR, ZDS within 4 weeks of stem cell harvest
  – Non-live virus vaccines ≥2 weeks before immune sup/TXP
  – DO NOT vaccinate donor to benefit recipient in allogeneic TXP
• ASSUME Immunologic 'restart' after TXP
  – ‘Immunologically naïve’ immune system after stem cell engraftment
  – BUT immunization likely less effective than ‘normals’ with ongoing immunosuppression, esp. Chronic graft vs host disease

Household Contacts and Caregivers

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendation</th>
<th>Other Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>ACIP Schedule: IIV, LAIV OK Except SCID, new/GV+SCT.</td>
<td></td>
</tr>
<tr>
<td>MMR</td>
<td>ACIP Schedule</td>
<td></td>
</tr>
<tr>
<td>VAR</td>
<td>ACIP Schedule</td>
<td>(IC avoid contact if skin lesions)</td>
</tr>
<tr>
<td>Zoster</td>
<td>ACIP Schedule</td>
<td>(IC avoid contact if skin lesions)</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>ACIP Childhood Schedule</td>
<td>(IC: Avoid diapers x 4 weeks)</td>
</tr>
<tr>
<td>OPV</td>
<td>SHOULD NOT BE ADMINISTERED</td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td>IDSA: Var immune &gt;50 yr</td>
<td></td>
</tr>
</tbody>
</table>

Influenza Vaccine: ACIP Schedule
Meningococcal Vaccine: ACIP Schedule (IC avoid contact if skin lesions)
Varicella: ACIP Schedule (IC: Avoid diapers x 4 weeks)
Zoster: IDSA: Var immune >50 yr

Recommendations for Healthcare Workers

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>HCW Recommendation</th>
<th>Other Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza Vaccine</td>
<td>Annual HCW vac. decr. risk to Pt +</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal (PPS, PCV)</td>
<td>No HCW Specific Rec.</td>
<td>All smokers, 65+, med.ind.</td>
</tr>
<tr>
<td>MMR*</td>
<td>2 doses</td>
<td>NOT immune, born before ’97, IB</td>
</tr>
<tr>
<td>Varicella</td>
<td>2 doses</td>
<td>NOT immune, IB</td>
</tr>
<tr>
<td>HPV</td>
<td>No HCW Specific Rec.</td>
<td>Rec. all women 9-28 yr</td>
</tr>
<tr>
<td>Td/Tdap</td>
<td>Tdap 1 dose, Td 11yr</td>
<td>Tdap exp. infant contact</td>
</tr>
<tr>
<td>HAV</td>
<td>Only sel. lab workers</td>
<td>All kids (2007 onward)</td>
</tr>
<tr>
<td>HBV</td>
<td>3 dose series</td>
<td>HBsAb @ 1 mc, if., cgt series</td>
</tr>
<tr>
<td>Meningococcal (MCV)</td>
<td>Only sel. lab workers</td>
<td>All 11+ kids (2008 onward)</td>
</tr>
<tr>
<td>Zoster</td>
<td>No HCW Specific Rec.</td>
<td>Healthy (Not IB) 60+ adults</td>
</tr>
</tbody>
</table>

*Live Virus Vaccines.
Adapted from data located at http://www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm.
Tools

- CDC Adult Immunization Scheduler
  - http://www.cdc.gov/vaccines/recs/Scheduler/AdultScheduler.htm
- CDC/ACIP Recommendations
  - http://www.cdc.gov/immunizations
  - http://www.cdc.gov/vaccines/pubs/ACIP-list.htm
- IAC Summary of Adult Immunization Rec’s
- IDSA Vaccination Rec’s for Immune compromise
  - CID 2014: 58 (1 FEBRUARY)