


**9:45 – 10:45 am**

**Preventive Medicine that Works:  
Adult Immunization**

**SPEAKER**  
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**Presenter Disclosure Information**

The following relationships exist related to this presentation:

- ▶ Robert H. Hopkins, Jr., MD, FACP, FAAP: No financial relationships to disclose.

**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.

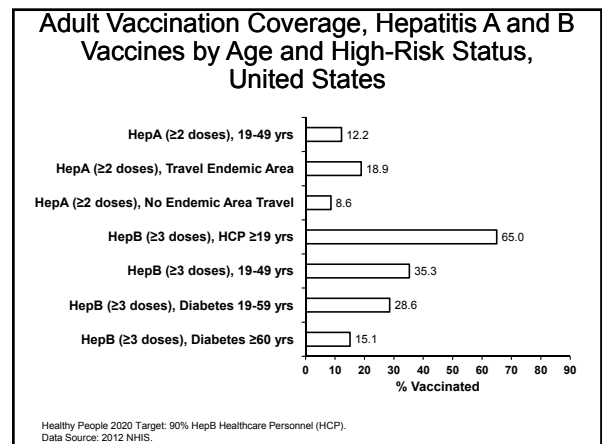
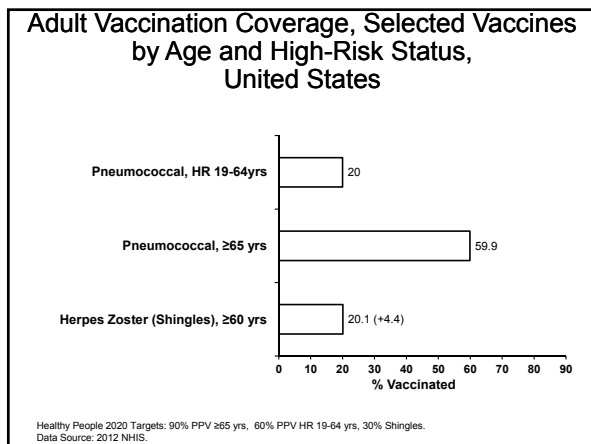
**Learning Objectives**

- 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
  - Splenectomy, Splenic Dysfunction

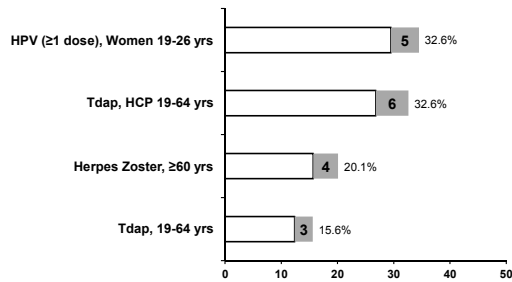
**Influenza Vaccination Coverage among Adults: 2011-12 and 2012-13 Seasons**

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

\* Statistically significant difference, P < 0.05.  
<http://www.cdc.gov/flu/fluavaxview/index.htm>



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



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
- 2014-15 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 influenza vaccine; LAIV = Live inactivated influenza vaccine (Quadrivalent).  
<http://www.cdc.gov/vaccines/recs/acip/downloads/m1g-slides-feb0904-1-flu.pdf>.

## Influenza Vaccine Indications

- **ALL 6 MONTHS AND OLDER + DON'T WANT FLU**
- **HEALTHCARE WORKERS**
  - High risk for disease (symptomatic and asymptomatic)
  - High risk for transmission
  - If sick not available to provide healthcare...
- **PATIENTS @ Highest Risk severe illness/spread**
  - Pregnant women
  - Newborns and Children <2 years
  - Elderly
  - "Medical Comorbidities"
  - Household contacts of high-risk
  - Long-term care/institutionalized, Crowded living conditions
- **VACCINATE ALL >6 months**
  - IDSA: 'it may not be beneficial to immunize patients NOT likely to respond': e.g. current recipients of intensive CTX, patients receiving anti-B cell antibody within 6 months

<http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-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)**
    - Research in process re: effectiveness
  - Current recommendation: subsequent Td q10yr
  - 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)

<http://www.cdc.gov/vaccines/vpd-vac/combo-vaccines/DTaP-Td-DT/Tdap.htm>.

## Invasive Pneumococcal Disease: Impact in Immune Compromised Patients

Population	Risk Factor	IPD Incidence
<b>Adults 18-64 years</b>	Undifferentiated	3.8/100,000
<b>Adults 18-64 years</b>	Hematologic Malignancy	186/100,000
<b>Adults</b>	HIV	173/100,000
<b>Adults 65+ years</b>	Undifferentiated	36.4/100,000

CDC Unpublished data, 2012.

## 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)
  - ACIP recommends – combined strategy with PPS23 – in adults
    - Details in subsequent slides

<http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/pneumo.html>

## 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**

Fine, et al. *ArchivesIM*. 1994(154):2666. Hutchinson, et al. *CanJFP*. 1999(45):2381. Watson, et al. *Vaccine*. 2002(20):2166. Conaty, et al. *Vaccine*. 2004(22):3214. Dear, et al. *Cochrane DB Syst Rev*. 2004, Issue 3. Moberley, et al. *Cochrane DB Syst Rev*. 2008, Issue 1. Moberley, et al. *Cochrane DB Syst Rev*. 2013, Issue 1.

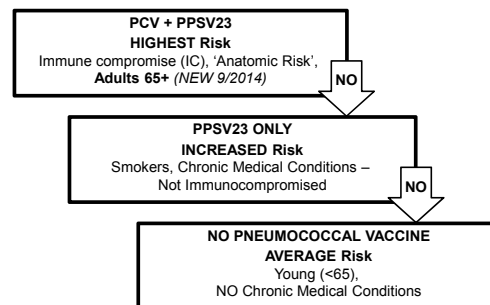
## PCV13 Adult Vaccine Effectiveness

### 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
  - Enrolled 9/2008-1/2010, followup ended 8/2013
  - Primary: 1<sup>st</sup> bacteremic CAP with vaccine-type PNC
  - Secondary: 1<sup>st</sup> non-bacteremic CAP, Other IPD
- Serologic and Urinary Ag used to identify PNC infection
- Met Primary and secondary endpoints, reduced PNC infection
- Presented, considered by ACIP Pneumococcal group in summer 2014
- DID NOT address sequential PCV13/PPSV23 immunization
- Full study published NEJM March 19 2015

Bonten, et al. COMMUNITY ACQUIRED PNEUMONIA IMMUNISATION TRIAL IN ADULTS (CAPITA) (Abstract ISPPD-0541). *Pneumonia*. 2014;3:95.

## Pneumococcal Immunization



## Pneumococcal Immunization I

### PPSV23 Alone for Increased Risk

All cigarette smokers ≥ 19 yo

Chronic conditions ≥19 yo:  
Diabetes

Lung disease: asthma, COPD  
Cardiovascular disease  
Kidney disease

(except ESRD, nephrotic syndrome  
– PCV13 recommended)

- Immunity lasts at least 5 yrs following 1 dose
- REVACCINATION ONCE** after age 65 (PLUS 5 years after initial dose) for those vaccinated prior to age 65
- Adults 65 years and older are in the highest risk group**

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5934a3.htm>. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6140a4.htm>.

## Pneumococcal Immunization II

### Sequential PCV13 + PPSV23 for Highest Risk

#### Immunocompromised:

- Disease:**
  - CA: solid tumors, hematologic malignancies, myeloma, etc.
  - HIV
  - INHERITED and OTHER immune deficiency (CVID, etc.)
  - End-stage kidney disease (ESRD), nephrotic syndrome
- Iatrogenic:**
  - MEDS: Steroids (20 mg/d or greater), biologic immunomodulators, other
  - TRANSPLANTS: solid organ, bone marrow, stem cell
- Asplenia:**
  - ANATOMIC: splenectomy (best if immunized prior to)
  - FUNCTIONAL: hemoglobinopathy, sickle cell, other

#### Anatomic:

- CSF leak, cochlear implant, splenectomy

**Adults 65 and older (New 9/2014)**

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6140a4.htm>. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm>.

# Pneumococcal 'Nuts and Bolts'

## INCREASED RISK

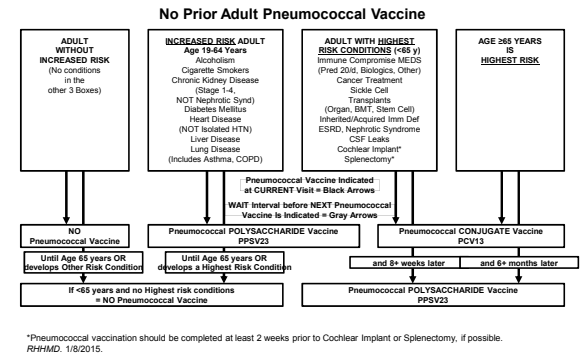
- Pneumococcal polysaccharide (PPSV23) NOW
- Booster once at 65+ yrs/5+ years later (only if initial dose before 64)

## HIGHEST RISK

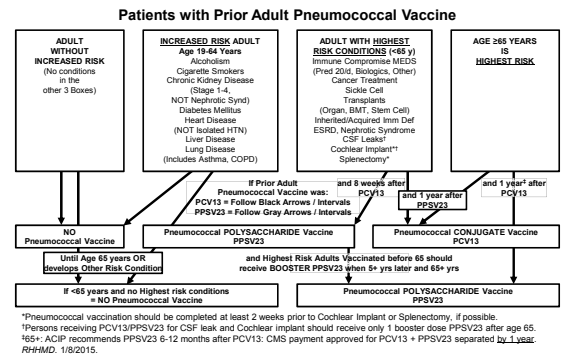
- Pneumococcal (PPSV23) vaccine-naïve patients (best practice):
  - PCV13 followed by PPSV23 at least 8 weeks later
  - Booster PPSV23 in 5 yrs AND final PPSV23 at 5+ yrs/65+ yrs
- Previously PPSV23-vaccinated patients:
  - PCV13 – at least 1 year after prior dose PPSV23 – followed by
  - Booster PPSV23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

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6140a4.htm> <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6337a4.htm>

# Flowsheet: Pneumococcal Vaccine



# Flowsheet: Pneumococcal Vaccine



# HiB Disease: Immune Compromise

Group	n	Age (yr) Mean (median) ± SD Range	No (%) Female	No (%) ≥65 yr of Age
Chronic renal failure	59	62.6 (63) ± 13.5 29-91	23 (38)	24 (41)
Diabetes mellitus	30	60.5 (61) ± 11.2 33-80	18 (60)	16 (53)
COPD	28	69.8 (72) ± 8.8 45-81	19 (68)	25 (89)
Multiple myeloma	20	68.7 (70) ± 10.1 43-84	9 (45)	16 (80)
Controls	32	63 (61) ± 8.2 53-80	19 (59)	19 (59)

Subgroup	Relative Risk of Non-Protective Ab Level	P-value
ESRD (Dialysis)	9.22 (1.29-66.17)	0.002
DM	6.4 (0.82-52.12)	0.018
COPD	4.57 (0.54-38.56)	0.059
Multiple myeloma	17.6 (2.46-26.2)	<0.0001

Nix, et al. Clin Vaccine Immunol. May 2012;19(5):766-771.

*"...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..."*

# 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)
  - Splenectomy (Functional/Anatomic), Hemoglobinopathy
    - 1 dose if not previously vaccinated
    - At least 14 days prior to splenectomy

[www.cdc.gov/vaccines/schedules/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/schedules/hcp/acip-recs/index.html)

# 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)

Centers for Disease Control and Prevention (CDC). *MMWR Morb Mortal Wkly Rep.* 2012;61(04):66-72.  
\* Provisional recommendations for MenB vaccine to be published mid 2015

## Meningococcal Vaccine

- Types A, C, Y, W-135: 3 Current vaccines
  - 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
- Type B (MenB): 2 Current vaccines
  - Approved late 2014
  - ACIP recommendations not yet published (as of 4/2015)

Centers for Disease Control and Prevention (CDC). *MMWR Morb Mortal Wkly Rep.* 2012;61(04):66-72.

## ACIP Adult Hepatitis A, B Indications

- |   |   |
|---|---|
| <p><b>Hepatitis A</b></p> <ul style="list-style-type: none"> <li>– Chronic Liver Disease           <ul style="list-style-type: none"> <li>• Includes chronic HBV, HCV</li> </ul> </li> <li>– MSM</li> <li>– Injection Drug Users</li> <li>– Travel to endemic area</li> <li>– Recipients of Clotting factors</li> <li>– Lab workers</li> </ul> <p><b>Dialysis HBV</b></p> <ul style="list-style-type: none"> <li>– High dose vaccine: all ESRD pt</li> </ul> <hr/> <p>IDSA:<br/>additional recommendations, immune compromised pt</p> | <p><b>Hepatitis B</b></p> <ul style="list-style-type: none"> <li>– Diabetes mellitus (&lt;60 GIVE, &gt;60 MAY give)</li> <li>– Chronic Liver Disease includes HCV</li> <li>– MSM</li> <li>– Injection Drug Users</li> <li>– Travel to endemic area/int'l adoption</li> <li>– Clotting factor recipients</li> <li>– &gt;1 sexual partner/6 mo, STD clinics</li> <li>– HEALTHCARE WORKERS</li> <li>– HIV</li> <li>– Household and sexual contacts of HBV patients</li> <li>– Developmental disability facility patients and staff</li> <li>– Male prison inmates, correction staff</li> <li>– Developmental disability facility patients and staff</li> <li>– Alaska and pacific island natives</li> <li>– Any others that want to prevent HBV</li> </ul> |
|---|---|

<http://www.cdc.gov/vaccines/recs/schedules/downloads/adult/2009/adult-schedule-bw.pdf>.

## 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

<http://www.cdc.gov/vaccines/recs/schedules/downloads/adult/2009/adult-schedule-bw.pdf>.

## 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
  - HPV9: 9 HPV types 3 dose series @ 0, 1-2 m, 6 m
  - Effective protection at least 5 years based on published data (ongoing)
  - Effective only for types patient has NOT previously acquired
- HPV9, HPV4 or HPV2 in Women 11-12 (9-26):
  - Prevent Cervical CA (Pre-CA), Genital Warts, other HPV disease\*
- HPV9 or 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)
  - Immunosuppression can reduce efficacy
- **VACCINE DOES NOT CHANGE CERVICAL CANCER SCREENING RECs!**

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6411a3.htm>

## MMR, Varicella

- 2 doses: immune competent children, selected adults
  - Healthcare workers, Int'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/mm6411a3.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/r5705a1.htm>.

## Immunodeficiency (ID) Cartoon

Immune Compromise	Humoral	Cellular	Complement
Cancer (+/- Cancer Treatment)	■	■	+
Stem Cell Transplant	■	■	■
Solid Organ Transplant	■	■	+
Splenectomy/Asplenia (Anatomic, Functional)	+	■	■
Renal Failure/Nephrotic	■	+	+
HIV	■	■	+
Immunosuppressive Treatment	■	■	+
Inherited Immunodeficiency	■	■	■
CSF Leak/Cochlear Imp	Anatomic Barrier Defect – Not ID...		

■ = 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/mm<sup>3</sup> (<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/mm<sup>3</sup>
- 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

MMR = Measles, Mumps, Rubella Combined Vaccine; VAR = Varicella Vaccine; OPV = Oral (Live) Polio Vaccine; SCID = Severe Combined Immunodeficiency; VAPP = Vaccine-associated Paralytic Polio; LAIV = Live Attenuated Influenza Vaccine.

## 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

K. Stratton, A. Ford, E. Rusch, and EW Clayton, Editors; Committee to Review Adverse Effects of Vaccines; Institute of Medicine. Adverse Effects of Vaccines: Evidence and Causality. National Academies Press, Washington DC 2012.

## IOM: Vaccines, Adverse Effects 2

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

K. Stratton, A. Ford, E. Rusch, and EW Clayton, Editors; Committee to Review Adverse Effects of Vaccines; Institute of Medicine. Adverse Effects of Vaccines: Evidence and Causality. National Academies Press, Washington DC 2012.

## Vaccine Effectiveness and Safety in Immunocompromised 1

- Sickle Cell Disease
  - 93% reduction IPD with introduction of PCV 7
  - Direct benefit +/- herd immunity... 12
- IIV in HIV and in Heart Transplant
  - Reduction in disease 13
- VAR and reduction in severe varicella disease
  - Kidney and Liver transplants 16-18
  - Children with Leukemia and HIV 19-20

Rubin, et al. CID. 2014;58 (1Feb).

## 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
    - Are Ab functional in immune suppressed?
    - Ab levels may not correlate with protection from diseases e.g. Zoster

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

## Vaccines: ACIP Recommendations

Vaccine	Adult Age	Immunocompetent	Immunosuppressed
Influenza	ALL	ALL	ALL (not all respond)
Pneumococcal	65+, Younger + Risk = PPS23 Only		PCV13+PPS23
Tetanus: Tdap, Td	Tdap once, Td Q10	Every Pregnancy	As Nonpregnant
HPV		<26 women, <21 men 'Universal'	
Zoster	60+	Same	Usually NOT
MMR	ALL Non-immune	Same	Usually NOT
Varicella	ALL Nonimmune	Same	Usually NOT
Meningococcal	MCV4 Pre-College	Travel, Exposure	Selected
HIB	None	None	Selected
Hepatitis A	None	Travel, Selected	Few
Hepatitis B	None	Many Selected	Few

Bridges, et al. Annals IM. 2014;160(4Feb).

## Cancer and Immunization

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

Vaccine	Prior to (During) Chemo	Post-Chemo >3 mo CTX, > 6mo Anti-B-cell Ab
Influenza Vaccine	ACIP Schedule (NOT LAIV)	
Tdap, Td Vaccines	ACIP Schedule (no CA specific recommendation)	
Pneumococcal Vax's	PCV13+PPSV23 then PPSV	ACIP Schedule (for Non-IC)
HIB Vaccine	ACIP Schedule (CA/CTX alone not indication)	
Meningococcal Vax's	ACIP Schedule (CA/CTX alone not indication)	
Hep B Vaccine	ACIP Schedule	IDSA Recommends
Hep A Vaccine	ACIP Schedule (CA/CTX alone not indication)	
HPV	ACIP Schedule (CA/CTX alone not indication)	
MMR	NOT RECOMMENDED	ACIP Schedule
VAR	NOT RECOMMENDED	ACIP Schedule
Zoster	NOT RECOMMENDED	ACIP Schedule

Rubin, et al. CID. 2014;58 (1Feb). Bridges, et al. Annals IM. 2014;160(4Feb).

## Immunization: Autoimmune Disease with Iatrogenic Immune Suppression

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

## HIV

Vaccine	ACIP	IDSA
Influenza Vaccine	Annual	Annual, <b>NOT LAIV</b>
Tdap, Td Vaccines	ACIP Schedule (1 <sup>st</sup> series, 1 adult Tdap, q10 year Td, qPreg)	
Pneumococcal Vaccine	PCV13 + PPSV23 then PPSV23 booster in 5 years and at 65+	
HIB Vaccine	Not Recommended	
Meningococcal Vaccines	ACIP Schedule: HIV alone not indication	
Hep B Vaccine	Vaccinate, HD 3 doses	3 doses, HD?, titer in 1 m Repeat series if <10
Hep A Vaccine	ACIP Schedule: HIV alone not indication	
HPV	ACIP Schedule + HPV4 in M/F	
MMR	IFF CD4 >200 + Nonimmune = 2 doses ( <b>IDSA NO MMRV</b> )	
VAR	CD4 >200 + Nonimmune = 2 doses ( <b>IDSA 3+mo, NO MMRV</b> )	
Zoster	NO if CD4 < 200	Contraindicated

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## Hemoglobinopathy, Asplenia, CSF Leaks and Cochlear Implants

Vaccine	Hemoglobinopathy, Asplenia	CSF Leaks and Cochlear Implants
Influenza Vaccine	Annual (IDSA: NO LAIV)	Annual
Tdap, Td Vaccines	ACIP Schedule (1 <sup>st</sup> series, 1 adult Tdap, q10 year Td, qPreg)	
Pneumococcal Vaccine	PCV13 + PPSV23 then PPSV23 booster in 5 years and at 65+	
HIB Vaccine	1 dose (14 days pre-spleen)	Not Recommended
Meningococcal Vaccine*	2 doses (2+mo), boost q 5 yrs	ACIP Schedule
Hep B Vaccine	ACIP Schedule (No specific indication in these IC groups)	
Hep A Vaccine	ACIP Schedule (No specific indication in these IC groups)	
HPV	ACIP Schedule (No specific indication in these IC groups)	
MMR	ACIP Schedule (No specific indication in these IC groups)	
VAR	ACIP Schedule (No specific indication in these IC groups)	
Zoster	ACIP Schedule (No specific indication in these IC groups)	

Rubin, et al. CID 2014; 58 (1Feb) Bridges, et al. Annals IM 2014; 160(4Feb)

## Solid Organ Transplants, ESRD, Nephrotic Syndrome

Vaccine	Pre-Transplant	Start 2-6 Months Post-TXP
Influenza Vaccine	Annual (IDSA: NO LAIV)	Annual(Outbreak=Immediate)
Tdap, Td Vaccines	ACIP Schedule (1 <sup>st</sup> series, 1 adult Tdap, q10 year Td, qPreg)	
Pneumococcal Vaccine	PCV13+PPSV23 then PPSV23 booster in 5 years and at 65+ years	
HIB Vaccine	ACIP Schedule (SOT Alone not indication)	
Meningococcal Vaccine	ACIP Schedule (SOT Alone not indication)	
Hep B Vaccine*	ACIP: ESRD, Chr liver dz only. IDSA: also in HbsAb Neg SOT Cand	
Hep A Vaccine	ACIP: Chr Liver dz only. IDSA also in HAV nonimmune SOT Cand	
HPV	ACIP Schedule to age 26 (SOT Alone not indication)	
MMR	ACIP (total 2 doses >4 wks pre-TXP)	Contraindicated
VAR	ACIP (total 2 doses >4 wks pre-TXP)	Contraindicated*
Zoster	IDSA: Var immune >50 yr. >4 wks pre-TXP	Contraindicated

## 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, ZOS 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

## Post-Stem Cell Transplant

Vaccine	Recommendation	Interval AFTER Transplant
Influenza Vaccine	IIV Annually ( <b>NO LAIV</b> )	Begin <b>6 months</b> after TXP
Tdap, Td Vaccines	3 dose series (1=Tdap)	Begin <b>6 months</b> after TXP
Pneumococcal Conjugate	3 dose series ( <b>4 if Chr-GVH</b> )	Begin <b>3-6 months</b> after TXP
Pneumo Polysaccharide	1 dose ( <b>NOT Chronic GVH</b> )	<b>1 year</b> after Transplant
HIB Vaccine	3 dose series	Begin <b>3-6 months</b> after TXP
Meningococcal MCV4*	(11-18 yr. only) 2 dose series	Begin <b>3-6 months</b> after TXP
Hep B Vaccine	3 dose series, <b>titer (&lt;10=rpt)</b>	Begin <b>3-6 months</b> after TXP
Hep A Vaccine	ACIP Schedule	Begin <b>6 months</b> after TXP
HPV	ACIP Schedule ( <b>HPV 4</b> )	Begin <b>6 months</b> after TXP
MMR	IFF <b>NO IS+C-GVH</b> , Neg M-Ab	<b>2 YR</b> after Txp, <b>8 mo</b> afterIG
VAR	IFF <b>NO IS+C-GVH</b> , Neg V-Ab	<b>2 YR</b> after Txp, <b>8 mo</b> afterIG
Zoster	<b>Contraindicated</b>	

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## Household Contacts and Caregivers

Vaccine	Recommendation
<b>Inactivated Vaccines</b>	
Influenza Vaccine	ACIP Schedule: IIV. <b>LAIV OK Except SCID, new/GV+SCT</b>
Other Inactivated Vaccines	ACIP Schedule
<b>Live-Virus Vaccines</b>	
MMR	ACIP Schedule
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	<b>SHOULD NOT BE ADMINISTERED</b>
<b>Travel</b>	
Oral Typhoid Vaccine	CDC Travel Schedule
Yellow Fever Vaccine	CDC Travel Schedule



## 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 HCW from working with (their) patients

<http://www.cdc.gov/mmwr/preview/mmwrhtml/00050577.htm>

## Recommendations for Healthcare Workers

Vaccine	HCW Recommendation	Other Consideration
<b>Influenza</b>	Annual	HCW vax. decr. risk to Pt +
<b>Pneumococcal (PPS, PCV)</b>	No HCW Specific Rec	All smokers, 65+, med.ind.
<b>MMR*</b>	2 doses	<b>NOT</b> immune, born before '57, <b>IS</b>
<b>Varicella*</b>	2 doses	<b>NOT</b> immune, <b>IS</b>
<b>HPV</b>	No HCW Specific Rec	Rec. all women 9-26 yr
<b>Td/Tdap</b>	Tdap 1 dose, Td Q10yr	Tdap esp. infant contact
<b>HAV</b>	Only selected lab workers	All kids (2007 onward)
<b>HBV</b>	3 dose series	HBsAb @ 1 mo; If -, rpt series
<b>Meningococcal</b>	Only selected lab workers	All 11+ kids (2006 onward)
<b>Zoster*</b>	No HCW Specific Rec	Healthy ( <b>Not IS</b> ) 60+ adults

\*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
  - <http://www.immunize.org/catg.d/p2011.pdf>
- IDSA Vaccination Rec's for Immune compromise
  - CID 2014: 58 (1 FEBRUARY)