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Overview of Influenza and Pneumococcal Vaccines

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Influenza Disease and Influenza Vaccines

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Immunization Training Seminar
Rural Health Network SWOSU College of Pharmacy
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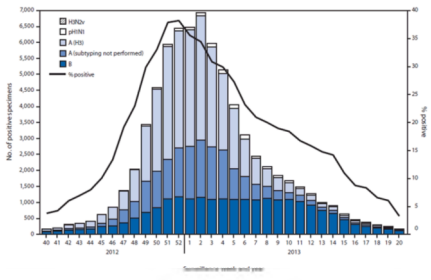
Objectives

1. Describe the influenza disease, including the causative agent
2. Identify those for whom influenza immunization is recommended
3. Describe the characteristics of the vaccines used to prevent influenza (schedule, contraindications, and/or adverse reactions
4. Locate resources relevant to current immunization practice
5. Obtain, assess and apply patient information to determine the need for immunization

Influenza Epidemiology

• Reservoir	Human, animals (type A only)
• Transmission	Respiratory Probably airborne
• Temporal pattern	Peak December – March in temperate climate May occur earlier or later
• Communicability	1 day before to 5 days after onset (adults)

Influenza Activity in the US 2012-2013 Season



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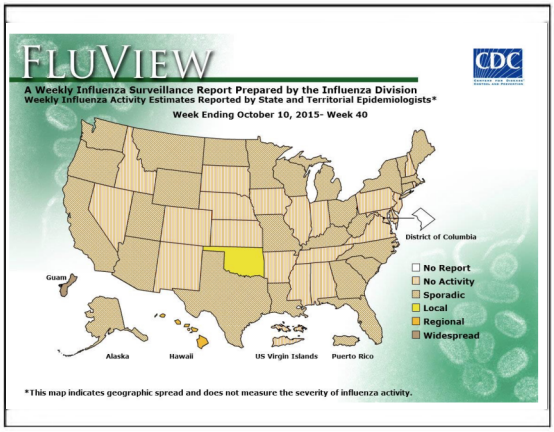


Influenza Transmission

- Respiratory transmission of virus
- Person to person transmission
  - Sneezing
  - Coughing
- Viral shedding in respiratory secretions for 5 – 10 days

Influenza Clinical Features

- Incubation period 2 days (range 1-4 days)
- Abrupt onset of fever, myalgia, sore throat, nonproductive cough, headache, malaise, rhinitis
- Severity of illness depends on prior experience with related variants

Complications of Influenza

- **Complications: pneumonia - most common; Reye syndrome (children); myocarditis**
- **Groups most at risk for flu: elderly, pediatrics, and those with chronic illness**
- **20 - 60% of high-risk groups vaccinated; 10,000 - 40,000 deaths/year**

Impact of Influenza- United States 1976 - 2007

- The number of influenza-associated deaths varies substantially by year, influenza virus type and subtype, and age group
- Annual influenza-associated deaths ranged from 3,349 (1985-86 season) to 48,614 (2003-04 season), with an average of 23,607 annual deaths
- Persons 65 years of age and older account for approximately 90% of deaths
- 2.7 times more deaths occurred during seasons when A(H3N2) viruses were prominent

Impact of Influenza

- Rates of hospitalization among children 2 years and younger are similar to those of persons 65 and older with high-risk medical conditions
- Children 24 through 59 months of age are at increased risk for influenza-related clinic and emergency department visits

Groups at Increase Risk of Complications of Influenza

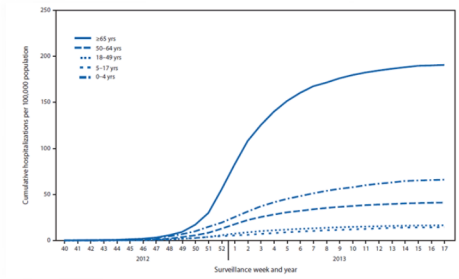
- **All children 6 months through 4 years of age**
- **All persons 50 years of age or older**
- **Persons 6 months of age and older with underlying medical conditions, particularly cardiovascular, pulmonary and metabolic conditions**
- **Immunosuppression**
- **Residents of long-term care facilities**
- **Pregnant women**

Groups at Increase Risk of Complications of Influenza, continued

- Children 6 months through 18 years and receiving long-term aspirin therapy – increased risk for Reye syndrome
- American Indians/Alaska Natives
- Morbidly obese (BMI ≥ 40)

US Hospitalization Rates for Influenza

October 1, 2012–April 30, 2013

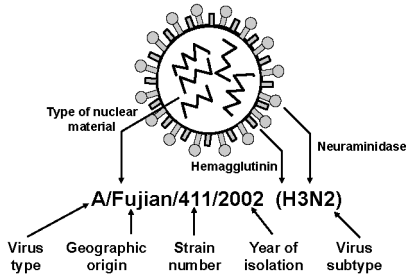


http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6223a5.htm?s_cid=mm6223a5_e#fig2

Influenza Virus Strains

- Type A
  - moderate to severe illness
  - all age groups
  - humans and other animals
- Type B
  - milder disease
  - primarily affects children
  - humans only
- Type C
  - rarely reported in humans
  - no epidemics

Influenza Virus



Influenza Antigenic Changes

- Antigenic Drift
  - –minor change, same subtype
  - –caused by point mutations in gene
  - –may result in epidemic
- Example of antigenic drift
  - –in 2002-2003, A/Panama/2007/99 (H3N2) virus was dominant
  - –A/Fujian/411/2002 (H3N2) appeared in late 2003 and caused widespread illness in 2003-2004

Influenza Antigenic Changes

- Antigenic Shift
  - –major change, new subtype
  - –caused by exchange of gene segments
  - –may result in pandemic

Influenza Type A Antigenic Shifts

Year	Subtype	Severity of Pandemic
1889	H3N2	Moderate
1918	H1N1	Severe
1957	H2N2	Severe
1968	H3N2	Moderate
1977	H1N1	Mild

Influenza Pandemics

Pandemic	Deaths in US
Spanish flu (H1N1) 1918-1919	675,000
Asian flu (H2N2) 1957-1958	70,000
Hong Kong flu (H3N2) 1968-1969	34,000
2009 H1N1 influenza 2009-2010*	8,870 – 18,300

*Between 43 million - 89 million cases of H1N1
195,000 – 403,000 H1N1-related hospitalizations

www.flu.gov/general/historicaloverview.html

Estimated 2009 H1N1 Cases, Hospitalizations, and Deaths (April 2009 – April 2010)

Outcome and age group	Mid-level Range	Estimated Range
Illnesses		
0-17 years	20,000,000	14 -28 million
18-64 years	35,000,000	25 - 52 million
65 and older	6,000,000	4 - 9 million
Total illnesses	61,000,000	43 - 89 million
Hospitalizations		
0-17 years	87,000	62 - 128 thousand
18-64 years	160,000	114 - 235 thousand
65 and older	27,000	19 - 40 thousand
Total hospitalizations	270,000	195 - 403 thousand
Deaths		
0-17 years	1,280	910 - 1880
18-64 years	9,570	6,800 – 14,040
65 and older	1,620	1,160 - 2,380
Total deaths	12,470	8,870 - 18,300

www.cdc.gov/h1n1flu/estimates 2009_h1n1.htm

Prevention of Influenza

- **The most effective strategy for preventing influenza and its complications is annual vaccination**
- **All persons ≥ 6 months who do not have contraindications to the vaccine should receive the influenza vaccination**

Timing of Influenza Vaccine Programs

- **Influenza activity can occur as early as October**
- **In more than 80% of seasons since 1976, peak influenza activity has not occurred until January or later**
- **In more than 60% of seasons the peak was in February or later**

Timing of Influenza Vaccine Programs

- **Providers should begin offering vaccine soon after it becomes available, if possible by October**
- **To avoid missed opportunities for vaccination, providers should offer vaccine during routine healthcare visits or during hospitalizations whenever vaccine is available**

Timing of Influenza Vaccine Programs

- Persons planning organized vaccination campaigns should consider scheduling these events after at least mid-October
- Scheduling campaigns after mid-October will minimize the need for cancellations because vaccine is unavailable
- Continue to offer influenza vaccine in December
- Providers should continue to vaccinate throughout influenza season

Composition of the 2015-2016 Influenza Vaccine

- **The 2015-2016 seasonal influenza vaccine will include**
- Trivalent vaccines
  - –A/California/7/2009 (H1N1)-like virus
  - –A/Switzerland/9715293/2013 (H3N2)-like virus
  - –B/Phuket/3073/2013-like virus
- Quadrivalent vaccines
  - –3 listed above and
  - –B/Phuket/3073/2013-like virus

Influenza Vaccines

- **Inactivated influenza vaccine (IIV)**
  - –intramuscular or intradermal
  - –trivalent (IIV3) and quadrivalent (IIV4)
- **Live attenuated vaccine (LAIV)**
  - –intranasal
  - –quadrivalent (LAIV4)
- **Recombinant influenza vaccine (RIV)**
  - –Intramuscular
  - –trivalent (RIV3)

	IIV	LAIV	RIV
Type of vaccine	Inactivated	Live attenuated	Recombinant
Route of administration	IM injection and intradermal (ID) injection	Intranasal spray	IM injection
Number of antigens	3 or 4	4	3
Approved age	• Intramuscular For persons aged ≥ 6 months* • Intradermal for 18 to 64 years	For persons aged 2 through 49 years	For persons aged 18 years or older
Other Information:	• Can be used in patients with chronic medical conditions • Can be used in persons who are close contacts with immunosuppressed patients	Only for healthy, non-pregnant adults	Does not contain any egg protein and can be given to age-appropriate persons with egg allergy of any severity

*Pharmacists should verify the approved age indication for each individual vaccine

Inactivated Influenza Vaccine (IIV) Recommendations

- **Advisory Committee on Immunization Practices recommends annual influenza vaccination for all persons 6 months of age and older**
- **Protection of persons at higher risk for influenza-related complications should continue to be a focus of vaccination efforts as providers and programs transition to routine vaccination of all persons aged 6 months and older**

Influenza Inactivated (IIV)*

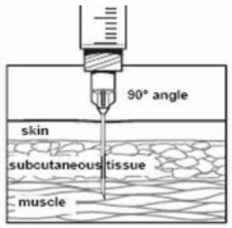
- Intramuscular
  - –standard-dose IIV* – persons aged 6 months or older, including pregnant women
  - –high-dose IIV – persons who are aged 65 years or older
- Intradermal IIV – persons aged 18 through 64 years

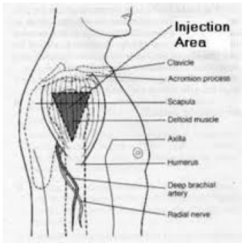
*Pharmacists should verify the approved age indication for each individual vaccine

Fluzone High-Dose IIV

- Contains 4 X amount of influenza antigen than regular Fluzone
- Approved only for persons 65 years and older
- Produced higher antibody levels; slightly higher local reactions
- Studies underway to assess clinical effectiveness

Intramuscular Injection





Fluzone Intradermal IIV

- Approved only for persons 18 through 64 years of age
- Dose is 0.1 mL administered by a specially designed microneedle injector system in the deltoid

Influenza Inactivated (IIV)*

- Contraindications:
  - –Severe allergic reaction after previous dose of any influenza vaccine, or to a vaccine component including egg protein
- Precautions:
  - –Moderate or severe acute illness with or without fever
  - –History of Guillain-Barre syndrome within 6 weeks of previous vaccine

Inactivated Influenza Vaccine Adverse Reactions

Local reactions	15%-20%
Fever, malaise	not common
Allergic reactions	rare
Neurological reactions	very rare

Live attenuated influenza vaccine (LAIV)

- Intranasal – healthy, non-pregnant persons age 2 to 49 years without high-risk medical conditions
- Active inhalation (i.e. sniffing) is not required by the patient during vaccine administration
- If a patient sneezes or blows their nose after receiving intranasal LAIV; Re-vaccination is not necessary.

FluMist

LAIV Vaccine Administration

- FluMist – intranasal administration
  - Two sprays in single device
  - Patient's head slightly tilted back
  - Remove rubber tip
  - Insert nasal apparatus just inside one nostril and push just until plunger stops
  - Remove dose-separating clip and second spray should be administered into other nostril
  - Do NOT have patient strongly "sniff" vaccine into nasal passage
  - Revaccination is NOT necessary in the event of nasal discharge or sneezing

Transmission of LAIV Virus

- **LAIV replicates in the nasopharyngeal mucosa**
- **Mean shedding of virus 7.6 days – longer in children**
- **Transmitted virus retained attenuated, cold-adapted, temperature-sensitive characteristics**
- **No transmission of LAIV reported in the U.S.**

Simultaneous Administration of LAIV and Other Vaccines

- Inactivated vaccines can be administered either simultaneously or at any time before or after LAIV
- Other live vaccines can be administered on the same day as LAIV
- Live vaccines not administered on the same day should be administered at least 4 weeks apart

Live attenuated influenza vaccine (LAIV)

- **Contraindications:**
  - **Severe allergic reaction to any component of the vaccine or to a previous dose of any influenza vaccine**
  - **Should not be used in the following populations (ACIP recommendation)**
    - Children 2 through 17 years of age who are receiving aspirin therapy
    - Children 2 through 4 years who have asthma or wheezing in the past 12 months
    - Pregnant
    - Immunosuppressed adults or caretakers of immunosuppressed adults (avoid for 7 days after receiving)
    - Adults with egg allergy (any severity)
    - Adults who have taken influenza antiviral medication within the previous 48 hours – avoid use of antiviral drugs for 14 days after vaccination

Live attenuated influenza vaccine (LAIV)

- Precautions:
  - **Moderate or severe acute illness with or without fever.**
  - **History of Guillain-Barre syndrome within 6 weeks of previous vaccine**
  - **Asthma in persons aged 5 years and older**
  - **Other chronic medical conditions (lung disease, cardiovascular disease, diabetes, renal or hepatic disease, hematologic, neurologic, and metabolic disorders**

Live Attenuated Influenza Vaccine Adverse Reactions

- Children
  - no significant increase in URI symptoms, fever, or other systemic symptoms
  - significantly increased risk of asthma or reactive airways disease in children 12-59 months of age
- Adults
  - significantly increased rate of cough, runny nose, nasal congestion, sore throat, and chills reported among vaccine recipients
  - no increase in the occurrence of fever
- No serious adverse reactions identified

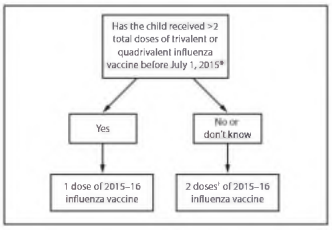
Recombinant influenza vaccine (RIV)

- Intramuscular – persons 18 years or older
- Does not contain any egg protein
- Can be give to age-appropriate persons with egg allergy of any severity

Recombinant influenza vaccine (RIV)

- Contraindications:
  - –Severe allergic reaction after previous dose of RIV or to a vaccine component
- Precautions:
  - –Moderate or severe acute illness with or without fever
  - –History of Guillain-Barre Syndrome within 6 weeks of previous vaccination

Influenza Vaccination of Children 6 Months Through 8 Years Of Age



* The two doses need not have been received during the same season or consecutive seasons.
† Doses should be administered >4 weeks apart.

Advisory Committee on Immunization Practices, United States, 2015–16 influenza season

Influenza Vaccine Storage and Handling

- IIV, LAIV, and RIV must be stored at refrigerator temperature (35°-46°F, 2°-8°C)
- Vaccines should be frozen; Discard if product has been frozen

IIV or LAIV?

1. 47 y/o pharmacist who administers influenza vaccine the general public; no contraindications
2. 38 yom with diabetes
3. 2 y/o healthy female; no contraindications
4. Pregnant patient with no contraindications

Test your knowledge

Which of the following patients is not a candidate for the influenza vaccination?

A. 5-month-old female; no medical conditions

B. 10-year-old male; recently diagnosed with Type 1 DM

C. 80-year-old female with COPD

D. 25-year-old male; no medical conditions

Selected Resources for Vaccine Information

- CDC Vaccine information
  - –http://www.cdc.gov/vaccines/acip/index.html
- Pink Book
  - –http://www.cdc.gov/vaccines/pubs/pinkbook/index.html
- Immunization Action Coalition
  - –http://www.immunize.org/vis/

Pneumococcal Disease and Vaccines

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Immunization Training Seminar
Rural Health Network SWOSU College of Pharmacy
October 24, 2015

Objectives

1. Describe diseases caused by *Steptococcus pneumoniae*
2. Identify those for whom the pneumococcal vaccine is recommended
3. Describe the characteristics of the vaccines used to prevent pneumococcal disease (schedule, contraindications, and/or adverse reactions)
4. Locate resources relevant to current immunization practice
5. Obtain, assess and apply patient information to determine the need for initial immunization or revaccination with a Pneumococcal vaccine

Pneumococcal Diseases

- *Streptococcus pneumoniae* -- Polysaccharide capsule with about 90 known serotypes
- 5% - 70% of adults have colonization of URT
- Infections: pneumonia, bacteremia, meningitis (leading cause of meningitis in pediatrics < 5 yo), sinusitis, acute otitis media, pharyngitis, and bacteremia

Pneumococcal Disease Epidemiology

- **Reservoir**
  - **–Human carriers**
- **Transmission**
  - **–Respiratory Autoinoculation**
- **Temporal pattern**
  - **–Peaks in Winter, but threat exists year-round**
- **Communicability**
  - **–Unknown Probably as long as organism in respiratory secretions**

Pneumococcal Pneumonia

- 100,000 to 135,000 cases requiring hospitalization per year
- Responsible for up to 1/3 of community-acquired pneumonias and up to 1/2 of hospital-acquired pneumonias
- Common bacterial complication of influenza and measles
- Case-fatality rate 5%-7%, higher in elderly

Clinical Features of Pneumococcal Pneumonia

- Abrupt onset of fever and chills or rigors
- Pleuritic chest pain
- Cough productive of mucopurulent, rusty sputum
- Dyspnea
- Tachypnea
- Hypoxia
- Tachycardia
- Malaise, and weakness

Pneumococcal Bacteremia

- More than 50,000 cases per year in the United States
- Rates higher among elderly and very young infants
- Case-fatality rate ~20%; up to 60% among the elderly

Pneumococcal Meningitis

- Estimated 3,000 -6,000 cases per year in the United States
- Case-fatality rate ~30%, up to 80% in the elderly
- Neurologic sequelae common among survivors
- Increased risk in persons with cochlear implant

Clinical Features Pneumococcal Meningitis

- Headache
- Lethargy
- Vomiting
- Irritability
- Fever
- Nuchal rigidity
- Cranial nerve signs
- Seizures and coma

Conditions that Increase Risk for Invasive Pneumococcal Disease

- Decreased immune function
- Asplenia (functional or anatomic)
- Chronic heart, pulmonary, liver or renal disease
- Cigarette smoking
- Cerebrospinal fluid (CSF) leak

Pneumococcal Disease in Children

- Bacteremia without known site of infection most common clinical presentation
- *S. pneumoniae* leading cause of bacterial meningitis among children younger than 5 years of age
- Highest rate of meningitis among children younger than 1 year of age
- Common cause of acute otitis media

Children at Increased Risk of Invasive Pneumococcal Disease

- **Functional or anatomic asplenia, especially sickle cell disease**
- **HIV infection**
- **Recipient of cochlear implant**
- **Out-of-home group child care**
- **African American children**
- **Alaska Native and American Indian children who live in Alaska, Arizona, or New Mexico**
- **Navajo children who live in Colorado and Utah**

Pneumococcal Vaccine

- Two pneumococcal vaccination preparations:
  - –Pneumococcal conjugate vaccine (PCV13)
  - –23-Valent pneumococcal polysaccharide vaccine (PPV23)
- Different indications & are NOT interchangeable

Pneumococcal Conjugate Vaccine (PCV) (Prevnar®13)

- Pnemococcal 13-valent conjugate vaccine (PCV 13) -- Preservative & thimerosal free
- >90% effective against invasive disease
- Indications for children and adults

PCV13 Recommendations (Children)

- **Schedule:** All Infants**: 4 dose series**
  - **Doses at 2, 4, and 6 months; booster dose at 12-15 months**
- **If a child is unvaccinated, has started but not completed a series of PCV7 or PCV13, or completed a series of PCV7, an age-based schedule to catch-up or begin the PCV13 series is available.**

PCV13 Recommendations (Children)

- Consider giving children aged 6 – 18 years who have not received PCV 13 previously with anatomic or functional asplenia, immunocompromising conditions, cochlear implant or CSF leaks

PCV13 Recommendations (Adults)

- All adults ≥ 65 years
- Adults age 19 through 64 years who have not received PCV13, and have the following conditions:
  - – asplenia,
  - –immunocompromizing conditions
  - –cochlear implants
  - –CSF leak

Pneumococcal polysaccharide vaccine (PPSV) (Pneumovax 23®)

- Mixture of purified capsular polysaccharides antigen 23 serotypes
- Not effective in children < 2 years
- 60% - 70 % effective against invasive disease
- Less effective in preventing pneumococcal pneumonia

PPSV23 Recommendations

- Adults 65 years of age or older
- Persons 19 of age and older who smoke or have asthma
- Persons 2 years of age or older with normal immune system and have a chronic illness
  - Cardiovascular disease, pulmonary disease, diabetes, alcoholism, cirrhosis, cerebrospinal fluid leak, or cochlear implant
- Persons 2 years of age and older with HIV

PPSV23 Recommendations, continued

- Immunocompromised persons 2 years of age or older
  - Splenic dysfunction or absence, Hodgkin disease, lymphoma, multiple myeloma, chronic renal failure, nephrotic syndrome or conditions such as organ transplantation with immunosupression, chemotherapy or high-dose corticosteroid therapy (14 days or longer)
- **PPSV should be considered for persons living in NH, LTC, certain Native Americans (i.e., Alaska Native, Navajo)**

PPSV23 and PCV13 (timing of doses in children)

- Both indicated if > 2 yrs if pt has chronic illness
- PPSV 8 weeks after last dose of PCV13
- For children with immuno-compromising conditions or asplenia, a second dose of PPSV23 should be given 5 years after the first dose of PPSV23.

PPSV23 and PCV13 (timing of doses in adults)

- **The two vaccines should not be given during the same visit**
- **Adults age ≥ 65 years who have not received either PCV13 or PPSV23:**
  - **PCV13 is given first, PPSV23 to be given 6 to 12 months later**
- **Adults age ≥ 65 years who have received 1 dose of PPSV23 at age ≥ 65 years:**
  - **PCV13 at least 1 year after dose of PPSV**

PPSV23 and PCV13 (timing of doses in adults)

- **Adults ≥ 65 years who have not received PCV13, but have received 1 or more doses of PPSV23 before age 65:**
  - **Administer PCV13 at least 1 year after most recent PPSV23 dose, then**
  - **Administer a dose of PPSV23, 6 to 12 months after PCV13 (or as soon as possible after this time window has passed), and at least 5 years after the most recent dose of PPSV23**

PPSV23 and PCV13 (timing of doses in adults)

- **Adults ≥ 65 years who have received PCV13 but not PPSV23 before the age 65:**
  - **Administer PPSV23, 6 to 12 months after PCV13**
- **Adults ≥ 65 years who have received PCV13 and 1 or more doses of PPSV23 before age 65.**
  - **Administer PPSV23, 6 to 12 months after PCV13 or as soon as possible if this time window has passed and at least 5 years after the most recent dose of PPSV23**

PPSV23 and PCV13 (timing of doses in adults)

- Adults age 19 to 64 years with immunocompromising conditions or asplenia who have not received either PCV13 or PPSV23
  - Administer PCV13 followed by a 1st dose of PPSV23 at least 8 weeks after PCV13, then a 2nd dose of PPSV23 at least 5 years after the 1st dose of PPSV23

PPSV23 and PCV13 (timing of doses in adults)

- Adults age 19 to 64 years with immunocompromising conditions or asplenia who have not received PCV13, but has received 1 dose of PPSV23
  - Administer PCV13 at least 1 year after the PPSV23; administer a 2nd dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after PPSV23

PPSV23 and PCV13 (timing of doses in adults)

- Adults age 19 to 64 years with immunocompromising conditions or asplenia who have not received PCV13, but has received 2 doses of PPSV23:
  - Administer PCV13 at least 1 year after the most recent dose of PPSV23

PPSV23 and PCV13 (timing of doses in adults)

- Adults age 19 to 64 years with immunocompromising conditions or asplenia who has received PCV13, but not PPSV23:
  - Administer PPSV23 at least 8 weeks after PCV13, 2nd dose PPSV23 at least 5 years after 1st dose

PPSV23 and PCV13 (timing of doses in adults)

- Adults age 19 to 64 years with immunocompromising conditions or asplenia who have received PCV13 and 1 dose PPSV23:
  - Administer 2nd dose PPSV23 at least 5 years after 1st dose of PPSV23

Pneumococcal Vaccines Adverse Reactions

- Local reactions
  - –polysaccharide 30%-50%
  - –conjugate 5%-49%
- Fever, myalgia
  - –polysaccharide <1%
  - –conjugate 24%-35%
- Severe adverse rare reactions

Pneumococcal Vaccines Contraindications and Precautions

- Contraindication:
  - –Severe allergic reaction to vaccine component or following prior dose of vaccine
- Precaution:
  - –Moderate or severe acute illness

Storage and Handling

- Both PPSV and PCV should be stored at refrigerator temperature (35°- 46° F) [2°- 8° C]).
- Pneumococcal vaccines must not be frozen

Test Your Knowledge

Which patient is a candidate for PPSV?

A. 30 yof who is 32 weeks pregnant

B. 3 yom with acute otitis media

C. 43 yof who smokes

D. 64 yom with no chronic illnesses

Test Your Knowledge

Describe the dosing schedule of the pneumococcal vaccines for the following patients*:

A. 65 yof - Has not received any Pneumococcal vaccines

B. 80 yom - Received 1st dose PPSV at age 68

C. 63 yof - Received 1st dose PPSV at age 60

D. 67 yom - Received 1st dose PPSV at age 62

*None of the above patients have any immunocompromising conditions.

Selected Resources for Vaccine Information

- CDC Vaccine information
  - –http://www.cdc.gov/vaccines/acip/index.html
- Pink Book
  - –http://www.cdc.gov/vaccines/pubs/pinkbook/index.html
- Immunization Action Coalition
  - –http://www.immunize.org/vis/