Immunizations For Healthcare Workers

APIC New England
October 18, 2012
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Division of Epidemiology and Immunization
MDPH
Disclosures

- I, Susan Lett, have been asked to disclose any significant relationships with commercial entities that are either providing financial support for this program or whose products or services are mentioned during my presentation. I have no significant relationships to disclose.

- I will discuss the use of vaccines in a manner not approved by the U.S. Food and Drug Administration.
  - But in accordance with ACIP recommendations.

- I may discuss vaccines not currently licensed by the FDA.
Outline of Presentation

• National Immunization Recommendations
  – Adult Immunization Schedule
  – Resources and Strategies

• Immunizations for Health Care Personnel (HCP)
  ▪ Varicella
  ▪ MMR
  ▪ Influenza
  ▪ Tdap
  ▪ Hepatitis B

• Work exclusions for infections from selected vaccine-preventable diseases

• Conclusions
A health care provider recommendation is the single most important determinant of whether or not someone gets vaccinated.
### HPV Now 2 Rows

- **Human papillomavirus (HPV) Female**: 3 doses
- **Human papillomavirus (HPV) Male**: 3 doses

### New Tdap Rec.

- 1 dose for ALL ≥ 65 yrs

### Catch up for males different

- Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs

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*Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection.
Figure 2. Vaccines that might be indicated for adults based on medical and other indications

<table>
<thead>
<tr>
<th>VACCINE ▼</th>
<th>INDICATION</th>
<th>Pregnancy</th>
<th>Immunocompromising conditions (excluding human immunodeficiency virus [HIV]) 8, 9, 7, 14</th>
<th>CD4+ T lymphocyte count</th>
<th>HIV infection 10, 13, 14</th>
<th>Men who have sex with men (MSM)</th>
<th>Heart disease, chronic lung disease, chronic alcoholism</th>
<th>Asplenia 15 (including elective splenectomy and persistent complement component deficiencies)</th>
<th>Chronic liver disease</th>
<th>Chronic kidney disease, end-stage renal disease, receipt of hemodialysis</th>
<th>Health-care personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza 2</td>
<td>1 dose TIV annually</td>
<td>1 dose TIV or LAIV annually</td>
<td>1 dose TIV annually</td>
<td>1 dose TIV or LAIV annually</td>
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<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap) 3, *</td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs</td>
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<tr>
<td>Varicella 4, *</td>
<td>Contraindicated</td>
<td>2 doses</td>
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<tr>
<td>Human papillomavirus (HPV) Female 5, *</td>
<td>3 doses through age 26 yrs</td>
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<tr>
<td>Human papillomavirus (HPV) Male 5, *</td>
<td>3 doses through age 26 yrs</td>
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<tr>
<td>Zoster 6</td>
<td>Contraindicated</td>
<td>1 dose</td>
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<tr>
<td>Measles, mumps, rubella (MMR) 7, *</td>
<td>Contraindicated</td>
<td>1 or 2 doses</td>
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<tr>
<td>Pneumococcal (polysaccharide) 8, 9</td>
<td>1 or 2 doses</td>
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<tr>
<td>Meningococcal 10, *</td>
<td>1 or more doses</td>
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<tr>
<td>Hepatitis A 11, *</td>
<td>2 doses</td>
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<td>Hepatitis B 12, *</td>
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</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention’s (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG) and American College of Nurse-Midwives (ACNM).

*For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

Contraindicated

No recommendation

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly indicated for adults ages 19 years and older, as of January 1, 2012. For all vaccines being recommended on the Adult Immunization Schedule: a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine’s other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers’ package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/pubs/acip-list.htm). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.
Because Bill says so…

- ACIP recommendations represent the standard of care for vaccination practice in the U.S. In general, to determine recommendations for use, one should follow the recommendations of ACIP rather than the information in the package insert.

Ask the Experts:
http://www.immunize.org/askexperts/experts_per.asp
Recommendations of the Advisory Committee on Immunization Practices

www.cdc.gov/vaccines/reccs/acip
ACIP General Recommendations

- Vaccine administration guidelines
- Combination vaccines
- Contraindication and precautions
- Managing adverse events
- Adult vaccination
- Adolescent vaccination
- Special Situations
  - Pregnant Women
  - Immunosuppressed, incl HCTRs
  - Latex allergy
- Storage and Handling Guidelines
- Vaccination Records
- Assessment and feedback strategy to increase vaccination rates

CDC Vaccines Main Page
www.cdc.gov/vaccines

US Immunization Schedules
www.cdc.gov/vaccines/schedule
Contraindications & Precautions

• Summary Table published annually by CDC with US adult schedule in MMWR. (CDC. MMWR 2012; vol.61, No.4)


• CDC Quick Guide to Contraindications Precautions
  http://www.cdc.gov/vaccines/recs/vac-admin/contraindications-vacc.htm
Other CDC Publications

CDC’s Pink Book

http://www.cdc.gov/vaccines/pubs/pinkbook/index.html

CDC’s Manual for Surveillance of Vaccine Preventable Diseases

American College of Physicians

Guide to Adult Immunizations

Go to: Immunization Portal

www.aca.com

Sections

1. Practice Improvement
2. Practical Advice
3. Vaccines and Their Indications
4. Special Populations
   • Women who are Pregnant or Breastfeeding
   • Immunocompromised Persons
   • Patients with Anatomical or Functional Asplenia
   • Childhood Catch-up
   • Health Care Workers (HCWs)
ACOG’s Immunization Program

www.ImmunizationForWomen.org
CDC Guidelines for Vaccinating Pregnant Women

- Guidelines for vaccination
- Travel and other vaccines
- Breast feeding and vaccination
- Prenatal screening

www.cdc.gov/vaccines/pubs/preg-guide.htm#prenatal
# Immunizations and Pregnancy

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Before pregnancy</th>
<th>During pregnancy</th>
<th>After pregnancy</th>
<th>Type of Vaccine</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis A</td>
<td>Yes, if at risk</td>
<td>Yes, if at risk</td>
<td>Yes, if at risk</td>
<td>Inactivated</td>
<td>IM</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Yes, if at risk</td>
<td>Yes, if at risk</td>
<td>Yes, if at risk</td>
<td>Inactivated</td>
<td>IM</td>
</tr>
<tr>
<td>Human Papillomavirus (HPV)</td>
<td>Yes, if 9 through 26 years of age</td>
<td>No, under study</td>
<td>Yes, if 9 through 26 years of age</td>
<td>Inactivated</td>
<td>IM</td>
</tr>
<tr>
<td>Influenza TIV</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Inactivated</td>
<td>IM, ID (18-64 years)</td>
</tr>
<tr>
<td>Influenza LAIV</td>
<td>Yes, if less than 50 years of age and healthy; avoid conception for 4 weeks</td>
<td>No</td>
<td>Yes, if less than 50 years of age and healthy; avoid conception for 4 weeks</td>
<td>Live</td>
<td>Nasal spray</td>
</tr>
<tr>
<td>MMR</td>
<td>Yes, avoid conception for 4 weeks</td>
<td>No</td>
<td>Yes, give immediately postpartum if susceptible to rubella</td>
<td>Live</td>
<td>SC</td>
</tr>
<tr>
<td>Meningococcal: • polysaccharide • conjugate</td>
<td>If indicated</td>
<td>If indicated</td>
<td>If indicated</td>
<td>Inactivated</td>
<td>SC, IM</td>
</tr>
<tr>
<td>Pneumococcal Polysaccharide</td>
<td>If indicated</td>
<td>If indicated</td>
<td>If indicated</td>
<td>Inactivated</td>
<td>IM or SC</td>
</tr>
<tr>
<td>Tetanus/Diphtheria Td</td>
<td>Yes, Tdap preferred</td>
<td>Yes, Tdap preferred if 20 weeks gestational age or more</td>
<td>Yes, Tdap preferred</td>
<td>Toxoid</td>
<td>IM</td>
</tr>
<tr>
<td>Tdap, one dose only</td>
<td>Yes, preferred</td>
<td>Yes, preferred</td>
<td>Yes, preferred</td>
<td>Toxoid/Inactivated</td>
<td>IM</td>
</tr>
<tr>
<td>Varicella</td>
<td>Yes, avoid conception for 4 weeks</td>
<td>No</td>
<td>Yes, give immediately postpartum if susceptible</td>
<td>Live</td>
<td>SC</td>
</tr>
</tbody>
</table>

Resources for Talking to Parents About Vaccines

- CDC resources for talking with parents Conversations
  www.cdc.gov/vaccines/conversations

- Clear Answers and Smart Advice About Your Baby’s Shots by Ari Brown, MD
  www.immunize.org/catg.d/p2068.pdf

- Immunization Action Coalition has many other resources at
  www.immunize.org

- Children’s Hospital of Philadelphia
  www.chop.edu/service/vaccine-education-center/home.html

- AAP
  www.aap.org

- AAFP
A 22 year old comes to employee health and is a newly diagnosed diabetic.

**Immunization:** 1 dose of MMR, MCV4 and Td vaccines at 16 years and a complete childhood series of DTaP, Hib, Hep A and polio vaccines. But, no record of HepB vaccine. She does not think she has had chickenpox.

What immunizations does she need?

- Hepatitis A
- MCV
- Tdap
- Hepatitis B
- MMR
- Td
- HPV
- PPSV23
- Varicella
- Flu
- PCV13
Vaccination Recommendations for Healthcare Personnel (HCP)

Definition – All paid and unpaid persons working in healthcare settings who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air.

CDC. Immunization of Health-Care Personnel: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR November 25, 2011 / 60(RR07);1-45
Definition of Healthcare Personnel

May include (But, is not limited to):

- physicians,
- nurses,
- nursing assistants,
- therapists,
- technicians,
- emergency medical service personnel,
- dental personnel,
- pharmacists,
- laboratory personnel,
- autopsy personnel,
- students and trainees,
- contractual staff not employed by the health-care facility, and
- persons not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from HCP and patients
  - e.g., clerical, dietary, housekeeping, laundry, security, maintenance, administrative, billing, and volunteers
Common Reasons HCP and Adult Patients Might Give for Not Getting Vaccinated

10. Vaccine preventable diseases are a thing of the past.
9. Vaccines don’t work.
8. I am great at washing my hands.
7. I always put on a mask before I am near patients that may have [INSERT DISEASE HERE].
6. I never come to work sick.
5. Vaccines will make me sick.
4. It is easier to deal with the rare case than to vaccinate routinely.
3. My patients are already vaccinated so I don’t need to be.
2. The healthcare facility where I work doesn’t require vaccines.
1. My provider didn’t recommend any vaccines for me.
Question: Appropriate ventilation, hand hygiene, and use of respiratory precautions are as effective in preventing transmission of vaccine preventable diseases as vaccines when used appropriately.

A. True
B. False
C. Depends
Factors Impacting Transmission of Infections

**Pathogen**
- Infectious dose
- Receptor binding
- Pathogenesis
- Strain/subtype characteristics
- Aerobiology
- Persistence/stability in environment

**Environment**
- Humidity
- Temperature
- Air exchange rates
- Physical barriers
- Other means that may reduce amount of virus including UV lights, HEPA filtration of air

**Host**
- Degree of viral/pathogen shedding
- Immunity
- Illness severity
- Cough, sneeze, etc
- Behaviors, e.g. hand washing, use of mask/respirator compliance
- Distance between people
- Number and types of contacts

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2012 ACIP Adult Immunization Schedule, Medical, Occupational and Behavior-Based Recommendations

FIGURE 2. Vaccines that might be indicated for adults, based on medical and other indications¹ — United States, 2012

<table>
<thead>
<tr>
<th>VACCINE ▼</th>
<th>INDICATION</th>
<th>Immunocompromising conditions (excluding human immunodeficiency virus [HIV])&lt;sup&gt;4,6,7,14&lt;/sup&gt;</th>
<th>HIV infection&lt;sup&gt;6,7,13,14&lt;/sup&gt; CD4&lt;sup&gt;+&lt;/sup&gt; T lymphocyte count</th>
<th>Men who have sex with men (MSM)</th>
<th>Heart disease, chronic lung disease, chronic alcoholism</th>
<th>Asplenia&lt;sup&gt;12&lt;/sup&gt; (including elective splenectomy and persistent complement component deficiencies)</th>
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<th>Diabetes, kidney failure, end-stage renal disease, receipt of hemodialysis</th>
<th>Healthcare personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza&lt;sup&gt;2,9&lt;/sup&gt;</td>
<td>Pregnancy</td>
<td>1 dose TIV annually</td>
<td>1 dose TIV or LAIV annually</td>
<td>1 dose TIV annually</td>
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</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)&lt;sup&gt;3,8&lt;/sup&gt;</td>
<td></td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 years</td>
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<tr>
<td>Varicella&lt;sup&gt;4,8&lt;/sup&gt;</td>
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<td>Contraindicated</td>
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<tr>
<td>Human papillomavirus (HPV)&lt;sup&gt;5,9&lt;/sup&gt; Female</td>
<td></td>
<td>2 doses</td>
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<tr>
<td>Human papillomavirus (HPV)&lt;sup&gt;5,9&lt;/sup&gt; Male</td>
<td></td>
<td>3 doses through age 26 years</td>
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<tr>
<td>Human papillomavirus (HPV)&lt;sup&gt;5,9&lt;/sup&gt;</td>
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<td>3 doses through age 21 years</td>
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<tr>
<td>Zoster&lt;sup&gt;4,8&lt;/sup&gt;</td>
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<td>Contraindicated</td>
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<tr>
<td>Measles, mumps, rubella&lt;sup&gt;7,8&lt;/sup&gt;</td>
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<td>Contraindicated</td>
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<tr>
<td>Pneumococcal (polysaccharide)&lt;sup&gt;8,9&lt;/sup&gt;</td>
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<td></td>
<td>1 or 2 doses</td>
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<td>Meningococcal&lt;sup&gt;10,8&lt;/sup&gt;</td>
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<td>Hepatitis A&lt;sup&gt;11,8&lt;/sup&gt;</td>
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<td>2 doses</td>
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<tr>
<td>Hepatitis B&lt;sup&gt;12,8&lt;/sup&gt;</td>
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<td>3 doses</td>
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</tbody>
</table>

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For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection: Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications). Contraindicated. No recommendation.
Recommended Vaccines for HCP Based on Risk of Healthcare Setting Transmission

## All HCP

<table>
<thead>
<tr>
<th>Vaccines for HCP in Certain Settings, e.g. lab workers, after direct exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
</tr>
<tr>
<td>Meningococcal conjugate (MCV4) ≤ 55 yrs,</td>
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<tr>
<td>meningococcal polysaccharide (MPSV4) ≥ 56 yrs</td>
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<tr>
<td>Influenza</td>
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<tr>
<td>Salmonella typhi (Ty21a oral live or polysaccharide parenteral vaccines)</td>
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<tr>
<td>Tdap</td>
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<tr>
<td>Inactivated polio vaccine</td>
</tr>
<tr>
<td>Measles, Mumps, Rubella (MMR)</td>
</tr>
<tr>
<td>Varicella</td>
</tr>
</tbody>
</table>

### Other Vaccines Recommended Not Based on Occupation:

HPV, Zoster, Pneumococcal Polysaccharide, Pneumococcal Conjugate Vaccine, Td, and Hepatitis A

MMWR. November 25, 2011 / 60(RR-07)
Varicella Vaccine

• 2 doses of varicella vaccine administered 4 weeks apart are recommended for all individuals without acceptable proof of immunity

• Acceptable proof of immunity
  – Written documentation of immunization
  – Laboratory evidence of immunity or disease
  – Reliable history of varicella or zoster (healthcare provider diagnosis or verification)

Note: Born in the US before 1980 does NOT apply to HCWs)
Measles Outbreaks

- Worldwide resurgence
- In US in 2012, 44 reported measles cases as of July 14
  - 222 cases in 2011
- Most measles cases associated with importation
  - travelers from other countries coming into the U.S. who are infected
  - returning U.S. citizens infected while traveling internationally

<table>
<thead>
<tr>
<th>International Measles Outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2011</strong></td>
</tr>
<tr>
<td>France</td>
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<tr>
<td>Italy</td>
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<td>Spain</td>
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</tbody>
</table>
MMR Vaccine

• 2 doses of MMR vaccine administered ≥ 4 weeks apart are recommended for all HCPs without acceptable proof of immunity

• Acceptable proof of immunity
  – Written documentation of immunization
  – Laboratory evidence of immunity or disease
  – Past history of diseases is NOT acceptable
  – Vaccination recommended for all HCPs, regardless of year of birth
Influenza Vaccine
Influenza Introduction

• Influenza viruses cause yearly epidemics and sporadic pandemics

• Influenza illnesses occur in all age groups
  ▪ Highest illness rates in young children

• Severe illness, hospitalizations and deaths disproportionately affect very young, elderly, pregnant women and persons with certain medical conditions
  ▪ e.g. asthma, diabetes, heart disease, neurologic conditions, chronic renal and liver disease, immune compromised conditions

• Average of 226,000 hospitalizations per year

• From 3,000 – 49,000 influenza-related deaths per year
Tools for the Prevention of Influenza

• Influenza vaccine
• Antiviral medications
  ▪ Can be used for treatment or prevention (prophylaxis)
• Hand hygiene
• Masks
• Respirators
• Environmental controls
  ▪ E.g. ensuring appropriate ventilation, air exchange, physical barriers, etc.
Influenza Vaccine

- Primary means for preventing influenza
- Recommended annually for **ALL** people 6 months of age and older
  - Including pregnant women
  - Including healthcare personnel
- “Insurance” against infection
- Benefit to those vaccinated plus decreases risk of spreading influenza to others
  - Not 100% effective
  - Need to use other tools in addition to vaccination
Impact of HCW Influenza Vaccination

Average annual savings of $13.66* - $46.85* per person vaccinated

Influenza and Vaccination

Four types of influenza vaccines available:

- **Trivalent inactivated influenza vaccine (TIV) (45 mcg)**
  - anyone 6 months of age or older

- **Nasal spray vaccine (LAIV): healthy, non-pregnant individuals (0.2 mL)**
  - ages 2-49 years
  - HCP not working with patients in a protected environment

- **High-dose inactivated injectable vaccine (TIV-HD) (180 mcg)**
  - 65 years and older

- **Intradermal inactivated vaccine (TIV-ID) (27 mcg)**
  - 18-64 years old
Intradermal Influenza Vaccine

- Fluzone ID had the same vaccine components as intramuscular and LAIV
  - Approved for adults 18-64 years
  - 40% less antigen
    (9 mcg per strain vs. 15 mcg.)
  - Needle 90% smaller
    (25 gauge, 1.5 mm)
  - Pre-filled syringe, no preservatives

- Give 0.1 mL intradermal (ID)
- Similar efficacy
- Similar safety profile
  - Some increased local reactions when compared to IM vaccine
    (redness, swelling, itching)

MMWR 2011;60:1128-  Vaccine 2011; 09.077
2012-2013 Algorithm for Children 6 Mos. through 8 yrs.

Has the child ever received influenza vaccine?

Yes

Did the child receive a total of 2 or more doses of seasonal influenza vaccine since July 1, 2010?

Yes

1 dose

No/Don’t know

2 doses

No/Don’t know

2 doses

• For simplicity, this algorithm takes into consideration only doses of seasonal influenza vaccine received since July 1, 2010.

• However, if a complete vaccine history is available, children who have received at least:
  ▪ 2 seasonal influenza vaccines during any prior season, and
  ▪ 1 dose of a 2009(H1N1)-containing vaccine (i.e., either 2010-2011 or 2011-2012 seasonal vaccine or the monovalent 2009 H1N1 vaccine) only need 1 dose for 2012-2013.
Influenza Vaccination of Persons with Egg Allergy

• All types and formulations of influenza vaccine contain residual egg protein (ovalbumin)

• The amount of ovalbumin per dose varies by manufacturer, vaccine type, and lot

• Many persons with “egg allergy” can tolerate receipt of TIV without serious reaction
Influenza Vaccination of Persons with Egg Allergy*

• If the person can eat cooked eggs without a reaction: vaccinate (TIV) without special precautions

• If after eating egg or egg-containing food the person has hives only: vaccinate (TIV) and observe for at least 30 minutes

• Providers administering vaccines should be prepared for rapid recognition and response to anaphylaxis

• If the person has hives and other symptoms (e.g. wheezing, nausea) then refer the person to a physician with expertise in management of allergy

• LAIV should **NOT** be administered to persons with egg allergy

* off-label use
Recommendations Regarding Influenza Vaccination for Persons Who Report Allergy to Eggs, 2012-2013 Flu Season

Can the person eat lightly cooked egg (e.g. scrambled egg) without reaction?*

Yes

Administer vaccine per usual protocol.

No

After eating eggs or egg-containing foods, does the person experience ONLY hives?

Yes

Administer TIV.

Observe for reaction for at least 30 minutes after vaccination.

No

Does the person experience other symptoms such as

• Cardiovascular changes (e.g. hypotension)?
• Respiratory distress (e.g. wheezing)?
• Gastrointestinal (e.g. nausea/vomiting)?
• Reaction requiring epinephrine?
• Reaction requiring emergency medical attention?

Yes

Refer to a physician with expertise in management of allergic conditions for further evaluation.

*Persons with egg allergy might tolerate egg in baked products (e.g., bread or cake). Tolerance to egg-containing foods does not exclude the possibility of egg allergy.

* off-label use
Influenza Vaccination Coverage of Health Care Personnel by Occupation, Mid-November 2011

<table>
<thead>
<tr>
<th>Group</th>
<th>Already vaccinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>63.4</td>
</tr>
<tr>
<td>Occupation:</td>
<td></td>
</tr>
<tr>
<td>Physician/dentist</td>
<td>77.6</td>
</tr>
<tr>
<td>Nurse practitioner/physician assistant</td>
<td>76.8</td>
</tr>
<tr>
<td>Nurse</td>
<td>75.7</td>
</tr>
<tr>
<td>Other†</td>
<td>58.7</td>
</tr>
</tbody>
</table>

† "Other" includes allied health professionals, technicians/assistants and aides, and administrative and non-clinical support staff.

http://www.cdc.gov/flu/professionals/vaccination/health-care-personnel.htm
Influenza Vaccination Coverage of Health Care Personnel by Work Setting, Mid-November 2011

- Hospital: 77.8%
- Physician's office: 64.4%
- Long-term care facility: 45.1%
- Other*: 57.0%

http://www.cdc.gov/flu/professionals/vaccination/health-care-personnel.htm
Conclusions for Influenza

- Many tools for influenza prevention, but vaccination is the primary means to prevent influenza
  - Best insurance against influenza infection and transmission to HCP family, friends, coworkers and patients

- Vaccination should be used in conjunction with other influenza prevention tools to most effectively decrease the spread of influenza
Tdap VACCINE
Pertussis Introduction

- Highly contagious bacterial infection
  - Secondary household attack rates can reach 80%
- Incubation period from 7 up through 21 days
- Infectious with onset of catarrhal cough and lasts 3 weeks
- Symptoms non-specific early in illness
  - Difficult to distinguish clinically from other causes of cough-illness
- Patients require droplet precautions
- Exposed HCP should be monitored daily for 21 days
- If HCP becomes ill, excluded from work until complete at least 5 days of antibiotics
Reported pertussis cases – 1922–2010

In 2012 to Date Nationwide: 29,000 cases, highest since 1959

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System and 1922-1949, passive reports to the Public Health Service
Pertussis Incidence, MA

- Overall incidence in MA declining steadily for several years, despite national resurgence

- MA: **462** cases to date (compared to **176** same time last year)
  - Cases increasing in infants, 7-10 and 11-19 year old age groups (waning immunity)
  - First infant **death** in Massachusetts due to pertussis in 10 years
  - Hospitalizations: 22 of 28 were infants

*2012 Data is as of August 23, 2012.*
Pertussis in Health Care Settings: Who’s at Risk?

- Waning vaccine-induced immunity has contributed to increasing pertussis disease among adolescents and adults, among whom it is often unrecognized.
- Nosocomial spread documented in various health-care settings, including hospitals and emergency departments serving pediatric and adult out-patient clinics, nursing homes, and long-term–care facilities.
- Identified source of pertussis:
  - Patients
  - HCP with hospital- or community-acquired pertussis
  - Visitor or family member

MMWR. November 25, 2011 / 60(RR-07)
Tdap Vaccine

Administer a single dose of Tdap to **ALL** adolescents and adults who previously have not received one, remembering:

- Children 7-10 years who are under-immunized with DTaP¹
  - 5 doses or 4 if the 4ᵗʰ dose is given at ≥ 4ᵗʰ birthday
- All Adolescents 11–12 years
- All ≥ 13 years in place of Td, including those ≥ 65 years²
- For **all** healthcare workers (HCWs) ASAP
- Pregnant women after week 20 of gestation³
- Cocooning: Close contacts of infants and pregnant women (parents, family members, HCWs)

¹ Off-label recommendation. MMWR 2011; 60 (No. 1):13-
³ Off-label MMWR 2011;60(41):1424-
Tdap and Pregnancy: Rationale* 

- Cocooning challenging, don’t protect youngest infants, most at risk for complications and death
- Cost effectiveness models favor vaccination during pregnancy
- Tdap before or during pregnancy helps protect the newborn from pertussis through passive immunity
- Passive pertussis antibody could interfere with the infant’s response to DTaP and might shift pertussis to a little older in infancy
- But, experts feel potential benefits of protecting youngest infants who are at highest risk for complications outweighs risk of shift in disease burden to older infants

* Off-label MMWR 2011;60(41):1424-
Tdap for Pregnant Women*

- Tdap **should** be administered to pregnant women who have not received a dose

- Vaccinate during third trimester or late in second trimester (after 20 weeks gestation)
  - Optimizes transfer of maternal antibodies to protect infant after birth

- If not administered during pregnancy, administer Tdap:
  - Immediately **postpartum** to mother, father, other family members
  - Ideally all close contacts, including HCWs should get vaccinated ≥2 weeks **before** contact with an infant

* Off-label MMWR 2011;60(41):1424-
Td-Tdap Interval Recommendation*

- Tdap can be administered **regardless** of the interval since the last tetanus and diphtheria containing vaccine
  - **No** minimum interval

- ACIP concluded that while longer intervals between Td and Tdap vaccination could decrease the of local reactions, the benefits of protection against pertussis outweigh the potential risk for adverse events

*Off-label recommendation. MMWR 2011; 60 (No. 1):13-
Healthcare Personnel and Tdap: Cost Effectiveness

• Vaccinating HCP with Tdap → reduce pertussis cases among HCP → reduce the costs associated with resource-intensive hospital investigations and control measures
  • e.g., case/contact tracking, postexposure prophylaxis, treatment of hospital acquired pertussis cases

• Control measures costs can be substantial
  • In four hospital-based pertussis outbreaks, the cost of controlling pertussis ranged from $74,870–$174,327 per outbreak.

HEPATITIS B VACCINE
Hepatitis B Introduction

- Highly infectious, transmitted via percutaneous or mucosal exposure to infectious blood or body fluids
- Hepatitis B virus (HBV) viable for at least 7 days on environmental surfaces
- Unvaccinated HCP at high risk for hepatitis B infection, especially during training when more likely to have needle sticks, other exposures
- Long incubation period – up to 6 months
- Cases of acute hepatitis B among HCP
  - ~100,000 annually before vaccine in 1982
  - 304 infections in HCP reported in 2004
Acute Hepatitis B Cases in HCP Reported to CDC, 2005-2010

• 203 cases among HCP (75 with frequent blood contact)

• Based on interview of a subset of cases

• Median age: 41 years (range: 18-69 years); 60% female

• 28 of 168 (17%) reported accidental stick or puncture with needle or other object contaminated with blood

• Vaccination response history sparse

---

1National Notifiable Diseases Surveillance System; Surveillance definition of HCP: persons employed in a medical, dental or other field involving contact with human blood
2Frequent blood contact defined as several times weekly
3Reported cases markedly underestimate incidence of infection because of asymptomatic disease and underreporting
Hepatitis B in Health Care Settings

- Hepatitis B (total 19 outbreaks, 2008-11, at least 150 outbreak-associated cases, >10,190 persons notified for screening):
  - 15 in long-term care facilities: ≥114 outbreak-associated cases and approximately 1,500 persons notified for screening
    - 80% (12/15) of the outbreaks were associated with infection control breaks during assisted monitoring of blood glucose (AMBG)
    - Led to new ACIP recommendation for hepatitis B vaccination of patients with diabetes
      - Ideally as soon as possible after diagnosis
        - All <60 years, ≥60 years at provider’s discretion
  - 4 outbreaks occurred in other settings

http://www.cdc.gov/hepatitis/Statistics/HealthcareOutbreakTable.htm
Hepatitis B Vaccine Recommendations for HCP

- The Occupational Safety and Health Administration (OSHA) mandates hepatitis B vaccine be available at employer’s expense to all HCP who may contact infectious materials.

- Complete series prior to HCP trainees having potential for exposure to HBV.

- 3-dose series at 0, 1 and 6 months for non-immune.

- Post-vaccination serologic testing:
  - Repeat 3-dose series if anti-HBs <10mIU/mL.

- Duration of protection >22 years.
### Recommended Postexposure Prophylaxis to hepatitis B virus, ACIP

<table>
<thead>
<tr>
<th>Vaccination &amp; Antibody Response Status Exposed Person</th>
<th>Source HBsAg-Positive</th>
<th>Source HBsAg-Negative</th>
<th>Source Not Tested or Status Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unvaccinated</strong></td>
<td>HBIG X1; Initiate HB vaccine series</td>
<td>Initiate HB vaccine series</td>
<td>Initiate HB vaccine series</td>
</tr>
<tr>
<td><strong>Previously Vaccinated</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Known Responder</strong></td>
<td>No treatment</td>
<td>No treatment</td>
<td>No treatment</td>
</tr>
<tr>
<td><strong>Known Nonresponder</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After 3 Doses</strong></td>
<td>HBIB X1 and initiate revaccination</td>
<td>No treatment</td>
<td>If known high risk source, treat as if source HBSAg-Pos.</td>
</tr>
<tr>
<td><strong>After 6 Doses</strong></td>
<td>HBIG X 2 (≥ 1 month apart)</td>
<td>No treatment</td>
<td>If known high risk source, treat as if source HBSAg-Pos.</td>
</tr>
<tr>
<td><strong>Antibody Response Unknown</strong></td>
<td>Test exposed person for anti-HBs. If adequate*, no treatment. If inadequate*, HBIG X1 and vaccine booster.</td>
<td>No treatment</td>
<td>Test exposed person for anti-HBs. If adequate*, no treatment. If inadequate*, initiate revaccination.</td>
</tr>
</tbody>
</table>

---

*Anti-HBs ≥ 10 mIU/mL is considered adequate.*
Hepatitis B Vaccination Coverage from NHIS, 2010

- High risk patients 19-49 years: 42%
- 19-59 with diabetes: 23%
- 60 years and older with diabetes: 11%
- HCP: 63%

* Adults were considered at high risk for hepatitis A or B if they had hemophilia and had received clotting factor concentrations, were a man who had sex with other men, had taken street drugs by needle, had traded sex for money or drugs, had tested positive for human immunodeficiency virus (HIV), or had sex with someone who would meet any of the previous criteria; considered themselves at high risk for HIV infection, or reported having a sexually transmitted diseases other than HIV or acquired immune deficiency syndrome (AIDS) during the previous 5 years.

† Respondents were asked if they had ever received the hepatitis A vaccine, and if yes, were asked how many shots were received.

§ Respondents were asked if they had ever received the hepatitis B vaccine, and if yes, if they had received at least 3 doses or less than 3 doses.
Testing HCP for Hepatitis B Immunity: Under Review by ACIP*

- Post-vaccination serologic testing recommended 1-2 months after Hepatitis B (Hep B) vaccine series for HCP with high risk for blood and body fluid exposure.

- An increasing proportion of HCP entering training and the workforce have received the Hep B vaccine series in infancy (as part of universal infant Hep B vaccination) without post-vaccination serologic testing.

- Antibody to hepatitis B surface antigen (anti-HBs) wanes over time and may no longer meet level defining seroprotection.

* This slide does not represent any official policy of CDC or the ACIP.
Testing HCP for Hepatitis B Immunity: Under Review by ACIP (2)

- Post-vaccination serologic testing for evidence of protection might not distinguish vaccine responders, delayed responders, or non-responders
- Implication of non-response to a challenge dose unknown
- Risks to HCP continue (e.g., blood and body fluid exposures, source patients with hepatitis B infection)
- Healthcare schools and institutions seeking guidance to ensure protection for HCP who received Hep B vaccine series in remote past without post-vaccination serologic testing

* This slide does not represent any official policy of CDC or the ACIP
<table>
<thead>
<tr>
<th></th>
<th>Measles</th>
<th>Mumps</th>
<th>Rubella</th>
<th>Varicella</th>
<th>Pertussis</th>
</tr>
</thead>
<tbody>
<tr>
<td>If exposed and not immune</td>
<td>5 days after</td>
<td>12 days after</td>
<td>7 days after</td>
<td>8 days after</td>
<td>Monitor for</td>
</tr>
<tr>
<td></td>
<td>exposure through</td>
<td>exposure through</td>
<td>exposure through</td>
<td>exposure through</td>
<td>cough for</td>
</tr>
<tr>
<td></td>
<td>21 days</td>
<td>25 days</td>
<td>23 days</td>
<td>21/28 days</td>
<td>21 days;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>consider</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>antibiotics</td>
</tr>
<tr>
<td>If ill</td>
<td>For 4 days</td>
<td>For 5 days</td>
<td>For 7 days</td>
<td>Until all</td>
<td>3 weeks</td>
</tr>
<tr>
<td></td>
<td>after rash first</td>
<td>after onset</td>
<td>after rash first</td>
<td>lesions dry and</td>
<td>after cough</td>
</tr>
<tr>
<td></td>
<td>appears</td>
<td>parotitis</td>
<td>appears</td>
<td>crust or no new</td>
<td>onset or 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>lesions &gt;24</td>
<td>days antibiotics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>hours</td>
<td></td>
</tr>
<tr>
<td>Vaccine Doses(^3)</td>
<td>2 MMR</td>
<td>2 MMR</td>
<td>1 MMR</td>
<td>2 Varicella</td>
<td>1 Tdap</td>
</tr>
</tbody>
</table>

1 Exposures are from first exposure through date of last exposure.
2 Longer if receive immune globulin.
3 For MMR and Varicella, the listed number of doses is accepted evidence of immunity.

Note: Check with state or local health authorities for isolation and quarantine specific to your jurisdiction

CDC. Immunization of Health-care Personnel: Recommendations of the Advisory Committee on Immunization Practices. MMWR 2011
Remember Your New 22 Year Old Healthcare Worker?
What immunizations does she need?

- Flu
- Tdap
- MMR
- Varicella
- HPV
- Hep B – occupational & DM
- PPSV - DM
Conclusions

• Outbreaks of vaccine preventable diseases continue to occur
  ▪ Result in health risks to patients and HCP and their families
  ▪ Very disruptive and expensive to investigate and manage
  ▪ Can be difficult to recognize early and before many people have been exposed
  ▪ Exposures and illnesses can result in substantial lost work time as early awareness and implementation of control measures challenging
Conclusions

• Vaccines have been highly successful in reducing the burden of many diseases

• Vaccination are a critical component of infection control to protect HCP and their patients, coworkers and families

• HCP should be
  - Assessed for vaccination and immunity status at the time of hire and at least annually to ensure they are up to date with recommended vaccines.
  - Provided with information about risks and benefits of the vaccines
Resources

• Many vaccine resources on CDC website:
  ▪ Main web page for vaccine information: http://www.cdc.gov/vaccines/.
  ▪ ACIP guidances including HCP vaccination guidance http://www.cdc.gov/vaccines/recs/default.htm.

• English and Spanish: 1(800) CDC-INFO

• Vaccine Adverse Events Reporting System:
  ▪ 1(800) 822-7967
For More Information

- Massachusetts Immunization Program
  - 1-617-983-6800
  - 1-888-658-2850
  - Website http://www.mass.gov/dph
  - Ordering MDPH materials

- CDC/NIP
  - 1-800-232-4636 (1-800-CDC-INFO) for both English and Spanish
  - 1-888-232-6348 TTY (M-F 10 AM – 10 PM)
  - Website http://www.cdc.gov/vaccines
EXTRA SLIDES
This schedule includes recommendations in effect as of December 23, 2011. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/pubs/acip-list.htm. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967).
HPV Footnote now for both females and males
FIGURE 3. Catch-up immunization schedule for persons aged 4 months through 18 years who start late or who are more than 1 month behind—United States • 2012

The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. Always use this table in conjunction with the accompanying childhood and adolescent immunization schedules (Figures 1 and 2) and their respective footnotes.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age for Dose 1</th>
<th>Minimum Interval Between Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose 1 to dose 2</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Birth</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Diphtheria, tetanus, pertussis³</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Haemophilus influenza type b³</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Pneumococcal⁴</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Inactivated poliovirus⁵</td>
<td>6 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Meningococcal⁶</td>
<td>9 months</td>
<td>8 weeks³</td>
</tr>
<tr>
<td>Measles, mumps, rubella⁷</td>
<td>12 months</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Varicella⁸</td>
<td>12 months</td>
<td>3 months</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>12 months</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age for Dose 1</th>
<th>Minimum Interval Between Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dose 1 to dose 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Tetanus, diphtheria/tetanus, pertussis³</td>
<td>7 years²</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Human papillomavirus¹⁰</td>
<td>9 years</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>12 months</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Birth</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Inactivated poliovirus⁵</td>
<td>6 weeks</td>
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</tr>
<tr>
<td>Meningococcal⁶</td>
<td>9 months</td>
<td>8 weeks⁹</td>
</tr>
<tr>
<td>Measles, mumps, rubella⁷</td>
<td>12 months</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Varicella⁸</td>
<td>12 months</td>
<td></td>
</tr>
</tbody>
</table>

MDPH 10-12
Influenza Vaccine and Prevention of Transmission, Population Studies

• Monto JID, 1973 Tecumseh study
  • From 1968 pandemic, vaccination of school children reduced illness in children and adults compared to town that did not vaccinate children

• Loeb JAMA 2009
  • Recent study of Hutterite communities in Canada
  • Found 61% reduction in adult cases of influenza by vaccinating children
Influenza Vaccine and Prevention of Transmission, Healthcare Settings

• Hospital-based HCP vaccination reduced nosocomial influenza (imm rates: increase 4 to 67% resulted in nosocomial flu rates: decrease 32% to 2%)
  • Salgado, et al. Infect Control Hospital Epidemiol 2004

• Reduced absenteeism by 28%
  • Saxen, et a. Pediatr Infect Dis 1999

• Four studies of benefits of health care worker vaccination in nursing homes found reductions in patient deaths with healthcare worker vaccination
  • Oshitani, et al; Potter, et al; Carmen, et al; Hayward et al.
  • Referenced in HCP Vaccination MMWR November 25, 2011
Influenza and Mask or Respirator Use

- Relatively few clinical studies done to assess reduction in influenza illness in clinical setting for masks or respirators

- Household transmission studies and one study of college students found
  - Limited reductions with mask +/- hand hygiene when
    - High levels of compliance with mask use
    - Early initiation of mask use
  - No reductions in influenza with increase in hand hygiene alone

- Study of 2009 H1N1 in hospital workers
  - Masks likely helpful
  - Emergency Department workers more likely to become ill with influenza than other types of workers
    - May have been related to lack of wearing mask with first encounter with patient

Apisarnthanarak CID 2012; Vanhems Archives Intern Med 2011; Aiello JID 2010; Cowling Epi Infect 2010; Aiello AJPH 2008
Examples of Nosocomial Transmission of Pertussis

1. **HCP to infant**
   - 2 month old premature infant developed cough and apnea; 3 weeks mechanical ventilation; pertussis suspected 10 days after symptom onset; recovered/discharged 2 months after diagnosis
   - 72 infant patients and 72 HCPs were exposed

2. **HCP to HCP**
   - 2006 outbreak, Mayo Clinic
   - Largest group affected: nursing staff (~2/3 of HCP cases).
   - Patients potentially exposed ~510
   - No documented transmission from HCP to patients, but numerous instances of transmission among HCP and from HCP to family members

The findings and conclusions in this presentation have not been formally disseminated by CDC and should not be construed to represent any agency determination or policy.
Background

• A 2006 study showed a substantial lack of uniformity in the way U.S. hospitals measure HCP vaccination rates

• Joint Commission accreditation now requires a variety of inpatient and outpatient facilities to annually measure influenza vaccination rates for staff & licensed independent practitioners

• The National Quality Forum recently issued a time-limited endorsement to a CDC-sponsored standardized measure (‘NQF measure’) for reporting HCP influenza vaccination rates
CMS Reporting Requirements

The Centers for Medicare & Medicaid Services’ (CMS) Hospital Inpatient Quality Reporting Program requires acute care hospitals to report a set of quality measures or receive decreased annual payment update.

- CMS published a final rule in August 2011 that includes HCP influenza vaccination as calculated by this measure in the Hospital IQR program.
- Data will be reported through the National Healthcare Safety Network (NHSN).
- A similar rule for ambulatory surgery centers was published in November 2011.
Measure Implementation Timeline

- August 2012: New aggregate reporting module incorporated into NHSN
  - Training webinars via CDC Oct 3 and 11, 2012

- January 1, 2013: CMS rule for **acute care hospital** reporting goes into effect

- August 15, 2013: First report from **acute care hospitals** due to CMS

- October 1, 2014: CMS rule for **ambulatory surgery center** reporting goes into effect

- May 15, 2015: First report from **ambulatory surgery centers** due to CMS
Vaccination Module

Background

The Advisory Committee on Immunization Practices (ACIP) recommends that all healthcare personnel (HCP) and persons in training for healthcare professions should be vaccinated annually against influenza.[1] Persons who are infected with influenza virus, including those with subclinical infection, can transmit influenza virus to persons at higher risk for complications from influenza. Vaccination of HCP has been associated with reduced work absenteeism and with fewer deaths among nursing home patients and elderly hospitalized patients. Although annual vaccination is recommended for all HCP and is a high priority for reducing morbidity associated with influenza in healthcare settings, national survey data have demonstrated that vaccination coverage levels are only approximately 60%.[2] This is well...