Management of Vaccine Preventable Diseases in 2017

Teri Moser Woo PhD, CPNP, ARNP, FAANP

Objectives

- Review current child and adolescent vaccination rates in the United States compared to the Healthy People 2020 goals
- Discuss vaccine-preventable diseases currently experiencing outbreaks in the United States
- Review management of vaccine-preventable diseases
  - Measles
  - Mumps
  - Varicella
  - Meningococcal disease
  - Influenza
  - Pertussis

HealthyPeople 2020 Goals

- Goals for universal vaccination coverage
  - 19 to 35 month olds:
    - 90% receive 4 DTap, 3 Hib, 3 IPV, 3 HPV, 1 MMR, 1 varicella
  - Kindergarten:
    - 90% receive 4 DTap, 3 polio, 2 MMR, 2 varicella
  - Adolescents age 13 to 15 yrs:
    - 80% receive: 1 Tdap, 1 meningococcal conjugate, 3 HPV
    - 90% receive 2 doses varicella
  - Adults
    - 90% receive pneumococcal vaccine; 30% receive zoster vaccine; 70% receive influenza

National Vaccine Coverage 2015: 19 to 35 mo olds

- ≥3 doses of poliovirus vaccine 93.7%
- ≥3 doses of HepB 92.6%
- ≥1 dose of MMR 91.9%
- ≥1 dose of varicella vaccine 91.8%
- ≥4 doses of DTap 84.6%
- the full series of Hib 82.7%
- ≥4 doses of PCV 84.1%
- ≥2 doses of HepA 59.6%
- HepB birth dose 72.4%
- rotavirus vaccination 73.2%
- combined seven-vaccine series 72.2%

National Vaccine Coverage 2015: Kindergarten

- MMR 2 doses: 94.6%
- DTap 5 doses: 94.2%
- Varicella 1 dose: 96.1%
- Varicella 2 doses: 94.3%
National Vaccine Coverage 2015: 13 to 15 yr olds

- 86.4% receive 1 Tdap
- 81.3% receive 1 meningococcal conjugate
- 83.1% receive 2 doses varicella or have hx of varicella disease
- 91.1% have received 3 doses of Hep B
- HPV Vaccine
  - Females: 62.8% have ≥1 dose; 41.9% have ≥3 doses
  - Males: 49.8% have ≥1 dose; 28.1% have ≥3 doses

National Vaccine Coverage 2015: Adults > 19 yrs

- Influenza 43.2%
- Pneumococcal vaccine (ever) 20.3%
- Tetanus in past 10 yrs: 62.2%
- Tetanus vaccination + pertussis vaccine (in past 9 yrs): 20.1%
- Zoster 27.9%

Outbreaks of Vaccine Preventable Diseases

- Measles 70 cases in 2016
  - 189 in 2015, 667 in 2014
- Mumps 5,311 cases in 2016
  - 1,057 in 2015, 1,223 in 2014
- Meningococcal disease Serogroup B
  - College campuses
  - Adult MSM
- Influenza annual outbreaks

The Traveling Rash

- Woman in her 20’s; case linked to British Columbia outbreak
- Worked at a bakery while contagious
- Traveled to Seattle for a concert at Key Arena
  - Stayed at the Best Western
- Pike Place Market, Starbucks, restaurants
- Tacoma: LeMay Car Museum, Harmon Brewing Company, Safeway, Kmart

A parent brings an 8 month old to the clinic who thinks they stood in line at Starbucks with this young woman. What is your treatment plan?

Measles

- Measles is transmitted by direct contact with infectious droplets
- Fever, cough, coryza, and conjunctivitis, followed by a maculopapular rash beginning on the face and spreading cephalocaudally and centrifugally
- The incubation period generally is 8 to 12 days from exposure to onset of symptoms.
- In family studies, the average interval between appearance of rash in the index case and subsequent cases is 14 days, with a range of 7 to 21 days.

Measles Treatment

- No specific antiviral therapy
- The WHO recommends vitamin A for all children with acute measles, regardless of their country of residence.
- Vitamin A for treatment of measles is administered once daily for 2 days, at the following doses:
  - 200,000 IU for children 12 months or older
  - 100,000 IU for infants 6 through 11 months of age
  - 50,000 IU for infants younger than 6 months.

Kafka Spots (CDC, 2016)
Measles: Care of Exposed People

- Measles vaccine within 72 hrs of exposure
- Immune Globulin (IG) can be administered either intramuscularly (IGIM) or intravenously (IGIV) within 6 days of exposure
  - IGIM 0.50 mL/kg IM (max. dose by volume is 15 mL)
  - IGIV (400 mg/kg) is the recommended IG preparation for:
    - Pregnant women; severely immunocompromised hosts; bone marrow transplant; patients on treatment for ALL within and until at least 6 months after completion of immunosuppressive chemotherapy; and HIV infection
- Give measles vaccine 6 mo after IGIM dose

AAP Redbook, 2015

MMR Vaccine

- Immunization During an Outbreak
  - Infants 6 through 11 months of age
    - Does not “count,” will need MMR at 12 to 15 mo
- International Travel
  - Infants 6 through 11 mo: 1 of MMR vaccine before departure
    - Does not “count,” will need MMR at 12 to 15 mo
  - Children 12-15 mo: give first dose of MMR vaccine before departure, second dose at age 4 to 6 yr
  - 12 months who have received 1 dose and traveling to areas where measles is endemic or epidemic get their second dose before departure, provided the interval between doses is 28 days or more
- Outbreak Control
  - All 6 to 11 mo olds at risk for exposure are vaccinated
  - Preschoolers get a second dose

AAP Redbook, 2015

The Skating Virus

- A parent brings their 8 year old to the clinic with a concern that they were at a hockey game and found out one of the hockey players has mumps.
- The 8 yr old has had two doses of MMR

Mumps Outbreak Control

- Administer second dose to 1-4 yr olds and anyone else who only had one dose
- Isolate anyone with zero doses of MMR
  - stay home from the 12th day after they were exposed to mumps through the 25th day after the onset of parotitis in the last person with mumps in the affected school
- A third dose of MMR may be administered to target populations
  - 2 dose effectiveness of MMR against mumps
    - 80% to 90%
    - 10% to 20% vaccinated people are susceptible to mumps during outbreaks

www.cdc.gov/mumps

Mumps

- Spread by droplets
- Fever, headache, muscle aches, swollen parotid glands
  - Fever may persist for 3–4 days and parotitis, when present, usually lasts 7–10 days.
- Incubation period for mumps is 16–18 days, with a range of 12–25 days.
- Infectious from 1–2 days before until 5 days after onset of parotitis
- 1311 cases in 2016
  - Eight states have reported more than 100 cases this year: AR, IA, IN, IL, MA, NY, OK and TX
  - College campuses: Harvard 40+ cases (April 2016)
  - 2016 outbreaks on campuses in Iowa, Indiana, Ohio, and Wisconsin

www.cdc.gov/mumps

Varicella

- Highly contagious, spread by droplet
- Symptoms include prodromal period of fever, headache, anorexia, followed by pruritic, vesicular rash that is in various stages.
- Incubation period 14 to 16 days
- Contagious from 1-2 days before rash appears until all lesions are crusted over
- Breakthrough varicella in vaccinated patients
  - Can be macular, rather than vesicular
  - PCR testing of lesions is most accurate (cdc.gov/varicella)

Vaccinated (CDC, 2016)
Itchy Bumps

- A healthy, unvaccinated 15 year old presents after being exposed to chickenpox. What is your treatment plan?

- A healthy non-vaccinated non-immune pregnant woman has been exposed to chickenpox. What is your treatment plan?

Varicella Exposure Treatment

- **Varicella Zoster IG (VariZIG)**
  - Give as soon as possible after exposure up to 10 days after exposure to:
    - Patients who have no evidence of immunity
    - Whose exposure will likely result in infection
    - At high risk for developing severe varicella
  - Groups at risk for severe disease
    - Immunocompromised without immunity
    - Newborns whose mothers have varicella from 5 days before to 2 days after delivery
    - Premature babies exposed to varicella or zoster
    - Pregnant women without evidence of immunity

- **Acyclovir treatment**
  - Persons at increased risk for moderate to severe varicella
  - These high risk groups include
    - Healthy, persons older than 12 years of age
    - Persons with chronic cutaneous or pulmonary disorders
    - Persons receiving long-term salicylate therapy
    - Persons receiving short, intermittent, or aerosolized courses of corticosteroids
  - Should be started within 24 hrs of rash appearing
  - Oral therapy vs IV therapy
    - IV therapy for severe disease and immunocompromised patients
    - PO dose: 20 mg/kg (not to exceed 800 mg) orally, 4 times daily for 5 days.

Rash and Fever at Daycare

- A parent calls the office worried that there has been a case of meningitis diagnosed at her child's daycare center. What is the treatment recommendation?

Meningococcal Disease

- A bacterial disease caused by Neisseria meningitides
  - 13 serotypes
    - A, B, C, Y, W
  - Causes meningococcal meningitis
  - Meningococcal meningitis, meningococcaemia
  - Sudden onset of fever, chills, malaise, myalgia and a rash that may be maculopapular, petechial or purpuric

- Outbreaks
  - College campuses
    - Princeton University 2014: 8 cases (ST409 strain)
    - UC Santa Barbara 2014: 4 cases (ST12 strain)
    - Univ of Oregon 2015: 7 cases
    - Rutgers University 2016: 2 cases
  - All UG students required to have Meningitis B vaccine for 2016-17
  - Adult MSM
    - Chicago ongoing outbreak since May 2015 (8 cases, 2 in March 2016)
    - Southern California 2016: 9 cases since May 1, 2016

Meningococcal vaccines

- Vaccines active against serotypes A, C, Y, or W
  - MenACWY-D (Menactra) and MenACWY-CRM (Menveo) approved for use in patients 9 to 55 years of age
  - HibMenC-TT (MenHibrix) approved for infants and children age 6 weeks to 18 months

- Vaccines active against serotype B in age 10 to 25 years
  - MenB-FHbp (Trumenba) – 3 doses
  - MenB-4C (Bexsero) – 2 doses
Meningococcal disease

- Patients who are acutely ill with meningococcal disease require immediate intensive treatment as 50% progress to invasive disease
  - Parenteral antibiotics
- Prophylaxis
  - Close contacts of infected persons are considered high risk:
    - Household contacts, especially children < 2 years of age
    - People who frequently sleep in the same house as initial contact in the 7 days prior to onset of illness
    - Childcare or preschool contacts within 7 days of onset of illness
    - Unprotected mouth-to-mouth resuscitation or unprotected contact during intubation at any time 7 days before onset of illness
    - Airline passenger seated next to index case on a flight lasting longer than 8 hours

Meningococcal Prophylaxis for Exposed Persons

- Antibiotic choices
  - Ceftriaxone:
    - < 15 years: 125 mg IM x 1 dose; > 15 years: 250 mg IM x 1 dose
  - Rifampin:
    - < 1 month of age: 5 mg/kg q 12 hours for 2 days; > 1 month of age: 10 mg/kg (max 600 mg) for 2 days
  - Ciprofloxacin:
    - > 1 month of age: 20 mg/kg (max 500 mg) in a single dose
  - Azithromycin:
    - 10 mg/kg (max 500 mg) in a single dose

Influenza

- Circulating strains vary from year to year
- Fever, cough, sore throat, myalgias
- Prevention:
  - Annual vaccination
  - 2016-2017 vaccine composition
    - An A/California/7/2009 (H1N1)pdm09-like virus
    - An A/Hong Kong/4801/2014 (H3N2)-like virus
    - A/Brisbane/60/2008-like virus (B/Yamagata lineage)
    - For quadrivalent vaccines, these viruses PLUS
      - B/Phuket/3073/2013-like virus (B/Victoria lineage)

- 2015-2016 season
  - > age 65 hospitalized at greatest numbers
  - Second highest hospitalization rate is 0 to 4 yr olds
  - > 85 pediatric deaths nationwide
- 2016-2017 season
  - 7 pediatric deaths as of Jan 27, 2017
- Influenza should be high on list of diagnosis
- Highest risk of complications
  - > 65 yrs of age
  - < 5 yrs of age – greatest risk in < 2 yrs

Antigenic “Drift”

- “Good match” is 50% to 60% effective
  - Range since 2003 has been 10% to 60% effective
- H3N2 is the predominant strain in 2014-2015 but 70% of samples have “drifted” from the H3N2 in the 2014-2015 vaccine
  - Discovered after Northern Hemisphere vaccine developed
- Influenza A genetically “drifts” from season to season
- 2014-2015 vaccine has an estimate of 23% vaccine effectiveness
- Antivirals recommended for all high risk patients with + flu or ILI

Chemoprophylaxis for Influenza Exposure

- children aged younger than 2 years;
- adults aged 65 years and older;
- persons with chronic lung, cardiovascular, renal, hepatic, hematological, metabolic disorders, or neurologic and neurodevelopment, persons with immunosuppression
- women who are pregnant or postpartum (within 2 weeks after delivery);
- persons aged younger than 19 years who are receiving long-term aspirin therapy;
- American Indians/Alaska Natives;
- persons who are morbidly obese (i.e., BMI is 40 or greater); and
- residents of nursing homes and other chronic-care facilities.
Oseltamivir (Tamiflu®) – Prophylaxis

- Chemo-prophylaxis (7 days)
- If child is 3 months or older and younger than 1 yr old
  3 mg/kg/dose once daily
- If 1 yr or older, dose varies by child's weight:
  - 15 kg or less, the dose is 30 mg once a day
  - >15 to 23 kg, the dose is 45 mg once a day
  - >23 to 40 kg, the dose is 60 mg once a day
  - >40 kg, the dose is 75 mg once a day
- Adults: 75 mg once daily

Oseltamivir (Tamiflu®) – Treatment

- Treat for 5 days
- If younger than 1 yr old:
  3 mg/kg/dose twice daily
- If 1 yr or older, dose varies by child's weight:
  - 15 kg or less, the dose is 30 mg twice a day
  - >15 to 23 kg, the dose is 45 mg twice a day
  - >23 to 40 kg, the dose is 60 mg twice a day
  - >40 kg, the dose is 75 mg twice a day
- Adults: 75 mg twice daily

Zanamivir (Relenza®)

<table>
<thead>
<tr>
<th>Use</th>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment (5 days)</td>
<td>10 mg/5 mg (two 5-mg inhalations)</td>
<td>10 mg/5 mg (two 5-mg inhalations)</td>
</tr>
<tr>
<td></td>
<td>(FDA approved and recommended for use in children 7 yr or older)</td>
<td>(FDA approved)</td>
</tr>
<tr>
<td>Chemo-prophylaxis (7 days)</td>
<td>10 mg/5 mg (two 5-mg inhalations)</td>
<td>10 mg/5 mg (two 5-mg inhalations)</td>
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<tr>
<td></td>
<td>(FDA approved for and recommended for use in children 5 yr or older)</td>
<td>(FDA approved)</td>
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Flu Surveillance

- www.cdc.gov/flu
- Weekly flu activity surveillance
- Virologic surveillance
  - Prevalence of Type A or B, plus subtypes
- Resistance patterns

Coughing for 2 weeks

- An unimmunized 6 month old presents with cough and posttussive vomiting and has been exposed to an older sibling with laboratory confirmed pertussis.
- What is the plan of care?

Pertussis Diagnosis

- Clinical Case Definition
  - In the absence of a more likely diagnosis a cough illness lasting ≥2 weeks with one of the following symptoms:
    - Paroxysms of coughing, OR
    - Inspiratory "whoop," OR
    - Posttussive vomiting, OR
    - Apnea (with or without cyanosis) (FOR INFANTS AGED < 1 YEAR ONLY)
- Laboratory Criteria for Diagnosis
  - Isolation of Bordetella pertussis from clinical specimen
  - Positive polymerase chain reaction (PCR) for B. pertussis
- Epidemiologic Linkage
  - Contact with a laboratory-confirmed case of pertussis

www.cdc.gov/pertussis
Probable Pertussis Diagnosis

- Meets the clinical case definition, is not laboratory confirmed, and is not epidemiologically linked to a laboratory-confirmed case, OR
- FOR INFANTS AGED < 1 YEAR ONLY:
  - Acute cough illness of any duration with at least one of the following signs or symptoms:
    - Paroxysms of coughing, OR Inspiratory "whoop", OR Posttussive vomiting, OR Apnea (with or without cyanosis)
    - AND
    - Polymerase chain reaction (PCR) positive for pertussis, OR
- FOR INFANTS AGED < 1 YEAR ONLY:
  - Acute cough illness of any duration with at least one of the following signs or symptoms:
    - Paroxysms of coughing, OR Inspiratory "whoop", OR Posttussive vomiting, OR Apnea (with or without cyanosis)
    - AND
    - Contact with a laboratory-confirmed case of pertussis

Confirmed Pertussis Diagnosis

- Acute cough illness of any duration with isolation of *B. pertussis* from a clinical specimen, OR
- Meets the clinical case definition AND is polymerase chain reaction (PCR) positive for pertussis, OR
- Meets the clinical case definition AND had contact with a laboratory-confirmed case of pertussis

Pertussis Treatment

- If treatment is started early, symptoms may be lessened
- Treat persons aged >1 year within 3 weeks of cough onset and infants aged <1 year and pregnant women (especially near term) within 6 weeks of cough onset
- Consider treating before test results are available

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Patient Age</th>
<th>Dose</th>
<th>Length of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azithromycin</td>
<td>&lt;6 months</td>
<td>10 mg/kg per day</td>
<td>5 days</td>
</tr>
<tr>
<td></td>
<td>children aged ≥ 6 months</td>
<td>10 mg/kg (maximum: 500 mg) on day 1, followed by 5 mg/kg per day (maximum: 250 mg) on days 2–5</td>
<td>5 days</td>
</tr>
<tr>
<td></td>
<td>Adults</td>
<td>500 mg on day 1, followed by 250 mg per day on days 2–5</td>
<td>5 days</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>infants aged &lt;1 month</td>
<td>not preferred because of risk for IHPS</td>
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<tr>
<td></td>
<td>≥2 months</td>
<td>40–50 mg/kg per day (maximum: 2 g per day) in 4 divided doses</td>
<td>14 days</td>
</tr>
<tr>
<td></td>
<td>Adults</td>
<td>2 g per day in 4 divided doses</td>
<td>14 days</td>
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</tbody>
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Pertussis Post-Exposure Management

- A person is infectious from the beginning of the catarrhal stage through the third week after the onset of paroxysms or until 5 days after the start of effective antimicrobial treatment.
- Postexposure prophylaxis to asymptomatic household contacts within 21 days of onset of cough
- Treat postexposure with same antibiotics as for pertussis