VACCINE-PREVENTABLE DISEASE EPIDEMIOLOGY

Massachusetts Immunization Action Partnership (MIAP) Conference October 17, 2019

Joyce Cohen and Hillary Johnson
We, Joyce Cohen and Hillary Johnson, 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 our presentations.

We have no relationships to disclose.

We 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.
Today’s Topics

- Massachusetts Morbidity & Epi Investigations
- Measles
- Mumps
- Pertussis
- Hepatitis A
- Influenza
- Tetanus
- Meningitis
- WHAT WOULD YOU DO?

PINK PANTHER’S TO DO LIST:
- TO DO
- TO DO
- TO DO, TO DO, TO DO, TO DO, TO DO, TO DO, TO DOO...
Data are current as of September 17, 2019 and are subject to change.

*Both confirmed and probable cases are reported for measles, mumps, rubella, tetanus, and varicella to reflect the true burden of disease. All other diseases confirmed cases only.

### Vaccine-Preventable Diseases in Massachusetts*, 2009 to Date

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles</td>
<td>2</td>
<td>3</td>
<td>24</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3**</td>
</tr>
<tr>
<td>Mumps</td>
<td>15</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>71</td>
<td>5</td>
<td>6</td>
<td>258</td>
<td>192</td>
<td>44</td>
<td>48</td>
</tr>
<tr>
<td>Rubella</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Meningococcal</td>
<td>14</td>
<td>8</td>
<td>14</td>
<td>6</td>
<td>11</td>
<td>11</td>
<td>12</td>
<td>11</td>
<td>21</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Pertussis</td>
<td>361</td>
<td>296</td>
<td>280</td>
<td>653</td>
<td>348</td>
<td>298</td>
<td>253</td>
<td>198</td>
<td>383</td>
<td>259</td>
<td>150</td>
</tr>
<tr>
<td>Hib &lt; 5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>43</td>
<td>46</td>
<td>43</td>
<td>35</td>
<td>64</td>
<td>53</td>
<td>371</td>
<td>159</td>
</tr>
<tr>
<td>Hepatitis B (Acute)</td>
<td>43</td>
<td>42</td>
<td>68</td>
<td>61</td>
<td>42</td>
<td>36</td>
<td>34</td>
<td>32</td>
<td>52</td>
<td>47</td>
<td>24</td>
</tr>
<tr>
<td>Tetanus</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Polio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pneumococcal Disease &lt; 5</td>
<td>81</td>
<td>72</td>
<td>40</td>
<td>51</td>
<td>24</td>
<td>27</td>
<td>20</td>
<td>31</td>
<td>21</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td>Varicella</td>
<td>1415</td>
<td>770</td>
<td>606</td>
<td>627</td>
<td>475</td>
<td>469</td>
<td>356</td>
<td>290</td>
<td>382</td>
<td>291</td>
<td>213</td>
</tr>
</tbody>
</table>

No cases of Polio or Diphtheria!
Vaccine-Preventable Disease Confirmed Cases vs. Investigations
Massachusetts*, 2018 – Sept 2019

<table>
<thead>
<tr>
<th>Disease</th>
<th>Investigated</th>
<th>Confirmed*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019 YTD</td>
<td>2018</td>
</tr>
<tr>
<td>Measles*</td>
<td>161</td>
<td>74</td>
</tr>
<tr>
<td>Mumps*</td>
<td>364</td>
<td>446</td>
</tr>
<tr>
<td>Rubella*</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Hib &lt; 5</td>
<td>119</td>
<td>153</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Polio</td>
<td>41</td>
<td>47</td>
</tr>
</tbody>
</table>

Data are current as of 10/10/2019.
*Both confirmed and probable cases are reported for measles, mumps, rubella to better reflect the true burden of disease. All other diseases include confirmed cases only.
Measles in the US 2019

- From January – October 3rd, 1,250 individual cases of measles have been confirmed in 31 states.
- This is the greatest number of cases reported in the U.S. since 1992.
- More than 75% of the cases this year are linked to outbreaks in New York.

Source: [https://www.cdc.gov/measles/cases-outbreaks.html](https://www.cdc.gov/measles/cases-outbreaks.html)
Measles in the US 2019

- The majority of cases are among people who were unvaccinated for measles.
- Measles can cause serious complications. As of October 3, 2019, 119 of the people who got measles this year were hospitalized, and 61 reported having complications, including pneumonia and encephalitis.

Source: https://www.cdc.gov/measles/cases-outbreaks.html
Three confirmed cases as of 10/10/19
- 161 cases investigated (usually 40-50 cases to date)
- All had recent travel
- Hundreds of people exposed in medical and other settings
- Enormous post-exposure efforts to identify susceptibles and vaccinate (or refer for immune globulin)
- Dozens of people quarantined

MDPH also conducts notifications for MA residents exposed on flights or out of state on a frequent basis.
Measles Prevention & Control Begins with You

Be Prepared:

• Make sure all staff have evidence of immunity – two documented and appropriately timed MMRs or a positive titer on record.

  Don’t lose* a staff member for two weeks because they don’t have the proper documentation.

• Call MDPH (617-983-6800) when the patient is in the office or, if known, BEFORE the patient is coming in. MDPH will help with:
  • Collection of the appropriate specimens
  • Reducing possible exposure to other patients & staff

*Required exclusion after exposure when susceptible = day 5 through day 21
Presumptive Evidence of Measles Immunity

- Evidence of measles immunity:
  - 2 appropriately spaced* and documented doses of MMR vaccine
  - Laboratory evidence of immunity or
  - Laboratory confirmation of disease

THEN:

- No additional doses are indicated or recommended
- No serologic testing is recommended

*At least 4 weeks apart
A systemic disease characterized by:

- Non-specific prodrome consisting of myalgia, loss of appetite, malaise, headache, low-grade fever
- Swelling of one or more salivary glands, usually the parotid glands, often tender or painful, with orchitis commonly reported in males after puberty
- 1/3 of infections may be asymptomatic or manifest as respiratory illness
- Rare complications include arthritis, encephalitis, thyroiditis, mastitis, ataxia, oophoritis, hearing loss, and others

infectious 2 days before onset of swelling, and five days after

Mumps in Massachusetts
2016: 258 Cases
2017: 192 Cases
2018: 44 Cases
2019 to date: 48 Cases
When should you consider mumps in the differential?

- When someone is unvaccinated or vaccination status is unknown
- When someone is a college student, regardless of vaccination status of MMR
- Most college students are vaccinated
- However, due to ‘force of infection’ (intense close contact) and waning immunity, once mumps arrives on a campus, the living conditions as well as the social habits of college aged students spread the mumps virus to those vaccinated. (The mumps component of the vaccine is around ~88% after two doses (range of 31 – 95%).
Mumps In Massachusetts 2016-2019 to date

- **Pediatric cases of mumps:** only 7% (36/542) of all confirmed* cases in MA have been in the 17 and under age group.

- 7% of confirmed* cases were ≤ 17 yrs.
- 53% of confirmed* cases were ages 18-24.
- 21% of confirmed* cases were ages 25-34.
- 18% of confirmed* cases were ages 35+.

- **Outbreaks:** Waning immunity following vaccination plays a role, in settings of intense close contact (for example in college dorms/college parties).

- Effectiveness of two doses of MMR against mumps: 88% (range of 31-95%)

- A 3rd dose of MMR can be used in outbreaks following consultation with MDPH. Two dose schedule sufficient for control in general population.

* Includes probable cases to better reflect disease burden. 2019 data are preliminary and subject to change.
Assessing the Clues…
Questions to ask when evaluating a case of suspect Measles, Mumps or Rubella

- Any documented vaccination history?
- Any contact with those with similar symptoms?
- Any recent travel? Any visitors from outside the US?
- For suspect mumps cases – Any recent dental work?
- For suspect measles cases – Take some pictures of the rash to share with medical directors at MDPH

Remember, measles, mumps, and rubella usually come along with a good story. What’s your patient’s story?
Did you get the details?

- **Who is more likely to have mumps?**
  - A fully vaccinated six year old who spent time in New Hampshire over the summer months
  - A fully vaccinated 18 year old home for the long weekend from college for Columbus Day
  - A 26 year old non-US born individual who has an unknown vaccination status, no recent travel, and who works in a long-term care facility.

- **Who is more likely to have measles?**
  - An unvaccinated 4 month old who visited with extended family who arrived from California.
  - A 38 year old non-US born individual who traveled to Israel for a friend’s wedding (vaccination history unknown).
  - A fully vaccinated 12 year old who traveled for 2 weeks through Spain and France with their family.
What is Pertussis?

- A cough illness lasting ≥2 weeks with at least one of the following:
  - Paroxysms of coughing
  - Inspiratory whoop
  - Post–tussive vomiting
  - Apnea (with or without cyanosis)
    - for infants <1 Year Only

- Long infectious period - up to 35 days
  - 14 days prior to cough onset and 21 days after cough onset

*Photo Courtesy of the Pennsylvania Chapter of the American Academy of Pediatrics*
PERTUSSIS TESTING

• Acceptable diagnostic tests include:
  • Culture at MA SPHL or any commercial lab
  • PCR from any commercial lab
  • Serology performed at MA State Public Health Lab (MA SPHL)
    • (Serologies from commercial labs are not acceptable due to inability to interpret results.)

<table>
<thead>
<tr>
<th>DURATION OF COUGH</th>
<th>CHILDREN (&lt;11 yrs)</th>
<th>ADULTS (≥ 11 yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 14 DAYS</td>
<td>NP Swab(s) (for Culture &amp; PCR Testing)</td>
<td>NP Swab(s) (for Culture &amp; PCR Testing)</td>
</tr>
<tr>
<td>14-28 DAYS</td>
<td>Serology at MA SPHL - OR - Serology at MA SPHL &amp; Consider NP Swab(s) (for Culture &amp; PCR Testing)</td>
<td>Serology at MA SPHL</td>
</tr>
<tr>
<td>29-56 DAYS</td>
<td>Serology at MA SPHL</td>
<td>Serology at MA SPHL</td>
</tr>
</tbody>
</table>
NP Swabs for Pertussis

**CULTURE:** Isolating actual live *B. pertussis* and other Bordetella species and growing them out.

**Turnaround Time:** 3-12 days

May be negative if too far out or if patient already took antibiotics.

**PCR:** Detects *B. pertussis* DNA

**Turnaround Time:** Typically 1 day

May be falsely positive so requires patient to meet clinical case definition (symptoms).
**SEROLOGY:** Serologic, single serum testing for the presence of IgG antibody to pertussis toxin.

**Turnaround Time:** 2 to 14 days.

Only valid if performed through the MA State Public Health Laboratory.

Must not have a pertussis containing vaccine in last 3 years.

**Ages 11 and up.**
Pertussis Prevention is in Your Hands

• Pertussis –
• Show of hands: How many of you use a mask when examining a patient you are considering testing for pertussis?

• Wearing a mask while seeing a patient with cough illness can prevent….

• The value of wearing a mask…

• The need for prophylaxis (zpak) if patient is positive for pertussis
Pertussis Notifications

Schools/teams/camps may send out notifications when there has been an exposure.

Read the advisory closely to determine if this is a general notification, or if the patient has been identified as a close contact.
Hepatitis A Outbreak in MA

- Ongoing outbreak that started in April 2018
- Over 500 cases reported statewide
- Person-to-person transmission
- Predominantly affecting people experiencing homelessness and people using drugs

Nationally, Hep A Outbreak first identified in 2016, 30 states have publicly reported the following as of Oct 4:
- Cases: 26,789
- Hospitalizations: 16,157
- Deaths: 274

Hepatitis A cases, by event date, Massachusetts, April 2018 - September 2019

Cases occurring after Week 1 in September excluded. Data for more recent weeks may be incomplete due to diagnosis and reporting delays. Data source: MDPH Bureau of Infectious Disease and Laboratory Sciences. Data as of 9/20/2019 and subject to change.
Vaccination recommendations

• Vaccinate all persons at high risk:
  • Persons experiencing homelessness
  • Persons who use injection or non-injection drugs and/or have chronic liver disease (including chronic hepatitis B or C infection or chronic alcohol use)
  • Persons recently or currently incarcerated
  • Men who have sex with men

• At least one dose of single-antigen hepatitis A vaccine
  – One dose has been shown to control outbreaks of hepatitis A and provides up to 95% protection in healthy individuals for up to 11 years.
Hepatitis A Vaccination For Children

• **2006 ACIP Recommendation:** Hepatitis A Vaccination routinely recommended for all children older than 1 year of age.
  • This first routinely vaccinated cohort would be roughly 14 years old in 2019.
• **MA 2018-2019 Hepatitis Outbreak:**
  • Median Age = 35 years (range 6-98 yrs)
    • Outliers: only two children in the outbreak. Both originally from outside the US, vaccination hx unknown.
    • All other cases are adults. Most unvaccinated or unknown vaccination history.

**Lesson:** Keep vaccinating your pediatric patients. You never know what their risk factors are going to be later in life.
Influenza Season 2018 - 2019

- We had two different waves of flu, the first caused by H1N1 viruses and the second caused by H3N2 viruses.
- Last season was record-breaking in duration, with flu activity elevated for 21 weeks.

- Four pediatric flu-related deaths in MA
  - 136 pediatric deaths nationally (9/28/19)

*Influenza-like illness (ILI) defined by fever ≥100°F and cough or sore throat as reported by Massachusetts sentinel provider sites
Influenza Reminders for Providers

- It’s about making flu personal.
  - Tell your patients what you do in your **office** to protect your patients.
  - Tell your patients what you do in your own **family**.
- Vaccinate your patients **throughout** the flu season.
- Massachusetts is #1 for flu vaccination for children ages 6 months – 17 years. (81% were vaccinated against flu 2018-2019.)
- Don’t give up on those families who don’t vaccinate.
  - Consult the CDC website for guidance to build vaccine confidence for your families.
  - [https://www.cdc.gov/vaccines/hcp/conversations/index.html](https://www.cdc.gov/vaccines/hcp/conversations/index.html)
What to Report to MDPH

- Please report:
  - Any pediatric flu-related deaths immediately
  - Please report any unusual clusters of influenza-like illness
  - Please report any suspected cases of novel flu, avian flu, or flu associated with contact with swine

- In general, labs report positive flu results
- Faxed teleform reports of rapid flu test results no longer required
Tetanus in the National News

Tetanus in an unvaccinated 6 year old child – Oregon, 2017

- **Tetanus** is an infection caused by bacteria invading the body and producing a poison (toxin) that causes painful muscle contractions.
- Another name for tetanus is "lockjaw."
- It often causes a person’s neck and jaw muscles to lock, making it hard to open the mouth or swallow.

Child went to rehab after being hospitalized and fully recovered.

https://www.cdc.gov/mmwr/volumes/68/wr/mm6809a3.htm

10/17/19

MIAP Conference 2019
Fatal Tetanus in an Adult MA Resident, 2019

• In May 2019, MPDH received notification of an adult resident hospitalized with tetanus.
• The case suffered a fall 4 days prior to admission which resulted in a small shard of wood lodged in case’s arm.
• Presented to a hospital with severe neck stiffness, wound drainage, and hypertension.
• Case was hospitalized for 46 days.
• Last reported tetanus-containing vaccine was approximately 13 years prior.

Message to all – Keep vaccinating. Make sure you and all those around you are up to date on your Td/Tdap
Meningococcal Disease – Quick MA

Summary

• MA sees cases of invasive meningococcal disease each year.

• Most notable outbreaks:
  • Outbreak among those experiencing homelessness in the Boston Area (2016-19)
  • MenB outbreak among college students in Western MA (2017-18).

Meningococcal disease is often severe and can be deadly. It can include infections of the lining of the brain and spinal cord (meningitis) and bloodstream infections (bacteremia or septicemia).

These bacteria spread through the exchange of respiratory and throat secretions like spit (e.g., by living in close quarters, kissing).

Several Colleges nationally have experienced MenB Outbreaks in recent years.
Meningococcal Disease

Meningococcal Disease – Vaccination Reminders

• MenACWY routinely recommended at 11 & 16 year appointments & will be part of MA School Requirements (Fall 2020).
• MenB vaccine is recommended at 16-23 yrs of age based upon shared clinical decision making (pref. age 16-18 yrs).

(Some colleges are choosing to require MenB for students.)
Checking In

ANY QUESTIONS?