Immunization: Implications for Vaccine Uptake and Development

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Objectives

At the conclusion of this presentation, pharmacists will be able to:
1) Explain issues regarding patients missing routine vaccinations
2) Identify ways to assess for missed vaccines
3) List key vaccines for catchup
4) Discuss safe practices to provide immunizations

At the conclusion of this presentation, pharmacy technicians will be able to:
1) Identify issues regarding patients missing routine vaccinations
2) Identify ways to assess for missed vaccines
3) List key vaccines for catchup

Disclosures

• Jeanette Wick has no real or potential conflicts of interest or financial disclosures related to the subject matter in this presentation.

Herd Immunity

• Successful pathogen spread depends on access to susceptible individuals
• If the proportion of the population that is immune exceeds a threshold, disease incidence declines
• Thresholds are pathogen specific

<table>
<thead>
<tr>
<th>Disease</th>
<th>Threshold</th>
<th>$R_e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>89%</td>
<td>1.7–4.3</td>
</tr>
<tr>
<td>Measles</td>
<td>80–94%</td>
<td>12–18</td>
</tr>
<tr>
<td>Mumps</td>
<td>19–44%</td>
<td>10–12</td>
</tr>
<tr>
<td>Pertussis</td>
<td>55–64%</td>
<td>5.5</td>
</tr>
<tr>
<td>Polio</td>
<td>80–86%</td>
<td>5.7</td>
</tr>
<tr>
<td>Rubella</td>
<td>81–91%</td>
<td>5.7</td>
</tr>
<tr>
<td>COVID-19</td>
<td>82%</td>
<td>5.7</td>
</tr>
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</table>
Herd Immunity

<table>
<thead>
<tr>
<th>Vaccine efficacy</th>
<th>Vaccination uptake</th>
<th>Effect on Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>No herd immunity</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>No herd immunity</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>No herd immunity</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>HERD IMMUNITY</td>
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</tbody>
</table>

COVID-19 pandemic and disruptions to routine childhood vaccination

Disruptions to Healthcare

- Between mid-March and June 2020, in-person outpatient visits fell by nearly 70%
- Pediatrics was among the hardest hit specialties, neck-and-neck with ophthalmology, otolaryngology, pulmonary, and dermatology
- Primary care reported 31% fewer visits

Focus on MEASLES

- In 2019, 31 states reported measles in 1,282 people.
- Greatest number of cases reported since 1992
- Most cases among the unvaccinated
Assessment

Hazel, Maddy, Gracie, Eloise, and Charlotte are representative of their herd. Gracie is an anti-vaxxer and has not been vaccinated for bovine coronavirus (a coronavirus that causes bovine diarrhea). Which of the following is TRUE?

A. Since Hazel, Maddy, Eloise, and Charlotte (meaning 80% of the herd) have been vaccinated, there is herd immunity.
B. Although Hazel, Maddy, Gracie, and Charlotte (meaning 80% of the herd) have been vaccinated, herd immunity is threatened.
C. Since Charlotte (meaning 20% of the herd) refuses to be vaccinated, she will develop immunity eventually if infected.

Measles Isn’t “Just Measles…”

- Measles-infected patients lose 11-73% of total baseline antibodies after infection
  - Immunity only returns after re-exposure to pathogens
  - Similar loss NOT seen in MMR vaccinated children
- Data suggests this results in infection susceptibility in patients who had infection- or vaccine-induced immunity

And What about Mumps?

- From January 1 to December 6, 2019, 48 states and the District of Columbia in the U.S. reported mumps infections in 3,252 people.
- Before the U.S. mumps vaccination program, clinicians reported about 186,000 cases each year (probably underestimated)
- Since the 2-MMR dose vaccination program started in 1989, cases decreased >99%, with only a few hundred cases reported most years.
- Since 2006, the CDC has tracked increases in cases and outbreaks about every five years.

What about Mumps?

- Recent outbreaks have occurred in tight-knit communities where vaccination rates were high.
- Two plausible theories these outbreaks: waning vaccine-induced immunity and immune escape.

What about Mumps?

- Waning vaccine-induced immunity suggests that vaccine-induced immunity is fading
- Waning vaccine immunity increases with time since vaccination, making adults more likely to become infected than children
- Immune escape suggests that the mumps virus genetically drifted from the vaccine strains and is no longer recognized.
- Implies that current vaccine is compromised and a new vaccine must be designed to target the new mumps virus epitopes.

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What about Mumps?

- Be aware of mumps outbreak control
- A 3rd dose of MMR prevents mumps and its complications safely and effectively in individuals at increased risk
- Vaccination prevents infection in individuals who have not yet been exposed or infected

Pharmacy Immunizations in Children

- Most community pharmacies provide all immunizations, but not to the youngest allowed age until recently
- 48 states had legislation allowing pharmacists to immunize pediatric patients in community settings
  - Of these, 25 states do not have minimum age restrictions
  - Only 29% of pharmacies immunized down to their state's minimum age
  - Of the 48 states and DC that allow pharmacists to provide at least some pediatric vaccinations, median minimum age was 7 years

Pharmacy Immunizations in Adults

- Pharmacists gave ~ 1/3 of adult flu vaccines in 2018-19 season
- Statistics on other immunizations is elusive

Tracking Infectious Skin Diseases

- Using data from Internet searching engines can be an early-warning system for detecting disease outbreaks
- Google detected flu outbreak in areas with a high volume of searches on flu-like symptoms

What Changed?

August 19th Amendment of PREP act:
- Authorized pharmacists to order and administer FDA approved vaccines to those 18 years old and up
- Some states resistant

The U.S. DHHS created guidance authorizes State-licensed pharmacists to order and administer, and State-licensed or registered pharmacy interns acting under the supervision of the qualified pharmacist to administer, to persons ages three or older COVID-19 vaccinations that have been authorized or licensed by the FDA.
Will This Change How (or WHO) Pharmacies Immunize?

What’s the difference?

<table>
<thead>
<tr>
<th>Route</th>
<th>Adults</th>
<th>Children 0-4</th>
<th>Adolescents 11-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM</td>
<td>Deltox</td>
<td>Deltox</td>
<td>Deltox</td>
</tr>
<tr>
<td>Needle gauge</td>
<td>23-25</td>
<td>22-25</td>
<td>23-25</td>
</tr>
<tr>
<td>Needle length</td>
<td>&lt;1 in (0-6 kg), 1 in</td>
<td>1 in-1.5 in</td>
<td>1 in-1.5 in</td>
</tr>
<tr>
<td>Aspiration</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Position</td>
<td>seated</td>
<td>Safe Hold</td>
<td>Seated</td>
</tr>
</tbody>
</table>

Please do not....

• Say, “This will not hurt a bit!”
• People have different thresholds for pain
• It may or may not hurt
• Say, “It may hurt a little, but just for a minute or two.”

Missed Opportunities for Vaccination Strategy

• Reducing missed opportunities for vaccination (MOV) is a strategy to increase immunization coverage simply by making better use of existing vaccination sites
• MOV refers to any contact with health services by an individual (child or person of any age) who is eligible for vaccination (e.g., unvaccinated, partially vaccinated, and free of contraindications to vaccination), which does not result in the person receiving one or more of the vaccine doses for which he or she is eligible.

Missed Opportunities for Vaccination Strategy

• How many opportunities do you miss?
• Why do you miss opportunities?
• What can you adjust or do differently?
Key Vaccines for Catch-Up Immunization

- Pneumococcal Conjugate Vaccine (PCV) for Children 4 Months through 4 Years
- Haemophilus influenzae type b-Containing Vaccines for Children 4 Months through 4
  - Hib vaccine products: ActHIB, Pentacel, Hibrix, or unknown
  - Hib vaccine products: PedvaxHIB vaccine only
- Diphtheria, Tetanus, and Pertussis-Containing Vaccines for Children 4 Months through 5
- Inactivated Polio Vaccine (IPV)
- Tetanus, Diphtheria-, and Pertussis-Containing Vaccines for Children 7 through 9 and 10 through 18

Assess

- What protocol does your workplace use to screen for vaccine adherence?
- Vaccination needs change over time based on
  - Age
  - Health conditions
  - Lifestyle
  - Travel
  - Occupation

Assess

Recommend and SHARE

- Do you...
  - Know the ACIP recommendations?
  - Have standing orders or procedures?
  - Have a reminder process and use it?
  - Periodically look at how you are doing?

- SHARE the tailored reasons
- HIGHLIGHT positive experiences
- ADDRESS patient questions
- REMIND patients that vaccines prevent serious illnesses
- EXPLAIN the potential costs of contracting the disease
Administer or Refer

- Properly store and handle vaccines
- Distribute Vaccine Information Statements (VIS) to patients
- Follow safety protocols
- Review the CDC Guide to Infection Prevention for Outpatient Care periodically
- Be aware of and prepared for potential adverse reactions
  - 15 minute waiting period?

Assessment

You screen a patient at prescription intake and find that she has missed several recommended vaccines? You use the SHARE approach, and she decides to be vaccinated today. You vaccinate her using standard precautions. Once you send her on her way, you enter the vaccinations into the ISS. Which step did you miss?

A. Reporting the immunizations to the patient’s primary care provider
B. Having the patient sit and wait for 15 minutes at least
C. Giving the patient a record of the vaccinations she received

Those Darned Vaccine Metrics

- Vaccinated at a pharmacy
- Often costs less than in a physician’s office
- Is more convenient and accessible
- The fiscal benefit of offering vaccines
  - The vaccine market may reach ~$49.27 billion by 2022, up from $32.31 billion in 2016
  - A 20% vaccination rate can drive a 6% increase in front-end sales

Safe Immunization Practices

- Follow Standard Precautions
  - Hand hygiene and environmental cleaning between patients
  - Use eye protection based on community transmission level
  - Moderate-substantial: Wear eye protection, likelihood of seeing asymptomatic COVID-19
  - Minimal to none: Universal eye protection required unless otherwise indicated as part of Standard Precautions.

Vaccine Administration → Vaccine Development

- Vaccination could be an evolutionary pressure on seasonal influenza if vaccines reduce the transmission rates of some (“targeted”) strains more than others
- More vaccinated populations should have a lower prevalence of targeted strains compared to less vaccinated populations
- Strains are defined in 3 ways:
  - influenza types and subtypes
  - lineages of type B
  - clades of influenza A/H3N2
- Researchers have detected a significantly greater frequency of an H3N2 clade with known vaccine escape mutations in more vaccinated countries during the 2014–2015 season, which is consistent with vaccine-driven selection within the H3N2 subtype.
- Vaccine-driven selection is likely when vaccines are most effective.
Vaccine Administration → Vaccine Development

- Pneumococcal disease: Elders and children at an increased risk
- Vaccines now cover many Streptococcus pneumoniae serotypes
- Pneumococcal serotypes identified as "pediatric" caused more than half of IPD in adults older than 65 years of age before PCV7 was introduced.
- Before the PCV7 vaccine, statisticians saw an annual post-holiday IUO spike in January among elderly people—attributed to intergenerational holiday gatherings.


What does this mean?
As vaccination rates improve, researchers look for better vaccines
• Broader coverage
• Greater efficacy
• New administration approaches

That's it!
Go forth and VACCINATE!
Your "herd" will benefit.