Immunizations: An Update in Older Adults

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Accreditation:
Pharmacists: 0798-0008-10-077-L01-P
Pharmacy Technicians: 0798-0008-10-077-L01-T
Nurses: N-632

Target Audience: Pharmacists, Technicians & Nurses

Program Overview:
Vaccines aren’t just for children. Every year, thousands of American adults become ill, are disabled or die of diseases that could have been prevented by vaccines. Although infectious diseases are no longer the most common causes of death for older Americans, pneumonia and influenza remain among the top 10 causes of death for seniors, according to the CDC. As the most accessible health care professional in virtually every community in the United States, the community pharmacist is ideally positioned to address this public health need by educating patients, partnering with other health care providers and now offering vaccinations/immunizations in the pharmacy or other community settings.

Objectives:
• Explain the effects of aging on vaccine response
• List the goals of vaccination in older adults
• Summarize the safety and efficacy data surrounding the use of influenza, pneumococcal, and herpes zoster vaccines in older adults

Speaker Disclosure: Dr. Hynicka has no actual or potential conflicts of interest in relation to the program

CE Credits: 1.0 contact hour

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Immunizations: An Update in Older Adults

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Overview
- US Population/ Life expectancy
- Immune response in older adults
- Goals of vaccination in older adults
- Influenza vaccine
- Pneumococcal vaccine
- Herpes zoster vaccine

Life Expectancy

Immune Response Following Vaccination

Adult Vaccination Schedule

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5901a5.htm
http://www.census.gov/mso/www/pres_lib/trends2050/800x600/slide17.html
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5901a5.htm
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Immune Response Following Vaccination

Goals of Vaccination in Older Adults

- Prevent morbidity and mortality
- Prevent exacerbations of chronic illness
- Prevent functional decline and frailty


Influenza Vaccine

Influenza Epidemiology

CID 2009;46:1078-84.

JAMA 2003;289:179-86.
Antibody Response to Influenza Vaccines

- Quantitative review of studies published after 1989, comparing influenza vaccine response in older vs younger adults
- Inclusion criteria:
  - Measurements of immune response for all 3 currently circulating influenza (sub) types
  - Measurements of immune response
  - Seroconversion- % of subjects with a 4-fold increase in antibody titre
  - Seroprotection- % of subjects with HI antibody titres ≥ 1:40 post-vaccination
  - Geometric mean titre (GMT) of HI antibody achieved post-vaccination
  - Antibody response measure at time of vaccination and 2 to 8 weeks post-vaccination

<table>
<thead>
<tr>
<th>Vaccine Component</th>
<th>Age group</th>
<th>Seroconversion (%)</th>
<th>Seroprotection (%)</th>
<th>GMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1N1</td>
<td>Young</td>
<td>60</td>
<td>83</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>Elderly</td>
<td>42</td>
<td>69</td>
<td>83</td>
</tr>
<tr>
<td>H3N2</td>
<td>Young</td>
<td>62</td>
<td>84</td>
<td>162</td>
</tr>
<tr>
<td></td>
<td>Elderly</td>
<td>51</td>
<td>74</td>
<td>126</td>
</tr>
<tr>
<td>B</td>
<td>Young</td>
<td>58</td>
<td>78</td>
<td>234</td>
</tr>
<tr>
<td></td>
<td>Elderly</td>
<td>35</td>
<td>67</td>
<td>100</td>
</tr>
</tbody>
</table>

High-Dose Inactivated Influenza Vaccine

- Licensed by the FDA on December 23, 2009
- Fluzone, High-Dose, Sanofi-Pasteur
- Indication/Administration: Single dose for persons ≥ 65 years of age
- Contents: 180 µg (60 µg of each strain) of influenza virus hemagglutinin antigen/ 0.5 mL dose
- Availability: 2010 to 2011 influenza season

Immunogenicity of High-Dose and Standard-Dose Influenza Vaccine in Adults > 65 years of age

- Methods: Multicenter, randomized, double blind, controlled trial
- Participants: ≥ 65 years of age, living in the community, medically stable
- Exclusion criteria: egg allergy, hx of Guillain-Barre syndrome, immunocompromised, active neoplastic disease
- Objectives:
  - Primary: Evaluation of lot-to-lot consistency and use HAI titers to compare immunogenicity
  - Secondary: Evaluation of rates of local and systemic ADEs
High Dose Influenza Vaccine: Results

- 3876 patients randomized
  - Mean age: 73 +/- 6 years (range 65-97)
  - 92% Caucasian
  - 50% female

Withdrawals
- 46 from HD vaccine group
- 32 from SD vaccine group

**Efficacy of High-Dose Influenza Vaccine in Older Adults**

<table>
<thead>
<tr>
<th>Vaccine Component</th>
<th>Dose</th>
<th>Seroconversion % (95% CI)</th>
<th>Seroprotection % (95% CI)</th>
<th>Day 28 GMT (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1N1</td>
<td>High Dose</td>
<td>48.6 (46.6-50.5)</td>
<td>89.9 (88.7-91.1)</td>
<td>115.8 (111.4-120.3)</td>
</tr>
<tr>
<td></td>
<td>Standard Dose</td>
<td>23.1 (20.2-25.6)</td>
<td>76.8 (74.3-79.1)</td>
<td>67.3 (63.7-71.1)</td>
</tr>
<tr>
<td>H3N2</td>
<td>High Dose</td>
<td>69.1 (67.3-70.9)</td>
<td>99.3 (98.9-99.6)</td>
<td>608.9 (588.5-635.9)</td>
</tr>
<tr>
<td></td>
<td>Standard Dose</td>
<td>50.7 (47.9-53.5)</td>
<td>96.5 (95.3-97.4)</td>
<td>332.5 (310.4-356.1)</td>
</tr>
<tr>
<td>B</td>
<td>High Dose</td>
<td>41.8 (39.8-43.7)</td>
<td>79.3 (77.6-80.3)</td>
<td>69.1 (66.6-71.6)</td>
</tr>
<tr>
<td></td>
<td>Standard Dose</td>
<td>29.9 (27.4-32.6)</td>
<td>67.6 (64.9-70.2)</td>
<td>52.3 (49.5-55.3)</td>
</tr>
</tbody>
</table>

**HAI GMT ratio**
- 1.7 (1.6-1.8)
- 1.8 (1.7-2.0)
- 1.3 (1.2-1.4)
Fluzone High Dose may be used for persons ≥ 65 years of age
No preference
Unknown if greater immune response will result in greater protection
Additional studies: 3-year postlicensure study to evaluate effectiveness began in 2009 and should be completed in 2012
Cost: ~ double that of standard flu vaccine

Poll Question #1: Which of the following answers is correct with respect to coadministering vaccines?
A. No vaccines should be administered together
B. Zostavax and Pneumovax can be administered at the same time
C. Zostavax and Influenza vaccine can be administered at the same time

Prevent influenza illness in 70 to 90% of healthy adults < 65
Outbreaks have been associated with low rates of vaccination in health care workers
Decreased staff absenteeism and illness

Indication:
- All persons ≥ 6 months
Contraindications/Precautions:
- Previous anaphylactic reaction to vaccine components
- Do NOT give live vaccine to persons ≥ 49 years
- Guillain-Barre syndrome within 6 weeks of a previous dose
Vaccine Dosing/Administration:
- 0.5 mL trivalent vaccine administered IM in the deltoid muscle
Side Effects:
- Soreness, redness at injection site
- Hoarseness, sore or red eyes, cough, fever, itchiness, aches
Pneumococcal Vaccine

- PPV-23
  - Purified free polysaccharides from the surface capsule of the bacterium → T cell independent immune response (poor immunologic memory)

- 7vPnc
  - Conjugation of the capsular polysaccharide to a protein carrier converts the polysaccharide to a T cell-dependent antigen

Pneumococcal Conjugate Polysaccharide vs Free Polysaccharide Vaccines

- Study design: randomized, open label, phase 2 study
- Population: Ambulatory adults ≥ 70 years of age who had not received the pneumococcal vaccine previously
- Endpoints:
  - Comparison of immunogenicity of 7vPnC with 23 PPV
  - Comparison of safety of 7vPnC with 23 PPV

Invaseive Pneumococcal Disease Epidemiology

* Rate per 100,000 population

http://www.cdc.gov/vaccines/pubs/pinkbook/pink-slides.htm
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Comparison of Pneumococcal Conjugate Polysaccharide and Free Polysaccharide Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>4</th>
<th>6B</th>
<th>9V</th>
<th>14</th>
<th>18C</th>
<th>19F</th>
<th>23F</th>
</tr>
</thead>
<tbody>
<tr>
<td>7vPnc</td>
<td>1391</td>
<td>2184</td>
<td>2567</td>
<td>2827</td>
<td>900</td>
<td>264</td>
<td>4096</td>
</tr>
<tr>
<td>7vPnc/PPV</td>
<td>1505</td>
<td>1172</td>
<td>2255</td>
<td>2436</td>
<td>985</td>
<td>522</td>
<td>1476</td>
</tr>
</tbody>
</table>

Immunogenicity Results (GMT): Initial Vaccine

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>4</th>
<th>6B</th>
<th>9V</th>
<th>14</th>
<th>18C</th>
<th>19F</th>
<th>23F</th>
</tr>
</thead>
<tbody>
<tr>
<td>7vPnc</td>
<td>1457</td>
<td>1351</td>
<td>2915</td>
<td>2397</td>
<td>1318</td>
<td>182</td>
<td>1309</td>
</tr>
<tr>
<td>PPV</td>
<td>663</td>
<td>809</td>
<td>985</td>
<td>1011</td>
<td>465</td>
<td>203</td>
<td>302</td>
</tr>
</tbody>
</table>

Immunogenicity Results (GMT): Second dose, by Vaccine Combination

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>4</th>
<th>6B</th>
<th>9V</th>
<th>14</th>
<th>18C</th>
<th>19F</th>
<th>23F</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV/7vPnc</td>
<td>456</td>
<td>353</td>
<td>1129</td>
<td>1006</td>
<td>282</td>
<td>87</td>
<td>396</td>
</tr>
</tbody>
</table>

Safety Results

<table>
<thead>
<tr>
<th>Reaction</th>
<th>7vPnc/PPV</th>
<th>7vPnc/PPV</th>
<th>7vPnc/PPV</th>
<th>7vPnc/PPV</th>
<th>7vPnc/PPV</th>
<th>7vPnc/PPV</th>
<th>7vPnc/PPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>40%</td>
<td>60%</td>
<td>80%</td>
<td>100%</td>
<td>120%</td>
<td>140%</td>
<td>160%</td>
</tr>
<tr>
<td>Severe</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>Pain</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
</tr>
</tbody>
</table>
Indication:
- All previously unvaccinated adults > 65 years

Contraindications/Precautions:
- Previous anaphylactic reaction to vaccine components
- Acute illness

Vaccine Dosing/Administration:
- 0.5 mL via IM or SQ injection

Side Effects:
- Soreness, redness at injection site
Shingles Prevention Study (VA Cooperative Study No. 403)

- Study design: Randomized, placebo-controlled, double blind trial at 22 sites
- Population: Adults ≥ 60 years of age
- Intervention: 0.5 mL of live VZV vaccine or placebo
- Endpoints:
  - Primary: Burden of illness due to herpes zoster
  - Secondary: Incidence of postherpetic neuralgia persisting more than 90 days after onset of rash

Shingles Prevention Study: Results

- Study subjects
  - 38,546 enrolled
  - Median age: 69 years
  - 6.6% in vaccine recipient group ≥ 80 years old
  - 6.9% in placebo group ≥ 80 years old
  - 95% Caucasian
  - 40% female
- > 95% actively involved/ followed to the end of the study
- Mean duration of herpes zoster surveillance was 3.13 years

Shingles Prevention Study: Burden of Illness Results

<table>
<thead>
<tr>
<th>Group of Subjects</th>
<th>Vaccine Group</th>
<th></th>
<th></th>
<th>Placoe Group</th>
<th></th>
<th></th>
<th>VE% [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Confirmed Cases/No. of Subjects</td>
<td>Incidence per 1,000 Person-Yrs</td>
<td>No. of Confirmed Cases/No. of Subjects</td>
<td>Incidence per 1,000 Person-Yrs</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All subjects</td>
<td>311/19,254</td>
<td>2.21</td>
<td>5.42</td>
<td>642/19,247</td>
<td>5.68</td>
<td>10.32</td>
<td>61.1 [51.3-68.3]</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 65 yr</td>
<td>222/16,370</td>
<td>1.38</td>
<td>3.98</td>
<td>394/16,356</td>
<td>4.13</td>
<td>28.70</td>
<td>61.1 [51.1-71.5]</td>
</tr>
<tr>
<td>≥ 79 yr</td>
<td>193/1841</td>
<td>5.47</td>
<td>7.16</td>
<td>305/1845</td>
<td>7.78</td>
<td>12.50</td>
<td>61.4 [39.4-86.5]</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>181/11,390</td>
<td>2.89</td>
<td>5.30</td>
<td>361/11,337</td>
<td>5.31</td>
<td>18.65</td>
<td>64.0 [51.4-75.4]</td>
</tr>
<tr>
<td>Female</td>
<td>330/7864</td>
<td>2.54</td>
<td>5.18</td>
<td>281/7908</td>
<td>5.47</td>
<td>10.70</td>
<td>57.5 [38.6-75.8]</td>
</tr>
</tbody>
</table>

Herpes Zoster Vaccine

- Indication:
  - > 65 years old regardless of prior zoster infection
- Contraindications/Precautions:
  - Previous anaphylactic reaction to any vaccine components
  - Immunocompromised patients
  - Acute illness
  - VZV seronegative patients – 2-dose series of varicella vaccine
- Vaccine Dosing/Administration:
  - 0.65 mL subcutaneously x one dose
- Side Effects:
  - Redness, soreness, swelling or itching at injection site
  - Headache
Herpes Zoster Vaccine Shortage

- Possible backorders or periods where vaccine is unavailable during 2010
- Shortage may persist into 2011
- Additional information may be obtained at http://www.cdc.gov/vaccines/vac-gen/shortages

Storage of Zostavax®

- Shipping
  - Vaccine should be maintained at a temperature of -15°C (+5°F) or colder
- Storage
  - Vaccine should be stored frozen at an average temperature of -15°C (+5°F) or colder until it is reconstituted for administration
  - May be stored or transported at refrigerator temperature (2 to 8°C or 36 to 46°F) for up to 72 hours

Summary/ Take Home Points

- As the US population ages immunizations will continue to be important to decrease the burden of illness
- Continue to recommend administration (OR provide immunization administration) of influenza, pneumococcal and herpes zoster vaccines
- Watch out for new vaccines on the horizon that may illicit an enhanced immune response in the older population

Notes