OUR LADY OF THE LAKE RMC

InPharmation

The official publication of the Pharmacy Department

Volume 3, Issue 4

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Pneumococcal Vaccination: Simplifying the Chaos

By Laura Carrell, PharmD and Alexis Horace, PharmD, BCACP, AAHIVP

Background

The pneumococcal vaccines can be a lifesaving prevention measure for patients at risk for pneumococcal disease. Both the 13-valent pneumococcal conjugate vaccine (Prevnar13® or PCV13) and the 23-valent pneumococcal polysaccharide vaccine (Pneumovax23® or PPSV23) stimulate an immune response to protect the body against *Streptococcus pneumoniae*, a bacteria responsible for 36% of pneumonia cases and over 50% of bacterial meningitis cases in the United States. *S. pneumoniae* is a gram positive, facultative anaerobic bacteria that may be encapsulated. Only the encapsulated bacteria are pathogenic, but the capsules contain polysaccharides that vary among the 92 different strains of this species. The large variety of strains of this species can make creation of an effective vaccine difficult, but preventing *S. pneumoniae* infection is extremely important in patients at risk for infection. While the species can infect people of all ages; the very young, very old, and immunosuppressed patients are at the highest risk of morbidity and mortality from *S. pneumoniae* infections.

Current guidelines from the Centers for Disease Control & Prevention (CDC) recommend pneumococcal vaccination for all adults over 65 years of age, patients with certain chronic disease states, patients with cerebrospinal fluid (CSF) leaks or cochlear implants, and immunocompromised patients. Healthy adults over 65 years of age should receive one dose of the PCV13 vaccine followed by one dose of the PPSV23 vaccine at least one year later. Patients with certain chronic diseases (including diabetes mellitus, chronic lung disease, and cigarette smoking) should receive one dose of PPSV23 prior to age 65 and then follow the usual schedule for patients older than 65 after they reach the age of 65. Patients with cochlear implants or CSF leaks should receive one dose of PCV13 followed by one dose of PPSV23 at least eight weeks later and then follow the usual schedule for patients older than 65 years after they reach the age of 65. Immunocompromised adults (such as those with HIV or asplenia) should receive one dose of PCV13 followed by one dose of PPSV23 at least eight weeks later and a second dose of PPSV23 five years after the first dose. If these patients are younger than 65 years of age at the second dose, they should receive a third dose after age 65 and at least five years after the initial dose. Both vaccinations should not be administered simultaneously.

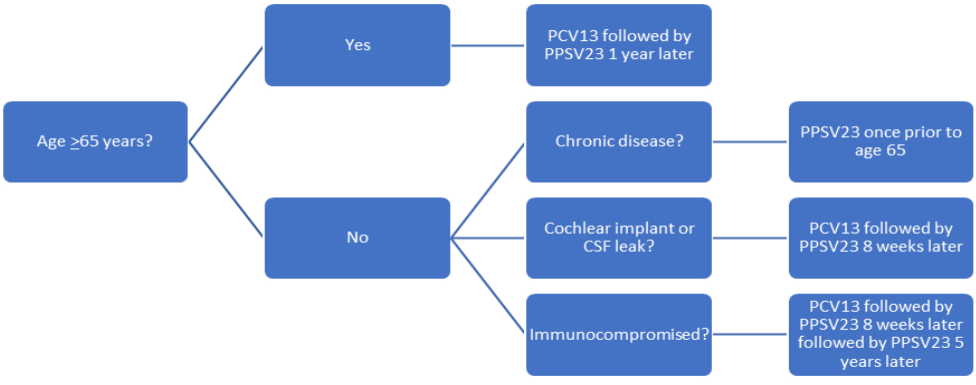

Figure 1: Flow chart for determining pneumococcal vaccination recommendation based on patient's age and comorbidities.

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Staff Spotlight

Kyle Daigle, PharmD

Kyle is one of the newest pharmacists in the critical care group. He was born in Lafayette, LA, but grew up in Natchitoches where his parents still live. He attended pharmacy school at the University of Louisiana Monroe and loves being a pharmacist because he enjoys being able to help others understand how medications work and how they can cause interactions.

In his spare time, Kyle enjoys playing video games. He also enjoys spending time with his only brother who is an accountant in Sulfur, LA. His dream vacation would be to go on a cruise in the Caribbean.

Kyle's favorite scripture is Romans 8:38 -39 "For I am persuaded that neither death nor life, nor angels nor principalities nor powers, nor things present nor things to come nor height nor depth nor any other created thing shall be able to separate us from the love of God which is in Christ Jesus our Lord." He likes this passage because of how it describes the depth of God's love for us.

Pneumococcal Vaccination (continued)

There is no evidence of decreasing disease risk when using both PCV13 and PPSV23 in a series, however the Advisory Committee on Immunization Practices (ACIP) used the best available information[ii]. This is an area that is ripe for research. The ACIP uses immunologic studies to deduce the vaccination sequence and currently suggests that PCV13 is administered before PPSV23 spaced at least 8 weeks to 1 year apart[ii].

Prevnar 13®

As its name suggests, the pneumococcal conjugate vaccine (Prevnar 13®, PCV13) contains 13 strains of *S. pneumoniae* conjugated to a non-toxic variant of the diphtheria toxin. Conjugation to this toxin causes the vaccine to stimulate a T cell dependent response which leads to a longer duration of effect than non-conjugated vaccines. This vaccine has been demonstrated to be 75% effective in patients over age 65 years. Only one dose is recommended and it should be given before PPSV23 if possible. In 2013, Jackson et al, compared opsogenic activity (a measure of the immune response) between patients who had received PPSV23 before PCV13 and patients who received PCV13 before PPSV23. They found that initial vaccination with PCV13 was associated with a higher immune response to subsequent vaccination. Greenberg, et al conducted a similar study in 2014 with similar results. They concluded that an initial dose of PCV13 augmented the anti-pneumococcal effect of a subsequent PPSV23 vaccine. Both of these studies suggest the importance of vaccination with PCV13 prior to PPSV23.

Pneumovax 23®

Pneumococcal polysaccharide vaccine (Pneumovax 23®, PPSV23) contains antigens from 23 types of pneumococcal bacteria. Currently, a dose of PPSV23 is recommended after PCV13 in all adults ≥65 years of age who have not previously been vaccinated. Individuals who have underlying medical conditions (Table 1) should be vaccinated as soon as possible, beginning at 2 years of age[ii].

Certain pneumococcal antigens were first tested in a population of South African males who were highly susceptible to pneumococcal pneumonia and results from this study showed protective efficacy of 76%-79% after 1 year follow-up. For pneumococcal bacteremia, vaccination prevented infection in the study population by 82% and 92%'. When looking at the nursing home patient population (average age 74 years), a prospective study in France showed that the pneumococcal polysaccharide vaccine was 77% effective in decreasing the incidence of infection. A study in elderly patients completed in the United States did not support pneumococcal vaccination for prevention of non-bacteremic pneumonia. However, the CDC conducted a retrospective analysis on surveillance data and found that Pneumovax 23® provided 57% (95% CI: 45% to 66%) protective benefit against invasive pneumococcal infection in patients greater than 6 years of age. For patients who have diabetes mellitus, coronary vascular disease, heart failure, chronic pulmonary disease, or anatomic asplenia, PPSV23 provided 64% - 84% effectiveness in reducing infection. Seventy-five percent (95%CI: 57% - 85%) effectiveness was seen in patients who were immunocompetent and ³65 years of age.

Risk Group	Medical Condition	
Immunocompetent persons	• Chronic heart disease • Chronic lung disease • Diabetes mellitus • Alcoholism*	• Chronic liver disease, cirrhosis* • Cigarette smoking* • Cerebrospinal fluid leak • Cochlear implant
Persons with functional or anatomic asplenia	• Sickle cell disease/other hemaglobinopathy • Congenital or acquired asplenia	
Immunocompromised persons	• Congenital or acquired immunodeficiency • Human immunodeficiency virus infection • Chronic renal failure • Nephrotic syndrome	• Leukemia • Lymphoma • Hodgkin disease • Generalized malignancy • Iatrogenic immunosuppression • Solid organ transplant • Multiple myeloma*

Table 1: Disease states qualifying patients for each risk group for pneumococcal vaccination.

Conclusion

As the most accessible healthcare professional, pharmacists play an important role in ensuring that patients receive the appropriate vaccine and are adequately protected against pneumococcal disease. The PCV13 vaccine should be administered prior to the PPSV23 vaccine if possible, and there should be at least 8 weeks between administrations of the two vaccines. Most importantly, pneumococcal vaccination is effective for the prevention of infections caused by *S. pneumoniae* and should be recommended for all patients at risk for these infections.

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Regulatory

Recent FDA Approvals:

- **Durvalumab (Imfinzi)** was approved by the FDA on May 1st for the treatment of locally advanced or metastatic urothelial carcinoma, who have disease progression during or following platinum-containing chemotherapy or who have disease progression within 12 months of neoadjuvant or adjuvant treatment with platninum-containing chemotherapy.
- **Abaloparatide (Tymlos)** was approved by the FDA on April 28th to treat osteoporosis in postmenopausal women at high risk for fractures or those who have failed other therapies.
- **Valbenazine (Ingrezza)** was approved by the FDA on April 11th for treatment of tardive dyskinesia. It is a monoamine transporter 2 inhibitor and the first drug to be approved by the FDA for this condition.
- **Ocrelizumab (Ocrevus)** was approved by the FDA on March 28th to treat patients with relapsing and primary progressive forms of multiple sclerosis (PPMS). It is an intravenous infusion to be given by a healthcare profession and is the first agent approved by the FDA for the treatment of PPMS.

FDA Med Safety Alerts:

The FDA is restricting the use of products containing codeine and tramadol in children. Due to the increased serious risk of slowed or difficult breathing and death, these products are not recommended in children 12 years of age and younger. Also, the FDA also strengthened the warning against the use of these products in breastfeeding women due to the possible harm to their infants.

Epic Quick Tip

The "Index" tab on the summary activity has a wide variety of useful pharmacy information. The "Pharmacy Monitoring" section displays relevant labs in areas that pharmacists manage including antibiotics, anticoagulation and TPN. The "Medication Overview" section provides a condensed current MAR report that allows the pharmacist to see active medications and a four day history of administration for each medication. The "Vitals and Flowsheet Data" section has a comprehensive flowsheet which displays vitals, ventilator settings, and intake/output in an easy to read chart.

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Patient Safety Corner

ISMP Safety Practice Guideline 8: Error Reporting

8.1 Report adverse events, close calls, and hazardous conditions associated with IV push medications internally within the healthcare organization as well as in confidence to external safety organizations such as ISMP for shared learning.

- Reporting these events or hazardous conditions allows the ability to create a reliable system and further improve patient safety.
- By reporting of close calls, the organization is able to further improve the design of systems for the future.
- There are secure external environments, such as the ISMP Federally-Certified Patient Safety Organizations (PSOs), that allow practitioners and healthcare organizations to report errors or close calls. Clinicians may even receive expert advice in analyzing specific events and collect data to identify potential risks.

8.2 Use internal and external information about adverse events, close calls, and hazardous conditions associated with IV push medications for continuous quality improvement.

- Internal information can aid the staff in identifying risks associated with their own setting, while also reminding staff of the commitment to speak up when risk is known.
- External information and stories aid an organization to evaluate similar risks within their own setting that might have not been evident until an event occurred.

Safety Opportunity

Heparin Nomogram

- Be sure to verify the indication for using heparin prior to initiating a heparin drip order set. With the conversion to EPIC, we now have two separate nomograms, one for cardiology and one for VTE. The nomograms have the same target ranges, however, bolus and starting doses are different. Please reference the Heparin nomogram on Form Web or reach out to a clinical pharmacist if you have questions.