Vaccination Schedules Tweaked for 2009

BY MIRIAM E. TUCKER
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This year's Adult Immunization Schedule includes the 2008 recommendation to use the pneumococcal polysaccharide vaccine in cigarette smokers and patients with asthma.

No new vaccines have been added to the schedule, but there are several changes to the chart's format, as well as updated footnotes for certain vaccines, said Dr. Gina Mootrey of the CDC's Immunization Services Administration, and her associates.

The schedule, published in January, was approved by the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (ACIP) and endorsed by the American Academy of Family Physicians, the American College of Physicians, and the American College of Obstetricians and Gynecologists (MMWR 2009;57:Q1-Q4).

ACIP voted to recommend pneumococcal polysaccharide vaccine to adults with asthma in June 2008, based on data suggesting that adults with asthma were at more than double the risk (adjusted odds ratio 2.4) for invasive pneumococcal disease. The ACIP decision on smokers was made in October 2008, based on data that smoking is the strongest independent risk factor for pneumococcal disease in nonelderly immunocompetent adults, with an adjusted odds ratio of 4.1.

In an editorial, Dr. Gregory A. Poland and Dr. William Schaffner noted that most asthmatic adults who develop invasive pneumococcal disease already have another condition for which the vaccine is indicated, but they don't receive it (Ann. Intern. Med. 2009;150:53-6).

"Making asthma an indication for pneumococcal vaccination will resolve previous ambiguity, be consistent with the influenza vaccine recommendations, and challenge us to identify and vaccinate these patients," said Dr. Poland of the Mayo Clinic, Rochester, Minn., and Dr. Schaffner of Vanderbilt University, Nashville, Tenn.

It is now recommended that all children from 5 years through 18 years of age (in addition to children aged 6 months to 5 years, per the previous recommendation), receive the influenza vaccine, as well as individuals who live with or care for people at increased risk for influenza-related complications, including all health care workers. As the target population for influenza vaccination continues to rise, it will become necessary to extend the "vaccination season" into December and January, "and even beyond," Dr. Poland and Dr. Schaffner said.

Additional changes to the childhood schedule involve dosing schedule provisions to accommodate the availability of a second oral rotavirus vaccine licensed by the FDA. The first dose of either vaccine should be administered at 6 weeks through 14 weeks 6 days of age. Immunization should not be initiated for infants 15 weeks 0 days of age or older. The final dose should be administered by 8 months 0 days of age.

Other changes and clarifications in the footnotes of the 2009 adult schedule include:

- A note was added to say that health care personnel are not at increased risk for human papillomavirus through occupational exposure, and that they should receive the vaccine consistent with age-based recommendations.
- A second dose of varicella vaccine should be given to adults who previously received only one dose.
- Information was added about an alternative four-dose schedule for the combined hepatitis A/B vaccine.
- The 5-year revaccination interval for the meningococcal vaccine was clarified.

Last fall, the American College of Physicians and the Infectious Diseases Society of America issued a joint statement on the importance of adult immunization, which was subsequently endorsed by 17 other medical societies. The statement advises that all physicians conduct an immunization review with their adult patients, that they provide recommended immunizations or refer patients to someone who will, and that all physicians and their staffs should be vaccinated according to the CDC, with particular attention to annual influenza immunization.

"We hope that publication of the annual Adult Immunization Schedule in this issue will prompt clinicians to redouble their efforts to improve their practices' immunization rates. Doing so will prevent needless morbidity, mortality, and expense," Dr. Poland and Dr. Schaffner concluded. Both doctors disclosed financial ties to several vaccine manufacturers.

ACIP members follow strict conflict of interest guidelines. ■

The Adult Immunization Schedule is available at www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm.

CLINICAL GUIDELINES FOR FAMILY PHYSICIANS

Therapeutic Monitoring of Vancomycin

BY NEIL S. SKOLNIK, M.D., AND LEILA S. HARDWARE, D.O., M.P.H.

Vancomycin is an antibiotic that is used primarily for treating an infection that may involve methicillin-resistant *Staphylococcus aureus*. However, given the increase in resistance to antibiotics, family physicians now also recommend it in the treatment of health care–associated pneumonia and resistant skin-structure infections.

When the drug was introduced, numerous adverse effects were reported, including infusion-related toxicities, nephrotoxicity, and possible ototoxicity. As a result, many physicians were trained to monitor peak and trough vancomycin levels to minimize its side effects and to maximize its effectiveness. New recommendations for the correct monitoring of serum levels of vancomycin were recently issued by the Infectious Diseases Society of America (Am. J. Health Syst. Pharm. 2009;66:82-98).

Guidelines are most useful when they are available at the point of care. A free and concise yet complete handheld computer version of this guideline is available for download at www.redi-reference.com.

Vancomycin side effects that are not related to serum concentration include fever, chills, and phlebitis. Red man syndrome may be associated with histamine release, and manifests as tingling and flushing of the face, neck, and upper torso. The chances of this syndrome increase if larger doses are administered too rapidly (more than 500 mg over less than 30 minutes in adults), so the drug should be administered intravenously over a period of at least 1 hour.

Data suggesting a direct causal relationship between other toxicities and specific serum concentrations are limited. Nephrotoxicity from vancomycin seems to be rare and is usually reversible. It occurs with only a slightly greater incidence than it does with other antibiotics and more frequently when used with an aminoglycoside. It is no longer recommended that peak vancomycin concentrations be monitored to reduce the incidence of nephrotoxicity. The condition seems to be more common with serum trough concentrations greater than 10 mg/L.

Monitoring vancomycin levels to prevent ototoxicity is not recommended because this side effect is rare and may not correlate with vancomycin levels. If a patient on the medication is not able to hear high-frequency sounds or has tinnitus, then it should be discontinued.

It is essential to administer the correct dosage of vancomycin because of concerns about the development of vancomycin-resistant organisms. *S. aureus* has become less susceptible to vancomycin, leading to a decrease in the designated minimum inhibitory concentration (MIC) for susceptible, intermediate resistant, and resistant organisms.

Most physicians learned that monitoring peak concentrations of vancomycin helped ensure its efficacy, and monitoring trough levels was important for minimizing adverse effects, but more recent data suggest that this may not be the case. Vancomycin kills *S. aureus* in a concentration-independent manner, and the antibiotic efficacy is related best to the area under the curve (AUC):MIC ratio.

A trough serum concentration just before the next dose at steady-state conditions would approximate the AUC and is considered the most practical and accurate method for monitoring vancomycin efficacy. Steady-state achievement is variable, but occurs approximately after the fourth dose.

It is now recommended that trough serum vancomycin concentrations always be maintained above 10 mg/L to avoid the development of resistance.

Based on the potential to improve clinical outcomes for complicated infections such as bacteremia, endocarditis, osteomyelitis, meningitis, and hospital-acquired pneumonia caused by *S. aureus*, total trough serum concentrations of 15-20 mg/L are now recommended as the target concentration for most infections requiring intravenous vancomycin.

Dosing should be calculated on actual body weight. For most patients with normal renal function, dosages of vancomycin of 15-20 mg/kg (as actual body weight) given every 8-12 hours are needed to achieve the suggested serum concentrations when the MIC is less than 1 mg/L. A loading dose of 25-30 mg/kg (based on actual body weight) can be considered in seriously ill patients to reach this targeted concentration more quickly. In patients whose cultures return with an MIC of more than 2 mg/L, it is unlikely that sufficiently high vancomycin concentrations can be achieved, and other therapies should be used.

Monitoring trough vancomycin concentrations to reduce nephrotoxicity is best suited to patients receiving aggressive dosing targeted to produce sustained trough levels of 15-20 mg/L, or patients at high risk of toxicity, such as those receiving concurrent nephrotoxins. Monitoring is also recommended for patients with unstable renal function and those who are receiving prolonged courses of therapy (over 3-5 days). There should be at least one steady-state trough concentration obtained (after the fourth dose) from patients on prolonged courses of vancomycin. For short courses of therapy lasting less than 5 days, frequent monitoring (more than a single trough before the third or fourth dose) is not recommended.

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