Topics in Primary Care Medicine

Immunizations for Adults

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"Topics in Primary Care Medicine" presents articles on common diagnostic or therapeutic problems encountered in primary care practice. Physicians interested in contributing to the series are encouraged to contact the series' editors.

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Immunization is the most cost-beneficial tool in preventive medicine. Active immunization induces antibody or antitoxin in response to administering a vaccine or toxoid. In this article I will focus on the use of active immunizations in adults to prevent tetanus, influenza, pneumococcal disease, hepatitis B, rubella and measles. Primary care providers can play a crucial role in preventing these infectious diseases by the use of specific vaccines in their patients. Recommendations are intended to serve as a guideline for practitioners while maintaining a public health perspective.

Specific Vaccines

Tetanus

Tetanus has become rare in the United States, with only 253 cases reported from 1982 through 1984. More than 96% of cases occurred in persons older than 19 years, and 59% of cases were in persons 60 years of age or older. Furthermore, in surveys of older adults, 40% to 70% do not have protective levels of antitoxin. Clinical tetanus may result not only from dirty wounds but also from minor acute wounds or from chronic skin lesions such as decubitus or venous stasis ulcers. In a few cases, however, a wound may not be implicated. During 1982 to 1984, 93% of cases occurred in persons with zero to one dose of toxoid or an unknown immunization status.

Administering tetanus toxoid provides excellent protection against clinical disease and it is recommended for all adults, especially for persons whose history of tetanus immunization is unknown. The primary series is completed by giving two 0.5-ml doses intramuscularly at least four weeks apart, followed by a third dose 6 to 12 months after the second dose. Subsequent boosters should be administered every ten years unless the patient suffers a tetanus-prone wound. An interrupted primary series may be continued regardless of the time elapsed since the last dose. A severe hypersensitivity or neurologic reaction to tetanus toxoid is the only contraindication to immunization. Although there are no known teratogenic effects of tetanus toxoid, administration should be postponed in pregnant women until the second trimester. Minor side effects such as soreness and erythema occur in as many as half of toxoid recipients, but systemic reactions are extremely rare.

Influenza

In 17 of the past 27 years, influenza epidemics have been associated with at least 10,000 excess deaths, 90% of which occur in persons older than 65 years. This excess mortality is attributed not only to influenza infection directly but also to increased cardiopulmonary disease. Influenza A viruses, which most commonly cause epidemics, are classified by their hemagglutinin and neuraminidase antigens. Influenza B viruses are less widespread and occur in sporadic outbreaks, but they have been the predominant cause of severe disease in some years.

Influenza vaccine is an inactivated virus, administered intramuscularly in a single dose of 0.5 ml during each fall preceding the onset of a flu season. The Centers for Disease Control have defined target groups for annual influenza vaccination (Table 1). Adults with chronic cardiopulmonary diseases requiring regular medical attention or admission to hospital in the preceding year and residents of long-term care facilities have the highest priority for influenza immunization.

Immunization with influenza vaccine provides 60% to 80% overall protection from clinical disease when antibodies to the predominant subtypes are induced. The protective efficacy of influenza vaccine correlates with antihemagglutinin antibody titers of 1:40 or more, but most prospective studies have been conducted in young adults. Data on efficacy in elderly persons are largely based on limited retrospective studies. A 70% reduction in hospital admissions and overall mortality was shown in elderly members of a health mainte-

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ABBREVIATIONS USED IN TEXT

anti-HBc = anti-hepatitis B core antibody
HBV = hepatitis B virus

nance organization who received influenza vaccine. In a recent outbreak in a nursing home in Michigan, vaccinated residents had 40% protection from influenza-like illness. Unvaccinated residents, however, were more likely to be admitted to hospital, to have pneumonia develop or to die by a twofold to fivefold factor. These studies suggest that influenza vaccine can reduce the incidence and severity of influenza illness in the highest risk group.

Technical improvements during the past decade in producing influenza vaccine have resulted in more potent and less toxic products. Mild side effects of sore arm, redness or swelling, or both, occur in up to 40%. Systemic symptoms of fever, malaise and myalgias for one to two days are reported in only 5% of vaccine recipients. Bronchospasm in persons with asthma may be transiently exacerbated. Life-threatening side effects are extremely rare and occur almost exclusively in persons with known anaphylactic reactions to eggs. Influenza vaccines produced after 1976 are not associated with an increased frequency of the Landry-Guillain-Barré syndrome.

Pneumococcal Disease

Each year an estimated 500,000 cases of pneumonia, 50,000 cases of bacteremia and 5,000 cases of meningitis in the United States are attributed to *Streptococcus pneumoniae*. Mortality from pneumococcal bacteremia exceeds 20% in high-risk persons, which is unchanged from the preantibiotic era. Preventing serious pneumococcal disease with an effective vaccine is thus the principal strategy for reducing mortality.

The 23-valent polysaccharide pneumococcal vaccine, licensed in the United States in 1983, covers up to 87% of the pneumococcal serotypes that cause bacteremia and meningitis, compared with 71% coverage by the 14-valent vaccine marketed in 1978. Pneumococcal vaccine is administered once, 0.5 ml intramuscularly. No need for a booster dose has been shown, as antibody titers have been maintained at protective levels for as long as seven years. Patients who received the 14-valent vaccine should not be revaccinated with the 23-valent vaccine as the increased incidence of side effects is not worth the additional coverage. Influenza vaccine may be administered simultaneously at a different site. Patients who are to receive radiation therapy or chemotherapy should, if possible, be vaccinated at least two weeks before the initiation of treatment.

Recommendations for the use of pneumococcal vaccine are based on identifying persons who are either at increased risk of morbidity and mortality from pneumococcal disease or who are at increased risk of acquiring a pneumococcal disease. Patients with chronic cardiovascular or pulmonary disease are at highest risk and should be top priority for immunization. Table 2 summarizes the categories of patients for whom pneumococcal vaccine is recommended. The immunologic response to the vaccine has been adequate in most high-risk categories of patients except those with multiple myeloma, advanced chronic lymphocytic leukemia, malignant lymphoma after chemotherapy and other causes of B-lymphocyte dysfunction.

TABLE 1.—*Target Groups for Prevention of Influenza**

Persons with chronic cardiovascular or pulmonary disorders that are severe enough to have required regular medical follow-up or admission to hospital during the preceding year
Residents of nursing homes and other long-term-care facilities
Medical personnel who have extensive contact with high-risk patients
Otherwise healthy persons older than 65 years of age
Persons with chronic metabolic diseases (including diabetes mellitus), chronic renal failure or disease, anemia, immunosuppression or asthma that are severe enough to require regular medical follow-up or admission to hospital during the preceding year

*Adapted from Immunization Practices Advisory Committee (ACIP) (*MMWR* 1985; 34:261-268, 273, 275).

TABLE 2.—*Recommendations for Pneumococcal Vaccine Use**

Persons with chronic illnesses, especially cardiovascular disease and chronic pulmonary disease, who would sustain increased morbidity with respiratory infections
Persons with chronic illnesses specifically associated with an increased risk for pneumococcal disease or its complications; these illnesses include sickle cell anemia, splenic dysfunction or asplenia, Hodgkin's disease, multiple myeloma, cirrhosis, alcoholism, chronic renal failure, cerebrospinal fluid leaks and immunosuppression
Otherwise healthy, older persons, especially those 65 years of age and older

*Adapted from Immunization Practices Advisory Committee (ACIP) (*MMWR* 1984; 33:273-276, 281).

Several randomized controlled clinical trials of pneumococcal vaccine have shown an 80% to 90% reduction of the incidence of pneumococcal disease among young adults in an epidemic setting. Recent prospective studies in free-living elderly or those living in institutions, however, have failed to show significant protection from pneumococcal bacteremia. These negative results may be due to the prohibitively large study size (100,000 patients) that would be required to show a clinical effect on an infrequent event. Alternative approaches for estimating vaccine efficacy have reported rates of 60% to 70% protection in adults.

Approximately half of vaccine recipients have mild local side effects that include erythema, induration or discomfort for as long as a week. A fever of up to 38°C (101°F) for one to two days occurs in 5% of vaccine recipients, but severe systemic reactions are rare. The incidence of anaphylactoid reactions is approximately five per million doses administered.

Hepatitis B

An estimated 200,000 persons in the United States become infected each year with the hepatitis B virus (HBV) and about two thirds are adults between 20 and 39 years of age. Fulminant hepatitis from HBV occurs rarely but carries a 75% mortality. Between 6% and 10% of adults with HBV infection become carriers in whom chronic active hepatitis, cirrhosis or hepatocellular carcinoma may develop.

An effective vaccine against HBV became available in 1982. The vaccine is composed of inactivated viral antigens purified from the serum of HBV carriers. A series of three doses of 1.0 ml each given intramuscularly provides 80% to 95% protection from HBV infection. The first two doses are administered four weeks apart and the third is given six months after the first. Suboptimal responses to HBV vaccine given by injection into the buttock have been reported, and the

deltoid muscle should be the site of administration in all adults.

Recommendations for preexposure vaccination against HBV infection are summarized in Table 3. The risk of HBV infection in health care personnel depends on exposure to blood and infected body fluids. Priority groups for receiving the HBV vaccine in health workers are surgeons, nonsurgical personnel who carry out or assist in invasive diagnostic and therapeutic procedures, anesthesiologists, pathologists, dentists, blood bank workers, phlebotomists, nurses doing frequent venipunctures, clinical laboratory technicians and respiratory therapists. Health care personnel with moderate exposure to infected blood but infrequent risk of percutaneous inoculation should also consider immunization against HBV infection. Examples of moderate risk categories are housekeeping personnel and medical staff who are not routinely involved in invasive procedures.

Serologic screening before HBV vaccination is cost effective only in population groups with a high prevalence of serologic markers of HBV infection. Serologic evidence for a past HBV infection is present in up to 80% of persons from the following groups: immigrants from areas of high HBV endemicity, users of illicit parenteral drugs, homosexually active men, clients in institutions for the mentally deficient, household contacts of HBV carriers and patients of hemodialysis units. Only one antibody test needs to be used for routine screening. Testing for anti-hepatitis B core antibody (anti-HBc) identifies all previously infected persons including carriers. Anti-hepatitis B surface antibody present at a minimum of 10 radioimmunoassay sample ratio units identifies previously infected persons with immunity, but not carriers. Testing for anti-HBc may be preferred for groups with higher carrier rates to avoid unnecessary vaccination.

The most common side effects of the HBV vaccine are soreness and erythema at the injection site. More severe reactions have been reported in fewer than 100 cases. There is no evidence of an increased risk of the acquired immunodeficiency syndrome in HBV-vaccine recipients, and the purification process for the vaccine inactivates HTLV III/LAV (human T-lymphotropic virus type III/lymphadenopathy-associated virus).

Measles and Rubella

Measles and rubella are "childhood" diseases whose incidence has been greatly reduced by effective vaccines and widespread immunization campaigns. In the past 20 years, the epidemiology of these diseases has changed, and many cases are now reported among adolescents and young adults. Outbreaks of measles and rubella on college campuses have accounted for as many as 20% of reported cases in recent years. Persons born before 1957 are likely to have been infected with the wild viruses, but subsequently unvaccinated persons would have little chance of being infected.

The live attenuated viruses used to prevent measles and rubella produce a mild or inapparent, noncommunicable infection. Antibodies develop in 90% to 95% after a single 0.5-ml dose given subcutaneously and immunity probably lasts a lifetime. Pregnancy and altered immune states are contraindications to the live virus vaccine. Measles and rubella vaccines contain 25 μg of neomycin, and a history of anaphylactive hypersensitivity to this drug is a contraindication to vaccination. Persons with anaphylactic reactions to eating eggs should not be immunized with measles vaccine.

TABLE 3.—*Recommendations for Hepatitis B Vaccine Use**

Health care workers who have frequent and direct blood contact, who are at risk of trauma that may result in percutaneous introduction of HBV and who may potentially transmit HBV to patients
Clients and staff of institutions for the mentally deficient
Hemodialysis patients
Homosexually active men
Users of illicit injectable drugs
Recipients of factor VIII or IX concentrates
Household and sexual contacts of HBV carriers
Special high-risk populations such as Alaskan Eskimos, native Pacific islanders and immigrants and refugees of Eastern Asia and sub-Saharan Africa
Inmates of long-term correctional facilities
Heterosexually active persons with multiple sexual partners

HBV = hepatitis B virus

*Adapted from Immunization Practices Advisory Committee (ACIP) (*MMWR* 1985; 34:322-323).

Measles encephalitis occurs in 0.1% of cases, and it is more common in adults than in children. Adults born after 1956 who do not have documentations of immunity are candidates for measles immunization. Persons vaccinated with the inactivated virus vaccine (available from 1963 to 1967) are at increased risk for the development of atypical measles when exposed to the wild virus and thus should be revaccinated with the current vaccine. Side effects to measles vaccine include fever to 39.4°C (103°F) in as many as 15% of vaccinees, beginning six days after administration and lasting as long as five days.

Rubella infection during the first trimester of pregnancy can result in the catastrophic congenital rubella syndrome in as many as 80% of fetuses. Premarital screening for rubella antibody identifies many susceptible women before pregnancy. The absence of detectable antibody is an indication to vaccinate. Rubella vaccine is indicated for previously unimmunized adults, particularly women of childbearing age. Adult vaccinees may have significant side effects, especially women, in whom arthralgias of the small peripheral joints may develop up to 40% of the time. Low-grade fever, sore throat, rash and lymphadenopathy may also occur. Symptoms generally begin 3 to 25 days after immunization and persist for 1 to 11 days.

Immunization Strategies

Primary care providers have the opportunity to promote adult immunizations on an individual basis. A history of immunizations should be obtained from each patient, including vaccine type, dose, date of administration and adverse effects. Patients should also be encouraged to keep a copy of their immunization history.

Selected vaccines may be indicated in most adults in a primary care practice. Patients' vaccination history, age, medical diagnoses, life-styles, occupations and travel plans will determine specific recommendations. For example, tetanus toxoid is recommended for adults of all ages, but indications for measles and rubella vaccines are generally limited to young adults, especially on entering college.

Influenza and pneumococcal vaccines have been administered to only about 20% of all high-risk persons. Although a

lack of public acceptance partly explains this low rate, primary care providers also underuse the vaccine even in patients who could benefit the most. Persons requiring regular medical attention or admission to hospital in the preceding year should be targeted for influenza and pneumococcal vaccination. Because two thirds of patients with serious pneumococcal disease have been admitted to hospital in the previous five years, vaccinating patients at the time of hospital discharge may help prevent future admissions for pneumococcal disease. An organized program involving nonphysician staff has been shown to improve vaccine coverage to 50%, and most of these patients accepted influenza vaccine in subsequent years.

Immunizations among health care workers may be indicated to protect either workers or patients. For example, HBV infection is an occupational risk for some health care providers, and preexposure prophylaxis may thus be indicated. Similarly, rubella infections in health care workers may have serious consequences for pregnant patients, and thus immunity should be established for all new employees. Medical personnel who have extensive contact with adults at high risk for influenza complications should consider influenza immunization. Transmission from health care staff to patients has not been proved but is theoretically possible.

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Medical Practice Question

EDITOR'S NOTE: *From time to time medical practice questions from organizations with a legitimate interest in the information are referred to the Scientific Board by the Quality Care Review Commission of the California Medical Association. The opinions offered are based on training, experience and literature reviewed by specialists. These opinions are, however, informational only and should not be interpreted as directives, instructions or policy statements.*

Interosseous Pressure Measurement

QUESTION:

Is interosseous pressure measurement considered accepted medical practice to determine if core decompression of the hip is necessary for avascular necrosis?

OPINION:

In the opinion of the Scientific Advisory Panel on Orthopedics, the measurement of interosseous pressure is considered accepted medical practice to determine if core decompression of the hip is necessary in the treatment of avascular necrosis. While it is not routinely indicated, this procedure can be a valuable adjunct in evaluating the vascularity of the femoral head. Though new diagnostic devices, such as magnetic resonance imaging, may replace it in the future, interosseous pressure measurement is considered by some physicians to be the only method specific enough at this time to determine whether there is increased pressure within the femoral head consistent with avascular necrosis.