Why Vaccinate Adults? Clinical Implications

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Despite the availability of numerous vaccines to prevent a number of illnesses that contribute to morbidity and mortality in adults in the US, their use has not reached appropriate levels. Only 50% of the adult population is adequately vaccinated for influenza vaccine and only 25% for pneumococcal vaccine.

The National Vaccine Advisory Committee (NVAC) report of 1994 outlined several reasons why vaccines were underused in adults, reasons that are still valid, including[1]:

- Misunderstanding of the importance of vaccine-preventable diseases in adults
- Ignorance of the safety and efficacy of adult vaccines
- Uncertainty about the different vaccination schedules for adult subpopulations
- Lack of organized programs for vaccine delivery to adults
- Little or no reimbursement for adult vaccinations costs

Strategies are needed to increase adult vaccination rates. Providers and the public must be made more aware of the indications for vaccinations (and for contraindications as well). Public health systems must be able to ensure adequate vaccine delivery. Financial support from public and private insurers is needed to ensure access to Medicare and Medicaid adult patients.[2]

Barriers to the appropriate use of vaccines fall into 2 large buckets. First, misunderstanding exists about the clinical importance of vaccinations and who to vaccinate. Second, access to vaccination often requires overcoming financial or other barriers that limit appropriate use.

Patient Perception

Misunderstanding about appropriate vaccination for adults often starts with patients themselves. Many senior patients incorrectly assume that the vaccines they received as children will protect them from disease for the rest of their lives. But this is often not the case. Some adults were never vaccinated as children. Many newer vaccines were not available when seniors were children. Some immunity from vaccination can begin to fade over time, leaving older adults without necessary protection. These factors coupled with greater susceptibility to common infections among older adults leaves this population vulnerable to serious disease.

Morbidity and Mortality

Influenza is responsible for 20,000 to 40,000 deaths annually, and an estimated 200,000 excess hospitalizations, costing $750 million to $1 billion during epidemic years.[3] Annual deaths from all pneumococcal disease are estimated to be 40,000. Yearly cases of pneumonia are about 500,000; sepsis, about 50,000; and meningitis, about 3000.[4] Hepatitis B infection occurs in 200,000 to 300,000 people per year and results in 10,000 to 15,000 hospitalizations and 250 deaths. About 1 million people are carriers of the hepatitis B virus (HBV), 250,000 have chronic active HBV, 4000 die each year from HBV-related cirrhosis, and 800 die each year from HBV-related liver cancer.[5]

Annually, there are about 50 cases of tetanus in the US, resulting in about 5 deaths, most of which are in those 60 years or older or who are diabetic. In nearly all reported cases of tetanus, the person was either never vaccinated or, if vaccinated with a primary series, hadn't received a booster vaccination in the previous 10 years.[6] Although rare, in the US, most cases of diphtheria occur in adults because only about 50% have been immunized. Native Americans are particularly susceptible. In 2005, 1 case of adult respiratory diphtheria caused by *C. ulcerans* was reported. The disease is more common in Africa, Asia, South America, and some Eastern European countries, so adults traveling to these areas must be sure to be immunized.[7] Of importance is the progressive decrease in immunity (defined as a diphtheria antitoxin concentration of ≥0.1 IU/mL) to

diphtheria with age—from 91% at age 11 to about 30% by age 60.[8]

Pertussis cases have been increasing in the US since the 1980s, especially among adolescents and adults. In 2005, there were 25,616 cases of pertussis, the least well-controlled bacterial vaccine–preventable disease in the US. Immunity to pertussis decreases 5 to 10 years after childhood vaccination.[9-11]

In 2005, there were 66 reported cases of measles in the US, of which 35% occurred in adults. Most cases of measles in the US occur among adults exposed to foreign visitors or who travel internationally.[12] In 1993, 20% of reported mumps cases for which age was known occurred among persons 20 years of age or older.[13]

Vaccination: The Science

Adult immunizations (Table 1) are administered in 3 ways: as a primary series (in previously unimmunized persons), as booster doses, and as periodic doses. Toxoids are used for diphtheria and tetanus; live virus vaccines provide immunity for herpes zoster, measles, mumps, and rubella; inactivated virus vaccine is used for influenza; inactive viral particles, for hepatitis B; and inactivated bacterial polysaccharide vaccine, for pneumococcal infection.[2]

Influenza Vaccine

In the US, epidemics of influenza typically occur during the winter months. Because of the morbidity and mortality of influenza and pneumococcal infection, vaccination of persons at increased risk for complications of these diseases is a key public health strategy in the US.[2]

One of the objectives of *Healthy People 2010* is to achieve 90% coverage of noninstitutionalized adults ages 65 years or older for both influenza and pneumococcal vaccinations.[14] Among older adults and those with chronic diseases, hospitalization rates increase 2- to 5-fold during influenza epidemics. Mortality rates increase not only due to influenza and pneumonia themselves, but also because of exacerbation of cardiopulmonary and other chronic diseases. During US epidemics in the periods 1972 to 1973 and 1990 to 1991, more than 40,000 influenza-associated deaths occurred, of which 90% were among those 65 years and older.[15]

Among elderly persons in nursing homes, those who were vaccinated experienced a 30% to 40% reduction in the incidence of illness, a 50% to 60% reduction in hospitalization and pneumonia, and a 70% to 100% reduction in mortality.[16] In 2006, however, only 65% of adults 65 or older were vaccinated for influenza. And among those ages 50 to 64 who had chronic illnesses, only 45% were vaccinated.[17]

Pneumococcal Vaccine

Infections due to *Streptococcus pneumoniae* are the major cause of adult community-acquired pneumonia, especially in elderly persons with chronic medical conditions. Despite their well-documented efficacy against bacteremic disease and

Table 1. Recommended Adult Immunization Schedule[a]

Vaccine	50 Years and Older
Tetanus, diphtheria, pertussis (Td/Tdap)[b,c]	1-dose Td booster every 10 years
Measles, mumps, rubella (MMR)[b,d]	1 dose[e] (if exposure is possible)
Varicella[b,f]	2 doses[e] (0, 4-8 wks)
Influenza[b,g]	1 dose annually
Pneumococcal (polysaccharide)[h]	1-2 doses[e] or 1 dose after age 65
Hepatitis A[i]	2 doses[b]
Hepatitis B[b, j]	2 doses[e]
Meningococcal[k]	1 or more doses[e]

[a] Adapted from CDC. Recommended adult immunization schedule, by vaccine and age group. United States. October 2006-September 2007. CDC Web site. http://www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm#print. Accessed August 17, 2007.
[b] Covered by the Vaccine Injury Compensation Program.
[c] For adults who are uncertain of having received these vaccines, a primary series is 3 doses, the first 2 doses administered at least 4 weeks apart and the third dose 6–12 months after the second. Tdap or tetanus and diphtheria (Td) vaccine may be used; Tdap should replace a single dose of Td for adults aged <65 years who have not previously received a dose of Tdap (either in the primary series, as a booster, or for wound management).
[d] Adults born before 1957 are considered immune to measles, mumps, and rubella. 1 dose of MMR should be given to those who travel internationally or may be exposed to foreign visitor. Do not give to those who are immunosuppressed.
[e] If some other risk factor is present (on the basis of medical, occupational, lifestyle, or other indications)
[f] All adults without evidence of immunity to varicella should receive 2 doses of varicella vaccine.
[g] All adults with risk factors (chronic cardiovascular or pulmonary disorders, chronic metabolic diseases, renal dysfunction, hemoglobinopathies, immunosuppression) and residents of assisted living (AL) communities, nursing homes, or long-term care (LTC) facilities.
[h] Adults with chronic pulmonary disorders, cardiovascular disease, diabetes mellitus, chronic liver or kidney diseases, asplenia, immunosuppressive conditions, malignancies, transplantation, chemotherapy, long-term corticosteroid use, or cochlear implants; and those who reside in LTC or or nursing homes. For persons aged >65 years, 1-time revaccination if they were vaccinated >5 years previously and were aged <65 years at the time of primary vaccination.
[i] Adults with chronic liver disease or who receive clotting factor concentrates.
[j] Adults with end-stage renal disease (ESRD) including those receiving hemodialysis; HIV infection or STDs; chronic liver disease; and those receiving clotting factor concentrates. For adults receiving hemodialysis and other immunocompromised adults, 1 dose of 40 micrograms/mL (Recombivax HB®) or 2 micrograms of 20 micrograms/mL (Engerix-B®).
[k] Adults with anatomic or functional asplenia, or terminal complement component deficiencies, or who travel internationally. Revaccination after 5 years might be indicated for adults previously vaccinated with MPSV4 who remain at high risk for infection.

deaths in the elderly population, pneumococcal polysaccharide vaccines are still very much underused.

The CDC estimates effectiveness of the vaccine in preventing morbidity to be 60% to 64% overall, but 44% to 61% in persons older than age 65. Although there is uncertainty about the length of time immunity lasts, morbidity and mortality have been shown to decrease.[5]

Misunderstanding about appropriate vaccination for adults often starts with patients themselves.

Hepatitis B Vaccine

Rates of new hepatitis B virus (HBV) infection and acute disease are highest among adults. Chronic infection usually occurs in young children and those who were infected as infants, and this chronicity increases lifetime risk for cirrhosis and hepatocellular carcinoma (HCC) and provides the main reservoir for continued HBV transmission.[18] Among all age groups, the overall effectiveness of the hepatitis B vaccine in preventing infection is 80% to 95%; among those 50 to 59 years of age, effectiveness is 70%; it further decreases to 50% in adults older than 60 years. Duration of protection is at least 7 years among healthy adults.[18] Studies have shown, however, that only 30% of high-risk men and 31% of high-risk women have ever received even 1 dose of hepatitis B vaccination. And among this group, only 64% to 73% completed the 3-dose series.[19]

Acellular Pertussis Vaccine

Pertussis is an acute, infectious illness marked by cough, which is more prevalent among children and adolescents than adults in the US. Immunity to pertussis decreases approximately 5 to 10 years after completion of childhood pertussis vaccination, leaving adolescents and adults susceptible to pertussis.[20] Efficacy of the pertussis vaccine was recently studied in adolescents and adults, ages 15 to 65, and found to be protective against *Bordetella pertussis* in 92% of cases.[21]

Tetanus-Diphtheria Toxoid

Tetanus is a noncommunicable disease caused by *Clostridium tetani* that enters the body through broken skin. Tetanospasmin, a potent neurotoxin, causes lockjaw and skeletal muscle rigidity that can impair respiratory function. From 1998 to 2000, the case–fatality ratio for reported tetanus was 18% in the United States.[20]

Vaccination against tetanus and diphtheria has markedly reduced the number of cases and deaths in the United States in all age groups. However, data from the Third National Health and Nutrition Examination Survey (NHANES III) indicate that only 60% of the adult population have serologic protection against diphtheria and 72% against tetanus. Among adults older than 70, only 30% had serologic immunity to either disease.[22]

In the US, one vaccine is licensed for use in adults and adolescents to prevent diphtheria, tetanus, and pertussis. ADACEL® (Sanofi Pasteur, Toronto, Ontario, Canada) can be given as a single-dose active booster to those aged 11 to 64.[23]

Measles-Mumps-Rubella Vaccine

Persons born before 1957 are generally considered to be immune to measles and do not need to be vaccinated unless they are healthcare workers. Most adults likely were infected naturally with mumps, but those who are considered susceptible should receive the vaccine. Those who were born in 1957 or later are considered immune if they have proof of receiving 1 dose of live mumps vaccine or evidence of mumps immunity. Adults should receive a rubella vaccine if they do not have proof of receiving one.[24]

A single dose of live measles vaccine provides long-lasting immunity to measles in at least 95% of recipients. A second dose of vaccine provides immunity in more than 90% or those who do not respond to a first vaccine. Mumps vaccine reduces the incidence by 75% to 95%. Rubella vaccine has efficacy similar to that of measles vaccine.[5]

Herpes Zoster Vaccine

Shingles affects about 1 million adults in the US each year, with about half of cases occurring among those older than 60.[25] Herpes zoster occurs when the dormant varicella virus from a previous episode of chickenpox is reactivated. It is believed that the virus multiplies as it is reactivated. Normally antibodies remaining from the initial chickenpox infection neutralize it. However, if antibodies aren't present, the virus

multiplies in the ganglia, destroys the host neuron, and spreads down the sensory nerves to the skin. Postherpetic neuralgia affects about 33% of patients with herpes zoster.

The CDC Advisory Committee on Immunization Practices (ACIP) recommends that adults 60 years of age and older be vaccinated with Zostavax® (Zoster Vaccine Live, Merck & Co., Whitehouse Station, NJ) to help prevent herpes zoster.

The Need

Clearly there is a tremendous opportunity for physicians to play a leadership role in ensuring that seniors receive their necessary vaccines. While the science of vaccination is forthright, unfortunately the question of access to vaccines remains. Helping patients understand the benefit of vaccination is only half the battle. Campaigning for Medicare coverage of vaccination and providing preventive services for our patients is the other half. (For revisions to the Medicare billing system for vaccinations and vaccines, please see in the September/October issue of *MPM* at: www.medicarepatientmanagement.com/issues/02-05/mpmSO07-MedMins-0827.pdf. MPM

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Provider Action

Impact to You

Vaccinations are vital for improving health outcomes for seniors. Medicare's measures of quality outcomes have always been focused on vaccination rates, and it is likely that pay-for-performance measures will be applied to vaccinations.

What You Need to Know

The clinical importance of vaccines needs to be better understood by healthcare providers and patients to eliminate the knowledge gap and achieve improved vaccination rates.

What You Need to Do

Practices need to incorporate vaccination strategies into their process—first, through educational initiatives such as in-services and community education nights for staff and patients, and second, through practice processes that include reminders for vaccination at each and every opportunity. Finally, practices need to continuously monitor vaccination rates to determine areas needing improvement.

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