Immunizations in adults with specific high-risk medical conditions

Immunizations in the adult population with chronic comorbidities constitute an essential preventive strategy to fight off various pathogens. Targeting patients with chronic obstructive pulmonary disease (COPD), human immunodeficiency virus (HIV), and end-stage renal disease (ESRD) with vaccinations is an important part of chronic care management.
The incidence of influenza has led to an increased rate of hospital admissions as well as to an increase in mortality in the COPD patient population because of the initial frail state of such patients. Activities of daily living (ADL) also have been found to be affected in the aging patient afflicted with influenza, specifically leading to dependency in self-care, administering of medication, and housekeeping chores. Such ADL strictures will markedly affect the aging COPD patient in whom limitations in deconditioning and ambulatory status will further affect his or her chronic disease state. Patients without the burden of COPD have higher improvement rates from an episode of influenza.

Yearly influenza vaccination is strongly urged in all patients with COPD. According to Nichol and colleagues, there has been as much as a 52% reduction in hospitalization and a 70% reduction in mortality in 1 subset of patients with COPD who were vaccinated. (When an adult shows signs or symptoms of an acute illness, however, flu vaccination should not be given.) The effect of influenza is extremely deleterious on the COPD patient, causing acute exacerbations and, in turn, increasing global medical expense. It has been calculated that influenza vaccination will lessen health care costs by $171 per year for the patient with chronic comorbidities. Contraindication to the influenza vaccine is allergy to eggs. And, avoid the live vaccine in those who are immunocompromised.

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pneumonia vaccination is the physician who does not inform his or her patient about vaccination. It is the health care provider’s duty to educate patients regarding immunizations and to alleviate any misgivings or fears they may have.

More vaccines are needed to protect our COPD patients from all the various respiratory pathogens causing pneumonia. There are immunostimulatory agents that have been found to decrease COPD exacerbations. A detoxified oral extract known as OM-85, found in 8 bacteria, was a factor causing H influenzae, S aureus, S pneumoniae, and other respiratory infections. OM-85 has been shown to diminish hospital admissions and to lessen the severe complications of exacerbations in COPD patients, but this agent is available only in Europe. More studies are needed to attest for its efficacy in this high-risk population. Research is being conducted in genome sequencing and genome mining to discover the proteins associated with common respiratory pathogens in COPD.

**ESRD considerations**

Renal-failure patients are a special group of immunocompromised individuals who require aggressive preventive management to minimize infection. ESRD is described as glomerular filtration rate less than 10 to 15 mL/min. ESRD patients manifest such symptoms as fatigue, weakness, anorexia, malaise, and memory impairment. Other system symptoms may occur.

The second most common cause of death in ESRD is infection. Mortality risk increases exponentially in septic renal-failure patients. The literature relates an increase in hospitalization, pulmonary infections, as well as hospital-related infections in this special population. Hepatitis B virus (HBV) infection presents a global health care concern for ESRD patients. HBV outbreaks have occurred in hemodialysis units. It can be contracted by contaminated equipment, subjected to infectious fluids via the parenteral route predisposed by an immunocompromised state and poor compliance with maintaining uniform infection disease protocol in dialysis centers. There has been an improvement in the infection rates with development of the HBV vaccine in 1980.

### Table. Advisory Committee on Immunization Practices (ACIP) Recommended Adult Immunization Schedule for Patients With HIV, Chronic Lung Disease, and Kidney Failure

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Immuno-compromising Conditions (Excluding HIV)</th>
<th>HIV Infection CD4+ T Lymphocyte &lt; 200 cells/µL</th>
<th>HIV Infection CD4+ T Lymphocyte &gt; 200 cells/µL</th>
<th>Chronic Lung Disease</th>
<th>Kidney Failure, End-stage Renal Disease, Receipt of Hemodialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>1 IIV dose annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td></td>
<td>Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Papillomavirus (HPV), female</td>
<td>3 doses through age 26 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Papillomavirus (HPV), male</td>
<td>3 doses through age 26 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>1 or 2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Meningococcal</td>
<td>1 or more doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>3 doses</td>
<td>3 doses</td>
<td>3 doses</td>
<td>3 doses</td>
<td></td>
</tr>
</tbody>
</table>

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster

Recommended if some other risk factor is present (eg, on the basis of medical, occupational, lifestyle, or other indications)

No recommendation


**Abbreviation:** IIV, inactivated influenza vaccine
of advanced renal failure), the more effective the vaccine will be.\textsuperscript{10} Dialysis patients’ response to the HBV vaccine is markedly less than that in the general population because of the attenuated immune response in these patients.\textsuperscript{10} Research documents a 54% response rate in ESRD patients compared with a 90% response rate in their healthy counterparts.\textsuperscript{10} Possible reasons for lower response to the vaccine could be sex, age, nutritional status, obesity, iron overload, hepatitis C infection, and blood transfusion history.\textsuperscript{11,12} It would make sense that the aging dialysis patient would have an attenuated response to the HBV vaccine, given the changes in his or her immune response on a cellular and humoral level.\textsuperscript{11} Nonetheless, given this information, it is still imperative to vaccinate dialysis patients. There is also a dearth of knowledge regarding the vaccine’s period of immunogenicity in the ESRD patient.\textsuperscript{10}

Current CDC (Centers for Disease Control and Prevention) recommendations propose initiating vaccination early on in the disease state of chronic kidney disease patients. Hemodialysis patients require extra doses in a stronger strength of Recombivax HB or Engerix-B. The recommendation is to give 3 doses of Recombivax HB and 4 doses of Engerix-B intramuscularly.\textsuperscript{10} Physicians should conduct serologic testing within 1 to 2 months after the vaccine is given. If the levels of the protective antibody titers are <10, revaccination with recombinant hepatitis vaccine needs to be performed. It is recommended that serologic testing be done annually. This information will help physicians decide if booster doses need to be given. According to the CDC, hepatitis A vaccine is not recommended for chronic kidney disease patients or for patients on hemodialysis.\textsuperscript{10}

Chronic renal disease patients, especially those receiving dialysis, should be given the influenza vaccine because of the high rates of morbidity and mortality associated with this illness.\textsuperscript{10} There is a high rate of streptococcal pneumonia in hemodialysis patients. Mortality rates are 14 to 16 times those in nondialysis patients.\textsuperscript{10} According to the literature, not enough patients are being vaccinated,\textsuperscript{10} a problem in this fragile group of patients. The newer PCV13 vaccine is still being evaluated regarding its immunogenicity in immunocompromised patients.\textsuperscript{10} There is limited research regarding tetanus and diphtheria immunization, but the Advisory Committee on Immunization Practices of the CDC recommends a single dose of the Tdap-tetanus, diphtheria toxoids, and acellular pertussis component-vaccine in unvaccinated adult patients. There was still a small percentage of tetanus, annual incidence of 0.10 per 1 million population, from approximately 2001 to 2005 to warrant recommending the vaccine.\textsuperscript{10} The combined diphtheria and tetanus toxoid booster dose (Td) should be offered 10 years after a patient has had his or her first Tdap vaccination.\textsuperscript{10,12} The small “d” and “p” indicate the minimal amount of diphtheria and acellular pertussis given to reduce adverse events.\textsuperscript{7} The 2 Tdap vaccines available are Boostrix and Adacel.\textsuperscript{6}

Herpes zoster, also known as shingles, can be extremely devastating in the older adult population. The patient develops painful vesicles in a dermatome. The neuralgia that ensues can be painful for months, even after the vesicles dissipate. Patients with chronic kidney disease or those on dialysis require a specific dose of antivirals based on an individual’s kidney function.\textsuperscript{10} The live attenuated vaccine can be given safely to ESRD patients.\textsuperscript{10}

Renal transplant patients require vaccination for preventable infections.\textsuperscript{12} Early vaccination is crucial, even prior to transplant because of the high risk of infections in this special population. Even though vaccination guidelines have been offered for this group of patients, administration of recommended vaccines has been reported to be insufficient, based on possible allograft rejection or anxiety about toxic effects of the vaccine.\textsuperscript{13} Live vaccinations are contraindicated in the renal transplant patient population. Vaccines are given no earlier than 6 months after transplant.\textsuperscript{12}

The increased rate of hepatitis B transmission is common among transplant patients.\textsuperscript{12} Without exception, all patients undergoing renal transplantation having acquired hepatitis B will go on to acquire chronic active disease when antiviral therapy is not provided.\textsuperscript{12} Hepatitis B vaccine is recommended because of the high morbidity and mortality associated with the occurrence of hepatitis B.\textsuperscript{12} It has been found that these patients have a decreased seroconversion response as well as a rapid fall in antibody titers, and because these patients are so fragile, it is imperative to monitor their antibody levels closely. Hepatitis A vaccine also should be provided to the renal transplant patient.\textsuperscript{12} Patients awaiting transplant should be offered an annual influenza vaccine.\textsuperscript{10} Monitoring for antibody titers is not recommended.\textsuperscript{10} Allograft rejection has been related to influenza infection.\textsuperscript{10} In addition, the pneumonia vaccine should be provided because of the risk for streptococcal pneumonia specifically during the first 3 years after renal transplant.\textsuperscript{12} In general, the antibody titer to most pneumococcal serotypes will drop and will require revaccination.\textsuperscript{10,12}

Transplant patients should receive Tdap every 5 years.\textsuperscript{12} Varicella zoster live vaccine should not be given to a patient with a renal allograft.\textsuperscript{12} The vaccine should be given to a patient who is a candidate for transplant.\textsuperscript{12} There is no concrete evidence to vaccinate an ESRD or renal transplant patient with HPV.\textsuperscript{10}

**Vaccinations and HIV patients**

HIV results from lack of a subset of T lymphocytes known as helper or inducer T cells.\textsuperscript{2} There are 2 types of HIV, HIV-1 and HIV-2.\textsuperscript{13} HIV-1 is the major type occurring in the United States; HIV-2 is the dominant type found in West Africa.\textsuperscript{13} Exposure to HIV can occur through needle sticks, sexual intercourse, transfusions or via maternal-fetal spread.\textsuperscript{13} Once infected with the virus, the patient can develop virus-like symptoms known as the “acute retroviral syndrome.”\textsuperscript{12} The patient will then go on to develop the chronic infection.\textsuperscript{2}
HIV patients are susceptible to various infections. Community-acquired pneumonia, herpes zoster, *Pneumocystis jiroveci* pneumonia, and toxoplasmosis are common in the HIV-infected patient. There is a paucity of research on how effective immunizations are in HIV patients. The vaccinations should be considered in an HIV patient whose CD4+ count is between 200 and 500 cells/µL. If the CD4+ count is less than 200 cells/µL or if there is documented AIDS-defining illness, a live vaccination, bacterial or viral, should not be given because of the adverse effects caused by the vaccine. Caregivers or household contacts of HIV-infected individuals can receive live viruses, with the exception of live-attenuated influenza vaccine.

Some literature has stated that HIV patients who are on antiretroviral treatment seem to respond better to vaccinations. However, HIV patients will have an attenuated response to vaccinations compared with HIV-negative patients secondary to their immunocompromised state. Vaccines recommended in the HIV patient are the following: pneumococcal, hepatitis A, hepatitis B, influenza, Td, Tdap, MMR (measles, mumps, rubella), varicella-zoster (VZV), HPV, and meningococcal.

The hepatitis B vaccine should not be given to the HIV-infected patient if there is immunity to hepatitis B or in the presence of an HBV infection. Hepatitis B vaccine should be given in 3 doses (0, 1, and 6 months range). If the titer level is <10 after vaccination, the patient should be revaccinated.

Influenza vaccine, which is given yearly, needs to be given in the inactivated form. Td is recommended every 10 years. A single dose of Tdap in patients aged 19 to 65 years may be given in place of a Td booster in patients who never received Tdap. Avoid live MMR in patients whose CD4+ count is <200 cells/µL. Avoid the live VZV vaccine in patients whose CD4+ count is <200 cells/µL. VZV is given in 2 doses (0, 3 months).

HPV vaccine is recommended in HIV female and male patients. However, there is limited data regarding the use of this vaccine in the HIV-infected patient. The meningococcal vaccine is given to HIV patients who have potential risks—those living in dormitories, military recruits, those traveling to endemic areas, those with complement component deficiency or occupational exposure.

**Final notes**

To serve special patient populations in a more constructive manner, physicians should gain an improved understanding of vaccines that are currently available as well as the appropriate protocols for administration of these vaccines. These vaccines and their respective protocols are important tools in protecting special patient population groups, for example, those who have been diagnosed with COPD, renal disease, or HIV.

Setting aside the importance of advancements in immunizations, health care providers must focus in on implementing vaccination in a larger segment of these chronically ill patients. At present not enough of these patients have been identified for vaccination. A more global effort toward vaccinating the chronically ill will significantly diminish mortality and morbidity. In essence, physicians should recognize the importance of vaccination. Elimination of physician inertia is imperative; it is time for physicians to develop a momentum aimed at creating a successful vaccination program for older adults with chronic comorbidities.

**References**