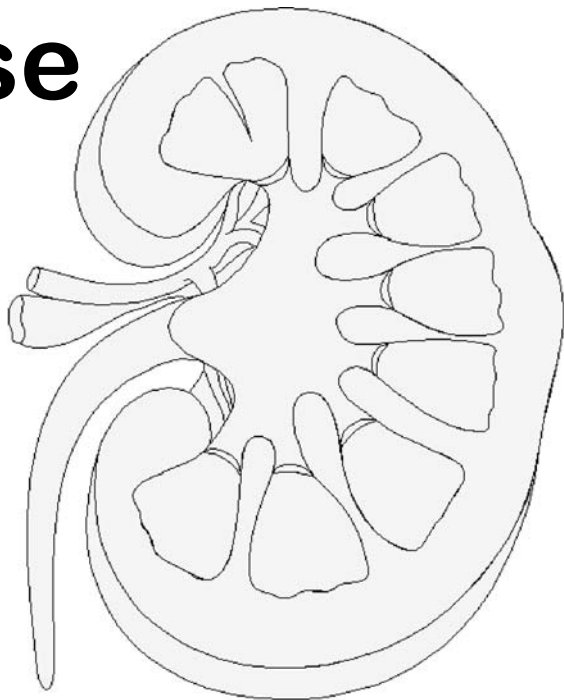


Guidelines for Vaccinating  
**Kidney Dialysis Patients** and  
**Patients with Chronic  
Kidney Disease**



summarized from  
**Recommendations of the Advisory Committee on  
Immunization Practices (ACIP)**



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This summary is not meant to apply to kidney patients who are recently post-transplant. These patients are considered more significantly immunosuppressed than those who have only chronic kidney disease, with or without dialysis.

## Vaccination of Renal Dialysis Patients and Patients with Chronic Renal Disease

“Patients with renal failure have an increased risk of infection with a variety of pathogens, particularly pneumococcus and hepatitis B. The efficacy of pneumococcal vaccination for some of these patients, including those on dialysis, may be considerably lower than for immunocompetent patients, their antibody levels may be lower, and they may require repeat vaccination or an increased dose of vaccine. Because secondary antibody responses are less affected than primary antibody responses, immunization strategies should be formulated early in the course of progressive renal disease. This approach is particularly important if transplantation and chronic immunosuppressive therapy are being considered. Nephrotic syndrome is the renal disease most clearly associated with an increased risk for pneumococcal infection.”<sup>1</sup>

Vaccine	Recommended	May Use if Otherwise Indicated	Contraindicated
Anthrax		X*	
DTaP/Tdap/Td		X*	
Hib		X*	
Hepatitis A		X*	
Hepatitis B	X (see p. 2)		
Influenza (TIV)	X (see p. 3)		
Influenza (LAIV)			X (see p. 4)
Japanese Encephalitis		X*	
MMR		X*	
Meningococcal		X*	
Pneumococcal	X (see p. 4)		
Polio (IPV)		X*	
Rabies		X*	
Rotavirus		X <sup>†</sup>	
Smallpox		X*	
Typhoid		X*	
Varicella		X*	
Yellow Fever		X*	

\*No specific ACIP recommendation for this vaccine exists for renal dialysis patients and patients with chronic renal disease.

†Children with primary immunodeficiency disorders and both children and adults who have received hematopoietic, hepatic, or renal transplants are at risk for severe or prolonged rotavirus gastroenteritis and can shed rotavirus for prolonged periods. [“Prevention of Rotavirus Gastroenteritis Among Infants and Children: Recommendations of the Advisory Committee on Immunization Practices” Unpublished]

# NOTES

## Hepatitis B Vaccine

"Hepatitis B vaccination is recommended for all susceptible chronic hemodialysis patients . . . Vaccination is recommended for pre-end-stage renal disease patients before they become dialysis dependent and for peritoneal and home dialysis patients because they might require in-center hemodialysis.

"Patients with uremia who were vaccinated before they required dialysis have been shown to have higher seroconversion rates and antibody titers. The response may also be better in children."<sup>2</sup>

### Dosage and Schedule

"For patients undergoing hemodialysis and for other immunosuppressed patients, higher vaccine doses or increased number of doses are required. A special formulation of one vaccine is now available for such persons (Recombivax HB, 40 µg/mL)".<sup>3</sup>

**Doses and Schedules: Hepatitis B Vaccines for Hemodialysis Patients**

Group	Recombivax HB			Engerix B		
	Dose	Volume	Schedule	Dose	Volume	Schedule
≥20 years of age: Predialysis*	10 µg	1.0 mL	3 doses at 0, 1, & 6 months	20 µg	1.0 mL	3 doses at 0, 1, & 6 months
≥20 years of age: Dialysis-dependent	40 µg	1.0 mL <sup>†</sup>	3 doses at 0, 1, & 6 months	40 µg	Two 1.0 mL doses at one site	4 doses at 0, 1, 2, & 6 months
<20 years of age <sup>¶</sup>	5 µg	0.5 mL	3 doses at 0, 1, & 6 months	10 µg	0.5 mL	3 doses at 0, 1, & 6 months

\* Immunogenicity might depend on degree of renal insufficiency.

† Special formulation.

¶ Doses for all persons aged <20 years approved by the U.S. Food and Drug Administration. For hemodialysis patients, higher doses might be more immunogenic.

**NOTE:** All doses should be administered in the deltoid by the intramuscular route.

Adapted from CDC. Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients. *MMWR* 2001;50 (No. RR-5):Table 3

"If an adult patient begins the vaccine series with a standard dose before beginning hemodialysis treatment, then moves to hemodialysis treatment before completing the series, complete the series using the higher dose recommended for hemodialysis patients. No specific recommendations have been made for higher doses for pediatric hemodialysis patients. If a lower than recommended vaccine dose is administered to either adults or children, the dose should be repeated."<sup>4</sup>

continued . . .

## **Hepatitis B Vaccine, continued**

### **Immunogenicity and Duration of Immunity**

"Although data concerning the response of pediatric hemodialysis patients to vaccination with standard pediatric doses are lacking, protective levels of antibody occur in 75% -97% of those who receive higher dosages (20- $\mu$ g) on either the 3- or the 4-dose schedule."<sup>5</sup>

"Limited data are available on the duration of immune memory after hepatitis B vaccination in . . . dialysis patients. No clinically important HBV infections have been documented among immunocompromised persons who maintain protective levels of anti-HBs. . . .However, among hemodialysis patients who respond to the vaccine, clinically significant HBV infection has been documented in persons who have not maintained anti-HBs concentrations of  $\geq 10$  mIU/mL."<sup>6</sup>

### **Serologic Testing**

Testing after vaccination is recommended for persons (including hemodialysis patients) whose subsequent clinical management depends on knowledge of their immune status. "Testing should be performed 1-2 months after administration of the last dose of the vaccine series by using a method that allows determination of a protective level of anti-HBs ( $\geq 10$  mIU/mL)."

"Persons found to have anti-HBs levels of  $< 10$  mIU/mL after the primary vaccine series should be revaccinated. Administration of three doses on an appropriate schedule . . ., followed by anti-HBs testing 1-2 months after the third dose, is usually more practical than serologic testing after one or more doses of vaccine."

"Persons who do not respond to revaccination should be tested for HBsAg. If the HBsAg test result is positive, the persons should receive appropriate management . . . and any household, sexual, or needle-sharing contacts should be identified and vaccinated. Persons who test negative for HBsAg should be considered susceptible to HBV infection and should be counseled about precautions to prevent HBV infection and the need to obtain HBIG postexposure prophylaxis for any known or likely parenteral exposure to HBsAg-positive blood."<sup>7</sup>

### **Booster Doses**

"For hemodialysis patients, the need for booster doses should be assessed by annual antibody to hepatitis B surface antigen (anti-HBs) testing. A booster dose should be administered when anti-HBs levels decline to  $< 10$  mIU/mL."<sup>8</sup>

## **Influenza Vaccine**

### ***Inactivated Influenza Vaccine (TIV)***

"The following groups are recommended to receive annual influenza vaccination . . . Persons at Increased Risk for Complications . . . adults and children who have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus [HIV])."<sup>9</sup>

## Influenza Vaccine, continued

### **Live, Attenuated Influenza Vaccine (LAIV)**

CONTRAINDICATED

“Persons Who Should Not Be Vaccinated with LAIV . . . persons with . . . other underlying medical conditions, including such metabolic diseases as diabetes, renal dysfunction, and hemoglobinopathies . . .” “These persons should receive inactivated influenza vaccine.”<sup>10</sup>

#### **Use of influenza antivirals for persons with impaired renal function<sup>11</sup>**

**Zanamivir.** Limited data are available regarding the safety and efficacy of zanamivir for patients with impaired renal function. Among patients with renal failure who were administered a single intravenous dose of zanamivir, decreases in renal clearance, increases in half-life, and increased systemic exposure to zanamivir were observed. However, a limited number of healthy volunteers who were administered high doses of intravenous zanamivir tolerated systemic levels of zanamivir that were substantially higher than those resulting from administration of zanamivir by oral inhalation at the recommended dose. On the basis of these considerations, the manufacturer recommends no dose adjustment for inhaled zanamivir for a 5-day course of treatment in patients with either mild-to-moderate or severe impairment in renal function.

**Oseltamivir.** Serum concentrations of oseltamivir carboxylate (GS4071), the active metabolite of oseltamivir, increase with declining renal function. For patients with creatinine clearance of 10-30 mL/min, a reduction of the treatment dosage of oseltamivir to 75 mg once daily and in the chemoprophylaxis dosage to 75 mg every other day is recommended. No treatment or chemoprophylaxis dosing recommendations are available for patients undergoing routine renal dialysis treatment.

## Pneumococcal Vaccine

### **PPV23**

“Vaccination is . . . recommended for immunocompromised adults at increased risk of pneumococcal disease or its complications (e.g., persons with splenic dysfunction or anatomic asplenia, Hodgkin's disease, leukemia, lymphoma, multiple myeloma, chronic renal failure, nephrotic syndrome, or conditions such as organ transplantation associated with immunosuppression).”<sup>12</sup>

### **Revaccination**

“. . . revaccination once is recommended for persons aged  $\geq 2$  years who are at highest risk for serious pneumococcal infection and those who are likely to have a rapid decline in pneumococcal antibody levels, provided that 5 years have elapsed since receipt of the first dose of pneumococcal vaccine. Revaccination 3 years after the previous dose may be considered for children at highest risk for severe pneumococcal infection who would be aged  $\leq 10$  years at the time of revaccination.

Persons at highest risk and those most likely to have rapid declines in antibody levels include persons with . . . chronic renal failure, nephrotic syndrome, or other conditions associated with immunosuppression (e.g., organ or bone marrow transplantation) . . .”<sup>13</sup>

continued . . .

## **Pneumococcal Vaccine (PPV23): continued**

### **Recommendations for use of PPV23 Among Children Previously Vaccinated with PCV7**

“Children who have completed the PCV7 vaccination series before age 2 years and who are among risk groups for which PPV23 is already recommended should receive one dose of PPV23 at age 2 years ( $\geq 2$  months after the last dose of PCV7). These groups at high risk include children with SCD, children with functional or anatomic asplenia, children who are HIV-infected, and children who have immunocompromising or chronic diseases. Although data regarding safety of PPV23 administered after PCV7 are limited, the opportunity to provide additional serotype coverage among these children at very high risk justifies use of the vaccines sequentially.”<sup>14</sup>

### **PCV7**

(These recommendations apply to children 24-59 months of age. All children 6 months through 23 months of age should get PCV7 regardless of their health status as part of the routine childhood immunization schedule.)

“Children aged 24-59 months should receive PCV7 vaccination if they are at high risk for pneumococcal infection caused by an underlying medical condition. This recommendation applies to the following groups: . . .

- children with immunocompromising conditions, including . . . chronic renal failure or nephrotic syndrome.”

“For children aged 24-59 months with underlying medical conditions . . ., ACIP recommends two doses of PCV7, administered 2 months apart, followed by one dose of PPV23 administered  $\geq 2$  months after the second dose of PCV7.”<sup>15</sup>

### **Recommendations for Use of PCV7 Among Children Previously Vaccinated with PPV23**

“Children aged 24-59 months who are at high risk for pneumococcal disease and who have already received PPV23 (i.e., children with [Sickle Cell Disease], HIV infection, or who have other immunocompromising illnesses or chronic diseases) could benefit from the immunologic priming and T-cell-dependent immune system response induced by PCV7. Thus, among children in these groups at high risk sequential use of the two pneumococcal vaccines can provide additional protection. Health-care providers should vaccinate children aged 24-59 months at high risk who have not previously received PCV7 but who have already received PPV23 with two doses of PCV7 administered  $\geq 2$  months apart. Vaccination with PCV7 should be initiated  $\geq 2$  months after vaccination with PPV23. Providers should be aware that minimal safety data are available regarding this vaccine sequence.”<sup>14</sup>

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