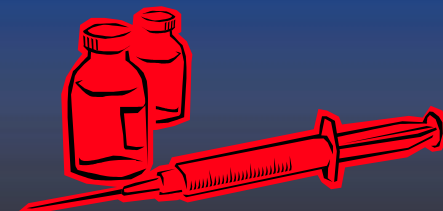
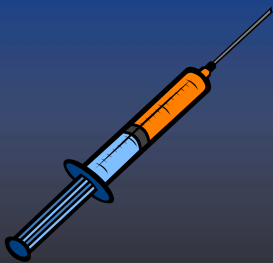




Protecting Our Health The Importance of Vaccinations

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The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention

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Overview

- Why do we have vaccination programs
- What are the vaccine preventable diseases
- The importance of certain vaccinations in kidney patients
 - Hepatitis B
 - Pneumococcal pneumonia
 - Influenza
- Recommendations for patients with chronic kidney disease
- The Safe and Timely Vaccine Coalition (STIC)



What is a vaccine?

the word "vaccination" has the Latin root "vacca" meaning cow

- A vaccine is a preparation used to establish resistance (immunity) to a disease.
- Term derived from Edward Jenner's (1749-1823) use of Cowpox to protect against Smallpox
- Jenner realized that milkmaids who had contact with cowpox did not get smallpox.





Types of vaccines

- Vaccines containing killed microorganisms
- Vaccines containing live, weakened (attenuated) microorganisms
- Toxoids-inactivated toxic compounds from microorganisms
- Subunit- contains portions of the disease causing organism

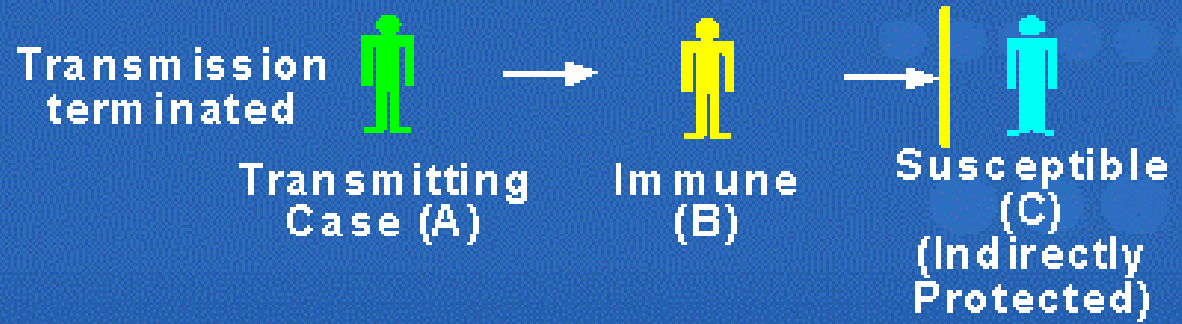
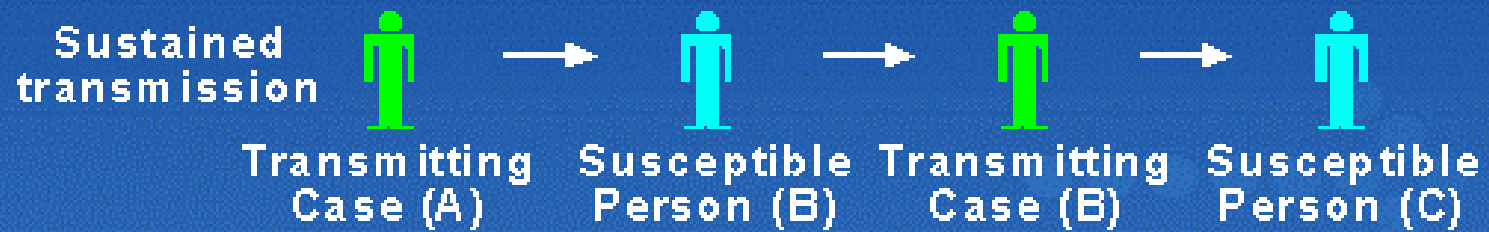


Purpose of vaccination

- The immune system recognizes vaccine agents as foreign, destroys them, and 'remembers' them.
- Vaccination programs have eliminated one of the most contagious and deadly diseases known to man, SmallPox.
- Some diseases (polio, rubella, chickenpox, measles, etc) are no longer as common as they were in the past
- As long as the vast majority of people are vaccinated (herd immunity), it is much more difficult for an outbreak of disease to occur.



Herd Immunity





Chronic and End Stage Kidney Disease and Vaccine Preventable Diseases

- Special population
- As kidney disease progresses patients become increasingly susceptible to infections
- Infection is the one of the leading causes of death among kidney patients
- Infection follows cardiovascular disease (the leading cause of death)



Morbidity in ESRD Patients (USRDS 2005 ADR)

- Cause-specific hospital admission rates have changed dramatically since 1993
- Infectious and cardiovascular hospitalizations are up 23 and 10 percent



Adjusted Mortality Due to Pulmonary Infection in Dialysis Patients, 1991-2002

	All	< 3 years on Dialysis	≥ 3 years on Dialysis
1991	5.1	5.5	5.8
1994	5.4	5	5.7
1996	5.3	4.9	5.7
1998	5.3	4.8	5.8
2000	4.8	4.3	5.2
2002	4.8	4.3	5.4



The Use of Vaccines in Patients with Kidney Disease

- Hepatitis B Virus
- Pneumococcal (*Streptococcus pneumoniae*)
- Influenza



Incidence and prevalence of HBV Infection among US Dialysis Centers, 2002



- Incidence of HBV infection decreasing to 0.12%
- Prevalence of HBsAg positivity in dialysis patients decreasing to 1%
- Has remained stable over the last decade
- 27.3% of centers reported one or more patients with chronic HBV infection
- 2.8% of US dialysis facilities reported one or more patients with newly acquired HBV infection



Sources for Bloodborne Virus infections in Hemodialysis Patients

■ External

- Transfusion from unscreened blood
- Non-dialysis related healthcare procedures
- Household/sex with infected contact
- Illegal injection drug use (more common in western countries)

■ Internal

- **Patient-equipment-patient (HBV contamination on devices, tubing, supplies, surfaces)**
- **Patient-equipment-staff-patient (HBV contaminated surfaces touched by staff transmit with contaminated gloves or hands)**
- **Patient-staff-patient (direct contamination of staff members hands/gloves with blood)**



Immunogenicity

- Primary series produces a protective anti-HBs response in **90-95% of adults with normal immune status**
- Proportion of patients with ESRD who develop a protective antibody response is lower
 - For those receiving a 3-dose schedule the median is 64% (range 34-88%)
 - For those receiving a 4-dose schedule the median is 86% (range from 48-98%)



Immunogenicity and CKD/ESRD

- Studies indicate that it is better to begin vaccinating patients before they become dialysis dependent
 - Adults with serum creatinine levels ≤ 4 mg/dl (mean 2 mg/dl) responded significantly (86%) better than patients with serum creatinine levels > 4 mg/dl (mean 9.5 mg/dl) (37%).

Fraser GM, et al. *J Hepatol* 1994;21:450–4.


Seaworth B, et al. *J Infect Dis* 1988;157:332–7.

Dukes CS, Street AC, Starling JF, Hamilton JD. *Vaccine* 1993;11:1229–32.




Causes of Pneumonia

- Community acquired pneumonia:
Streptococcus pneumoniae
- Influenza
- Secondary bacterial pneumonia
(following influenza)



Bacterial Pneumonia and Dialysis Patients



- Dialysis Patients have 14-16 times higher pulmonary infectious (pneumonia) mortality rates compared with the general population.
- The relative risk for death at 6 months in first-year dialysis patients who experienced an episode of pneumonia was 5.1
- Relative risk for cardiovascular events in the first 6 months also was greater at 3.02

Sarnak MJ, Jaber BL.. *Chest* 2001;120(6):1883-7.

Dinitz-Pensy M, Forrest GN, Cross AS, Hise MK. *Am J Kidney Dis* 2005; 46(6): 997-1011

National Surveillance of Dialysis Associated Diseases, 1995-2002



Category	% of Patients Vaccinated				
	1995	1999	2000	2001	2002
Influenza	--	67	64	65	--
Pneumococcal pneumonia*	--	29	27	26	--
Hepatitis B	35	55	58	60	55

***Despite the high mortality and increased cardiovascular event rates associated with pneumonia, immunization rates with pneumococcal vaccine remain low**





Influenza

- Influenza epidemics have been responsible for an average of 36,000 deaths/y in the United States between 1990 and 1999
- Influenza vaccination rates in the general population have been increasing
- Vaccination rates in the ESRD population have remained well below the target of Healthy People 2010



Vaccine Response Among Dialysis Patients



- Efficacy of influenza vaccination in this population has been a point of debate
 - Earlier studies showed an impaired response to influenza vaccination in patients with renal disease
- Recent literature shows that although the overall antibody response to influenza vaccination is diminished in dialysis patients, they can still mount a protective antibody response



Influenza Vaccine Delivery and Effectiveness in ESRD, USRDS 1997-1999

- Influenza vaccination rates were lower in non-whites, women, younger patients, and peritoneal dialysis patients
- Influenza vaccination was associated with a lower risk for hospitalization and death

Gilbertson DT, et al. *Kidney Int* 2003;63:738–743.



Pneumococcal Vaccine Studies in Chronic Renal Failure Patients

- Fuchshuber A, Kuhnemund O, Keuth B, Lutticken R, Michalk D, Querfeld U. Pneumococcal vaccine in children and young adults with chronic renal disease. *Nephrol Dial Transplant* 1996;11(3):468-73.
- Furth SL, Neu AM, Case B, Lederman HM, Steinhoff M, Fivush B. Pneumococcal polysaccharide vaccine in children with chronic renal disease: a prospective study of antibody response and duration. *J Pediatr* 1996 Jan;128(1):99-101.
- Nikoskelainen J, Koskela M, Forsstrom J, Kasanen A, Leinonen M. Persistence of antibodies to pneumococcal vaccine in patients with chronic renal failure. *Kidney Int* 1985 Oct;28(4):672-7.



Pneumococcal Vaccine and CKD/ESRD

- On review of 26 published studies in this population, all studies demonstrated a serologic response by the majority of patients to at least some pneumococcal serotypes.
- Use of steroids did not alter this response.
- In the studies with a greater than 6-month follow-up, declining antibody titers were consistently reported, and this decline was usually more rapid than in healthy controls.
- The incidence of serious adverse reactions to PI is very low.

Robinson J. Efficacy of pneumococcal immunization in patients with renal disease--what is the data? *Am J Nephrol* 2004;24(4):402-9.



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



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



Available from: http://www.cdc.gov/ncidod/dhqp/dpac_dialysis_pc.html

Vaccination of Renal Dialysis Patients and Patients with Chronic Renal Disease



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†	
Smallpox		X*	
Typhoid		X*	
Varicella		X*	
Yellow Fever		X*	



Hepatitis B Vaccine

- **Hepatitis B vaccination is recommended for all susceptible chronic hemodialysis patients**
- **Vaccination is recommended for pre-ESRD patients before they become dialysis dependent**
- **Higher seroconversion rates and antibody titers occur in uremic patients prior to becoming dialysis dependent**

Doses and Schedules of Licensed HBV Vaccines for Hemodialysis Patients



<u>Group</u>	<u>Recombivax</u>			<u>Engerix-B</u>		
	<u>Dose</u>	<u>Volume</u>	<u>Schedule</u>	<u>Dose</u>	<u>Volume</u>	<u>Schedule</u>
Patients \geq 20 years						
Pre-Dialysis	10 μ g	1 ml	0, 1, and 6 mos	20 μ g	1 ml	0, 1, and 6 mos
Dialysis-dependent	40 μ g	1 ml	“	40 μ g	2-1 ml doses at one site	0, 1, 2, and 6 mos
Patients < 20 years*	5 μ g	0.5 ml	“	10 μ g	0.5 ml	0, 1, and 6 mos
Staff members	10 μ g	1 ml	“	20 μ g	1 ml	0, 1, and 6 mos

*Dose recommended by FDA; higher doses maybe more immunogenic for hemodialysis patients



HBV Vaccine Effectiveness



- 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 (≥ 10 mIU/mL).
- Infections have occurred in individuals who have not maintained their anti-HBs (≥ 10 mIU/mL)



Pneumococcal Polyvalent Vaccine (PPV23)

- PPV23: Pneumovax® 23 and Pnu-Immune® 23, include 23 purified capsular polysaccharide antigens of *S. pneumoniae*
- 85%–90% of the serotypes that cause invasive pneumococcal infections among children and adults



PPV23 Administration

- For patients with chronic renal failure, age ≥ 2 years of age
- Single revaccination if ≥ 5 years have elapsed since receipt of first dose
- If patient is aged ≤ 10 years: consider revaccination 3 years after previous dose



Pneumococcal Conjugate Vaccine

- PCV7: the seven most common serotypes isolated from the blood or CSF of children aged <6 years account for 80% of infections and are the serotypes in the licensed PCV7
- 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.
- ACIP recommends two doses of PCV7, administered 2 months apart, followed by one dose of PPV23 administered >2 months after the second dose of PCV7



Influenza

- Patients with CKD or ESRD are a priority group for vaccination with inactivated influenza vaccine (TIV)
- **Live, Attenuated Influenza Vaccine (LAIV) is contraindicated for these patients**



Influenza and Healthcare Workers

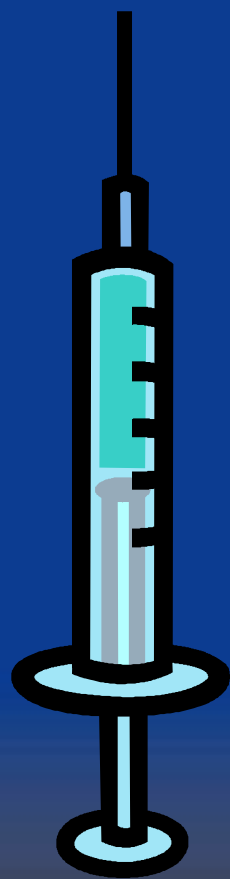
- To reduce staff illnesses and absenteeism during the influenza season and to reduce the spread of influenza to and from workers and patients, the following HCWs should be vaccinated in the fall of each year:
 - Persons who attend patients at high risk for complications of influenza;
 - Persons aged 65 years;
 - Persons with certain chronic medical conditions
 - Pregnant women who will be in the second or third trimester of pregnancy during influenza season.

CDC. Immunization of Health-Care Workers, Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC). *MMWR* 1997; 46 (RR-18):1-42

Live, attenuated influenza vaccine (LAIV) compared with inactivated influenza vaccine




Factor	LAIV	Inactivated Influenza Vaccine
Route	Intranasal	IM
Type	Live virus	Killed virus
Number of strains	3(2 As and 1 B)	3(2 As and 1 B)
Approved age risk group	Health persons 5-49 yrs	Persons \geq 6 mos
Can be administered to close contacts of immunocompromised individuals not requiring a protective environment	Yes	Yes
Close contacts of immunocompromised requiring a protective environment	Not preferred	Yes



**Safe &
Timely
Immunizations
Coalition**



STIC



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A Comprehensive Resource
Guide of Educational
Materials on Hepatitis B,
Influenza, and
Pneumococcal Immunizations

- Facilities in ESRD Network 6, 11, and 15 are participating in the data collection phase of this project
- Every facility should have received a packet of educational materials
- There are 3 working groups
 - Marketing and Education
 - Data
 - Intervention & Evaluation



STIC Goals

- Educate patients and staff about the importance of vaccine preventable diseases
- Improve vaccination rates among patients and staff
 - Pneumococcal Vaccine- achieve the Health people 2010 goals (90% of patients in high risk groups)
 - Influenza- achieve the Health people 2010 goals (90% of patients in high risk)
 - HBV- achieve the Health people 2010 goals (90% of patients in high risk and 98% of dialysis Staff)
 - **Vaccinate all susceptible patients**
 - **Vaccinate all staff who have exposures to bloodborne pathogens**

Protect patients,
Protect healthcare personnel,
Protect quality healthcare

*Prevention Is
Primary!*

