

Varicella (Chickenpox) and Herpes Zoster (Shingles):

Overview of VZV Disease and Vaccination for Healthcare Professionals

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Revised August 2, 2013



Outline

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Varicella-Zoster Virus (VZV)

- Human alpha-herpesvirus
- Causes varicella (chickenpox) and herpes zoster (shingles)
- Primary VZV infection leads to varicella
- VZV establishes latency in dorsal root ganglia after primary infection
- VZV can reactivate at a later time, causing herpes zoster
- There are 3 licensed vaccines to prevent varicella (Varivax[®], Proquad[®]) and herpes zoster (Zostavax[®]) in the US:
 - Varivax[®] (licensed 1995)
 - Proquad[®] (licensed 2005)
 - Zostavax[®] (licensed 2006)

VARICELLA

VARICELLA: CLINICAL DESCRIPTION

Varicella: Clinical Features in Unvaccinated Cases

- Persons with varicella may develop prodrome of fever, malaise, headache, and abdominal pain 1-2 days before rash
- Rash involves 3 or more successive crops over several days; each crop usually progresses within less than 24 h from macules to papules, vesicles, pustules and crusts so that on any part of the body there are lesions in different stages of development
- Rash usually starts on face and trunk, then spreads to extremities
- Rash usually involves 250-500 lesions that are pruritic
- Lesions are typically crusted 4-7 days after rash onset

Varicella: Clinical Features in Vaccinated Persons (“breakthrough varicella”)

- Breakthrough varicella is defined as infection with wild-type varicella disease occurring > 42 days after vaccination
- Approximately 15-20% of 1-dose vaccinated persons may develop varicella if exposed to VZV
- Usually milder clinical presentation than varicella in unvaccinated cases
 - Usually low or no fever
 - Develop < 50 lesions
 - Experience shorter duration of illness
 - Rash predominantly maculopapular rather than vesicular
- 25-30% of breakthrough varicella cases are not mild and have clinical features more similar to varicella in unvaccinated persons



Varicella: Complications

- Secondary bacterial infection of skin lesions
- Central nervous system manifestations (meningoencephalitis, cerebellar ataxia)
- Pneumonia (viral or bacterial)
- Hepatitis, hemorrhagic complications, thrombocytopenia, nephritis occur less frequently
- Certain groups at increased risk for complications
 - Adults
 - Immunocompromised persons
 - Pregnant Women
 - Newborns

Varicella: Transmission

- Transmitted person to person by direct contact, inhalation of aerosols from vesicular fluid of skin lesions of acute varicella or zoster, or aerosolized respiratory tract secretions
- Average incubation period: 14-16 days after exposure to rash (range: 10-21 days)
- Period of contagiousness: 1-2 days before rash onset until all lesions crusted or disappear if maculopapular rash (typically 4-7 days)
- Varicella in unvaccinated persons is highly contagious (61-100% secondary household attack rate)
- Varicella in 1 dose-vaccinated persons half as contagious as unvaccinated cases
 - One study indicated that varicella in 1-dose vaccinees with < 50 lesions was 1/3 as contagious as unvaccinated persons although contagiousness in vaccinees with ≥ 50 lesions was similar to unvaccinated persons

**VARICELLA: EPIDEMIOLOGY AND
IMPACT OF THE VARICELLA
VACCINATION PROGRAM**

Varicella Disease Burden in the United States Before Introduction of Varicella Vaccine in 1995

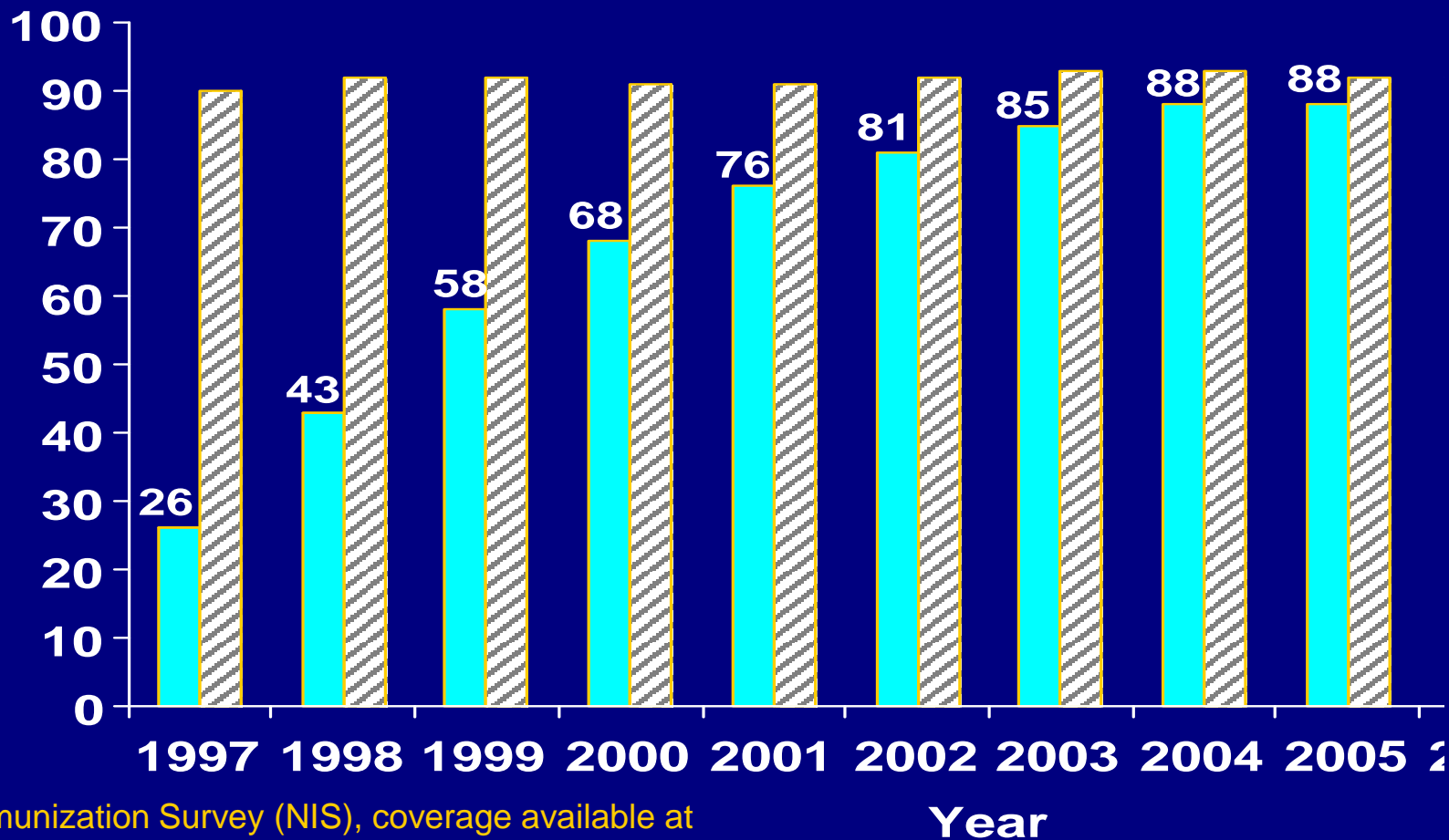
- 4 million cases/year
- 11,000 - 13,500 hospitalizations/year
- 100 - 150 deaths/year
- Greatest disease burden in children
 - >90% cases
 - 70% hospitalizations
 - 50% deaths



Experience with 1-dose Varicella Vaccination Program

- 1-dose varicella vaccination coverage in 19-35 month-olds increased from 26% to 91% from 1997 to 2008
- Varicella disease incidence declined by 90% in two varicella active surveillance sites by 2005 as compared to 1995
- Varicella hospitalizations declined 88% during 1994-2002
- Varicella mortality rate declined 93% from 1990-1994 to 2005-2006 in persons aged <50 years

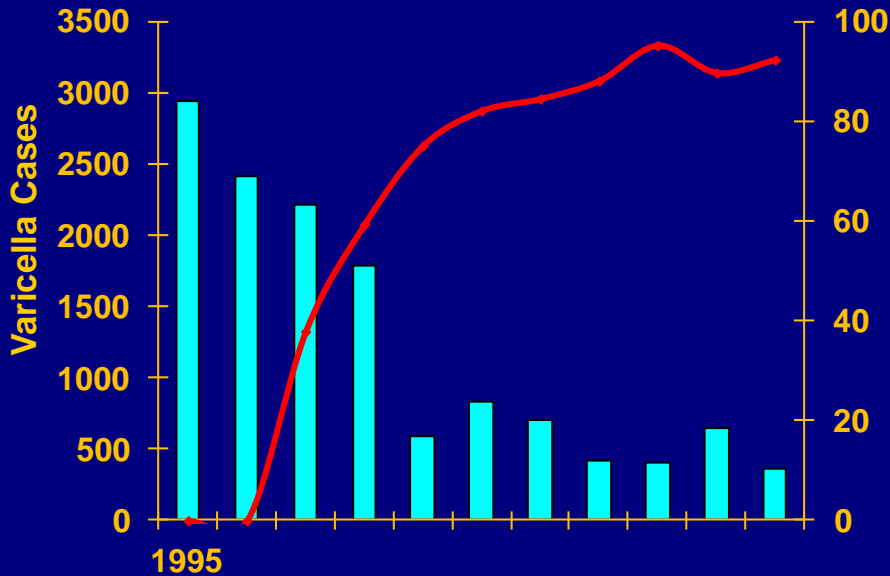
Varicella and Measles Vaccine Coverage (1+ doses)*, Children 19-35 Months National Immunization Survey, 1997-2008



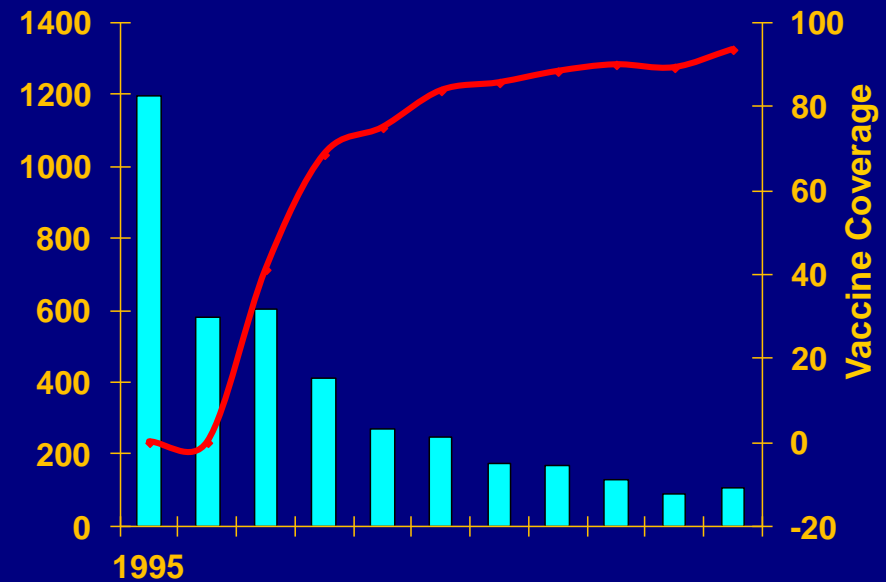
*National Immunization Survey (NIS), coverage available at <http://www.cdc.gov/vaccines/stats-surv/default.htm#nis>

Varicella Cases and 1-Dose Vaccine Coverage Varicella Active Surveillance Project Sites, 1995-2005

Antelope Valley, California



West Philadelphia

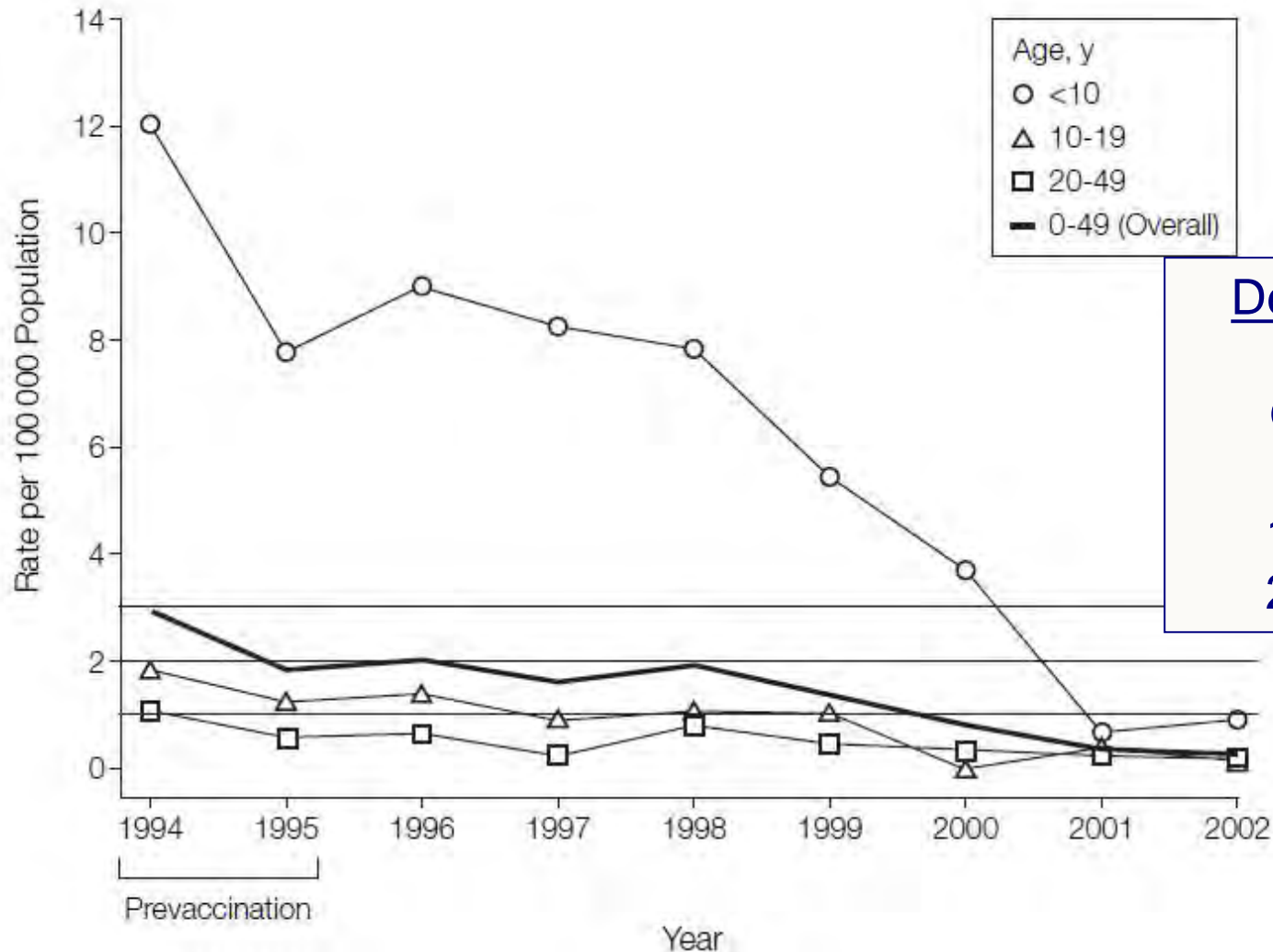


— Vaccination coverage

■ Varicella cases

90% decline in varicella incidence in both sites

Varicella-Related Hospitalization Rates U.S., 1994-2002



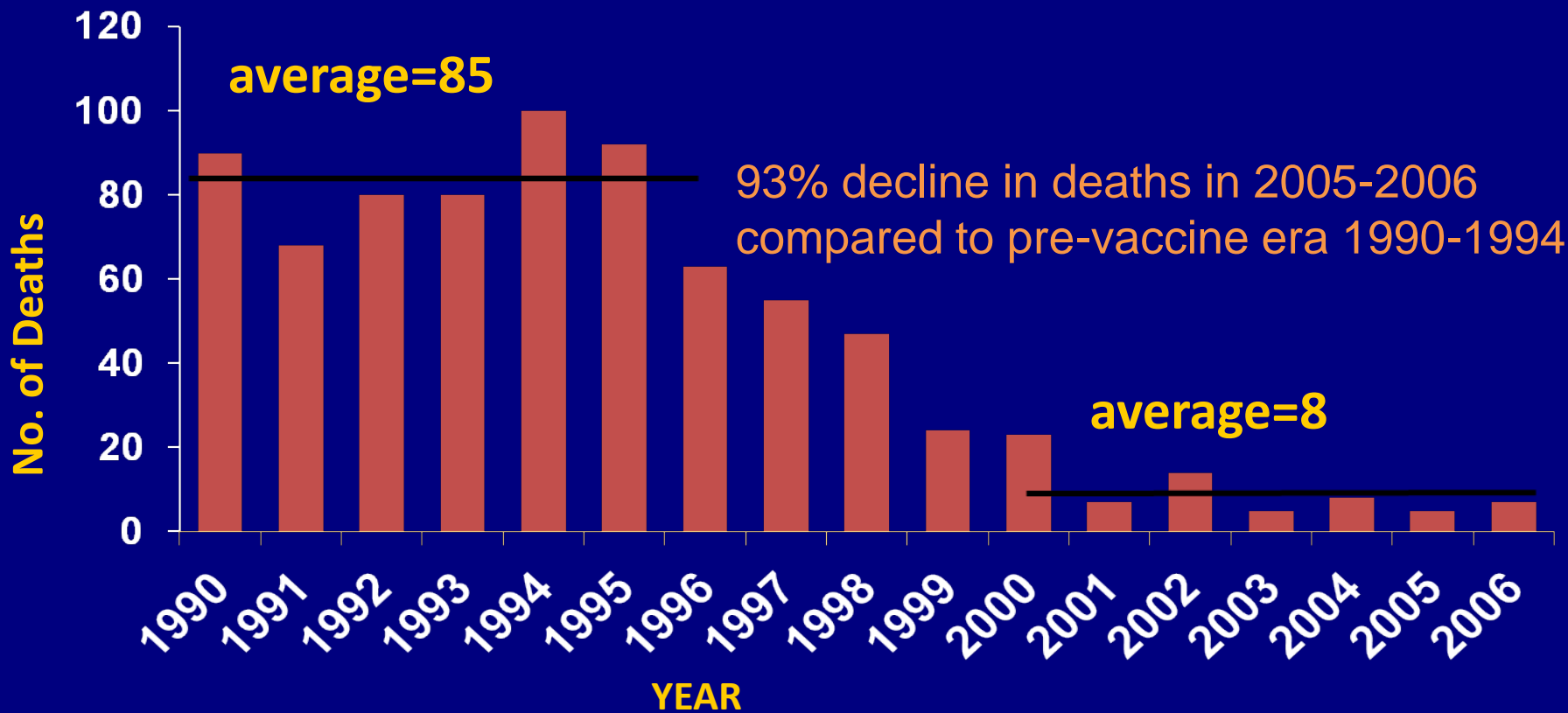
Decline 1994-95 to
2002

Overall	88%
< 10 yrs	91%
10-19 yrs	92%
20-49 yrs	78%

Reduction in Varicella Health Care Costs

- Total estimated direct medical expenditures for varicella hospitalizations and ambulatory visits
 - 1994-1995 \$85 million
 - 2002 \$22 million
- 74% decline in total estimated direct medical expenditures for varicella hospitalizations and ambulatory visits from 85 to 22 million

Decline in Reported Varicella Deaths <50 years of age, US, 1990-2006



Impressive Achievements with the 1-Dose Varicella Vaccination Program But Challenges to Varicella Control Remained...

- 15-20% of children vaccinated with 1 dose remain at risk for varicella due to lack of immune response or partial protection
 - Concern about accumulation of susceptible individuals
- Vaccinated persons with breakthrough varicella disease are contagious
- Outbreaks continued during the 1-dose program

VARICELLA: VACCINE INFORMATION

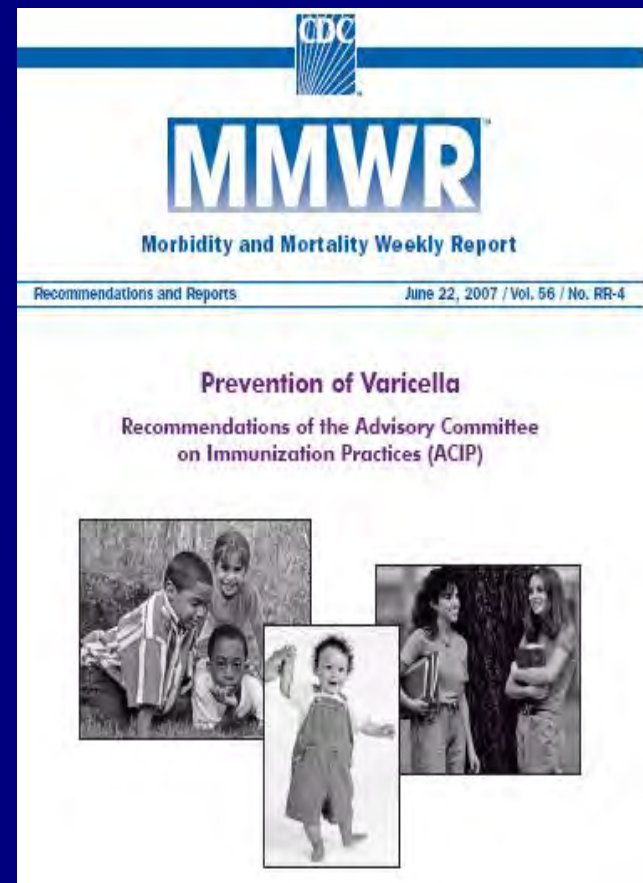
Varicella Vaccines

- Two live attenuated varicella virus vaccines licensed for use in US: Varivax[®] and Proquad[®]
- Both vaccines may be used for first and second doses of varicella vaccine
- Varivax[®] (1,400 pfu) is the single-antigen varicella vaccine licensed in 1995 for use among healthy persons aged ≥ 12 months
- Proquad[®] or MMRV (9,800 pfu) is a combination measles, mumps, rubella, and varicella vaccine licensed in 2005 for use among healthy children aged 12 months-12 years

Current Varicella Vaccination Policy in the United States

Implemented routine 2-dose
childhood varicella
vaccination program in 2006

- 1st dose at age 12-15 months
- 2nd dose at age 4-6 years
- Catch-up vaccination of children and adolescents who had previously received one dose
- 2 doses for all adolescents and adults without evidence of immunity
- Pre-natal screening and post-partum vaccination



Criteria for Determining Persons Who Can Be Considered Immune to Varicella

- Documentation of age-appropriate vaccination with varicella vaccine
- Laboratory evidence of immunity[†] or laboratory confirmation of disease
- Birth in the US before 1980[§]
- Diagnosis or verification of history of varicella disease by a health-care provider
- Diagnosis or verification of history of herpes zoster by a health-care provider

[†]Commercial assays may lack sensitivity for detecting vaccine-induced immunity

[§]For healthcare personnel, pregnant women, and immunocompromised persons, birth before 1980 should not be considered evidence of immunity

Rationale for Timing of 2nd Dose of Varicella Vaccination at 4-6 Years of Age

- Varicella epidemiology during 1-dose program
 - Low incidence among 1-4 year old children
 - Outbreaks in elementary and middle schools
- Similar immune response to 2nd dose with intervals 3 months or 3-4 years after 1st dose
- Programmatic harmonization with MMR vaccine and availability of MMRV vaccine

Post-licensure One-Dose Vaccine Effectiveness in US*

- 17 studies with 20 estimates
 - Study designs: case-control, cohort (outbreaks, other), household contact
- Prevention all varicella
 - Median 85% (range 44% - 100%) Mean 81%
- Prevention of combined moderate and severe varicella
 - Median 97% (range 86% - 100%) Mean 96%
- Prevention of severe varicella*
 - Median 100% (range 97% to 100%) Mean 99%

*Definition 1) Varicella with > 500 lesions or a complication requiring physician visit
2) disease severity scale used in clinical trials: # lesions, fever, systemic signs and subjective assessment of illness

Pre-licensure 2-Dose Varicella Vaccine Efficacy and Immune Response

2 Dose Vaccine Efficacy	
-Any disease	98%
-Severe disease	100%
Immune Response children aged 12 months-12 years, single antigen varicella vaccine*	
*Measured as Geometric Mean Titer by VZV IgG gpELISA in units of μ /ml	
-6 weeks after 1 dose	12.5
-6 weeks after dose 2 at age 4-6 years	212.4

Simultaneous Administration of Vaccines

- Varicella vaccine, either Varivax[®] or combination MMRV may be administered simultaneously with other vaccines recommended for children 12-15 months and children 4-6 years
- If varicella vaccine is not administered on the same day as MMR or live attenuated influenza vaccine, the vaccines should be separated by at least 4 weeks
- If separated by less than 4 weeks the vaccine given second should be repeated

Contra-indications and Precautions for Varicella Vaccination

- Severe allergic reaction to vaccine component or following a prior dose
- Immunosuppression
- Pregnancy
- Moderate or severe acute illness
- Recent blood product (due to potential inhibition of response to varicella vaccination)

Varicella Vaccination in Certain Groups of Immunocompromised Persons

- Varicella vaccine may be administered to persons with isolated humoral immunodeficiency
- Patients with leukemia, lymphoma, or other malignancies whose disease is in remission and those chemotherapy have been terminated ≥ 3 months can receive live-virus vaccines
- Consider varicella vaccination for HIV-infected children with CD4+ T-lymphocyte percentage of 15% or higher
 - Eligible children should receive 2 doses of single-antigen varicella vaccine 3 months apart
- Data on use of varicella vaccine in HIV-infected adolescents and adults lacking, but safety is likely to be similar to response in HIV-infected children. Vaccination may be considered for HIV-infected persons with CD4+T-lymphocyte count ≥ 200 cells/ μ l

Post-exposure Prophylaxis

- Varicella vaccine recommended for use in healthy persons without evidence of immunity within 3-5 days after exposure to varicella
 - $\geq 90\%$ effective in preventing varicella if vaccinated within 3 days of exposure and $\sim 70\%$ effective in preventing varicella and $\sim 100\%$ effective in modifying severe disease if given within 5 days
 - Vaccination still recommended for those with no other evidence of immunity even after 5 days of exposure because it will help provide protection against future exposures
- Varicella Zoster Immune Globulin (available product, VariZIG™) recommended for certain groups at high risk for severe disease **AFTER EXPOSURE TO THE VARICELLA-ZOSTER VIRUS AND within 10 days of exposure.**

Varicella Vaccine Storage and Handling

Varivax

- Store frozen at 5°F (-15° C) or colder at all times
- May be stored up to 72 hours at 35-46°F (2-8°C), but discard unused vaccine after 72 hours at this temperature
- Discard if not used within 30 min of reconstitution
- Store diluent at room temp or in refrigerator

MMRV

- Store frozen at 5°F (-15° C) or colder at all times
- May NOT be stored at refrigerator temperature **AT ANY TIME**
- Discard if not used within 30 min of reconstitution
- Store diluent at room temp or in refrigerator

Freezer Requirements for Varicella Vaccine Storage

- Acceptable Freezer Units:
 - Stand-alone freezers
 - Freezer compartments of refrigerator-freezer combinations, provided that the freezer compartment has its own separate, sealed, and insulated exterior door
- Unacceptable Freezer Units:
 - Units with an internal freezer door that is unsealed and un-insulated (e.g., small, dormitory-style refrigerators)
- Temperatures should be documented at beginning and end of each day

Varicella Vaccine Adverse Events

- Non-serious adverse events
 - Rash, Fever Injection site reactions
 - Possible vaccine failure

- Serious adverse events are rare
 - Encephalitis Ataxia
 - Pneumonia Arthritis
 - Hepatitis Vasculitis
 - Thrombocytopenia

Reporting a Vaccine Adverse Event

- Complete VAERS form (next slide) for vaccine adverse events and if feasible, collect specimen for testing
 - CDC laboratory can conduct VZV PCR testing and genotyping
 - Genotyping may help to distinguish outcomes caused by wild-type versus vaccine strain VZV
- Additional Info: <http://vaers.hhs.gov/index/> ;
1-800-822-7967

Vaccine Adverse Events Reporting System (VAERS)

WEBSITE: www.vaers.hhc.gov E-MAIL: info@vaers.org FAX: 1-877-721-0366

 VACCINE ADVERSE EVENT REPORTING SYSTEM 24 Hour Toll-Free Information 1-800-822-7967 P.O. Box 1100, Rockville, MD 20849-1100 PATIENT IDENTITY KEPT CONFIDENTIAL		For CDQFDA Use Only VAERS Number: _____ Date Received: _____				
Patient Name: _____ Last First MI. _____ Address: _____ _____ City State Zip _____ Telephone no. (____) _____		Vaccine administered by (Name) _____ Responsible Physician _____ Facility Name/Address _____ _____ City State Zip _____ Telephone no. (____) _____		Form completed by (Name): _____ Relation <input type="checkbox"/> Vaccine Provider <input type="checkbox"/> Patient/Parent to Patient <input type="checkbox"/> Manufacturer <input type="checkbox"/> Other Address (if different from patient or provider) _____ _____ City State Zip _____ Telephone no. (____) _____		
1. State	2. County where administered	3. Date of birth _____/____/____	4. Patient age _____	5. Sex <input type="checkbox"/> M <input type="checkbox"/> F	6. Date form completed _____/____/____	
7. Describe adverse event(s) (symptoms, signs, time course) and treatment, if any				8. Check all appropriate: <input type="checkbox"/> Patient died (date _____/____/____) <input type="checkbox"/> Life threatening illness <input type="checkbox"/> Required emergency room/doctor visit <input type="checkbox"/> Required hospitalization (____ days) <input type="checkbox"/> Resulted in prolongation of hospitalization <input type="checkbox"/> Resulted in permanent disability <input type="checkbox"/> None of the above		
9. Patient recovered <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN				10. Date of vaccination _____/____/____ AM _____ PM	11. Adverse event onset _____/____/____ AM _____ PM	
12. Relevant diagnostic tests/laboratory data						
13. Enter all vaccines given on date listed in no. 10						
Vaccine (type)		Manufacturer	Lot number	Route/Site	No. Previous Doses	
a. _____		_____	_____	_____	_____	
b. _____		_____	_____	_____	_____	
c. _____		_____	_____	_____	_____	
d. _____		_____	_____	_____	_____	
14. Any other vaccinations within 4 weeks prior to the date listed in no. 10						
Vaccine (type)		Manufacturer	Lot number	Route/Site	No. Previous doses	Date given
a. _____		_____	_____	_____	_____	_____
b. _____		_____	_____	_____	_____	_____
c. _____		_____	_____	_____	_____	_____
15. Vaccinated at: <input type="checkbox"/> Private doctor's office/hospital <input type="checkbox"/> Public health clinic/hospital		<input type="checkbox"/> Military clinic/hospital <input type="checkbox"/> Other/unknown		16. Vaccine purchased with: <input type="checkbox"/> Private funds <input type="checkbox"/> Military funds <input type="checkbox"/> Public funds <input type="checkbox"/> Other/unknown		17. Other medications
18. Illness at time of vaccination (specify)			19. Pre-existing physician-diagnosed allergies, birth defects, medical conditions (specify)			
20. Have you reported this adverse event previously? <input type="checkbox"/> No <input type="checkbox"/> To health department <input type="checkbox"/> To doctor <input type="checkbox"/> To manufacturer		Only for children 5 and under				
		22. Birth weight _____ lb. _____ oz.		23. No. of brothers and sisters		
21. Adverse event following prior vaccination (check all applicable, specify)				Only for reports submitted by manufacturer/immunization project		
Adverse Event	Onset Age	Type Vaccine	Dose no. in series	24. Mfr./mfr. proj. report no.	25. Date received by mfr./mfr. proj.	
<input type="checkbox"/> In patient	_____	_____	_____	_____	_____	
<input type="checkbox"/> In brother or sister	_____	_____	_____	_____	_____	
26. 15 day report? <input type="checkbox"/> Yes <input type="checkbox"/> No				27. Report type <input type="checkbox"/> Initial <input type="checkbox"/> Follow-Up		
<small>Health care providers and manufacturers are required by law (42 USC 300aa-25) to report reactions to vaccines listed in the Table of Reportable Events Following Immunization. Reports for reactions to other vaccines are voluntary except when required as a condition of immunization grant awards.</small>						

**VARICELLA: VARICELLA
VACCINATION OF HEALTHCARE
PERSONNEL**

Varicella Vaccination of Healthcare Personnel

- To prevent disease and nosocomial spread of VZV, healthcare institutions should ensure that all HCP have evidence of immunity to varicella
 - Evidence of immunity = (1) laboratory evidence of immunity, (2) history of clinician diagnosed or verified varicella or zoster, (3) Documentation of age-appropriate vaccination
- Pre-vaccination serologic probably cost-effective
- Routine testing for varicella immunity after 2 doses of vaccine not recommended
 - Sensitive tests indicate 94-99% adults develop antibodies after second dose
 - VZV-specific cell-mediated immunity affords protection to vaccinated adults, even in the absence of detectable antibody response.
 - Available commercial assays may not be able to detect vaccine-induced immunity

HERPES ZOSTER

HERPES ZOSTER: CLINICAL DESCRIPTION

Herpes Zoster (Shingles)

- Following initial infection (varicella), VZV establishes permanent latent infection in dorsal root and cranial nerve ganglia
- Years to decades later VZV reactivates and spreads to skin through peripheral nerves causing pain and a unilateral vesicular rash in a dermatomal distribution
- ~1 million cases in the U.S. annually
- Lifetime risk of developing zoster: about 30%

Clinical Features of Herpes Zoster

Prodrome: headache, photophobia, malaise, fever, abnormal skin sensations and pain

Rash:

- Unilateral, involving 1-3 adjacent dermatomes
- Thoracic , cervical, ophthalmic involvement most common
- Initially erythematous, maculopapular
- Vesicles form over several days, then crust over
- Full resolution in 2-4 weeks
- Occasionally, rash never develops (zoster sine herpette)

Complications of Herpes Zoster

- Postherpetic Neuralgia (PHN)
 - Pain \geq 30 days occurs in 18-30% of zoster cases
 - Mild to excruciating pain after resolution of rash
 - Constant, intermittent, or triggered by trivial stimuli
 - May persist weeks, months or occasionally years
 - Can disrupt sleep, mood, work, and activities of daily living and lead to social withdrawal and depression
 - Risk factors for PHN include age \geq 50, severe pain before or after onset of rash, extensive rash, and trigeminal or ophthalmic distribution of rash

Complications of Herpes Zoster

- Herpes Zoster Ophthalmicus
 - ~15% of HZ cases
 - Can occur when ophthalmic division of trigeminal nerve is involved
 - Untreated, 50-70% develop acute ocular complications
 - Can lead to chronic ocular complications, reduced vision, even blindness
- Neurologic complications
 - Myelitis, encephalitis, ventriculitis, meningoencephalitis, cranial nerve palsies, ischemic stroke syndrome
- VZV viremia
 - Cutaneous dissemination, pneumonia, hepatitis, disseminated intravascular coagulation
- Dermatologic complications
 - Secondary infections of rash
 - Permanent scarring and changes in pigmentation

VZV Transmission from Zoster

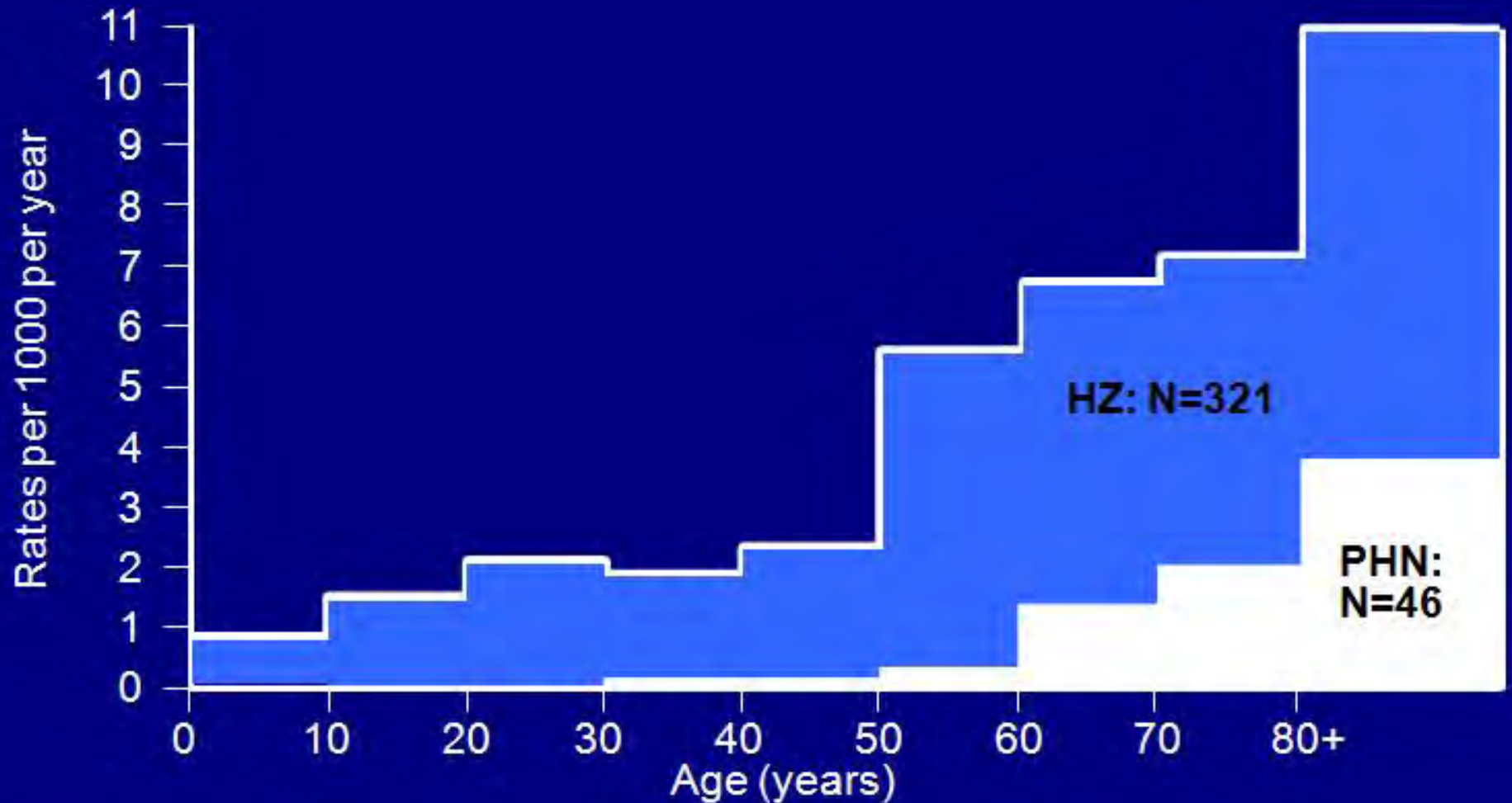
- VZV can be transmitted from persons with zoster to persons with no history of varicella disease or vaccine and cause varicella
 - Risk of VZV transmission from zoster is much lower than from varicella
 - Transmission is mainly through direct contact with zoster lesions, although airborne transmission has been reported in healthcare settings
 - Localized zoster is only contagious after the rash erupts and until the lesions crust
 - Transmission from localized zoster can be decreased by covering the lesions

HERPES ZOSTER: EPIDEMIOLOGY

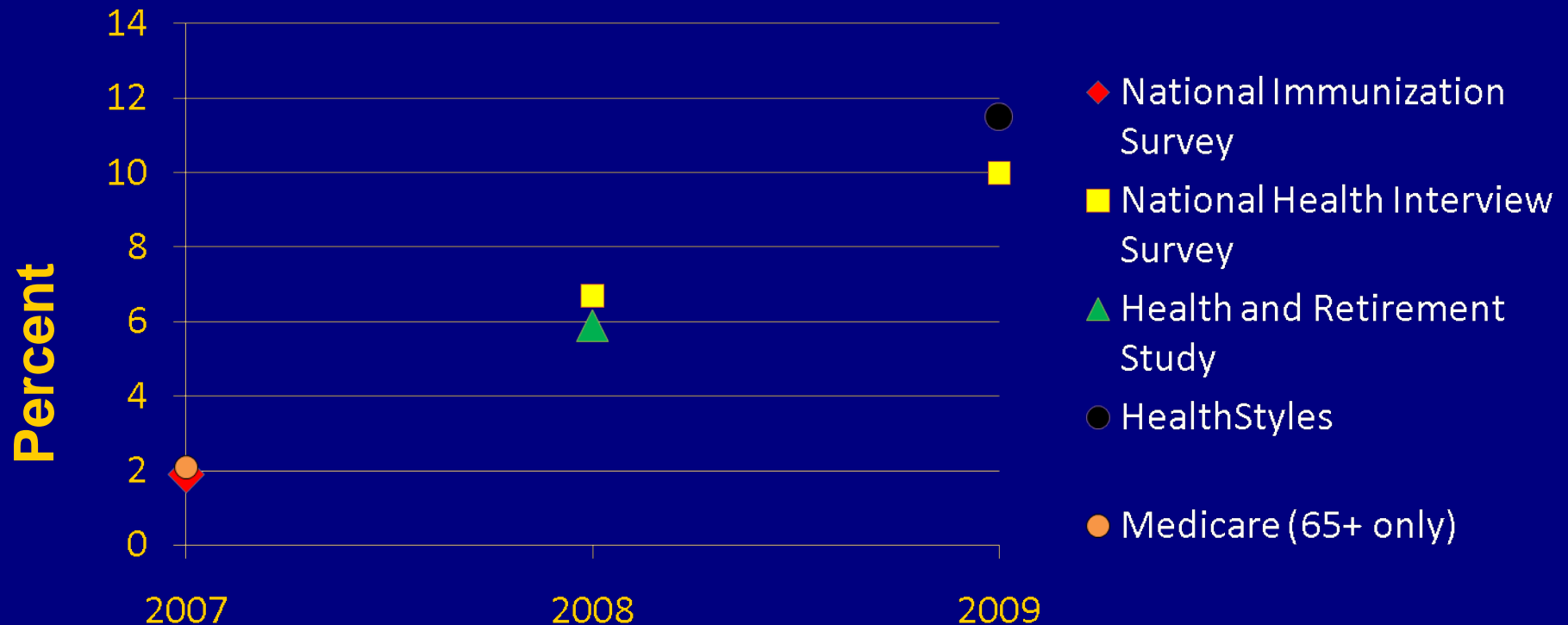
Risk Factors for Herpes Zoster

- Increasing age
- Immunosuppression
 - Bone marrow and solid organ transplantation
 - Patients with hematological malignancies and solid tumors
 - HIV
 - Immunosuppressive medications
- Gender: Increased risk in females
- Race: Risk in blacks less than half that in whites
- Trauma or surgery in affected dermatome
- Early varicella (in utero, infancy): Increased risk of pediatric zoster

Age-specific Incidence of Herpes Zoster and Postherpetic Neuralgia: U.K., 1947-1972



Herpes Zoster Vaccination Coverage: U.S., Age 60 or Older, 2007-2009



1 Lu PJ, Euler G, Jumaan A, Harpaz R. Herpes zoster vaccination among adults aged 60 years or older in the United States, 2007: Uptake of the first new vaccine to target seniors. *Vaccine*. 2009; 27: 882-7

2 (2008) Lu PJ, Euler GL, Harpaz R. Herpes zoster vaccination among adults aged 60 years and older, in the U.S., 2008. *Am J Prev Med*. 2011 Feb;40(2):e1-6

2 (2009) Greby S, Lu PJ, Euler G, Williams W, Singleton J. 2009 Adult Vaccination Coverage, The National Health Interview Survey. Available from: <http://www.cdc.gov/vaccines/stats-surv/nhis/2009-nhis.htm>

3 Hales C, Harpaz R, Bialek S. Herpes Zoster In the Health and Retirement Study. Poster Session Presented at: Infectious Diseases Society of America; 2010 October 21-24; Vancouver, BC. Available at: <http://idsa.confex.com/idsa/2010/webprogram/Paper4825.html>

4 Lindley M, Harpaz R, Bialek S. Awareness and Uptake of Zoster Vaccine among U.S. Adults ≥60 Years. Presented at National Immunization Conference; 2010 April 19 – 22; Atlanta, GA. Available at: <http://cdc.confex.com/cdc/nic2010/recordingredirect.cgi/id/6765>
Am J Prev Med. 2011 Feb;40(2):e1-6

5 Joesoef R, Harpaz R, Bialek S. Herpes Zoster (HZ) Vaccination Among Elderly in the United States, 2007: Costs and Geographic Variation. Poster Session Presented at: Infectious Diseases Society of America; 2010 October 21-24; Vancouver, BC. Available at: <http://idsa.confex.com/idsa/2010/webprogram/Paper2756.html>

HERPES ZOSTER: VACCINE INFORMATION

Herpes Zoster Vaccine

- Licensed in 1996
- Live, attenuated VZV
- Same strain used in the varicella vaccine, but 14x more potent
- Administered subcutaneously in deltoid region

Herpes Zoster Vaccine Efficacy

- Decreased zoster incidence by 51%
- Decreased risk of post-herpetic neuralgia in all participants by 67%
- Decreased burden of illness (severity x duration) in all participants by 61%

ACIP Recommendations for Zoster Vaccine

- In October 2008, the Advisory Committee on Immunization Practices (ACIP) recommended a dose of the herpes zoster vaccine (HZV) for all adults ≥ 60 years of age unless they have contraindications
- HZV should be offered at the patient's first available clinical encounter

ACIP Recommendations for Zoster Vaccine

- HZV can be administered simultaneously with influenza and pneumococcal vaccines
- HZV is recommended whether or not the patient reports a prior episode of zoster
- It is not necessary to check varicella history or titers before administering HZV
- HZV should be offered to eligible persons including those >80 y.o., frail, or with chronic illnesses

Contraindications for Zoster Vaccine

- Immunosuppression (high-dose steroids, biological response modifiers, chemotherapy, AIDS) is a contraindication for HZV
- HIV-positive status alone is not an contraindication
- Persons ≥ 60 y.o. anticipating immunodeficiency due to initiation of treatments or progression of illness should be offered HZV
- HZV is not recommended for persons ≥ 60 y.o. who have received the varicella vaccine

Zoster Vaccine Storage and Handling

- Must be stored at 5° F (-15° C) or colder AT ALL TIMES until reconstitution
- Protect from light
- Administer within 30 minutes of reconstitution

VZV LABORATORY TESTING

VZV Laboratory Testing

- Objectives of VZV Laboratory Testing
 - Confirm clinical diagnosis of varicella or herpes zoster with atypical presentation, such as varicella disease in vaccinated persons or shingles in immunosuppressed persons
 - Assess a person's susceptibility to varicella
 - Distinguish between vaccine and wild-type strains of the virus
- Available Testing Facilities
 - Contact your local health department to check if they offer VZV testing
 - CDC's National VZV Laboratory offers a range of VZV testing services. Please contact your local health department to determine the policy for sending specimens to CDC

Contact Information and Additional Resources

Contact Information:

- Nipinfo@cdc.gov
- 800.CDC.INFO

National VZV Laboratory:

- vzvlab@cdc.gov
- <http://www.cdc.gov/shingles/lab-testing/index.html>

Additional Resources:

- CDC Chickenpox (Varicella) Website: <http://www.cdc.gov/chickenpox/index.html>
- CDC Varicella Vaccine Webpage: <http://www.cdc.gov/vaccines/vpd-vac/varicella/>
- CDC Herpes Zoster Disease and Vaccine Webpages:
<http://www.cdc.gov/shingles/index.html>
<http://www.cdc.gov/vaccines/vpd-vac/shingles/>