Varicella Disease
Varicella and Zoster Vaccines

Pink Book Webinar Series 2017

JoEllen Wolicki, BSN, RN
Nurse Educator
Immunization Services Division
Varicella Zoster Virus

- Herpes virus (DNA)
- Primary infection results in varicella (chickenpox)
- Recurrent infection results in herpes zoster (shingles)
- Short survival in environment
Varicella Pathogenesis

- Respiratory transmission of virus
- Replication in nasopharynx and regional lymph nodes
- Primary viremia 4 to 6 days after infection
- Multiple tissues, including sensory ganglia, infected during viremia
Varicella Clinical Features

- Incubation period 14 to 16 days
- Mild prodrome for 1 to 2 days (adults)
- Rash generally appears first on the head; most concentrated on the trunk
- Successive crops over several days with lesions present in several stages of development
Varicella Complications

- **Complications include:**
  - Bacterial infection of lesions
  - Hemorrhagic varicella
  - CNS manifestations
  - Pneumonia (primary viral or secondary bacterial)
  - Congenital varicella
  - Perinatal varicella

- **Prevaccine era:**
  - Hospitalization ~3 per 1,000 cases or 1,000/year
  - Death ~1 per 60,000 cases or 100/year
Varicella with secondary bacterial infection
Groups at Increased Risk of Complications of Varicella

- Persons older than 15 years
- Infants younger than 1 year
- Immunocompromised persons
- Newborns of women with rash onset within 5 days before to 48 hours after delivery
Varicella Epidemiology

Reservoir  |  Human
---|---
Transmission  |  Person to person – respiratory tract secretions  
  |  Direct contact with lesions
Temporal Pattern  |  Peak in late winter and spring (U.S.)
Communicability  |  1 to 2 days before until lesions have formed crusts  
  |  May be longer in immunocompromised
Herpes Zoster (Shingles)

- Reactivation of varicella zoster virus
- Associated with:
  - Aging
  - Immunosuppression
  - Intrauterine exposure
  - Varicella disease younger than 18 months of age
Complications of Herpes Zoster

- Dissemination with generalized skin eruptions and involvement of the central nervous system, lungs, liver, and pancreas

- Postherpetic neuralgia (PHN)

- Ophthalmic zoster
Zoster involving the ophthalmic division of the trigeminal nerve
Herpes Zoster

- 500,000 to 1 million episodes occur annually in the United States
- Lifetime risk of zoster estimated to be 32%
- 50% of persons living until age 85 will develop zoster
## Varicella-containing Vaccines

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<td>Zostavax</td>
<td>50 years and older</td>
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Varicella Vaccine
Immunogenicity and Efficacy

- **Detectable antibody:**
  - 97% of children 12 months through 12 years following 1 dose
  - 99% of persons 13 years and older after 2 doses

- **1 dose of varicella vaccine is:**
  - 70%–90% effective against any varicella disease
  - 95%–100% effective against severe varicella disease
Herpes Zoster Vaccine Efficacy

- Vaccine recipients 60 to 80 years of age had 51% fewer episodes of zoster
  - Efficacy declines with increasing age
  - Significantly reduces the risk of postherpetic neuralgia
  - Reduces the risk of zoster 69.8% in persons 50 through 59 years of age
Varicella Vaccination and Children

- Routine recommendations:
  - Dose 1 at 12–15 months of age
  - Dose 2 at 4–6 years of age
- Minimum interval between doses is 3 months for children younger than 13 years of age
Varicella Vaccination and Adolescents and Adults

- All persons 13 years of age and older without evidence of varicella immunity
  - 2 doses separated by at least 4 weeks
- Do not repeat first dose because of extended interval between doses
- Second dose recommended for persons of any age who have only received 1 dose
Varicella Vaccination and Health Care Personnel

- Vaccination is recommended for all susceptible health care personnel
- Prevaccination serologic screening probably cost-effective
- Postvaccination testing not necessary or recommended
- Give 2 doses, 4 weeks apart to susceptible persons
Acceptable Evidence of Varicella Immunity

- Written documentation of age-appropriate vaccination
- Laboratory evidence of immunity or laboratory confirmation of varicella disease
- U.S.-born before 1980*
- Health care provider diagnosis or verification of varicella disease
- History of herpes zoster based on health care provider diagnosis

*Birth year immunity criterion does not apply to health care personnel or pregnant women

MMWR 2007;56(RR-4):16-17
Zoster Vaccination

- Administer 1 dose of zoster vaccine to adults 60 years and older
  - Need for booster dose or doses not known at this time

- Vaccination is recommended for persons with a history of herpes zoster (shingles)
Zoster Vaccination

- It is not necessary to ask about history of chickenpox before administering zoster vaccine
- Persons 60 years of age and older can be assumed to be immune to varicella regardless of their recollection of chickenpox
Zoster Vaccine and Serology

- Do not perform serologic testing to verify varicella immunity prior to administering zoster vaccine
  - If tested and seronegative, the person should receive 2 doses of single-antigen varicella vaccine (Varivax) separated by at least 4 weeks
  - Zoster vaccine is not indicated for persons who have immunity because they received varicella vaccine
Varicella-Containing Vaccine Contraindications

- Severe allergic reaction to a vaccine component or following a prior dose
- Pregnancy or planned pregnancy within 4 weeks*
- Immunosuppression

*ACIP off-label recommendation
Varicella-Containing Vaccines and Immunocompromised Persons

- Single-antigen varicella vaccine may be administered to persons with isolated humoral immunodeficiency

- Consider varicella vaccination for:
  - HIV-infected children with CD4 count of 15% or higher
  - HIV-infected older children and adults with CD4 count of 200 or higher
Varicella-Containing Vaccines Precautions

- Moderate or severe acute illness
- Recent blood product (varicella and MMRV)
  - Varicella or MMRV vaccine should not be administered for 3–11 months after receipt of antibody-containing blood products
Varicella-Containing Vaccines Precautions

- MMRV only: personal or family (i.e., sibling or parent) history of seizures of any etiology

- These children generally should be vaccinated with separate MMR and varicella vaccines
Zoster Vaccine Contraindications

- Severe allergic reaction to a vaccine component or following a prior dose
- Pregnancy or planned pregnancy within 4 weeks*
- Immunosuppression

*ACIP off-label recommendation

MMWR 2008;57(RR-5)
Zoster Vaccine Contraindications: Immunosuppression

- AIDS or other clinical manifestation of HIV infection
  - Includes persons with CD4+ T-lymphocyte values less than 200 per mm$^3$ or less than 15% of total lymphocytes
Zoster Vaccine Contraindications: Immunosuppression

- High-dose corticosteroid therapy
  - 20 mg or more per day of prednisone or equivalent lasting 2 or more weeks
  - Vaccination should be deferred for at least 1 month after discontinuation of therapy
Zoster Vaccine Contraindications: Immunosuppression

- Leukemia, lymphoma, or other malignant neoplasm affecting the bone marrow or lymphatic system
  - Persons whose leukemia or lymphoma is in remission and who have not received chemotherapy or radiation for at least 3 months can be vaccinated*

*ACIP off-label recommendation
MMWR 2008;57(RR-5)
Zoster Vaccine Contraindications: Immunosuppression

- Preferred: administer zoster vaccine before treatment with recombinant human immune mediators and immune modulators
  - If not, assess the immune status of the recipient on a case-by-case basis
- Defer vaccination for at least 1 month after discontinuation of treatment

MMWR 2008;57(RR-5)
Zoster Vaccine Contraindications: Immunosuppression

- Hematopoietic cell transplant recipients
  - Experience is limited
  - Assess the immune status of the recipient on a case-by-case basis
  - If a decision is made to vaccinate, the vaccine should be administered at least 24 months after transplantation

*MMWR 2008;57(RR-5)*
Zoster Vaccine Precautions

- Moderate or severe acute illness

- Current treatment with an antiviral drug active against herpes viruses
  - Discontinue at least 24 hours before administration of zoster vaccine
  - Should not be taken for at least 14 days after vaccination

- Recent receipt of a blood product is NOT a precaution
Adverse Reactions

- Local reactions (pain, erythema)
  - Varicella:
    - 19% (children)
    - 24% (adolescents and adults)
  - Zoster: 34%

- Rash: varicella recipients (3%–4%)
  - May be maculopapular rather than vesicular
  - Average 5 lesions

- Systemic reactions not common
Adverse Reactions

MMRV and MMR + VAR

- Fever is more common in the 5–12 days after vaccination with MMRV (22%) than with MMR + VAR (15%)
- Data from CDC Vaccine Safety Datalink sites indicate the rate of febrile seizures following MMRV (9 per 10,000 vaccinated) was approximately 2 times higher than among those receiving MMR + VAR at the same visit (4 per 10,000 vaccinated)
- Merck postlicensure surveillance has identified a similar trend
MMRV Vaccine

- For the first dose of measles, mumps, rubella, and varicella vaccines at age 12–47 months, either MMR vaccine and varicella vaccine or MMRV vaccine may be used.

- Providers who are considering administering MMRV vaccine should discuss the benefits and risks of both vaccination options with the parents or caregivers.
Unless the parent or caregiver expresses a preference for MMRV vaccine, CDC recommends that separate MMR vaccine and varicella vaccine should be administered for the first dose for children 12–47 months of age.
MMRV Vaccine

- **Administer MMRV:**
  - For the second dose of measles, mumps, rubella, and varicella vaccines at age 15 months through 12 years
  - For the first dose at age 48 months or older
Varicella-Containing Vaccines: Storage and Handling

- Store varicella-containing vaccines in:
  - A freezer between -58°F and +5°F (-50°C and -15°C)*
  - The original packaging with the lids closed (protect from light)
  - A clearly labeled bin and/or area of the storage unit

- Use ONLY the manufacturer-supplied diluent to reconstitute the lyophilized vaccine
  - Store diluent in a refrigerator or at room temperature
  - Do not freeze diluent

*Vaccine may be stored in the refrigerator between 36°F and 46°F (2°C and 8°C) for up to 72 continuous hours after removal from freezer. Discard unused vaccine after 72 hours

CDC Vaccine Storage and handling Toolkit
Varicella-Containing Vaccines Storage Labels

**VAR (Varivax)**
- **Ages:** 12 months and older
- **Use for:** Any dose in the series
- **Route:** Subcutaneous (subcut) injection

Reconstitute VAR powder ONLY with manufacturer-supplied sterile water diluent

Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.

**MMRV (ProQuad)**
- **Ages:** 12 months through 12 years
- **Use for:** Any dose in the series
- **Route:** Subcutaneous (subcut) injection

Reconstitute MMRV powder ONLY with manufacturer-supplied sterile water diluent

Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.

**HZV (Zostavax)**
- **Recommended ages:** 60 years and older
- **Use for:** Single dose
- **Route:** Subcutaneous (subcut) injection

Reconstitute HZV powder ONLY with manufacturer-supplied sterile water diluent

Beyond Use Time: Discard reconstituted vaccine if not used within 30 minutes.

Vaccine storage labels example available at [www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)
Vaccine Administration

- **Preparation:**
  - Varicella-containing vaccines must be reconstituted BEFORE administering
  - Use the diluent supplied by the manufacturer

- **Route: Subcutaneous (Subcut) injection**
  - Needle gauge: 23–25 gauge
  - Needle length: 5/8 inch

- **Site: Upper outer triceps of the arm or the thigh**
Vaccine Administration Errors and Varicella-Containing Vaccines

- Wrong diluent used to reconstitute the vaccine
- Zoster vaccine administered to a child
- Varicella vaccine instead of zoster vaccine administered to an adult
- Expired vaccine and/or diluent administered
# Varicella-containing Vaccine Resources and References

- Resources and references are available on the webinar webpage.

## Varicella vaccine resources and references

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*Varicella-containing Vaccine Resources and References*
Additional Slides
Varicella Laboratory Diagnosis

- Isolation of varicella virus from clinical specimen
- Rapid varicella virus identification using real-time PCR (preferred, if available) or DFA
- Significant rise in varicella IgG by any standard serologic assay
Varicella Zoster Immune Globulin

- Used for postexposure prophylaxis for persons in whom varicella vaccine is contraindicated (pregnant women, immunosuppressed, etc.)
Varicella Vaccine
Post Exposure Prophylaxis

- Varicella vaccine is recommended for use in susceptible persons after exposure to varicella
  - 70%–100% effective if given within 72 hours of exposure
  - Not effective if administered more than 5 days after exposure but will produce immunity if not infected
Varicella Breakthrough Infection

- Breakthrough infection is significantly milder, with fewer lesions (but transmissible).
- No consistent evidence that risk of breakthrough infection increases with time since vaccination.
- Risk of breakthrough varicella 2.5 times higher if varicella vaccine administered less than 30 days following MMR.
- No increased risk if varicella vaccine given simultaneously or more than 30 days after MMR.
Zoster Following Vaccination

- Most cases in children
- Not all cases caused by vaccine virus
- Risk from vaccine virus less than from wild-type virus
- Usually a mild illness without complications such as postherpetic neuralgia