

## Varicella-Zoster Virus (VZV) infections

In susceptible persons, VZV infection causes primary varicella (chickenpox). After initial infection, VZV remains latent and can reactivate at a later time causing herpes zoster (shingles). Shingles is characterized by grouped vesicular lesions in the distribution of 1–3 sensory dermatomes, sometimes accompanied by pain and/or itching. For more information regarding shingles, see the [Zoster Quicksheet](#).

## Infectious period

From 1–2 days before rash onset and continuing until all lesions are crusted (usually about 5 days).

## Varicella exposure

- Varicella exposure can occur from direct contact with or aerosolization of lesion material, or through respiratory aerosols from an infectious person with primary varicella.
- The CDC definition of exposure includes close contact with an infectious person, such as close indoor contact (e.g., in the same room) or face-to-face contact. Experts differ in their opinion about the duration of contact; some suggest 5 minutes and others up to 1 hour. Exposure does not include transitory contact.
- Persons with shingles can also transmit VZV; exposure to a person with shingles can result in varicella in a susceptible person. Exposure is considered to occur if there is contact with not-yet-crusted lesions in an immunocompetent person with localized shingles (e.g., via close patient care, touching, or hugging). If contact precautions were being implemented (i.e., if lesions were completely covered), it is not considered an exposure. For details regarding zoster exposures, see the [Zoster Quicksheet](#).

## Incubation period

10–21 days from exposure to rash onset, most commonly 14–16 days. Incubation period may be up

to 28 days in persons who have received varicella-zoster immune globulin (VariZIG) after an exposure and may be shortened in immunocompromised patients. Among neonates born to mothers with active infection, the incubation period can be as short as 2 days after birth.

## Clinical case definition (January 2024)

In the absence of a more likely diagnosis:

- An acute illness with a generalized rash with vesicles (maculopapulovesicular rash), OR
- An acute illness with a generalized rash without vesicles (maculopapular rash).

In vaccinated persons who develop “breakthrough” varicella more than 42 days after vaccination, the disease is almost always mild with fewer than 50 skin lesions and shorter duration of illness. The rash may also be atypical in appearance (maculopapular with few or no vesicles).

## Laboratory criteria for diagnosis

### Confirmatory:

- Positive polymerase chain reaction (PCR) for varicella-zoster virus (VZV) DNA
- Positive direct fluorescent antibody (DFA) for VZV DNA
- Isolation of VZV
- Significant rise (i.e., at least a 4-fold rise or seroconversion) in VZV IgG antibody.

### Supportive:

Positive test for serum VZV immunoglobulin M (IgM) antibody.

## Epidemiologic Linkage Evidence

### Confirmatory:

- Exposure to or contact with a laboratory-confirmed varicella case, OR
- Can be linked to a varicella cluster or outbreak containing ≥1 laboratory-confirmed case, OR
- Exposure to or contact with a person with herpes

zoster (regardless of laboratory confirmation).

### **Presumptive:**

- Exposure to or contact with a probable varicella case that had a generalized rash with vesicles.

### **Healthcare Record Evidence**

Provider diagnosis of varicella or chickenpox but no rash description.

### **Specimen collection for PCR and virus isolation**

- A PCR assay can detect VZV nucleic acid in vesicle swabs, scabs, or lesions.
- For PCR, the ideal specimens include scabs and dry lesion swabs. In cases with neurological symptoms, cerebrospinal fluid can also be tested.
  - Remove several scabs (a glass slide is useful for this purpose) and place in a clean, dry container. Swab basal cells from the unroofed lesion. Place swab in clean, dry container. Swabs submitted for PCR should be sent dry rather than diluted in viral transport media (VTM).
- Contact CDPH for more detailed instructions and to request testing.

### **Case classification**

#### **Confirmed:**

- Meets clinical evidence AND confirmatory laboratory evidence OR
- Meets clinical evidence with a generalized rash with vesicles AND confirmatory epidemiologic linkage evidence.

#### **Probable:**

- Meets clinical evidence with a generalized rash with vesicles OR
- Meets clinical evidence with a generalized rash without vesicles AND:
  - epidemiologic linkage evidence OR
  - supportive laboratory evidenceOR
- Meets healthcare record criteria AND:
  - confirmatory or presumptive epidemiologic

linkage evidence OR

- confirmatory or supportive laboratory evidence

### **Presumptive evidence of immunity**

The criteria below provide evidence of immunity to varicella for the purposes of a contact investigation:

- Documentation of age-appropriate varicella vaccination (preschool-aged children (i.e.,  $\geq 12$  months of age): 1 dose; school-aged children, adolescents, and adults: 2 doses; or
- Laboratory evidence of immunity; or
- Prior laboratory confirmation of disease; or
- U.S. birth before 1980 (this should not be considered evidence of immunity for healthcare personnel, immunocompromised persons, pregnant women, and persons born outside the U.S.); or
- Prior healthcare provider diagnosis or verification of a history of varicella or shingles.

### **Postexposure prophylaxis (PEP)**

- Varicella vaccine may be effective in preventing illness or modifying illness severity if given within 3 days, and possibly up to 5 days, after first exposure.
- Varicella zoster immune globulin (VarIZIG) should be administered as soon as possible and within 10 days of first exposure to:
  - Immunocompromised persons without evidence of varicella immunity;
  - Pregnant women without evidence of varicella immunity;
  - Newborn infants whose mothers had onset of chickenpox within 5 days before delivery or within 48 hours after delivery (VarIZIG is not indicated for neonates whose mothers have shingles);
  - Hospitalized preterm infants born at 28 weeks gestation or later whose mothers do not have evidence of immunity; and
  - Hospitalized preterm infants born earlier than 28 weeks' gestation or who weigh 1,000 grams

or less at birth, regardless of maternal history of varicella disease or vaccination.

- Antiviral PEP for healthy exposed, susceptible persons is not routinely recommended, however, acyclovir as PEP may be considered.
- If PEP is indicated due to an exposure in a healthcare setting, and it is within the time window for the indicated PEP, it is the healthcare facility's responsibility to arrange for PEP administration.

### Recommendations for varicella control

- Infectious persons should be isolated until all lesions are crusted (usually about 5 days).
- Vaccinated persons with breakthrough varicella may develop lesions that don't crust (macules/papules only). Such persons should be isolated until no new lesions appear within a 24-hour period.
- Healthcare professionals who lack evidence of immunity should receive varicella vaccine as soon as possible and be restricted from work from day 8 through 21 after exposure or through day 28 if they received VariZIG.
- Healthcare professionals who have received only 1 dose of vaccine and who are exposed to VZV should receive the second dose with a single antigen live attenuated varicella vaccine (i.e., not given in combination as in MMRV vaccine), preferably within 3 to 5 days of exposure, provided at least 4 weeks have elapsed after the first dose. After immunization, management is similar to that of 2-dose vaccine recipients.
- Exposed healthcare personnel who have received two doses of varicella vaccine should be monitored daily from day 8 after first exposure through day 21 after last exposure for symptoms.
- Exposed persons without evidence of immunity who have contraindications to vaccination (e.g., immunocompromised persons, pregnant women) should be excluded from an outbreak setting through 21 days after rash onset of the last identified case because of the risk of severe disease in these persons.

- Because of the high likelihood of infection, school exclusion of nonimmune siblings of cases from day 8 after sibling's rash onset through day 21 after the last day the sibling was infectious is reasonable.
- There are no specific public health recommendations for exclusion in non-outbreak settings, however, as a control measure, exclusion of under-vaccinated children or adults from high-risk settings can be considered.
- CDC defines a varicella cluster as 3-4 cases and an outbreak as  $\geq 5$  cases that are related in time and place. However, single cases in a high-risk setting, e.g., healthcare facility, prison/jail, or homeless shelter, should be investigated.

### Varicella outbreaks in schools

- Local health jurisdictions should weigh the risks and benefits of school exclusion of nonimmune students in the context of a new or ongoing outbreak.
- CDPH does not generally recommend that healthy students without evidence of varicella immunity be excluded from school during an outbreak. CDC recommends that students who do not have evidence of varicella immunity and whose parents refuse vaccination for them be excluded from school from the start of the outbreak through 21 days after rash onset of the last identified case.

### Course of infection

In children, varicella lesions are often the first sign of disease. Adults may have 1–2 days of fever and malaise prior to rash onset. Varicella rashes are pruritic, generalized and progress from macules to papules to vesicular lesions before crusting. Two to four successive crops of lesions will appear over several days and will be in several stages of development. Lesions usually first appear on the head, then the trunk, and then the extremities; the highest concentration of lesions is on the trunk (centripetal distribution).

Typical varicella cases have about 250–500 lesions. Breakthrough varicella (infection in a vaccinated person) tends to be milder with fewer lesions (usually <50) and mild or no fever.

### Complications

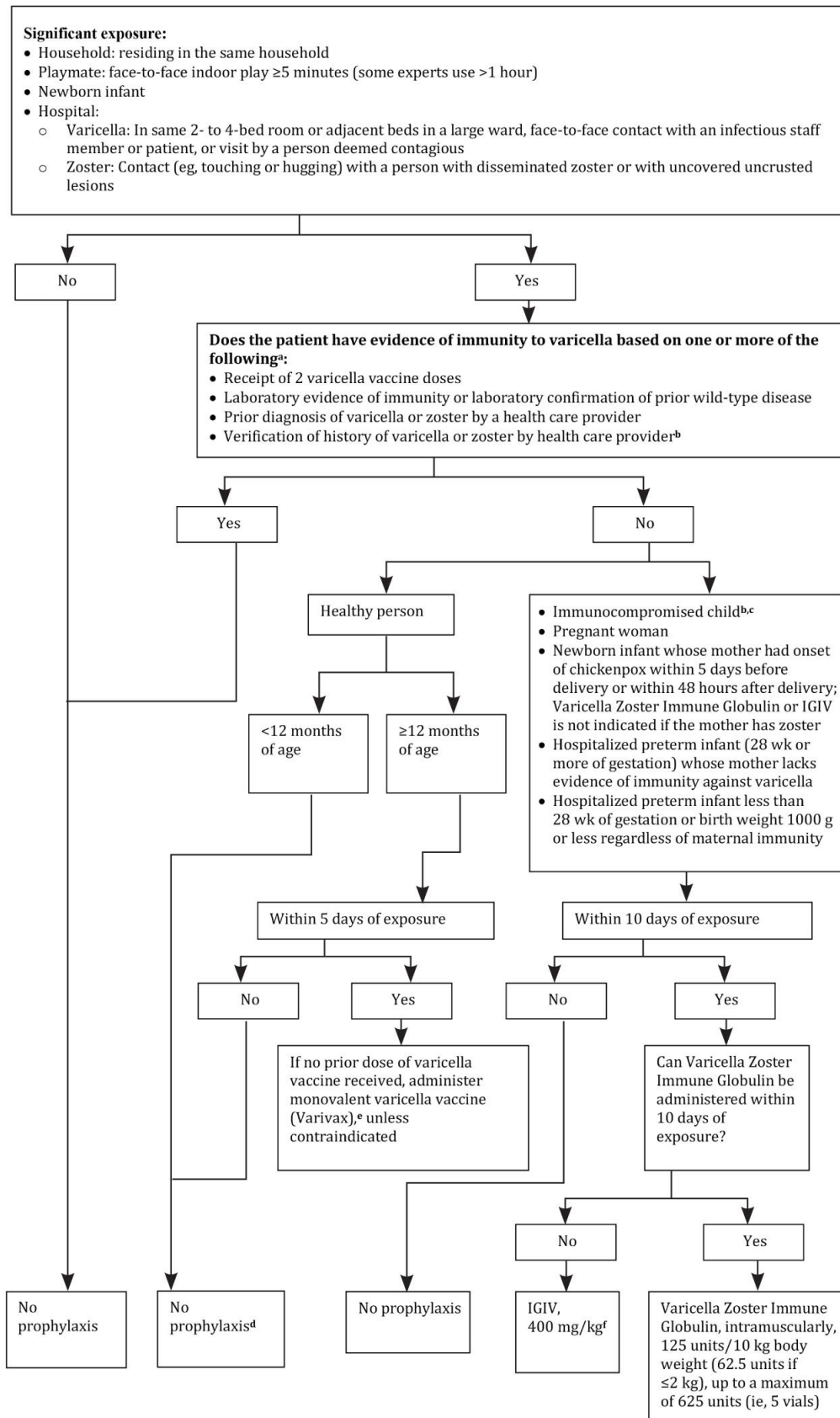
- Bacterial superinfection of skin lesions
- Pneumonia (viral or bacterial)
- Central nervous system manifestations
- Reye syndrome (children with varicella should not receive salicylates or salicylate-containing products due to the risk of Reye syndrome)

### State reporting requirements

- Persons who were hospitalized or died due to primary varicella (chickenpox) infection.
- Varicella (chickenpox) clusters (3-4 cases) and outbreaks ( $\geq 5$  cases).
- Single, non-hospitalized varicella (chickenpox) cases are not reportable unless a part of a cluster or outbreak.
- Herpes zoster (shingles) cases are not reportable.

# Management of Exposures to Varicella-Zoster

(From 2021-2024 AAP Red Book)



### Figure Legend

IGIV indicates Immune Globulin Intravenous. VariZIG is manufactured by Cangene Corporation (Winnipeg, Canada) and distributed in the United States by FFF Enterprises (Temecula, California; 800-843-7477) and ASD Healthcare (Frisco, Texas; 800-746-6273).

<sup>a</sup> People who receive hematopoietic stem cell transplants should be considered nonimmune regardless of previous history of varicella disease or varicella vaccination in themselves or in their donors.

<sup>b</sup> To verify a history of varicella vaccination in an immunocompromised child, health care providers should inquire about an epidemiologic link to another typical varicella case or to a laboratory confirmed case, or evidence of laboratory confirmation. Immunocompromised children who have neither an epidemiologic link nor laboratory confirmation of varicella should not be considered as having history of disease.

<sup>c</sup> Immunocompromised children include those with congenital or acquired T-lymphocyte immunodeficiency, including leukemia, lymphoma, and other malignant neoplasms affecting the bone marrow or lymphatic system; children receiving immunosuppressive therapy, including  $\geq 2$  mg/kg/day of systemic prednisone (or its equivalent) for  $\geq 14$  days, and certain biologic response modifiers; all children with human immunodeficiency virus (HIV) infection regardless of CD4+ T-lymphocyte percentage; and all hematopoietic stem cell transplant patients regardless of pretransplant immunity status.

<sup>d</sup> If the exposed person is an adolescent or adult, has chronic illness, or there are other compelling reasons to try to avert varicella, some experts recommend preemptive therapy with oral acyclovir (20 mg/kg per dose administered 4 times per day, with a maximum daily dose of 3200 mg) or oral valacyclovir (if  $\geq 3$  months of age; 20 mg/kg per dose administered 3 times per day, with a

maximum daily dose of 3000 mg) beginning 7 to 10 days after exposure and continuing for 7 days. If the child is  $\geq 12$  months of age, age-appropriate vaccination still is recommended for protection against subsequent exposures, but vaccine should not be administered while antiviral therapy is being administered; if the exposure occurred during an outbreak, 2-dose vaccination is recommended for preschool-aged children younger than 4 years for outbreak control.

<sup>e</sup> If 1 prior dose of varicella vaccine has been received, a second dose should be administered at  $\geq 4$  years of age. If the exposure occurred during an outbreak, a second dose is recommended for preschool-aged children younger than 4 years for outbreak control if at least 3 months have passed after the first dose.

<sup>f</sup> If VariZIG and IGIV are not available, some experts recommend preemptive therapy with oral acyclovir (20 mg/kg per dose, administered 4 times per day, with a maximum daily dose of 3200 mg) or oral valacyclovir (if  $\geq 3$  months of age; 20 mg/kg per dose, administered 3 times per day, with a maximum daily dose of 3000 mg) beginning 7 to 10 days after exposure and continuing for 7 days. Preemptive oral acyclovir has only been studied in the normal host but sometimes is used in addition to VariZIG or IGIV in the immunocompromised host.

### Resources

- [Local health department contacts](#)
- [CDPH Varicella Healthcare Exposure Investigation Quicksheet](#)
- [CDC manual for disease surveillance](#)
- [AAP Redbook varicella chapter CDC Prevention of Varicella Recommendations of the Advisory Committee on Immunization](#)