

Varicella

BASIC EPIDEMIOLOGY

Infectious Agent

Human (alpha) herpesvirus 3 (varicella-zoster virus, VZV) a member of the *Herpesvirus* group

Transmission

Direct contact with patient with varicella (chickenpox) or zoster (shingles); droplet or airborne spread of vesicle fluid (chickenpox and zoster) or secretions of the respiratory tract (chickenpox); indirectly by contaminated fomites. Scabs are not infectious.

Incubation Period

Usually 14-16 days (range 10-21 days). May be prolonged after receipt of Varicella-Zoster Immune Globulin (VariZIG) and in the immunodeficient.

Communicability

Communicable 5 days before rash onset (especially 1-2 days before rash onset) and for up to 5 days after onset of lesions (until crusting). Communicability may be prolonged in persons with altered immunity.

Clinical Illness

Varicella, the primary infection with VZV, is an acute, generalized disease that occurs most commonly in children and is characterized by a maculopapular rash (few hours), then vesicular rash (3-4 days), often accompanied by fever. Lesions are typically more abundant on trunk; but sometimes present on scalp, mucous membranes of mouth and upper respiratory tract. Lesions commonly occur in successive crops, with several stages of maturity present at the same time. Lesions are discrete, scattered and pruritic. Mild, atypical and unapparent infections also occur.

Vaccinated persons with varicella may not have fever and may only have a few lesions that may resemble bug bites. Successive crops of lesions are unusual in vaccinated individuals. "Breakthrough" varicella which can be seen in previously vaccinated persons more than 42 days after varicella vaccination, is usually a mild illness characterized by few lesions (<50), most of which are maculopapular or rather than vesicular.

Severity

Acute varicella infections are typically self-limiting and mild, particularly with vaccinated persons. Complications often require hospitalization and mostly occur in vulnerable populations, such as infants, adolescents, pregnant women, persons with conditions such as cancer or HIV/AIDS, person taking immunosuppressive medications or long-term steroids, and organ transplant recipients.

However, healthy adults can develop complications from infections in their unvaccinated children. Common complications include secondary bacterial infections from *Staphylococcus* or *Streptococcus* (primarily invasive group A), sepsis, and dehydration. Complications more frequent among infants and children include secondary bacterial pneumonia, encephalitis, and cerebellar ataxia; whereas complications more frequent in adults include primary viral pneumonia, diffuse cerebral involvement, and hemorrhagic, multiple organ system involvement. These complications can lead to permanent disability or death; however, since the introduction of the varicella vaccine in 1996, hospitalizations due to varicella have decreased 93% and deaths 94%.

Varicella infections in special situations:

Varicella-like rash in vaccine recipients: A varicella-like rash in a recently vaccinated person may be caused by either wild- or vaccine-type virus. Approximately 4% of children receiving varicella vaccine develop a generalized rash with a median of 5 lesions, 5–26 days postvaccination, and 4% develop a localized rash at the injection site with a median of 2 lesions, 8–19 days postvaccination. The rash may be atypical in appearance (maculopapular with no vesicles).

Breakthrough disease: refers to a case of wild-type varicella infection occurring more than 42 days after vaccination. Such disease is usually mild with a shorter duration of illness, fewer constitutional symptoms, and fewer than 50 skin lesions. Breakthrough cases with fewer than 50 lesions have been found to be one-third as contagious as varicella in unvaccinated persons, but breakthrough cases with 50 or more lesions can be just as contagious as cases in unvaccinated persons. Though generally mild, about 25%–30% of breakthrough cases among 1-dose vaccinated children have clinical features more like those in unvaccinated children even though rare, severe presentations with visceral dissemination have been reported. Persons who received 2 doses of vaccine are less likely to have breakthrough disease than those who received 1 dose. Additionally, breakthrough varicella may be further attenuated among 2-dose vaccine recipients though the difference was not always statistically significant. No cases of breakthrough varicella with visceral dissemination have been reported.

Secondary transmission of vaccine virus refers to a varicella-like rash due to Oka-VZV (i.e., the vaccine-strain variant of VZV) occurring in a non-vaccinated contact of a person who received varicella vaccine. Secondary transmission can occur within 10–21 days after exposure either to a person recently vaccinated or to a person who develops herpes zoster due to vaccine-strain virus. It is extremely rare. All secondary transmissions occurred from vaccine recipients who developed at least a limited rash illness.

Varicella infections during pregnancy:

For pre- and postpartum women and potentially their newborns, onset of a maternal varicella infection between 5 days before to 2 days after delivery may result in a lethal infection in the neonate, as antibodies had less time to pass from mother to fetus, with a fatality ratio up to 30% if VariZIG is not given.

For pregnant women in the first 20 weeks of gestation, congenital VZV infection, while rare, is an infection in the fetus that can cause abnormalities in the neonate, such as hypoplasia of an extremity, skin scarring, localized muscular atrophy, encephalitis, cortical atrophy, chorioretinitis, microcephaly, and low birth weight. Additionally, children infected with VZV in utero may develop herpes zoster early in life without any additional, external exposures.

DEFINITIONS

Clinical Case Definition

An illness with acute onset of diffuse (generalized) maculopapulovesicular rash without other apparent cause. In vaccinated persons who develop varicella more than 42 days after vaccination (breakthrough disease), the disease is almost always mild with fewer than 50 skin lesions and shorter duration of illness. The rash can also be atypical in appearance (maculopapular with few or no vesicles).

Laboratory Criteria for Diagnosis

- Isolation of VZV from a clinical specimen, **OR**
- Varicella antigen detected by direct fluorescent antibody (DFA), **OR**

- Varicella-specific nucleic acid detected by polymerase chain reaction (PCR), **OR**
- Significant rise in serum varicella immunoglobulin G (IgG) antibody level by any standard serologic assay.

Case Classification

- **Confirmed:** A case that meets the clinical case definition **AND**
 - Is either laboratory confirmed **OR**
 - Is epidemiologically linked to another probable or confirmed case
- **Probable:** A case that meets the clinical case definition **without** epidemiologic linkage or laboratory confirmation.

Note:

- **Two or more patients that meet clinical case definition and are epidemiologically linked to one another meet the confirmed case definition.**
See Varicella case status classification flow chart.

SURVEILLANCE AND CASE INVESTIGATION

Case Investigation

Local and regional health departments should investigate most laboratory reports of varicella. Confirmation of clinical case definition and ascertainment of vaccine history is needed for patients reported via lab result only. However, the following lab results do not require any follow up as they are almost always indicative of immunity or shingles:

- Any VZV lab result for people over 50 years of age.
- VZV IgG results for patients over 20 years of age.

Note:

- Children entering the state of Texas with varicella or developing varicella within 2 weeks of entering the state of Texas should not be considered Texas varicella cases. The jurisdiction for these cases is considered to be the location in which the individual was exposed. Appropriate control measures will still need to be implemented regardless of the case's origin.

Reports made via the varicella reporting form generally do not need investigation, unless the jurisdiction chooses to do so. **There are some exceptions,** however.

- Investigation into vaccination status should be done for any patients that are reported without vaccination history, especially for those that are school age.
- Outbreaks of varicella should be investigated.
- Hospitalized cases of varicella should be investigated.
 - Medical records for varicella hospitalizations should be faxed or emailed along with varicella investigation form.
- Deaths from varicella should be investigated.

Providing education to patients to prevent further spread of disease and encouraging timely vaccinations are also worthwhile activities. And discussing reporting requirements and exclusion criteria with healthcare providers, schools, and daycares is always encouraged.

Case Investigation Checklist

- Confirm that laboratory results meet the case definition.
- Confirm clinical case definition.
- Review medical records or speak to an infection preventionist or physician to verify case definition and vaccination status.

- The Varicella (Chickenpox) Reporting Form can be used to record information collected during the investigation.
- Determine vaccination status of the case. Sources of vaccination status that should be checked include:
 - Case (or parent), ImmTrac, school nurse records, primary care provider, etc.
- Identify close contacts and ensure appropriate control measures are implemented (see control measures below).
- Ensure all suspected, probable, and confirmed cases follow airborne *and* contact precautions until all lesions are crusted over.
- In the event of an outbreak, the Varicella Outbreak Report Form must also be completed and submitted to EAIDU.
- In the event of a varicella hospitalization, copies of the medical record, physician notes, admission summary, H&P, and discharge diagnosis should be faxed or emailed to DSHS EAIDU.
- In the event of a death, copies of the hospital discharge summary, death certificate, and autopsy report should also be faxed to DSHS EAIDU.
 - The Varicella Death Investigation Form must also be completed and submitted to EAIDU.
- The Varicella (Chickenpox) Reporting Form generally does not need to be submitted to EAIDU, except in these circumstances:
 - Varicella outbreak
 - Hospitalization due to varicella
 - Varicella death
- All confirmed and probable case investigations must be entered and submitted for notification in the NEDSS Base System (NBS). Please refer to the *NBS Data Entry Guidelines* for disease specific entry rules.

Control Measures

- Isolate or exclude the case from the setting immediately.
- Identify close contacts and verify immunity.
 - Evidence of immunity to varicella includes
 - Documentation of age-appropriate vaccination
 - Laboratory evidence of immunity
 - Birth before 1980
 - For healthcare personnel, pregnant women, and immunocompromised persons, birth before 1980 should not be considered evidence of immunity; in such cases, the other criteria of evidence of immunity should be sought.
 - Diagnosis or verification of a history of varicella disease by a healthcare provider.
 - Diagnosis or verification of a history of herpes zoster by a healthcare provider.
- Identify high risk contacts:
 - Immunocompromised persons (including people with HIV or AIDS)
 - Cancer patients
 - Pregnant women
 - Neonates whose mothers are not immune
- Provide post-exposure vaccination as appropriate (see Prophylaxis Guidelines) A notification letter can be sent to those that may have been exposed to the case.

Prophylaxis Guidelines

- **Varicella Vaccine for Healthy Persons**
 - Varicella vaccine is recommended for post-exposure administration for unvaccinated persons, 12 months of age or older, without other evidence of

immunity.

- The varicella vaccine should be administered within three days after exposure in order to be most effective.
 - Persons who have not received 2 doses should be brought up to date.
 - VariZIG is not recommended for healthy, full-term infants who are exposed post-natally, even if their mothers have no history of varicella.
 - Child-care facility setting:
- Varicella vaccine (or history of prior disease) is required for all children (≥ 12 months of age) to enroll in any licensed child-care facility in Texas, and vaccine is recommended for all susceptible children (≥ 12 months of age). **VariZIG for Persons Who Have Contraindications to Vaccination:**
 - **Pregnant women—**
 - Women known to be pregnant or attempting to become pregnant should not receive a varicella-containing vaccine.
 - Evidence of varicella immunity should be obtained as soon as possible. If no varicella antibody is detectable, VariZIG should be strongly considered for pregnant women who have been exposed.
 - VariZIG should be given as soon as possible and within 10 days of exposure.
 - Administration of VariZIG to these women has not been found to prevent viremia, fetal infection, congenital varicella syndrome, or neonatal varicella.
 - The primary indication for VariZIG in pregnant women is to prevent complications of varicella in the pregnant mother rather than to protect the fetus. Susceptible pregnant women are at risk for associated complications when they contract varicella. Varicella causes severe maternal morbidity, and 10%-20% of infected women develop varicella pneumonia, with mortality reported as high as 40%. Their babies may also develop Congenital Varicella Syndrome, which may lead to severe complications, even death of the newborn.
 - **Immunocompromised patients—**
 - This category is comprised of persons who have primary and acquired immune-deficiency disorders, neoplastic diseases and those who are receiving immunosuppressive treatment. Most immunocompromised persons should not receive varicella vaccine.
 - Patients receiving monthly high-dose (≥ 400 mg/kg) Immune Globulin Intravenous (IGIV) are likely to be protected and probably do not require VariZIG if the most recent dose of IGIV was administered ≤ 3 weeks before exposure.
 - CDC recommends VariZIG to immunocompromised patients without evidence of immunity as soon as possible and within 96 hours of exposure.
 - **Newborn infants:**
 - CDC recommends VariZIG to newborns infants whose mothers develop chickenpox with 5 days before delivery up to 48 hours after delivery.
 - **Premature neonates exposed post-natally:**
 - CDC recommends VariZIG to hospitalized premature infants born at greater or equal to 28 weeks of gestation, whose mothers do not have evidence of immunity to varicella.
 - VariZIG is also recommended for hospitalized premature infants born less than 28 weeks of gestation or who weigh $\leq 1,000$ g at birth,

regardless of their mother's evidence of immunity to varicella.

- **Health-Care Personnel (HCP):**
 - Nosocomial transmission of varicella is well recognized. To prevent disease and nosocomial spread, vaccination is recommended routinely for all health care personnel without evidence of immunity and is the preferred method for preventing varicella in health-care settings. Preferably, HCP should be vaccinated when they begin employment. Routine testing for varicella immunity after 2 doses of vaccine is not recommended for the management of those fully vaccinated.
 - HCP who have received 2 doses of vaccine and who are exposed should be monitored daily during days 10-21 after exposure through the employee health program or by an infection control nurse to determine clinical status.
 - HCP who have received 1 dose of vaccine and who are exposed should receive the second dose with single-antigen varicella vaccine within 3-5 days after exposure.
 - Unvaccinated HCP who have no other evidence of immunity who are exposed to VZV are potentially infective from days 10-21 after exposure and should not have patient contact during this period. They should receive post-exposure vaccination as soon as possible.
- **Persons Who Should Not be Vaccinated**
 - **Persons Allergic to the Vaccine**
 - Persons with a severe allergic reaction to a vaccine component or following a prior dose of vaccine should not receive varicella vaccine.
 - **Persons with Acute Illness**
 - Vaccinations of persons with moderate or severe acute illness should be postponed until the condition has improved.

CDC Recommendations for VariZIG:

- The most recent guidelines for VariZIG can be found in the [MMWR article on Updated Recommendations for Use of VariZIG – United States, 2013](#)

If VariZIG is indicated, it will need to be purchased by the provider. VariZIG can be ordered from FFF Enterprises (California), 800-843-7477 or online at www.fffenterprises.com. DSHS does not stock VariZIG.

Exclusion

- According to the Texas Administrative Code (TAC), children in school and childcare settings shall be excluded until vesicles become dry OR, if lesions are not vesicular, until 24 hours have passed without new lesions. Additionally, the Centers for Disease Control and Prevention (CDC) encourages unimmunized individuals or those who lack evidence of immunity from attending school from the start of a varicella outbreak through 21 days after rash onset of the last identified case. In Texas, 2 doses of a varicella vaccine are required for K-12th grades; therefore, for those with only one dose on record, the health department can choose to recommend excluding those individuals as well and recommend they receive the second dose from their healthcare provider.
- In the hospital, strict isolation is appropriate because of the risk of serious varicella complications in immunocompromised susceptible patients.

MANAGING SPECIAL SITUATIONS

Outbreaks

- In general, the threshold for an outbreak investigation should be 3 or more cases

- related in location (e.g., school, church, etc.) within a 3-week period. In the presence of nosocomial varicella of known or suspected concurrent streptococcal infections, or among populations at high risk for complications (e.g., immunocompromised or susceptible adolescents or adults), the threshold for response should be 2 cases.
- Three or more cases in a household does not meet the threshold for an outbreak. name in NBS. However, there should still be an appropriate investigation initiated.
 - Notification of an outbreak in the affected setting or community is recommended.
 - For outbreaks in school settings:
 - All parents should be sent a letter notifying them of the outbreak and includes recommendations on vaccination and exclusion.
 - If vaccinated is contraindicated or refused, refer to the Exclusion section.
 - One dose of the varicella vaccine has been used successfully for outbreak prevention and control in school settings. A second dose is now recommended for outbreak control.
 - During a preschool-aged children outbreak, a second dose of varicella vaccine is also recommended for children 1-4 years of age to assist with outbreak control.
 - Children who are vaccinated with a first or second dose during an outbreak may immediately return to school after vaccination.
 - Active identification of persons with immunocompromising conditions who do not have evidence of immunity to varicella is also recommended.
 - For outbreaks in residential institutions and healthcare settings:
 - Residents and staff are at high risk for exposure. Risk of severe disease and complications may be higher among persons without evidence of immunity because of age or immune status.
 - Refer to Health Care Personnel (HCP) section above for vaccination guidelines.
 - Ask the VPD Team if letters are needed.

If an outbreak of varicella is suspected, notify the regional DSHS office or EAIDU at **(800) 252-8239** or **(512) 776-7676**.

REPORTING AND DATA ENTRY REQUIREMENTS

Provider, School, Child-Care Facility, and General Public Reporting Requirements

Confirmed and clinically suspected cases are required to be reported **within 1 week** to the local or regional health department or to DSHS EAIDU at **(800) 252-8239** or **(512) 776-7676**.

Local and Regional Reporting and Follow-up Responsibilities

Local and regional health departments should:

- Enter the case into NBS and submit an NBS notification on all **confirmed and probable** cases to DSHS within 30 days of receiving a report of confirmed case.
 - Please refer to the *NBS Data Entry Guidelines* for disease-specific entry rules.
 - A notification can be sent as soon as the case criteria have been met. Additional information from the investigation may be entered upon completing the investigation.
- Fax, send a secure email, or mail a completed investigation form (ONLY if part of an outbreak, hospitalized, or death due to varicella) within 30 days of completing the investigation.
 - **In the event of a death, copies of the hospital discharge summary, death**

certificate, autopsy report and death investigation form should also be sent to DSHS EAIDU. Please notify EAIDU when the death is reported.

- Investigation forms may be faxed to **512-776-7616**, securely emailed to VPDTexas@dshs.texas.gov or mailed to:

Infectious Disease Control Unit
Texas Department of State Health Services
Mail Code: 1960
PO Box 149347
Austin, TX 78714-9347

When an outbreak is investigated, local and regional health departments should: Report outbreaks within 24 hours of identification to the regional DSHS office or to EAIDU at (800) 252-8239 or 512-776-7676.

LABORATORY PROCEDURES

Specimens associated with varicella cases are not routinely submitted to the DSHS laboratory in Austin. However, PCR (preferred) and viral testing (not preferred) are available through the DSHS laboratory. Serology testing is not currently available at DSHS. Before shipping specimens, be sure to notify DSHS EAIDU VPD staff at **(512) 776-7676**.

The CDC also does varicella PCR testing and providers can usually ship directly to CDC for varicella (unlike other diseases). Information about submitting to CDC can be found here: <http://www.cdc.gov/chickenpox/lab-testing/collecting-specimens.html>

PCR Specimen Collection and Submission (preferred)

Specimen Collection

- The preferred specimens are scabs, vesicle fluids or skin scrapings.
- Specimens should be collected as close to onset date as possible and no later than 1 week from onset date.
- Do NOT use any media. Specimens should be submitted in a dry tube.
- Synthetic swabs should be used. Do not use cotton swabs for specimen collection. Instructions for how to collect different types of varicella specimens for PCR can be found here: <http://www.cdc.gov/chickenpox/lab-testing/collecting-specimens.html>

Submission Form

- Use Specimen Submission Form G-2V.
- Make sure the patient's name and date of birth/social security number match exactly what is written on the container.
- Mark the date of onset and date of collection. Write in VZV PCR as the test to be performed.

Specimen Shipping

- Specimens should be sent at ambient temperature.
- Specimens can be sent regular mail, but ensure they will not arrive on a weekend or holiday.
- Ship specimens to:

Laboratory Services Section, MC-1947
Texas Department of State Health Services

Attn. Walter Douglass (512) 776-7569
 1100 West 49th Street
 Austin, TX 78756-3199

Causes for Rejection:

- Specimen submitted on a preservative such as formalin or submitted in viral transport media.
- Missing two patient identifiers on tube
- Discrepancy between name on tube and name on form

Viral Isolation Specimen Collection and Submission (not preferred) Specimen

Collection

- The preferred specimens are vesicle fluids or skin scrapings.
- Specimens should be collected as close to onset date as possible and no later than 1 week from onset date.
- Place swab in 1-2 mL of viral transport media. Synthetic swabs should be used. Do not use cotton swabs for specimen collection.

Submission Form

- Use Specimen Submission Form G-2V.
- Make sure the patient's name and date of birth/social security number match exactly what is written on the container.
- Mark the laboratory test requested (viral isolation), date of onset, and date of collection. List the suspected virus or disease in the Virology section.

Specimen Shipping

- Maintain specimens at 2-8°C immediately after collection. Specimens not received at the lab within 12 hours of collection should be frozen at -70°C. Specimens should be shipped on dry ice.
- DO NOT mail on a Friday unless special arrangements have been pre-arranged with DSHS Laboratory.
- Ship specimens to:

Laboratory Services Section, MC-1947
 Texas Department of State Health Services
 Attn. Walter Douglass (512) 776-7569
 1100 West 49th Street
 Austin, TX 78756-3199

Causes for Rejection:

- Specimen submitted on a preservative such as formalin or submitted in viral transport media.

REVISION HISTORY

January 2021

- Updated the investigation checklist and reporting and data entry requirements section to match each other in regard to faxing varicella reporting forms and medical records
- Added a Severity section
- Updated Control Measures section
- Updated the Prophylaxis section
- Updated Exclusion recommendations

- Updated the Outbreaks section of Managing Special Situations
- Updated the outbreak requirements
- Updated the Causes for Rejection for specimen submission
- Updated flow chart

December 2022

- Added Varicella Infections in Special Situations section

FLOW CHART

**Varicella:
Case Status Classification**

