

# STATE OF COLORADO

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## **Guidelines for Assessment of Varicella Vaccine Effectiveness During School & Child Care Center Outbreaks**

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Varicella vaccination rates among school-aged children in Colorado are currently high. As the vaccine provides less than 100% protection (70–90% from a number of studies) against varicella infection, school and child care center (CCC) outbreaks will continue to occur, and most cases in these outbreaks will occur among vaccinated children (because the numbers of unvaccinated children are very low relative to the numbers of vaccinated children). This presents a counter-intuitive situation, especially to school/CCC administrators, parents, and healthcare providers who may be concerned that the vaccine is not working.

It is not necessary to assess varicella vaccine effectiveness in all school/CCC outbreaks. However, in situations with large numbers of cases, severe complications of varicella, or significant concern among school administrators, parents or healthcare providers, such an assessment may serve a useful role in documenting that the vaccine is performing as expected (or, conversely, to identify situations with apparent high rates of vaccine failure).

If adequate vaccination records are available at the school/CCC, an assessment of varicella vaccine effectiveness (**VE**) can be conducted fairly easily by following these guidelines.

1. Confirm that there is an outbreak of varicella by one or more of the following:
  - a. Observation of cases by an experienced health/public health professional.
  - b. Determination that varicella was diagnosed by a clinician in at least several cases.
  - c. Testing varicella lesion specimens from several cases by polymerase chain reaction (PCR - call CDPHE for approval and assistance).
2. A case definition for outbreak-related cases of varicella is: an illness with acute onset of diffuse (generalized) maculo-papulovesicular rash occurring in a specific setting and time-period with no other apparent cause. [Note: mild “breakthrough” cases may not have a typical varicella rash and may be afebrile; the breakthrough rash may involve a small number of papules (bumps) and no vesicles (fluid-filled blisters)]
3. Interview parents of outbreak-related cases about symptoms, history of varicella illness and varicella vaccination, illness complications, and possible transmission at home. A sample questionnaire is attached.
4. Obtain varicella vaccination (and varicella disease history) records from the school/CCC for all children in classrooms involved in the outbreak.

5. Varicella illness is classified as mild (<50 lesions), moderate (51–500 lesions), or severe (>500 lesions, hospitalization, or other complications of varicella).
6. The outbreak is not over until at least 21 days (and preferably 42 days) have elapsed since the last case.
7. The following persons should be excluded from the calculation of **VE**:
  - a. Children with a previous history of varicella.
  - b. Children who were vaccinated more than four days before their first birthday.
  - c. Children who were vaccinated less than 42 days before their illness onset.
  - d. Children less than 12 months of age.
  - e. Children in classrooms with no cases or only one case of varicella (to assure that there was ample opportunity for exposure to varicella).
8. The attack rate among vaccinated cases (**ARV**) is defined as the number of cases who were vaccinated (and not excluded based on #7) divided by the total number of vaccinated children (who were not excluded).
9. The attack rate among unvaccinated cases (**ARU**) is defined as the number of cases who were unvaccinated (and not excluded based on #7) divided by the total number of unvaccinated children (who were not excluded).
10. The estimated percent vaccine effectiveness (**VE**) at preventing varicella of any severity is calculated using the formula:  $[(\mathbf{ARU} - \mathbf{ARV}) \div \mathbf{ARU}] \times 100$ .
11. If there are no unvaccinated children or extremely few unvaccinated children (e.g. < 4), then use 0.75 as a reasonable “population estimate” of **ARU** (from studies and previous outbreak investigations).
12. The estimated **VE** at preventing moderate-to-severe varicella illness is calculated using the same formula as #10, except that mild varicella cases are classified and included in the calculation as non-cases.
13. If the estimated **VE** is unexpectedly low (<60%), an assessment of vaccine storage and handling may be indicated; contact CDPHE for further guidance.

For questions or further assistance, call one of the CDPHE vaccine preventable disease coordinators: Sandy Rios at 303-692-2671 or Denise Woods-Stout at 303-692-2672.

### References

1. Galil K, et al. Outbreak of varicella at a day-care center despite vaccination. *N Engl J Med.* 2002;347:1909-15.
2. CDC. Outbreak of varicella among vaccinated children — Michigan, 2003. 2003;53:389-92.
3. Orenstein WA, et al. Field evaluation of vaccine efficacy. *Bulletin of the World Health Organization.* 1985;63:1055-1068.

Case Name: \_\_\_\_\_

ID Number: \_\_\_\_\_

Interviewed on: \_\_\_\_/\_\_\_\_/\_\_\_\_

Call Log: \_\_\_\_\_

By \_\_\_\_\_

**Varicella School/Childcare Outbreak - Case Form**

Hi, this is \_\_\_\_\_. I work with the \_\_\_\_\_ health dept. May I speak with the parent or guardian of \_\_\_\_\_?

Hi, this is \_\_\_\_\_. I am working with the \_\_\_\_\_ health dept. As you may already know, some children in your child's school have come down with chickenpox recently. We are contacting parents of children who have had chickenpox to help determine the effectiveness of the chickenpox vaccine. Are you willing to answer questions now or is there a better time to call back?

**If NO:** best time to call back \_\_\_\_\_

**If YES:** I want to assure you that this information will be kept confidential.

1. May I have your name please \_\_\_\_\_
2. What is your relationship to (\_\_\_\_\_):  Parent  Other \_\_\_\_\_
3. When did you first notice your child's rash? \_\_\_\_/\_\_\_\_/\_\_\_\_
4. Child's DOB? \_\_\_\_/\_\_\_\_/\_\_\_\_
5. Child's class? \_\_\_\_\_
6. Did your child ever have chickenpox before this case of chickenpox?  Yes  No  Don't know
- 6a. *If YES*, at what age? \_\_\_\_\_ Years OR \_\_\_\_\_ Months
7. At the most severe stage of your child's chickenpox, how many spots (bumps/blisters/scabs) were present? (*read options*)
  - less than 50 (all could be counted in 30 seconds or less). How many? \_\_\_\_\_
  - 50 to 249 (Some skin was affected, but there was a several clear areas at least as big as the child's hand)
  - 250 to 500 (many rash spots were present, but there was a clear area at least as big as the child's hand)
  - over 500 (many rash spots were present, and in some areas you could not see normal skin between areas where rash spots were found)
8. As best as you can recall, did ANY of the rash spots become little blisters with fluid in them (which then scabbed)?
  - Yes  No  Don't know
9. Were there any complications from this case of chickenpox? (specify) \_\_\_\_\_
10. Was your child hospitalized because of chickenpox or one of its complications?  Yes  No
11. Has your child ever received the chickenpox vaccine? (*Please look at the child's immunization record if you have it. This may be listed as "varicella vaccine" or "VARIVAX"*)  Yes  No  Don't know
  - 11a. *IF YES*, vaccine date: \_\_\_\_/\_\_\_\_/\_\_\_\_
  - 11b. Medical provider, practice name and phone number where the chicken pox vaccine was administered  
\_\_\_\_\_
12. Did any other members in your household recently have chicken pox?  Yes  No  Don't know
- 12a. *IF YES*, who (ages) and when (onsets) ? \_\_\_\_\_