Management of Varicella Zoster Virus Infections in Prison Populations

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1. PURPOSE

The Federal Bureau of Prisons (BOP) Clinical Guidance for the *Management of Varicella Zoster Virus (VZV) Infections* provides recommendations for the medical management of federal inmates with varicella (chickenpox) and herpes zoster (shingles), as well as for prevention and control measures.

2. EPIDEMIOLOGY OF VARICELLA ZOSTER VIRUS

Varicella zoster virus causes two distinct clinical conditions. Primary VZV infection causes **varicella** (chickenpox), a contagious rash illness typically occurring among children. Years after the initial infection, VZV can reactivate to cause **herpes zoster** (shingles), normally presenting as a unilateral, painful, vesicular rash that occurs in adults.

- Before the introduction of varicella vaccine in the United States in 1995, almost all persons developed varicella, with 90% of the cases occurring before age 15. Data indicate that 97% of U.S. born persons who were born between 1960 and 1980 are immune.
- In tropical and subtropical regions, varicella more typically occurs in teenagers and adults; hence, foreign-born inmates are more likely to be susceptible to varicella than U.S. born inmates.
- With increased vaccination coverage and decreased incidence of wild-type chickenpox, a higher proportion of chickenpox cases will be those that occur after vaccination as "breakthrough disease."
- Beginning at ages 40–50, incidence rates of herpes zoster increase rapidly. Approximately 50% of persons who live to age 85 will experience shingles.

3. OVERVIEW OF VARICELLA (CHICKENPOX)

NATURAL HISTORY

Varicella, or chickenpox, is a highly contagious systemic disease that normally results in lifelong immunity. Persons with a prior history of varicella, who are re-exposed to wild-type VZV, develop an asymptomatic reinfection that boosts VZV antibody titers, but rarely causes a second bout of chickenpox**.**

PRESENTATION

Chickenpox normally presents with mild constitutional symptoms and the sudden onset of a maculopapular rash that rapidly evolves to a vesicular exanthem. Adults may have 1 to 2 days of fever and malaise prior to rash onset. The rash classically spreads in successive crops, resulting in lesions appearing in various stages of evolution, including papules, superficial vesicles ("dew drops"), pustules, and crusted lesions. Lesions are concentrated on the trunk, with fewer lesions on the distal extremities (but not involving the palms of the hands or soles of the feet).

Atypical and subclinical cases of varicella without a rash are rare, but do occur. Most cases of chickenpox are self-limited without serious sequelae. Life-threatening complications such as encephalitis, pneumonia, and hepatitis occur more commonly in newly infected adults and immunocompromised persons.

Inmates presenting with vesicular rash should be evaluated for possible VZV infection, as described in *Table 1* below.

TABLE 1. VARICELLA DIAGNOSIS

The diagnosis of chickenpox (varicella) can be made or supported by any one or more of the following:

(1) PHYSICAL EXAMINATION to identify the symptoms typical of VZV rash: Lesions that are simultaneously in all stages of development—from vesicles on a red base, to umbilicated pustules, to crusted lesions.

(2) PATIENT HISTORY of exposure to varicella or herpes zoster in the past three weeks.

(3) LABORATORY TESTS can be useful for confirmation of the diagnosis, particularly if the presentation is atypical:

- ***Polymerase chain reaction (PCR) testing of vesicular fluid is the recommended test for varicella.*** It is widely available from commercial labs (see *Appendix 1*, Varicella Testing).
- ***IgM testing is not recommended for diagnosis of varicella.***

TRANSMISSION

VZV infection is readily transmitted from person to person as follows:

- **DROPLET SPREAD** when a person with chickenpox coughs or sneezes.
- **DIRECT CONTACT** with upper respiratory secretions or with lesions that have not yet crusted.
- **AIRBORNE SPREAD**, which is more likely to affect immunocompromised individuals.
- **CONGENITAL** transmission.

Varicella is highly contagious, with a secondary attack rate of 70–90% (i.e., rate of transmission from a chicken pox case to those previously uninfected). For the definition of "Significant Exposure," see *Appendix 3, Step 4*.

VARICELLA IN PREGNANCY

Pregnant women who get chickenpox are at increased risk for pneumonia and other life-threatening complications. If a pregnant woman develops varicella in the first trimester or early in the second trimester, her baby has a small risk (0.4 – 2.0 %) of being born with congenital varicella syndrome. The baby may have scarring on the skin; abnormalities in the limbs, brain, or eyes; and low birth weight. If a woman develops varicella rash in the period from five days before delivery to two days after delivery, the newborn will be at risk for neonatal varicella. Currently, the mortality rate for neonatal varicella is about 7%.

4. OVERVIEW OF HERPES ZOSTER (SHINGLES)

NATURAL HISTORY

Following primary VZV infection, varicella infection persists in a dormant state in the dorsal-root ganglia. Reactivation of VZV infection results in herpes zoster (shingles). Shingles occurs sporadically in otherwise healthy individuals, but more commonly affects the elderly and immunocompromised persons.

PRESENTATION

Herpes zoster usually presents as a rash in one or two adjacent dermatomes. The rash most commonly appears on the trunk along a thoracic dermatome, and usually does not cross the body's midline. Approximately 20% of shingles patients develop a rash that overlaps adjacent dermatomes. Even less commonly, the rash can be more widespread and affect three or more dermatomes. This condition, called **disseminated zoster**, usually occurs only in people with compromised or suppressed immune systems. Disseminated zoster can be difficult to distinguish from varicella.

The rash is usually painful, itchy, or tingly. These sensations may precede the actual rash onset by days to weeks. In the prodromal phase, people may also have headache, photophobia (sensitivity to bright light), and malaise. The rash subsequently develops into clusters of clear vesicles that continue to form over three to five days and progressively dry and crust over. They usually heal in two to four weeks. There may be permanent pigmentation at the site of the rash.

COMPLICATIONS

People with compromised or suppressed immune systems are more likely to have complications from herpes zoster. **Postherpetic neuralgia (PHN)**, the most common complication of herpes zoster, presents as persistent pain in the area where the rash was located. PHN can last for weeks or months and, occasionally, for many years. Older adults are more likely to have PHN and to have more prolonged and more severe pain. PHN is rare in people younger than 40 years old. Other predictors of PHN include the size of the rash and the level of pain with the rash.

➔ *See treatment options for PHN under Treatment of Herpes Zoster/Shingles in Section 5.*

Other complications of herpes zoster include:

- Ophthalmic involvement with acute or chronic ocular sequelae (herpes zoster ophthalmicus)
  - ➔ *The presence of eyelid and nose lesions indicates potentially sight-threatening keratitis and is considered a medical emergency.*
- Bacterial superinfection of the lesions, usually due to *Staphylococcus aureus*
- Cranial and peripheral nerve palsies
- Visceral involvement such as meningoencephalitis, pneumonitis, hepatitis, and acute retinal necrosis

TRANSMISSION

Herpes zoster is less contagious than chickenpox; however, VZV can be transmitted by direct contact, droplet, or aerosol exposure to the vesicular lesions of a person with shingles. The infectiousness of herpes zoster is greatly increased for immunocompromised persons and when disseminated disease is present.

➔ *In susceptible contacts, transmission of VZV from persons with herpes zoster may result in chickenpox.*

5. TREATMENT

➔ *Appendix 2, Antiviral Therapy for VZV Infections, outlines drug treatment options for VZV infections.*

TREATMENT OF VARICELLA/CHICKENPOX

It is recommended that adults with varicella receive antiviral treatment (usually with oral acylovir) because it has been shown to decrease the duration and severity of the illness.

- **For maximum benefit, antiviral therapy for varicella should be given within 24 hours** of the onset of rash.
- **Intravenous acyclovir** (and possibly hospitalization) is indicated for immunocompromised persons with chickenpox.
- **Consult with a physician expert** regarding inmates who have complicated primary VZV infections such as varicella pneumonia, varicella during pregnancy, or varicella in an immunocompromised host.
- **Pruritus** should be treated topically (e.g., calamine lotion) and, if necessary, with systemic antihistamines to minimize scratching and the serious secondary bacterial infections that could result. Fingernails should be cut short.

TREATMENT OF HERPES ZOSTER/SHINGLES

ANTIVIRAL THERAPY

➔ *See Appendix 2 for specific information about dosing of antiviral therapy.*

Antiviral therapy (usually with oral acyclovir) decreases viral shedding, accelerates healing of skin lesions, and reduces acute pain.

➔ *Famciclovir and valacyclovir, although more simply dosed than acyclovir, offer no major therapeutic advantages; therefore, they should be only selectively considered.*

- **PHN:** The effect of antiviral therapy on the development of PHN is less clear. It is hypothesized that, by inhibiting viral replication and reducing neural damage, antiviral therapy may help prevent development of PHN.
- **For maximum benefit, antiviral therapy for herpes zoster should be given within 72 hours of the onset of the rash.** The presence of new vesicles correlates with recent viral replication and may be an indicator that the patient could benefit from antiviral therapy, even beyond 72 hours after rash onset.

- **HIV Co-Infection:** Orally administered acyclovir in standard doses is effective in treating herpes zoster in persons with HIV co-infection. Acyclovir therapy should be continued until all lesions have crusted over, due to the risk of relapse in this population. Intravenous acyclovir is recommended for disseminated herpes zoster (rash involving three or more dermatomes).

ADDITIONAL TREATMENTS FOR HERPES ZOSTER/SHINGLES

- Short-term use of acetaminophen and non-steroidal anti-inflammatory medication can be useful for treatment of acute neuritis.
- The concurrent administration of a tapering course of prednisone has been demonstrated to decrease acute zoster pain and decrease time for cutaneous healing. However, steroids should not be prescribed for inmates who have absolute or relative contraindications, e.g., diabetes mellitus.
- Topical antiviral agents are of no benefit.
- Patients should be advised to keep the lesions clean to prevent secondary bacterial infections. A nonocclusive, nonadherent, sterile dressing can prevent the irritation caused by contact with clothing.
- Pain may be severe and should be aggressively managed.

HERPES ZOSTER OPHTHALMICUS

VZV reactivation involving the first branch of the trigeminal nerve often presents with unilateral pain and lesions involving the nose, forehead, or periocular areas. Left untreated, these patients may develop potentially sight-threatening keratitis, and other ocular complications such as episcleritis and iritis.

➔ *Diagnosis of herpes zoster ophthalmicus warrants emergency evaluation by an ophthalmologist. If feasible, administer one dose of antiviral therapy prior to leaving for the evaluation.*

POSTHERPETIC NEURALGIA (PHN)

Chronic pain following a bout of herpes zoster can be protracted, incapacitating, and refractory to therapy, particularly in the elderly.

Potentially effective treatments, alone or in certain combinations, include (in order of preference):

1. Tricyclic antidepressants (preferably amitriptyline or nortriptyline).
2. Gabapentin or pregabalin, if tricyclic antidepressants have proven unsuccessful or intolerable.
3. Addition of short-term opioids, if not relieved by gabapentin or tricyclics alone.
4. Topical capsaicin applied to healed, intact skin (often poorly tolerated because of the burning associated with its application).
5. Short-term use of 5% lidocaine patches. Consult the BOP National Formulary for available formulary items.

PATIENT EDUCATION

Appendix 6 contains a handout offering practical advice for inmates with varicella or herpes zoster.

7. HOUSING OF INMATES WITH VARICELLA OR HERPES ZOSTER

For all inmates with chickenpox (varicella) or disseminated herpes zoster, and all immunocompromised inmates with herpes zoster:

These inmates should be transferred to a community hospital if medically indicated. Otherwise, they should be housed *either* in the institution's airborne infection isolation (AII) room *or* in a single cell with a door that closes; their contact with other inmates should be restricted.

- **Airborne infection isolation rooms are preferred for immunocompromised inmates who have chickenpox or shingles, or for any inmate with disseminated shingles.**
- The inmate can return to general population housing or transferred when skin lesions have crusted.
- Anyone entering the cell of an inmate with contagious chickenpox or disseminated herpes zoster should wear masks (NIOSH-certified particulate respirators or surgical masks). They should wear gloves when any direct contact with the inmate is anticipated.

For inmates with herpes zoster (without immunosuppression):

These inmates can be maintained in general population so long as the inmate is cooperative and the lesions can be kept covered. However, transmission of VZV can occur, resulting in secondary cases of chickenpox. **If secretions cannot be easily contained, it is strongly recommended that inmates be housed in a single cell to prevent transmission of varicella.** Contact precautions should be utilized, including the use of gloves whenever dressings are changed.

➔ *Inmates with herpes zoster (shingles) should be put on Medical Hold and not be transferred until lesions have crusted over.*

8. CONTACT INVESTIGATIONS/CONTACT MANAGEMENT

VARICELLA (CHICKENPOX)

- **The steps involved in conducting a varicella contact investigation and managing contacts** are outlined in *Appendix 3*, *Varicella Contact Investigation Checklist*. Contact investigations associated with varicella are complex. Seek consultation from the Regional and Central Offices as necessary.
- **Guidelines for post-exposure prophylaxis** are outlined in *Step 10* of *Appendix 3*, as well as in *Appendix 4* (Varicella Vaccine) and *Appendix 5* (VariZIG).

HERPES ZOSTER (SHINGLES)

Typically, contact investigations are not performed for contacts to shingles. A limited contact investigation may be considered in circumstances when there is extensive drainage from the lesions. Consult the Regional/Central Office.

DEFINITIONS

BREAKTHROUGH CHICKENPOX is defined as a case of wild-type varicella infection occurring more than 42 days after vaccination. Breakthrough infection is significantly milder than infection among unvaccinated persons, with fewer lesions (generally fewer than 50), many of which are maculopapular rather than vesicular. Most persons with breakthrough infection do not have fever.

CHICKENPOX is the common term for primary varicella infection.

CONFIRMATION OF IMMUNITY is a positive (reactive) Varicella Zoster Virus IgG result.

DISSEMINATED HERPES ZOSTER is diagnosed based upon the appearance of lesions in three or more dermatomes. It occurs more frequently in immunosuppressed persons.

EXPOSURE PERIOD is the time period when the chicken pox case could have been exposed to varicella.

HERPES ZOSTER, commonly called shingles, is a primarily dermatologic disease caused by the reactivation of latent (dormant) varicella zoster virus.

INCUBATION PERIOD for an infectious disease is the time period between exposure to the disease and the development of symptoms.

INDEX CASE is the first case of a contagious disease in a group or population that serves to call attention to the presence of the disease.

INFECTIOUS PERIOD is the time period during which an infected host can transmit infection.

POSTHERPETIC NEURALGIA (PHN) is the most common complication of herpes zoster. It is a persistent pain in the area where the rash was located (see *Complications* in *Section 4*).

RECURRENT INFECTION: Although immunity following varicella is considered to be long-lasting, second cases of varicella do occur rarely among immunologically normal persons.

SHINGLES is the common term for herpes zoster.

SIGNIFICANT EXPOSURE is the definition of what constitutes an exposure to varicella in the BOP, for the purposes of the contact investigation (see *Appendix 3, Step 4*).

VARICELLA, commonly called chickenpox, is a highly contagious, systemic disease that usually occurs in childhood and is caused by an acute infection with varicella zoster virus.

VARICELLA ZOSTER VIRUS (VZV) is a herpes family virus that causes chickenpox and shingles.

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APPENDIX 1. VARICELLA TESTING

LABORATORY CONFIRMATION OF VARICELLA

Laboratory diagnosis can be important to confirm the diagnosis of chickenpox. **Varicella zoster virus polymerase chain reaction (PCR) is the method of choice for diagnosis of varicella.** Real-time PCR methods are widely available in commercial reference and public health laboratories. PCR assays are the most sensitive and specific types of tests available.

➔ *Do not test inmates with suspected varicella for varicella IgM, because commercially available tests lack sensitivity and specificity.*

SPECIMEN COLLECTION

- **Vesicular fluid, preferably from a fresh, fluid-filled vesicle, is the specimen of choice. Crusts from lesions are also excellent specimens.** Less desirable specimen sources include nasopharyngeal secretions, saliva, blood, urine, bronchial washings, and cerebrospinal fluid because these sources have a lower yield for positive tests.
- Follow the instructions from your local public health laboratory or contracted commercial laboratory for collecting, processing, and shipping samples for testing. Contact the National Laboratory Administrator if further assistance is required.

VARICELLA IMMUNITY TESTING

Serologic evaluation of immunity involves testing for anti-varicella antibodies (IgG). A positive (reactive) IgG result is indicative of varicella immunity.

➔ *Do not test inmates who are varicella contacts for varicella IgM.*

SPECIMEN COLLECTION

- Serum is the specimen of choice for anti-varicella antibodies (IgG).
- Follow the instructions from your local public health laboratory or contracted commercial laboratory for collecting, processing, and shipping samples for testing. Contact the National Laboratory Administrator if further assistance is required.

APPENDIX 2. ANTIVIRAL THERAPY FOR VARICELLA ZOSTER VIRUS (VZV) INFECTIONS

ANTIVIRAL THERAPY FOR VZV INFECTIONS IN ADULTS			
DRUG	**HERPES ZOSTER**	**VARICELLA**	**MEDICATION NOTES**
ACYCLOVIR 200, 400, 800 mgs	800 mg po every 4 hours (5 times daily) for 7–10 days ***For immunocompromised patients:*** 10 mg/kg IV every 8 hours for 7 days	800 mg po 4 times daily for 5 days	• Decrease dose if renal function is impaired. • Can be administered with or without food. • Infuse acyclovir IV over 1 hour. Rapid infusion may cause renal damage. • Closely monitor and hydrate. • ***In immunocompromised patients:*** thrombocytopenic purpura/hemolytic uremic syndrome (TTP/HUS) has been reported. • Obese patients should be dosed using ideal body weight (IBW).
FAMCICLOVIR (Famvir) 125, 250, 500 mgs	500 mg po, every 8 hours for 7 days		• Decrease dose if renal function is impaired. • May be taken without regard to meals.
VALACYCLOVIR (Valtrex) 500 mgs, 1 gm	1000 mg po, 3 times daily for 7 days		
OTHER IMPORTANT NOTES: • For maximum benefit, treatment for varicella should be given within *24 hours* of rash onset. Treatment for herpes zoster should be initiated within *72 hours* of rash onset. • In persons with HIV infection or other potentially immunocompromised conditions, continue antiviral therapy until lesions have crusted. • Intravenous acyclovir is required for disseminated disease or serious complications of VZV infection.			

APPENDIX 3. VARICELLA CONTACT INVESTIGATION CHECKLIST

A contact investigation should be initiated whenever a single case of chickenpox is suspected. The contact investigation steps below may overlap in time. Promptly evaluate close contacts as they are identified.

✓	TASK
	1. IDENTIFY, ISOLATE, and CONFIRM varicella case; complete varicella timeline below.
	a. Appropriately isolate suspected chickenpox case. See *Section 7* on housing inmates. **Begin treatment**, if indicated. See *Section 5* on treatment. Place on Medical Hold (SENTRY/BEMR).
	b. Consider lab confirmation, particularly if clinical presentation is atypical. See *Appendix 1*.
	c. Determine the exposure and infectious periods for the varicella case, and the incubation period for the varicella contacts. Utilize the ***Varicella Timeline Calculator*** available at: *https://www.bop.gov/resources/health_care_mngmt.jsp* or fill in the blanks below.

c.1. EXPOSURE PERIOD for *Varicella Case* (time period when VZV exposure could have occurred)

It can be determined when a varicella case could have been exposed to VZV by using the dates for the incubation period--from 10 to 21 days before the onset of rash. Knowing these dates allows the investigator to determine when (and where) the varicella case could have been exposed to VZV.

___/___/___ = **Date varicella case developed rash**

___/___/___ = **EXPOSURE PERIOD for varicella case began** (21 days *before* rash developed)

___/___/___ = **EXPOSURE PERIOD for varicella case ended** (10 days *before* rash developed)

c.2. INFECTIOUS PERIOD for *Varicella Case* (time period when case was able to transmit VZV)

The infectious period is used to identify the group of contacts who were exposed while the case was infectious.

___/___/___ = **INFECTIOUS PERIOD for varicella case begins** (2 days *before* rash developed)

___/___/___ = **INFECTIOUS PERIOD for varicella case ends** (when all lesions are crusted, 4-7 days *after* rash onset)

c.3. INCUBATION PERIOD for *Varicella Contact* (time period from VZV exposure to onset of varicella)

The incubation period is used to determine when susceptible contacts are at risk for developing varicella.

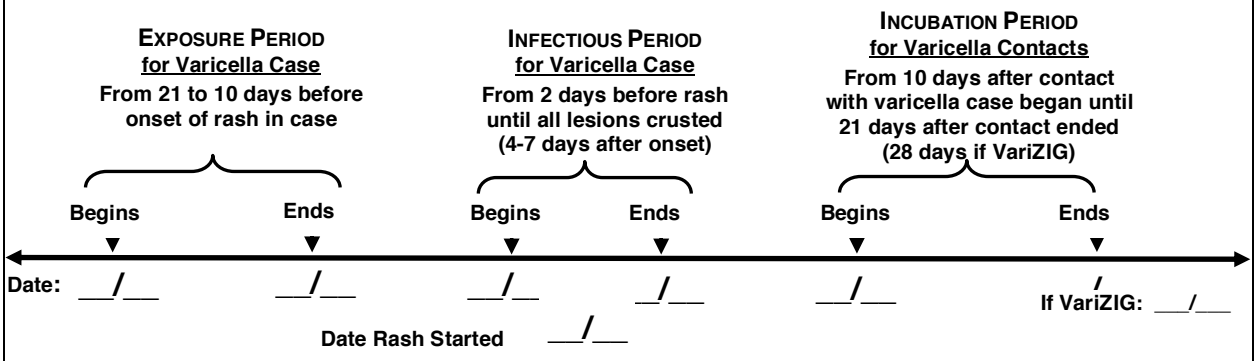
___/___/ ___ = **Date exposure began.** If contact has been ongoing, then the "date exposure began" is the date that the case infectious period began. Date may vary depending on exposure history.

___/___/ ___ = **Date exposure ended.** The date that exposure to the varicella case ended is usually (1) the date that the case was isolated from general population or (2) the end of the case infectious period. This date may vary depending on the exposure history of individual contacts.

___/___/___ = **INCUBATION PERIOD for contact begins** (10 days after exposure to varicella case *began)*

___/___/___ = **INCUBATION PERIOD for contact ends** (21 days after exposure to varicella case *ended)*

c.4. VARICELLA TIMELINE: Fill in the dates calculated in c.1.–c.3. above.



✓	TASK
	2. Make notifications regarding the potential for a varicella outbreak.
	a. Notify correctional management officials of the varicella case and the anticipated need to stop movement of contacts. **b.** Alert facility clinicians and staff regarding the need to detect and report new cases. **c.** Report to BOP regional & central offices per BOP policy. **d.** Report to local public health authorities (if required).
	3. Convene contact investigation team and issue "Varicella Alerts."
	a. Identify team leader. Identify roles and responsibilities of team members. **b.** Develop plan for managing contact investigation data. **c.** Develop communication plan for staff, inmates, and visitors. **d.** Issue Varicella Alerts (see sample notifications at http://sallyport.bop.gov/co/hsd/infectious_disease/index.jsp.
	4. Identify contacts with "significant exposure" and prioritize contacts.
	When identifying contacts, "significant exposure" to varicella is defined as follows: Exposure is defined as at least *one hour of contact* with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing indoor airspace during the infectious period (2 days before rash onset until all lesions are crusted or until the inmate with varicella was isolated). Consider all inmates in a housing unit that share a common area to be "contacts."
	a. Obtain inmate traffic history to obtain housing, work, and school and social locations during infectious period. Consider touring exposure sites to evaluate transmission potential. ☐ Facility/housing _____ ☐ Work _____ ☐ School _____ ☐ Social contacts_____
	b. Interview index case for close contacts, recent visitors, and activities.
	c. Identify inmate contacts who are "high risk" (pregnant or immunocompromised). Check CD4 count for HIV infected inmate contacts.
	d. Identify inmate contacts who are scheduled to release or transfer to another institution or to residential reentry within the 21-day incubation period.
	e. Identify inmate contacts who have transferred out to another correctional facility. Provide Regional/Central Office with Sentry ranges associated with where varicella case was housed so report can be generated.
	5. Stop transfers of identified inmate contacts pending Varicella IgG results.
	Housing unit contacts and other identified contacts with "significant exposure" who are scheduled to be transferred to another correctional facility or to Residential Reentry during their incubation period shall not be moved until it has been determined that the contact has confirmation of immunity (i.e., VZV IgG positive). Varicella contacts should be placed on "Medical Hold" and not be transferred until 21 days after their exposure ended or until a positive IgG result is obtained.
	6. Educate staff and inmates.
	Staff and inmates should be provided general information about chickenpox (staff recalls, staff emails, inmate town halls). Emphasis should be placed on the importance of promptly reporting inmates with varicella symptoms, i.e., fever and rash.
	7. Check if contacts have varicella symptoms.
	Assess each identified contact for symptoms of chickenpox.

(Appendix 3, page 2 of 4)

✓	TASK
	8. Test for varicella IgG for selected groups of contacts.
	a. Create a linelist of varicella contacts who should be tested for Varicella IgG below. EXCEL linelist can be accessed at: *http://sallyport.bop.gov/co/hsd/infectious_disease/index.jsp*.
	b. Obtain STAT Varicella IgG blood test for the following contacts with "significant exposure" and without history of a positive IgG: • Inmates due to be transferred during the incubation period (NOTE: In detention centers, because of the high frequency of inmate movement, it is generally necessary to test all housing unit contacts) • High-risk inmates (HIV-infected, pregnant, or immunocompromised) • Cellmate(s) of chicken pox case • Health care orderlies or attendants (who could potentially expose high-risk inmates to varicella) • Inmates with work assignments who could expose others (e.g., van drivers, workers at adjacent facility) With the exception of detention center settings, it is generally recommended to test only the groups listed above, not all inmate contacts. ***IMPORTANT NOTE:*** Do not order IgM tests for inmate contacts because of high rates of false positive results. **INTERPRETATION OF TEST RESULTS:** **IgG positive or reactive:** Means contact is immune to varicella. No follow-up is required. Inmates can be housed in general population and continue with any previously scheduled movement out of the institution. **IgG negative or non- reactive:** Means that the contact is susceptible to varicella and is at risk for developing chickenpox during 10–21 days following exposure (>28 days if VariZIG was administered). IgG negative inmates contacts shall not be transferred outside the institution during this time period.
	9. Make decisions about housing within the institution.
	→ *See Step 1 above for information on determining the incubation period.* • To prevent exposing another housing unit, it is recommended that inmates housed in the same housing unit as a chicken pox case (the **"exposed housing unit"**) not be moved to another housing unit during the incubation period. • Avoid moving new inmates into the "exposed housing unit" during the incubation period. • Do not move immunocompromised inmates into the "exposed housing unit" during the incubation period. • Consider moving identified close contacts not currently housed in the "exposed housing unit" into that unit to avoid exposing another housing unit. • Consider individually isolating IgG-negative cellmates until the end of the 21-day incubation period. If isolating IgG-negative inmate contacts, it is recommended that they not be housed together—if one develops chickenpox, the other susceptible contact will be re-exposed. ***NOTE:*** In general, it is not recommended that "exposed housing units" be locked down.

(Appendix 3, page 3 of 4)

✓	TASK
	10. Consider post-exposure prophylaxis.
	In rare instances post-exposure prophylaxis may be indicated. It should only be pursued after consultation with Regional/Central office. • **VARICELLA VACCINATION.** To be effective, post-exposure varicella vaccination must be administered within 3-5 days post-exposure, a time-frame that is rarely feasible in the correctional setting. Varicella vaccination can be considered for IgG negative contacts in outbreak situations with multiple generations of varicella cases. ➔ *See Appendix 4 for more information.* ***NOTES:*** ***HIV infection with CD4 less than 200 cells/µL and pregnancy are contraindications to varicella vaccination.*** HIV status and pregnancy status must be known prior to vaccination. ***Varicella vaccine must be kept frozen at -15°C (5°F) or colder.*** The vaccine is reconstituted at room temperature with a diluent and must then be administered within 30 minutes. • **VARIZIG.** Post-exposure prophylaxis with VariZIG should be considered for susceptible (VZV IgG negative) inmates who are pregnant or who are HIV-infected with a CD4 less than 200 cells/µL or severely immunocompromised. VariZIG is ideally administered within 4 days post-exposure, but can be administered within 10 days of exposure. ➔ *See Appendix 5 for more information.*
	11. Observe for new cases of chickenpox.
	a. Prompt identification and isolation of new varicella cases is critically important to control varicella. During the 21-day incubation period observe for new varicella cases. Continue to educate correctional staff and exposed inmates about the need to report inmates with symptoms (especially fever and rash).
	b. It is recommended that exposed inmates who have been identified as IgG negative be evaluated daily for signs and symptoms of varicella. Utilize a low threshold of suspicion of chickenpox for isolation of potential cases and for treatment of immunocompromised contacts who develop symptoms.
	c. With any new cases, return to Steps 1–10 above.
	12. Summarize outbreak.
	• # of cases • # treated • # hospitalized • # of contacts • Factors that contributed to the outbreak • How to prevent future outbreaks • Recommendations for response to future outbreaks

APPENDIX 4. VARICELLA VACCINE PROPHYLAXIS

The CDC recommends the use of varicella vaccine as post-exposure prophylaxis for susceptible contacts. Vaccination within 3 days of exposure to rash has been shown to be 90% effective in preventing varicella; vaccination within 5 days of exposure is approximately 70% effective in preventing varicella, and 100% effective in modifying severe disease. Administration of a second dose (4 weeks or more after the initial dose) is recommended for persons who receive a single dose following an exposure.

In the BOP, varicella vaccination is rarely used in the context of varicella exposures because of logistical difficulties obtaining and storing vaccine and the challenge of administering vaccine within the recommended timeframes. **The decision to administer varicella vaccine prophylactically should be made in consultation with the Regional/Central office.**

INDICATION

Post-exposure prophylaxis with varicella vaccine can be considered for the following groups of susceptible contacts, since vaccination may prevent varicella or reduce disease severity:

- Susceptible HIV-infected contacts with CD4 of 200–1000 cells/µL (see **CONTRAINDICATIONS** below).
- In the context of a varicella outbreak with multiple generations of cases, varicella vaccine may be indicated as an outbreak containment measure—even if more than 5 days have passed since exposure—to prevent future generations of varicella cases.

CONTRAINDICATIONS

Varicella vaccine is a live vaccine and should **NOT** be administered to pregnant women or HIV-infected persons with CD4 <200 cells/μL.

IMPORTANT NOTE: Screening for HIV infection and pregnancy is necessary prior to vaccine administration if clinical status is unknown.

ADMINISTRATION, DOSING, AND TIMING

- The vaccine should be administered within 3 days and ordinarily no more than 5 days after varicella exposure to be maximally effective. Administration after 5 days exposure may be indicated because it will help provide protection against future exposures (if the current exposure does not cause infection).
- Varicella vaccine should be administered in accordance with the manufacturer's instructions after informing the inmate of the vaccine's benefits and risks. The varicella vaccine (VARIVAX®) is administered subcutaneously to adults in a 0.5 mL dose, repeated at the same dose 4 to 8 weeks later.

STORAGE

Varicella vaccine must be stored in a frost-free freezer with an average temperature of -15^{o}C (5^{o}F) or colder. The vaccine is reconstituted at room temperature with a diluent and must then be administered within 30 minutes.

PRECAUTIONS

- Varicella vaccine should not be administered concurrently with VariZIG or other immunoglobulins.
- Vaccinated persons may develop a rash that is potentially contagious. They should be monitored closely following vaccination and should be restricted from close contact with individuals who are pregnant or immunocompromised.
- If vaccinated inmates develop a rash, they should be isolated in either an airborne infection isolation room (AII) or in a single room, as if they had wild-type varicella, until the lesions have crusted.

APPENDIX 5. VARICELLA ZOSTER IMMUNOGLOBULIN (VARIZIG®) PROPHYLAXIS

VariZIG, a purified human immune globulin made from plasma containing high levels of anti-varicella antibodies, has recently become commercially available. **Consult with Regional/Central Office prior to prescribing VariZIG.**

INDICATION

The CDC recommends VariZIG for individuals who have been exposed to a case of varicella, *and* who are at high risk for severe disease and complications *and* are IgG negative. These individuals include:

- Immunocompromised patients (with primary or acquired immunodeficiency—including HIV with CD4 <200 cells/μL), patients with neoplastic diseases, and patients receiving immunosuppressive treatments)
- Pregnant women

  NOTE: *In pregnant women, VariZIG does not prevent congenital varicella syndrome or neonatal varicella, but limits the potentially severe complications of chickenpox in the mother.*

ADMINISTRATION, DOSING, AND TIMING

- VariZIG should be administered intramuscularly as soon as possible after exposure to the varicella-zoster virus, within 96 hours (4 days) for greatest effectiveness, and at most within 10 days of exposure.
- VariZIG is supplied in 125-U vials. The recommended dose is 125 units/10 kg (maximum: 625 units).
- In situations where administration of VariZIG is not possible within 10 days, an alternative is immune globulin intravenous (IGIV), dosed at 400 mg/kg and administered once. Consult the Office of the Chief Pharmacist prior to administering IGIV.
- For high-risk patients who have additional exposures to varicella-zoster virus three weeks or more after initial VariZIG administration, another dose of VariZIG should be considered.

NOTE: Because varicella zoster immune globulin might prolong the incubation period by 7 days, any patient who receives VariZIG should be observed closely for signs and symptoms of varicella for 28 days after exposure. Antiviral therapy should be instituted immediately if signs or symptoms of varicella occur.

APPENDIX 6. INMATE EDUCATION: CHICKENPOX AND SHINGLES

If you have chickenpox or shingles …

- ☑ Take medications as prescribed by your health care provider.
- ☑ Don't scratch! Scratching can make the sores harder to heal or lead to scarring. It could also cause the sores to become infected.
- ☑ Take showers. Cool showers every 3 to 4 hours can calm the itching.
- ☑ Apply calamine or a similar lotion to the rash to help relieve the itching.
- ☑ If itching is particularly severe, over-the-counter or prescribed antihistamines may help. Ask your health care provider.
- ☑ Rest! Getting plenty of rest helps you get over any infection.
- ☑ Eat a bland diet if necessary. If chickenpox sores develop in your mouth, switch to a diet of soft, bland foods. Spicy, acidic, or hard, crunchy foods can irritate mouth sores.
- ☑ Treat a fever. Fever can be reduced with acetaminophen (Tylenol).