Alberta Public Health Disease Management Guidelines

Varicella (Chickenpox)

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Health and Wellness Promotion Branch

Public Health and Compliance Branch

Alberta Health

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Case Definition

Confirmed Case

Clinical illness[A] with laboratory confirmation of infection:

- Detection of VZV DNA by polymerase chain reaction (PCR) in an appropriate clinical specimen[B]

  OR
- Positive serologic test for VZV IgM antibody in the absence of recent immunization[C] with varicella vaccine

  OR
- Seroconversion or significant change between acute and convalescent varicella-zoster IgG titre by any standard serologic assay in the absence of recent administration of any blood product or immunization with varicella vaccine

  OR
- Isolation or direct antigen detection of varicella-zoster virus (VZV) from an appropriate clinical specimen[B]

OR

Clinical illness[A] in a person with an epidemiological link to a laboratory-confirmed case of varicella (chickenpox) or VZV (shingles) infection.

Probable Case

Clinical illness[A] in the absence of laboratory confirmation or epidemiological link to a laboratory- confirmed case.

Confirmed Case – Congenital

Any stillborn or neonate[D] who has clinical evidence[A] of congenital varicella syndrome and:

- History of mother with confirmed or probable primary varicella infection in the first 20 weeks of pregnancy

  OR
- Laboratory confirmation[E] of varicella infection in the absence of maternal confirmation of primary varicella infection in the first 20 weeks of pregnancy.

Confirmed Case – Neonatal

Clinical illness[A] with laboratory confirmation[E] of varicella infection in a neonate[D] whose mother develops varicella rash from five days before to two days after delivery.

[A] See Clinical Presentation.
[B] Appropriate clinical specimens include swab from fresh lesion, CSF or eye fluid aspirate.
[C] Clinical illness less than 14 days and more than 42 days after immunization is significant and if confirmed, is reportable via Notifiable Disease Report (NDR).
[D] A neonate is defined as a newborn up to and including 28 days of age.
[E] See Confirmed Case definition.

Reporting Requirements

Physicians/Health Practitioners and Others

- Varicella disease is **reportable** for all congenital, neonatal or hospitalized cases.
- Physicians, health practitioners and others shall notify the Medical Officer of Health (or designate) of the zone (herein referred to as the Zone MOH), of all **reportable cases** of varicella disease, confirmed or probable, in the prescribed form by mail, fax or electronic transfer within 48 hours (two business days).
- Physicians, health practitioners and others shall also notify the Zone MOH of all susceptible contacts identified for non-hospitalized varicella cases.

Laboratories

All laboratories shall report all positive laboratory results by mail, fax or electronic transfer within 48 hours (two business days) to the:

- Chief Medical Officer of Health (CMOH) (or designate), and
- Zone MOH.

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- The Zone MOH where the case currently resides shall forward the initial Notifiable Disease Report (NDR) of all confirmed and probable cases who are **hospitalized for varicella disease** to the CMOH (or designate) within two weeks of notification and the final NDR (amendment) within four weeks of notification.
- The Zone MOH shall forward the initial *Perinatally Acquired Notifiable Disease Enhanced Report Form* for all cases of **congenital and neonatal varicella** within two weeks of notification and the final form within four weeks of notification.
- For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by phone, fax or electronic transfer within 48 hours (two business days) including:
  - name,
  - date of birth,
  - out-of-province health care number,
  - out-of-province address and phone number,
  - positive laboratory report, and
  - other relevant clinical/epidemiological information.

Epidemiology

Etiology

Varicella Zoster Virus (VZV) is a DNA virus, a member of the *Herpesvirus* family. VZV causes a primary infection of varicella (chickenpox) usually during childhood and latent infection known as Herpes Zoster (shingles).[1,2]

Clinical Presentation

Unimmunized Persons

Chickenpox occurs most commonly in children and may or may not begin with a prodromal period.[1] The prodromal period, when present, occurs one to two days before onset of lesions and may include fever, malaise, headache and anorexia.[3] The lesions appear in successive crops that progress from macules to papules to vesicles and scab over within three to seven days.[2,4] They also tend to develop on the trunk, face and progress to the extremities.[1] Ulcerated lesions may also be present on mucous membranes of the upper respiratory tract and oropharynx, conjunctiva, rectal and vaginal mucosa.[1] Atypical cases of hand-foot-and-mouth disease in children and occasionally adults, caused by an emerging lineage of coxsackievirus (CV)-A16 and enterovirus A71, are sometimes misdiagnosed as chickenpox.[5,6]

After primary infection, the virus remains dormant in the sensory nerve ganglia. Later in life reactivation of varicella virus can occur resulting in herpes zoster (shingles).[7] A syndrome, zoster sine herpete, where there is dermatomal pain but absence of the rash, is an infrequently reported finding.[8]

Immunized Persons (Breakthrough Varicella)

Breakthrough varicella is defined as infection with wild type VZV more than 42 days after varicella vaccine.[2] In general, breakthrough disease is associated with atypical rash (maculopapular with few or no vesicles), significantly reduced number of lesions (< 50 lesions), little or no fever and shorter duration of illness.[2]

Refer to Appendix 1 for comparison of primary varicella, breakthrough varicella and shingles disease.

Complications

Varicella is generally considered a mild disease, but may rarely be associated with severe complications including death.[2,3] Complications may include secondary bacterial and soft tissue infections including necrotizing fasciitis, pneumonitis, bacteremia, otitis media, septic arthritis, osteomyelitis, toxic shock-like syndrome, endocarditis, encephalitis, hepatitis, thrombocytopenia, cerebellar ataxia, and more recently Guillain-Barré syndrome.[9,10] The risk of severe invasive group A streptococcal infection has been estimated at 40–60 times higher among previously healthy children with varicella.[11] Complications such as pneumonia, encephalitis, and death are more likely to occur in adults, adolescents and immunocompromised individuals.[11]

Congenital Varicella Syndrome

Congenital varicella syndrome (characteristic scarring skin lesion [cicatrix]) often occurs in a dermatomal distribution, hypoplasia of an extremity, skin abnormalities, encephalitis, microcephaly, ocular abnormalities, cognitive impairment and low birth weight) may occur in 0.2–0.4 % of infants following maternal infection with varicella in the first or second trimester.[1,3,11] Children exposed in utero during the second 20 weeks of pregnancy can develop inapparent varicella and subsequent shingles early in life without ever having had extra uterine varicella.[12]

Neonatal Varicella

Maternal varicella disease in the five days before to two days after birth may result in severe neonatal infection and fatality rate as high as 30%.[13]

Diagnosis

Clinical diagnosis of varicella is often made by history and physical examination.[14] For laboratory confirmation, see Table 1: Diagnostic Tests for VZV Infection.

At the Alberta Public Health Laboratories (ProvLab), PCR amplification assay has replaced direct detection of viral antigen by direct fluorescent antigen test (DFA) and isolation of the virus by a modified culture (shell vial) technique. Testing a blood sample (serum separator tube) for VZV IgM and IgG tests is still available.

For more information of specimen collection recommendations refer to the ProvLab Guide to Services.

Table 1: Diagnostic tests for VZV Infection[2,7,12]

Test	Specimen	Comments
Polymerase Chain Reaction (PCR)	• Vesicular swabs or scrapings - Scrapings from maculopapular lesions • Scabs from crusted lesions • Biopsy tissue, CSF	• PCR is an example of Nucleic acid amplification test (NAAT) • Detects VZV DNA and is gold standard • Most sensitive and specific • Can distinguish between wild type and vaccine strain
IgM	• Acute serum specimens for IgM	• Not specific and sensitive. • False positive results can occur due to rheumatoid factor or high IgG levels. • May be detectable in recurrent VZV infection (herpes zoster).
IgG	• Acute and convalescent serum specimens for IgG	• Requires fourfold or greater rise in titres to confirm infection • Immunized individuals may not achieve fourfold rise in convalescent sample making IgG detection an unreliable measure of immunity or protection in this population • Assay may lack sensitivity in those with agammaglobulinemia or who are severely immunocompromised
Viral Culture	• Vesicular fluid • Biopsy specimens from sterile sites (e.g., CSF, joint fluid)	• Requires special media therefore expensive and time consuming • Least sensitive • Not available in Alberta
Direct Fluorescent Antibody (DFA)	• Vesicle scraping • Swab of lesion base (must include cells)	• Second choice • Rapid test • Lower sensitivity than PCR • Not available in Alberta

Treatment

- Supportive therapy as indicated.
- Antiviral therapy may be considered and is usually recommended for individuals at high risk of complications.
- The duration and route of treatment depends on the extent of infection and host factors. Most viral replication has stopped within 72 hours of rash onset in the immunocompetent host.[12]
- Antiviral therapy initiated within 24 hours of rash onset is the most effective.
- In persons under the age of 18 years, avoid the use of acetylsalicylic acid (ASA, Aspirin) because of the association with Reye's syndrome.

Reservoir

Humans.[2]

Transmission

Transmission occurs from person-to person via:

- airborne route i.e. from respiratory secretions or through the inhalation of aerosols from vesicular fluid of skin lesions, OR
- by direct contact with skin lesions from a person infected with varicella or herpes zoster.[1,2]

The attack rate among susceptible household contacts is approximately 61–100%.[2] Vertical transmission during the first 20 weeks of pregnancy can result in congenital varicella syndrome.[1]

Incubation Period

The incubation period is generally 14–16 days but may range from 10 days to three weeks (21 days).[2] This period may be prolonged for as long as 28 days in persons who have received post-exposure treatment (e.g., varicella-zoster immune globulin) as well as in immunocompromised individuals.[1,12]

Period of Communicability

The period of communicability is typically one to two days before the onset of the rash and continues until all lesions are crusted.[11] This generally occurs within a three to seven day period.[2]

Host Susceptibility

In general, individuals of any age who have not had varicella infection or who have not been immunized with age appropriate doses of varicella-containing vaccine are at risk of infection. Infection confers lifelong immunity.[3]

The following individuals are at increased risk of severe varicella disease:

- susceptible pregnant women,
- susceptible immunocompromised persons,
- newborn infants of mothers who develop varicella from five days before until 48 hours after delivery,
- neonates in intensive care settings, regardless of their mothers' evidence of immunity, and
- recipients of hematopoietic stem cell transplantation (HSCT).

Incidence

Varicella occurs worldwide and is mainly a childhood disease in temperate countries without immunization programs. There has been a decrease in the disease burden in Canada since the introduction of childhood varicella immunization programs. However, cases of varicella are significantly under-reported; therefore it is difficult to determine the effect of varicella immunization programs on the incidence of varicella infections.[11,15]

In Alberta, a provincial varicella immunization program targeting infants and youth began in the spring of 2001, and was fully implemented by April 2003. For more information, refer to the Alberta Immunization Policy (AIP).

Hospitalized varicella cases became notifiable in Alberta in 2013. An average of 11 cases are reported each year.[16] Average age of cases is 33 years old (range 0–91 years old, median 29 years old). The majority of cases are unimmunized (> 80%).

Public Health Management

Key Investigation

- Confirm that the client meets the case definition.
- Obtain a history of illness, including symptoms and date of rash onset.
- Determine varicella-specific immunization history including:
  - number of doses,
  - date/location where administered, and
  - if not immunized, reason why.
- Assess for vaccine-modified varicella infection (break through infection).
- Determine possible source of infection, taking into consideration the incubation period:
  - recent immigration or travel during the incubation period,
  - recent contact with others who have recently traveled, or
  - recent contact with a confirmed case of varicella or shingles.
- Determine occupation (i.e., health care workers (HCWs) and/or others who may work with pregnant women).
- Determine pregnancy status of female cases.
- Determine the period of communicability (one to two days before onset of rash until lesions have crusted over).
- Identify contacts that may have had **significant exposure** (see Table 2 for definition)[11,12] to the case during the period of communicability.
- **Susceptible contacts** (see Table 2 for definition) are considered potentially infectious from 8–21 days following exposure to a case (and up to 28 days if they receive VariZig. See post-exposure prophylaxis (PEP) section).

Table 2: Definitions

Significant Exposure	Susceptible Contact[11]	Proof of Immunity[11]
One or more of the following: • continuous household contact (living with the case) • sharing the same hospital room or being indoors with a case for more than an hour • prolonged face-to-face contact (more than five minutes) with a case • direct contact (touching) with lesions or articles soiled with discharges from vesicles of a case	Any person without documented **proof of immunity**. Includes: • newborns of mothers who develop varicella between five days prior to delivery and 48 hours (two days) after delivery, • immunocompromised individuals, • hospitalized patients, especially premature infants, • pregnant women who have never had varicella disease, shingles, or varicella vaccine, and • healthy individuals who have never had varicella disease, shingles, or varicella vaccine.	Any person with **one** of the following: • written documentation of receipt of two doses of a varicella containing vaccine, • laboratory evidence of immunity, • laboratory-confirmed varicella infection in the past, • physician-diagnosed shingles disease, or • self-reported history or physician-diagnosed varicella disease prior to routine immunization in Alberta, January 2001*

* For start dates of other Canadian jurisdictions, see the National Advisory Committee on Immunization Varicella Proof of Immunity - 2015 Update.

Management of a Case

NOTE: Individuals with congenital varicella syndrome (CVS) are not communicable, and there is no public health follow-up for cases or their contacts.

- It is recommended that cases avoid attending school or work until lesions have crusted over.
- The MOH may exclude cases from activities where all other persons attending that activity have not previously been exposed (e.g., weekly club or dance class).
- In circumstances when an immunocompromised individual is present in the facility, it is recommended the immunocompromised individual should be excluded (not the case) and referred to their physician.[F]
- **Air travel** is **not** recommended until lesions have crusted over, due to the recirculation of cabin air. However, if inadvertent exposure occurs during air travel, there is no requirement for public health follow-up of contacts.
- **Swimming** in public pools is **not** recommended until lesions have healed and crusts are no longer present to avoid exposing individuals not previously exposed.
- Airborne and **contact** precautions, in addition to routine practices, are recommended for hospitalized patients.
- Any individual with varicella lesions should not enter a hospital setting until all lesions have crusted over. This includes visitors and health care workers.
- Outpatients and day-surgery patients should be advised to notify site-specific hospital staff if they develop varicella and should be rescheduled to come to hospital when their lesions have crusted over.
- Site-specific hospital Infection Prevention and Control (IPC) staff should be notified if a patient develops a varicella rash within 48 hours of leaving the hospital.
- **Health Care Workers (HCW)[G]** that are infected with varicella should notify their site-specific Occupational Health and Safety (OHS) designate.

Management of Contacts

NOTE: Individuals with CVS are not communicable and there is no public health follow-up for cases or their contacts.

Non Health Care Workers

- Assess disease history or serological evidence of disease, including shingles disease.
- Assess vaccine history.
- Assess for eligibility of PEP.
- Susceptible household contacts of confirmed and probable cases should avoid contact with the following individuals for the duration of their incubation period:
  - immunocompromised ,
  - susceptible pregnant women (particularly those in the third trimester),
  - hospitalized premature infants, and
  - infants born to susceptible mothers.
- Susceptible household contacts should also be advised to avoid airline travel for 8–21 days from the date of exposure.
- There is no requirement for public health follow-up of contacts exposed to a case while traveling by airline.

[F] Rationale: other individuals in the facility may be incubating varicella, creating further potential exposures. This decision is made on a case-by-case basis by the MOH.

[G] HCW includes the following.

- all health practitioners (as defined in the Alberta Public Health Act, “any person who provides health care or treatment to any person”); and
- all individuals at increased risk for exposure to, and/or transmission of, a communicable disease because they work, study, or volunteer, in one or more of the following health care environments:
  - hospital,
  - nursing home, supportive living accommodation, or home care setting,
  - mental health facility,
  - community setting,
  - office or clinic of a health practitioner, and
  - clinical laboratory.

Health Care Workers

- Susceptible HCWs in acute care and community settings who have ***unprotected exposure*** to confirmed or probable chickenpox or disseminated varicella zoster (shingles) cases may be excluded from day eight after first exposure to day 21 after last exposure. The date of last exposure is counted as day 0. See Appendix 2 for more detailed information.

Unprotected Exposure Definition

- Face-to-face contact with a case for five (5) minutes or more, without wearing appropriate Personal Protective Equipment (PPE).
- Being in the same room/airspace with a case for one (1) hour or more (cumulative), without wearing appropriate PPE.
- Touching the lesions or articles freshly soiled by discharges from vesicles of a case without wearing appropriate PPE.

Post-Exposure Prophylaxis (PEP)

Vaccine

- Varicella vaccine is effective in preventing or reducing the severity of disease if given to susceptible individuals within 72 hours and no longer than five days after exposure.
- Refer to the AIP for current recommendations for post exposure immunization.

Varicella-Zoster Immune Globulin

- Varicella-zoster immune globulin (VariZIG) may be considered for susceptible contacts with significant exposure who are at high risk for severe disease and who have contraindications for post-exposure varicella vaccine. Consultation with an Infectious Disease Specialist is recommended. Refer to the AIP for more information.

Prenatal Screening

- Pregnant women with a history of varicella disease or immunization do not require serological testing for varicella immunity. If disease/immunization history is uncertain, specimens should be collected. Laboratory tests currently available are not sensitive enough to detect vaccine-induced immunity.
- Pregnant women with negative or indeterminate serology for varicella should be assessed and, if eligible, be offered varicella vaccine as per the AIP.

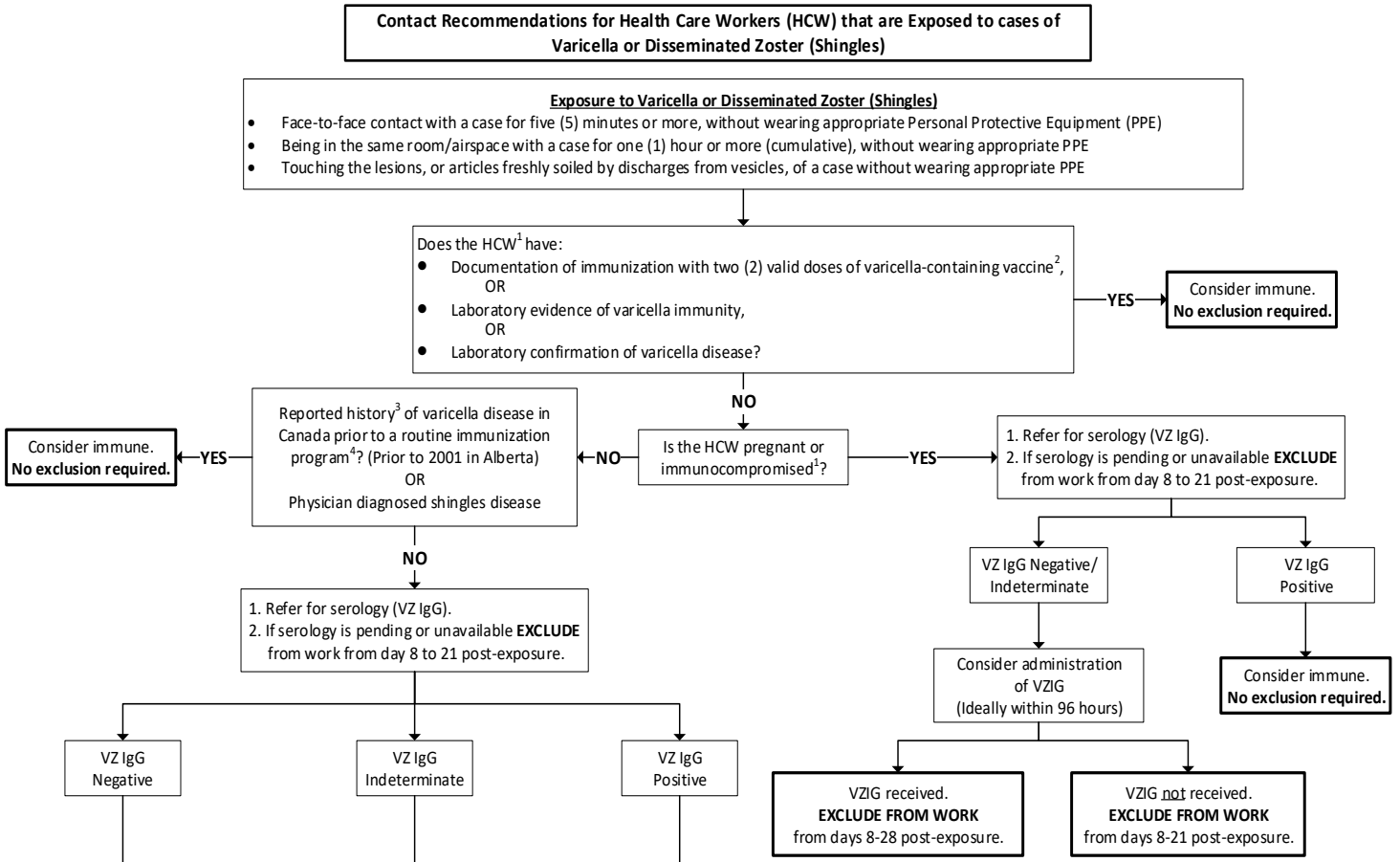
Preventative Measures

- Educate the public about the risks of varicella infection.
- Promote routine immunization against varicella. Refer to the AIP for current immunization recommendations.
- Educate the public on how to prevent transmission of varicella (chickenpox) including:
  - practicing good hand hygiene and respiratory etiquette,
  - avoiding sharing drinks or any other items used on the nose or mouth, and
  - cleaning frequently-touched household surfaces.
- HCWs should demonstrate proof of immunity upon hire.
  - proof of immunity includes history of disease or serological evidence of disease or documented age-appropriate doses of varicella vaccine.
- Advise susceptible pregnant women to:
  - avoid individuals with varicella, and
  - report any contact with a case to their physician immediately.

Appendix 1: Comparison of Varicella, Breakthrough Varicella and Shingles

Refs [1,2,12,13]	Varicella (Chickenpox)	Breakthrough Varicella	Shingles (Herpes Zoster)
Definition	Primary infection with VZV (chickenpox)	Usually a mild Infection with wild-type VZV occurring > 42 days after varicella immunization[18]	Herpes Zoster (shingles) develops after reactivation of latent VZV after a primary episode of varicella (chickenpox)
Clinical Manifestations	• Presents as rash, malaise and low grade fever • Fever, malaise and upper respiratory tract infection may precede rash by 1 or 2 days[1,14] • Rash is generalized, pruritic (itchy), vesicular (fluid-filled) and typically consists of 200–500 lesions • Lesions tend to develop on the trunk and face, progressing to extremities[1] • Ulcerated lesions may be present on mucous membranes (e.g., mouth, throat, conjunctiva, rectum and vagina).	• A mild illness of shorter duration with usually < 50 lesions • Rash is usually maculopapular rather than vesicular • Systemic symptoms such as fever occur less frequently[1,18]	• Painful vesicular rash with pain and itching • Rash is distributed along one to three sensory dermatomes • Shingles may disseminate to other regions of the skin and to visceral organs, especially in immunocompromised patients
Complications	• Secondary bacterial infections mainly caused by group A Streptococcus resulting in cellulitis, necrotizing fasciitis, septicemia, and toxic shock syndrome • Pneumonia • Encephalitis, • Cerebellar ataxia • Reye syndrome • Death	N/A	• Postherpetic neuralgia (PHN) is the most common complication. It is prolonged neurogenic pain that lasts for more than 90 days from the onset of rash • Disseminated infection involving visceral organs may occur in immunocompromised individuals
Transmission	• Person-to-person by direct contact, droplet or airborne spread of vesicle fluid or secretions of the respiratory tract of cases. • Indirectly by touching articles soiled by discharges from vesicles and mucous membranes of cases.	• Person-to-person by direct contact, droplet or airborne spread of vesicle fluid or secretions of the respiratory tract of cases	• The fluid in shingles vesicles contains VZV but is much less contagious than varicella.(pathogen data) • Direct contact with fluid in vesicle causes varicella (not shingles) in susceptible persons
Incubation Period	10–21 days (commonly 14 to 16 days)	10–21 days (commonly 14 to 16 days)	VZV remains latent for a few to many years and then reactivates
Period of Communicability	Typically 1–2 days before the onset of the rash and until all lesions are crusted	Typically one to two days before the onset of the rash and until all lesions are crusted	While active lesions (usually 7–10 days) until all lesions are crusted over[2,17]
Host Susceptibility/ Risk Factors	• Infants • Adolescents • Adults • Pregnant women • Immunocompromised individuals		• Older adults (over 50 years of age) • Immunocompromised individuals • Children with history of intrauterine varicella or varicella in first year of life[2]
Incidence	In countries without immunization programs, varicella mainly develops in 50% of children by age five years and 90% by age of 12 years. In the pre-vaccine era, approximately 350,000 varicella cases and 1,500 to 2,000 varicella-related hospitalizations occurred each year in Canada. Since the introduction of immunization programs in Canada, there has been a decrease in the burden of varicella.[11]	The rate of breakthrough varicella disease following one dose of univalent varicella vaccine has been estimated at 7.2% over a 10 year follow-up period.[11]	Lifetime risk of HZ is estimated to be 30% in the general population. Approximately 130,000 new cases of HZ, 17,000 cases of PHN and 20 deaths occur in Canada per year.[19]

Appendix 2: Management of HCW Contacts



[1] For HCWs who are HSCT recipients, refer to Alberta Health's HSCT Immunization Guidelines for further details about susceptibility.
[2] Zostavax® may be considered a valid first dose in a 2-dose varicella vaccine series on a case-by-case basis. Shingrix® doses cannot be counted in a varicella vaccine series.
[3] History of varicella disease may be self-reported or physician-reported.
[4] For start dates in other Canadian jurisdictions see the NACI Varicella Proof of Immunity – 2015 Update.
[5] Ideally vaccine should be given within 3-5 days to potentially attenuate or prevent disease.
[6] The second dose of varicella vaccine is recommended.

Revised October 31, 2018

Appendix 3: Revision History

Revision Date	Document Section	Description of Revision
December 2019	General	Updated to new guideline template. References updated throughout.
	Case definition	Updated to include Congenital and neonatal varicella
	Reporting Requirements	Updated including reporting of congenital and neonatal cases
	Epidemiology/Public Health Management	Entire section revised
	Management of Contacts	Revised. Divided into 2 sections: Management of Non-HCW Contacts and Management of HCW Contacts
	Post-Exposure prophylaxis (PEP of Contacts	New section added and divided into recommendations for use of Vaccine and VariZig
	Prenatal Screening	New section added
	Annex A	Previous Annex A removed. However, relevant information has been included in diagnosis section.
		The new Annex A is a table-Comparison of Varicella (Chickenpox), Breakthrough Varicella and Shingles (Herpes Zoster)
	Annex B	Changed to an algorithm on the management of contacts who are HCW
September 2021	General	• Updated Template • Diagnosis and Treatment section moved to Epidemiology • Updated web links
	Key Investigation	• Put all definitions in table 2
	Management of a Case	• Moved definition of HCW to footnote (same as was done in Rubella guideline)

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