

Newfoundland and Labrador Immunization Manual	
Section 8	Immunization for Special Populations

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8.1 Immunization Post Bone Marrow Transplant/Stem Cell Transplant

Policy

Allogenic and autologous bone marrow transplant (BMT) or stem cell transplant (SCT) recipients frequently lose specific protective immunity to diseases preventable by routine immunizations, therefore re-immunization may be necessary. This is organized by the oncology clinic and public health nurses may be requested to participate in immunization. Recipients of a bone marrow transplant (BMT) or stem cell transplant (SCT) are to receive immunizations as outlined in this policy. If there is a noted discrepancy between the schedule outlined in this manual and the schedule provided by the facility where the transplant was received, consultation with a Medical Officer of Health (MOH) is recommended.

Procedure

1. The Oncology Nurse Coordinator/designate will provide oral and written information on immunization to the patient/parents/family. (Fact Sheet – *Appendix A*). A record will be provided for the documentation of the vaccines. **There is a schedule for children under 7 years and one for children ≥ 7 years including Adults.**
2. The Oncology Nurse Coordinator/designate will notify the regional Communicable Disease Control Coordinator of the required vaccinations utilizing the Request for Immunization Post Bone Marrow/Stem Cell Transplant Form (*Appendix B* or *Appendix C*).
3. Multiple vaccines can be given at each visit.
4. Live vaccines **must not** be administered if evidence of graft versus host disease (GVHD) or continued immunosuppression is present.
5. Live vaccines must be given at the same time or at a minimum of 28 days apart. The public health nurse is to contact the Oncology Nurse coordinator/designate to verify that the live vaccines are ordered by the Haematologist/Oncologist.
6. If there has been a change in the recipient's health status since last immunization clinic appointment please confirm the client's eligibility to continue with the scheduled vaccines by contacting the Oncology Nurse Coordinator/designate.
7. Varicella vaccine recipients should avoid the use of salicylates for 6 weeks after vaccination.
8. Please refer to the Canadian Immunization Guide and the Provincial Immunization Manual for specific information on vaccines and their administration.

9. The attached guidelines and appendix B and C have been developed to assist the immunizer with the scheduling of the immunizations. The decision when to commence the program is done by oncology/transplant specialist or designate.
10. Guidelines for inactivated vaccines post-transplant:

a) Influenza vaccine (Inf)

- Can commence at 6 months post-transplant
- Given yearly in the fall prior to the influenza season
- Children less than 9 years receiving the vaccine for the first time require two doses one month apart

b) Routine immunizations

Children less than 7 years

- Diphtheria toxoid, tetanus toxoid, acellular pertussis, inactivated polio and *Haemophilus influenza* (**DTaP-IPV-Hib**).
- Three doses should be given to all clients
 - Can commence at 6 -12 months post-transplant
 - Give at 12 months, 14 months, and 20 months post-transplant for convenience of scheduling

Children greater than or equal to 7 years <18 years

- Tetanus toxoid, diphtheria toxoid and acellular pertussis (**Tdap**)
- Three doses should be given to all clients
 - Can commence at 6 -12 months post-transplant
 - Give at 12 months 14 months, and 20 months post-transplant for convenience of scheduling
- *Haemophilus influenzae* type b conjugate vaccine (**Hib**)
- Three doses should be given to all clients
 - Can commence at 6 -12 months post-transplant
 - Give at 12 months, 14 months and 20 months post-transplant for convenience of scheduling
- Inactivated polio vaccine (**IPV**)
- Three doses should be given to all clients
 - Can commence at 6-12 months post-transplant
 - Give at 12 months, 14 months and 20 months post-transplant for convenience of scheduling

Adults ≥ 18 years

- Tetanus toxoid, diphtheria toxoid and acellular pertussis (**Tdap**) (**Td**)
 - Can commence at 6-12 months post-transplant
 - Give one dose Tdap at 12months

- Give 2 doses of Tdap (Td if available) at 14 months and 20 months
- *Haemophilus influenzae* type b conjugate vaccine (**Hib**)
- Three doses should be given to all clients
 - Can commence at 6-12 months post-transplant
 - Give 3 doses at 12 months, 14 months and 20 months post-transplant for convenience of scheduling
- Inactivated polio vaccine (**IPV**)
 - Three doses should be given to all clients
 - Can commence at 6 -12 months post-transplant
 - Give at 12 months, 14 months and 20 months post-transplant for convenience of scheduling

c) **Pneumococcal vaccine**

- Pneumococcal conjugate vaccine (**Pneu-C-13**)
- Three doses should be given to all clients
 - Can commence at 3-6 months post-transplant
 - Regardless of age pneumococcal conjugate vaccine 3 doses of Pneu-C-13, 4 weeks apart.
 - Give at 6 months, 7 months and 8 months post-transplant for convenience of scheduling
- Pneumococcal polysaccharide vaccine (**Pneu-P-23**)
 - All transplant patients give 6 months after last dose of Pneu-C- 13 or when recipient reaches age 2.
 - A single re-immunization with pneumococcal polysaccharide 23 is recommended:
 - 1 year after the initial dose of the vaccine.

d) **Meningococcal vaccine**

Children greater than 12 months of age to 10 years of age

- Meningococcal C conjugate vaccine (**Men- C-C**)
 - Can commence 6-12 months post-transplant
 - Give 1 dose 12 months post-transplant for convenience of scheduling.
- Meningococcal quadrivalent conjugate vaccine (**Men-C- ACYW135**)
 - Give 1 dose to when child is in grade 4 with school program (8 weeks from Men-C-C)

Children 11 years to Adults

- Meningococcal quadrivalent conjugate vaccine (Men-C- ACYW135)
- 1 dose 12 months post-transplant

e) Hepatitis B vaccine (HB)

- Three doses should be given to all patients
 - Can commence at 6-12 months post-transplant
 - Give at 12 months, 14 months and 20 months post-transplant for convenience of scheduling
 - Administer double dose µg that is recommended for age at time of administration

11. Guidelines for Live Vaccines Post Transplant

a) Measles, mumps and rubella Vaccine (MMR)

- This is a live vaccine which **must not** be given before 24 months post-transplant
- Recipient must be deemed immunocompetent by specialist
- No GVHD present
- Give 2 doses of MMR 3 months apart.
- Serology recommended after 2nd dose.

b) Varicella vaccine

- This is a live vaccine which **must not** be given before 24 months post-transplant
- Recipient must be deemed immunocompetent by specialist
- No GVHD present
- Administer 2 doses of Varicella.
- Serology recommended after 2nd dose.

c) Other live vaccines

- Bacille-Calmette Guerin, Yellow Fever, Oral Typhoid Vaccine, MMRV are **contraindicated**.

12. Recommendations for all household contacts of immunosuppressed patients

- Annual influenza vaccine
- Non-immune household contact should be immunized against measles, mumps, rubella and varicella
- IPV and hepatitis A vaccine should be administered if there is an outbreak

References

British Columbia Centre for Disease Control (2010) Communicable Disease Control Immunization Programs. Section III-Immunization of Special Populations.

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Appendix A



IMMUNIZATIONS AFTER BONE MARROW/STEM CELL TRANSPLANT FACT SHEET

Why more immunizations are needed

Most patients who have had a bone marrow or stem cell transplant lose the immunity they had from previous vaccinations and some childhood diseases. Also because the immune system is suppressed after the transplant, a person is at a higher risk for infections. To gain protection from these illnesses it is important to get re-immunized according to a set recommended schedule.

Keeping track of the immunizations

A record will indicate when the immunizations are due. It is important to get the immunizations on time and to have them recorded on the immunization card by the Community Health Nurse. It is necessary to bring the card to the doctor's office for review at follow-up appointments.

Getting the vaccines

The Haematology/Oncology Team will inform the Community Health Nurse in your area of the vaccine requirements. You can contact the Community Health Nurse and set up an appointment for the immunizations. The nurse will record the vaccines on the card and will also maintain a record in the office.

The following immunizations are recommended:

- a) Influenza Vaccine (Flu vaccine "Flu Shot")
The influenza viruses usually are the main cause of serious respiratory disease each year. The vaccine helps prevent chest infections and should be administered prior to the start of the influenza season. All household contacts who are over the age of six months should also receive this vaccine.
- b) Routine Immunizations
In early childhood, children receive protection against diphtheria, tetanus, polio, pertussis and *Haemophilus influenzae* type b diseases. These vaccines should be re-administered post-transplant and can be started at 6-12 months post-transplant.
- c) Pneumococcal Vaccine
Pneumococcal bacteria can cause infections such as pneumonia, bloodstream infections and meningitis. This vaccine should be started at 3-6 months post-transplant.
- d) Meningococcal Conjugate Vaccine
This vaccine prevents invasive infections such as meningitis and bloodstream infections. This vaccine can be started at 6-12 months post-transplant.

e) Hepatitis B Vaccine

This vaccine prevents blood borne infections from Hepatitis. It can be administered at 6-12 months post-transplant. It is a three-dose vaccine given at 12 months, 14 months and 20 months post-transplant.

f) Live Vaccines

Measles, mumps, and rubella (MMR) and Varicella vaccine **should not** be given before 24 months post-transplant. **PHN must consult with the pediatric or adult nurse transplant consultant to verify your health status and eligibility to receive a live vaccine.**

Measles is a viral infection that can produce encephalitis and which is fatal in 1/3,000 cases. Spread by contact with nasopharyngeal secretions.

Mumps is a viral infection that can lead to orchitis, deafness, and meningitis. Spread by contact with nasopharyngeal secretions and saliva.

Rubella is a viral infection that produces mild disease; it is teratogenic if contracted by mother during first trimester of pregnancy. Spread via contact with nasopharyngeal secretions and saliva.

Varicella (chickenpox) is a viral infection that causes an itchy rash that blisters. Chickenpox can cause serious illnesses in children; such as encephalitis and pneumonia. Chickenpox is spread by contact with blisters or from secretions from the nose or mouth.

If you require more information about immunizations, please contact the Community Health Nurse in your area.

Appendix B

Worksheet for Immunization Post Bone Marrow/Stem cell transplant for children less than 7 years

Client's name: _____ Age: _____ DOB: _____
 Parent's name: _____ School: _____ MCP: _____
 Address: _____ ☎: _____
 Date of BMT/SCT: _____ Type: _____
 Start Date: _____ Physicians signature: _____

Prior to giving live vaccines CHN must consult with Transplant Nurse Consultant to verify client's eligibility status.

Contact Numbers: Pediatric oncology/transplant Nurse Consultant: **777- 4668**

Adult Oncology/transplant Nurse Consultant: **777- 7361**

Please complete this sheet and fax to the CDCN Coordinator. Thank you

# of month post-transplant	Vaccine/s	Date	Signature	Next Dose Date
6 months	Pneu-C-13 ¹			
	Inf (yearly) ³			
7 months	Pneu-C-13 ¹			
8 months	Pneu-C-13 ¹			
12 months	DTaP-IPV-Hib ²			
	Men-C-C ⁴			
	HB ⁵			
14 months	Pneu-P -23 ¹			
	HB ⁵			
	DTaP-IPV-Hib ²			
20 months	DTaP-IPV-Hib ²			
	HB ⁵			
24 months	MMR ⁶			
	Var ⁷			
27 months	MMR ⁶			
	Var ⁷			
	Pneu-P -23 ¹			
Footnotes				
1. Pneumococcal conjugate vaccine (Pneu-C-13) give 3 doses 4weeks apart. Pneumococcal polysaccharide (Pneu-P-23) vaccine should be given 6 months after 3rd Pneu-C-13 or when child reaches age 2. Booster dose of Pneu-P-23 1 year after initial dose.		2. Diphtheria toxoid, tetanus toxoid, acellular pertussis (DTaP) inactivated polio (IPV), Haemophilus influenzae type b (Hib).		4. Meningococcal conjugate vaccine Men-C-C, child will receive meningococcal quadrivalent Men-C-ACYW135 with school program in grade four.
		3. Influenza children < than 9 years old receiving the Inf vaccine for the first time require 2 doses one month apart		
5. Administer double µg dose for healthy child of same age for hepatitis B vaccine.		6. Measles ,Mumps and rubella (MMR) vaccine: CHN must consult with Transplant Nurse Consultant to verify client's eligibility status prior to administering live vaccine.		7. Varicella (Var) CHN must consult with Transplant Nurse Consultant to verify client's eligibility status prior to administering live vaccine.

Appendix C

Worksheet for Immunization Post Bone Marrow/Stem Cell Transplant for Children ≥ 7 Years and Adults

Client's name: _____ Age: _____ DOB: _____
 Parent's name: _____ School: _____ MCP: _____
 Address: _____ ☎: _____
 Date of BMT/SCT: _____ Type: _____
 Start Date: _____ Physicians signature: _____

prior to giving live vaccines CHN must consult with Transplant Nurse Consultant to verify client's eligibility status.

Contact Numbers: Pediatric oncology/Transplant Nurse Consultant: **777- 4668**

Adult Oncology/Transplant Nurse Consultant: **777- 7361**

Please complete this sheet and fax to the CDCN Coordinator. Thank you

Commence Date	Vaccine/s	Date	Signature	Date of next dose
6 months	Pneu-C-13 ¹			
	Inf (yearly) ²			
7 months	Pneu-C-13 ¹			
8 months	Pneu-C-13 ¹			
12 months	Hib ³			
	HB ⁴			
	Men-C-C (<10 yrs/prior to grade 4) or Men-C-ACYW135 ⁵ (>11 yrs/grade 4 or later)			
	Tdap-IPV (Td-IPV if available)			
14 months	Tdap-IPV (Td-IPV if available)			
	Hib ³			
	HB ⁴			
	Pneu-P -23 ¹			
18 months	HB ⁴			
20months	Hib ³			
	Tdap-IPV (Td-IPV if available)			
24 months	MMR ⁶			
	Var ⁷			
27 months	MMR ⁶			
	Var ⁷			
	Pneu-P-23 ¹			

Footnotes

1. Pneumococcal conjugate vaccine (Pneu-C-13) Give 3 doses 4 weeks apart. Pneumococcal polysaccharides (Pneu-P-23) vaccine should be given 6 months after 3rd Pneu-C-13 or when child reaches age 2. Booster dose of Pneu-P-23 give 1 year after initial dose.

2. Influenza children < than 9 years old receiving the Inf vaccine for the first time require 2 doses one month apart

3. Haemophilus influenzae type b vaccine (Hib) 3 doses at separated by minimum of 4 weeks.

4. Administer **double the µg dose** for healthy child of same age up to & including age 19. Those 20 years and older give 40 µg (adult formulation).

5. Meningococcal conjugate vaccine Men-C-C one dose age 10 years and under followed by Men C-ACYW135 when child is in grade 4. Individuals age 11 and older receive one dose of Men C-ACYW135.

6. Measles, Mumps and rubella (MMR) CHN must consult with Transplant Nurse Consultant to verify client's eligibility status prior to administering live vaccine.

7. Varicella (Var) CHN must consult with Transplant Nurse Consultant to verify client's eligibility status prior to administering live vaccine.

Note: HPV vaccine may be added to schedule but eligibility is defined by birth year and sex.

8.2 Immunization of Asplenic Population

Background

The spleen is the organ that forms part of the hemo-lympatic system. It plays an important role in regulating immunity, particularly for encapsulated bacteria such as *Neisseria meningitidis*, *Haemophilus influenzae* type b and *Streptococcus pneumoniae*. Asplenia may be anatomic or functional in nature. The asplenia patient is at risk for developing infections from encapsulated bacteria some of which are vaccine preventable. Individuals undergoing elective and/or emergency splenectomy, as are those whose asplenic condition is congenital or functional in nature are eligible for vaccines to decrease the risk of infection.

Definitions

Asplenia: is the absence of the normal function of the spleen. The condition may be, functional, congenital or the result of surgical removal.

Anatomic asplenia surgical removal or congenital absence of the spleen

Congenital asplenia: (rare) may be due to a genetic disorder and can include absent or defective splenic function

Functional asplenia: occurs when splenic tissue is present but does not work well, e.g., sickle-cell disease, polysplenia; such patients are managed as if asplenic.

Surgical asplenia: Surgical removal of the spleen (splenectomy) which may be elective or an emergency

Guidelines for all Asplenic Patients

The attending physician will:

- Advise the patient/parent/family of the vaccine requirements
- Provide oral and written information on the required vaccines
- Refer the patient/parent /family to the Public Health Nurse for Immunization

Congenital asplenia

Vaccine schedule to be initiated at two months even if infant hospitalized vaccination is to be started as per appropriate schedule.

Functional asplenia

Those who have been diagnosed with functional asplenia should be immunized as soon as their condition is identified.

Surgical asplenia

If elective splenectomy, the vaccines should be given 2 weeks prior to the removal of the spleen. If an emergency splenectomy the vaccines should be given two weeks after the surgery. If hospital discharge is delayed then the vaccines can be given before discharge or as soon as the patient is stable.

The Public Health Nurse will:

- Review the immunization status of the patient and update as per schedule or recommendations for age.
- Multiple vaccines can be given at each visit.

Guidelines for Vaccines

All routine vaccines should be administered according to the recommended immunization schedule for the individual's age, if **not** previously immunized. If the asplenic individual is up-to-date with routine vaccinations there is no need to re-immunize. Unimmunized individuals who have had a splenectomy in the past or who have functional asplenia should be immunized as soon as their condition is identified.

Recommended vaccines for those with anatomic or functional asplenia	
All routine immunizations	Immunize according to routine schedule
Hib vaccine	All individuals greater than 5 years of age require one dose regardless of immunization history
Meningococcal vaccine	Meningococcal quadrivalent conjugate vaccine for those ≥ 2 months of age. Reinforcement doses(s) recommended
Pneumococcal vaccine	Conjugate and/ or polysaccharide vaccine depending on age
Influenza vaccine	Immunize yearly (all those ≥ 6 months of age)

(1) *Haemophilus influenzae* type b (Hib) vaccine:

Children less than 5 years

- Vaccinate with age appropriate primary series
- Primary series 2, 4, 6 & 18 months

Children greater than and equal to 5 years – adults

- Give one dose of Hib

(2) *Meningococcal Vaccine*

Children age 2 months to 11 months

- Men-C–ACYW135-CRM 2 or 3 doses given 8 weeks apart.
- 3rd or 4th dose at 12-23 months
- Revaccination**

Children 12 to 23 months

- 2 doses of Men-C-ACYW135-CRM at least 8 weeks apart
- Revaccination**

Children age 24 months to Adult

- If not previously vaccinated with Men –C-ACYW135 give 2 doses administered 8 weeks apart
- Revaccination **

**** Revaccination with Men-C-ACYW-135**

A booster dose should be given every 3 to 5 years if vaccinated at 6 years of age or younger and every 5 years for those vaccinated at 7 years and older.

(3) *Pneumococcal Vaccine***Children and Adults**

Individuals will receive conjugate and/ or polysaccharide vaccine depending on age.

Infants

- Routine immunization with pneumococcal conjugate 13 valent (Pneu-C-13)
- Give at 2, 4, 6 & 12 months
- At 24 months give pneumococcal polysaccharide 23 valent (Pneu-P-23) one dose at least 8 weeks post Pneu –C- 13.

Children 24 months - 59 months

Children not previously vaccinated with pneumococcal vaccine or who have not completed a series

- Pneu-C-13 1 dose
- Pneu-P-23 1 dose at least 8 weeks after Pneu-C-13

Children who have completed pneumococcal series but who have not previously received Pneu-C-13

- Pneu-C-13 1 dose
- If not previously immunized with Pneu-P-23; Pneu-P-23 1 dose ≥ 8 weeks after Pneu-C-13

Adults

- Pneu-C-13 1 dose
- Pneu-P-23 1 dose a minimum of 8 weeks later

Revaccination Pneu-P-23

- Revaccinate once, 5 years after the initial Pneu-P-23 vaccination.

(4) Influenza vaccine

- Immunize yearly all those > than 6 months
- Children less than 9 years receiving influenza vaccine for the first time require two doses one month apart

References

British Columbia Centre for Disease Control (2010) Communicable Disease Control Immunization Programs. Section III-Immunization of Special Populations.

Public Health Agency of Canada. (2006). Canadian Immunization Guide (Seventh Edition).

Public Health Agency of Canada Statement on the use of Pneumococcal Conjugated Vaccines. (November 2010)

Public Health Agency of Canada Supplement Statement on the use of Quadrivalent Conjugated Meningococcal Vaccines. (January 2010)

8.3 Immunization Recommendations for Patients with Chronic Kidney Disease

Background

Patients with chronic kidney disease are at increased risk for infection due to underlying conditions such as diabetes, inadequate calorie and protein intake due to poor appetite and to invasive devices such as dialysis access catheters. Many of these infections are vaccine preventable such as influenza, pneumococcal infection, varicella and hepatitis B. Research has shown that the earlier in the course of kidney disease that patients are vaccinated the more likely they are to obtain an adequate immune response.

Recommendations

1. All patients with chronic kidney disease should have their immunization status reviewed by their physician at the time of the diagnosis. The assessment for hepatitis B immunization for patients requiring dialysis modalities can be done by the Progressive Renal Insufficiency (PRI) staff in consultation with the Communicable Disease Control Nurse (CDCN). Serology will be requested and monitored by the PRI or Dialysis staff. Vaccination, if indicated, can be coordinated by the PRI staff or a referral can be made to the CDCN.

2. The recommended vaccines are included in Table 1:

Table 1: Vaccines for those with chronic kidney disease

Vaccine	Recommendations ¹
All routine vaccines	• Immunize according to routine schedule • Live vaccines should not be given to patients when significant immunosuppression is present
Pneumococcal vaccine	• Conjugate or polysaccharide vaccine depending on the age and risk¹ • A single re-immunization with pneumococcal polysaccharide 23 is recommended 5 years after the initial dose of Pneu-P-23 vaccine.
Influenza vaccine	• Annual vaccine in the fall; household members should also be vaccinated
Varicella vaccine	• Not routinely recommended • Varicella vaccine should be considered for susceptible (as determined by serology) transplant candidates before transplantation because varicella is a significant cause of morbidity and mortality and is contraindicated after transplantation
Hepatitis A vaccine	• Susceptible dialysis patients with “chronic liver disease” should be administered the vaccine
Hepatitis B vaccine	• Discussed in detail in #3.

¹ Refer to the Newfoundland and Labrador Immunization Manual for specific information on immunization requirements available at http://www.health.gov.nl.ca/health/publichealth/cdc/health_pro_info.html#immunization

3. Hepatitis Screening

The first step in the process of evaluating the need for hepatitis B vaccine is screening for previous hepatitis exposure which includes serology for hepatitis A, hepatitis B and hepatitis C. The following serology should be requested:

- Hepatitis A
 - Antibody to hepatitis A virus (Anti-HAV)
- Hepatitis B
 - Hepatitis B surface antigen (HBsAg)
 - Antibody to hepatitis B surface antigen (Anti-HBs) and
 - Antibody to hepatitis B core antigen (Anti-HBc)
- Hepatitis C
 - Antibody to hepatitis C virus (Anti-HCV)

See Appendix A - Table 2 & 3, & 4 for the possible serology results.

4. Hepatitis B Immunization

The hepatitis B serology results, interpretation and vaccination recommendations are provided in Appendix A, Table 3. The dose and schedule for hepatitis B products are provided in Appendix B, Table 5.

1. Patients given the primary series of hepatitis B vaccine should have serology for anti-HBs done one to six month after the final dose of the series.
 - If the anti-HBs ≥ 10 International Units per Liter (IU/L) consider immune
 - If anti-HBs is less than <10 IU/L a second three dose series must be administered and testing for anti-HBs should be done one to six month after the last dose
 - i. If the anti-HBs remains <10 IU/L following the second series, consider the patient a **non-responder**
 - ii. A **non-responder** is a patient who has received the HB vaccine series twice (6 doses) and the anti-HBs remains < 10 IU/L
 - Annual testing for hepatitis B
 - iii. Responders (patients who have mounted a response ≥ 10 IU/L) are tested annually for anti-HBs to ensure continued immunity
 - iv. **Non-responders** should be tested annually (for infection) HBsAg and Anti-HBc

References

1. BC Centre for Disease Control Communicable Disease Control Immunization Program. Section 3: Immunization of Special Populations November 2010. Retrieved May 28, 2013 from http://www.bccdc.ca/NR/rdonlyres/AD481BC8-EBBD-45FF-A085-C797C76C2BCB/0/SectionIII_ImmunizationofSpecialPopulationsFeb2013.pdf
2. Centers for Disease Control and Prevention. (2001). Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients. MMWR, 50, 1-43.
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5. Dinits-Pensy M, Graeme N, Forrest MD, et al. (2005). The use of vaccines in adult patients with renal disease. American Journal of Kidney Diseases, 46(6), 997-1011.
6. Fabrizi F, Vivek D et al. (January, 2011). The impact of diabetes mellitus on the immunological response to hepatitis B virus vaccine in dialysis patients: Meta-analysis of clinical trials. Alimentary Pharmacology & Therapeutics, 1-25.
7. Public Health Agency of Canada. (2013). Canadian Immunization Guide. Retrieved May 28, 2013 from <http://www.phac-aspc.gc.ca/publicat/cig-gci/>
8. Sheth R. (January 1, 2009). "A retrospective cohort study of the duration of hepatitis B vaccine immunity and associated factors in pediatric dialysis patients" (January 1, 2009). *Texas Medical Center Dissertations (via ProQuest)*. Paper AAI1463604. <http://digitalcommons.library.tmc.edu/dissertations/AAI1463604>

Appendix A

Table 2: Baseline serology for hepatitis A

Hepatitis A	Anti-HAV	Interpretation
	NR	- Susceptible; if patient has chronic liver disease, vaccinate - No further testing required
	R	- Immune - No further testing required

Table 3: Serology results for hepatitis B and vaccination protocols

HBs Ag	Anti-HBs IU/L	Anti-HBc	Clinical status	Interpretation	Vaccination Protocol
NR	<10	NR	- No prior history of vaccination - Incomplete vaccination	Susceptible	- Vaccinate with hepatitis B primary series (3 doses) - Test Anti-HBs one to six months after last dose of series
NR	≥ 10	NR	Results after primary series	Immune	Test Anti-HBs annually
NR	< 10	NR	Results after primary series	Susceptible	- Revaccinate with 3 doses of hepatitis B vaccine - Test anti-HBs one – six months after last dose - If anti-HBs remains <10 - No further vaccine - Consider non-responder - Test HBsAg and Anti-HBc annually
NR	≥10	R	Past infection	Immune	- No vaccination - Refer for medical evaluation - Testing as recommended by physician
NR	< 10	NR	Results of annual testing and a previous protective response	May be susceptible	Give one booster dose and retest anti-HBs in one month
NR	<10	R	- Maybe recovering from acute HBV infection - Maybe immune, with a low level of anti-HBs (from past infection) - May be susceptible with false positive anti-HBc - Maybe chronically infected with an undetectable level of HBsAg		- Follow up with Anti-HBe and HBeAg to clarify infection status - Refer for medical evaluation and vaccine recommendations
R	NR	R	Acute hepatitis B infection or Chronic carrier		- No vaccination - Refer for medical evaluation

Table 4: Baseline serology for hepatitis C

Hepatitis C	Anti-HCV	Interpretation
	NR	• Document • No further testing required
	R	• Refer for medical evaluation

Legend:

Acronym	Interpretation
R	Reactive
NR	Non-reactive
<	Less than
≥	Greater than or equal to
Primary hepatitis B series	Three or four doses of hepatitis B vaccine as per recommendations in Appendix B
IU/L	International units per litre

Appendix B

Table 5: Dose and schedule for hepatitis B-containing vaccines for patients with chronic renal failure requiring dialysis.

Recipients	Monovalent hepatitis B			
	Recombivax HB®		Engerix®	
	Dose	Schedule Months: 1 st dose=month 0	Dose	Schedule Months: 1 st dose=month 0
Dialysis and chronic renal failure under 16 years of age	Double the microgram (µg) dose for healthy child of same age	3 or 4 dose schedule	Double the µg dose for healthy child of same age	3 or 4 dose schedule
Dialysis and chronic renal failure 16 – 19 years of age	Double the µg dose for healthy child of same age	3 or 4 dose schedule	40 µg	0, 1, 2, 6 months
Dialysis and chronic renal failure, 20 years of age and older	40 µg (adult formulation)	0, 1, and 6 months	40 µg	0, 1, 2, 6 months

8.4 Guideline for the Pre-placement Assessment of Healthcare workers for Communicable Disease

The purpose of this guideline is to provide a comprehensive, consistent provincial approach to the pre-placement assessment of healthcare workers (HCWs) for specific communicable diseases and to provide evidence based recommendations for the immunization of HCWs for vaccine preventable diseases.

These recommendations are intended to minimize the risk of occupationally acquired communicable diseases to the HCWs and the HCWs' families, to protect patients and other staff from exposure to infected workers, and to sustain the work force during outbreaks of communicable diseases. Healthcare workers are at risk of exposure to and possible transmission of vaccine preventable disease because of their contact with patients or infective materials from patients. Additionally, patients, residents and other HCWs may be placed at risk if healthcare workers are not adequately assessed and immunized against vaccine preventable diseases. Maintenance of immunity against vaccine-preventable diseases is identified as an integral part of the infection prevention Occupational Health (OH) Program in the Regional Health Authorities.

All routine vaccines and vaccines for high risk individuals are the responsibility of the employee or employers. As an employer, government provides these vaccines for their employees. In private industry the employer or employee is responsible for any costs related to immunization programs.

This guideline was originally developed by the Department of Health & Community Services, Communicable Disease Control Division, in collaboration with a provincial ad hoc committee with representatives from the Medical Officers of Health, Infection Control, Communicable Disease Control, Occupational Health and the Public Health Laboratory. It will be updated by the Communicable Disease Control Division to reflect changes in immunization recommendations.

Definitions

Bacille Calmette-Guerin (BCG) - A vaccine used to prevent *Mycobacterium tuberculosis* in infants and young children. It is mainly used in countries with a high prevalence of TB.

Droplet Precautions - Precautions required when the infectious organism is transmitted through large droplets from the infected person during coughing or sneezing. More information on Droplet Precautions is available in the Public Health Agency Guideline (2013).

Exposure – The state of being exposed to an infectious agent. It can occur via contact exposure such as when the infectious agent is transferred through physical contact between an infected source and a host or through the passive transfer of the infectious agent to a host via an intermediate object.

Exposure prone procedures (EPPs) – Procedures where transmission of HBV, HIV or HCV from a HCW to a patient is more likely to occur and may include the following:

- digital palpation of a needle tip in a body cavity (a hollow space within the body or one of its organs) or the simultaneous presence of the HCW's fingers and a needle or other sharp instrument or object in a blind or highly confined anatomic site, e.g., during major abdominal, cardiothoracic, vaginal and/or orthopedic operations, or
- repair of major traumatic injuries, or
- major cutting or removal of any oral or perioral tissue, including tooth structures, during which there is a potential for the patient's open tissues to be exposed to the blood of an injured HCW (PHAC, 1998, SHEA, 2010).

Healthcare settings – A variety of healthcare settings including hospitals, ambulatory care facilities, out-patient clinics, child health clinics, home care settings, long-term care or residential facilities and medical areas of correctional facilities.

Healthcare workers (HCWs) – Individuals who provide health care or support services such as nurses, physicians, dentists, nurse practitioners, paramedics and sometimes emergency first responders, allied health professionals, unregulated healthcare providers, clinical instructors and students in health care disciplines, volunteers and housekeeping staff. Healthcare workers have varying degrees of responsibility related to the health care they provide, depending on their level of education and their specific job/responsibilities. Immunization requirements will be determined by their specific job and responsibilities. (PHAC, 2013)

Interferon gamma release assay (IGRA) – A test for cell mediated immunity responses to antigens that simulate mycobacterial proteins. The proteins used in IGRA are absent from all BCG strains.

Latent tuberculosis infection (LTBI) – The presence of latent or dormant infection with *Mycobacterium tuberculosis* with no evidence of clinically active disease. Individuals with LTBI are non-infectious.

Nontuberculous mycobacteria (NTM) – These are all mycobacterial species except those that cause tuberculosis.

Patient – For the purpose of this document this term will be used to identify the individual (patient, client or resident) who receives care in a healthcare facility or in the community.

Routine Practices - Routine Practices are the infection prevention and control practices for use in the routine care of all patients, at all times, in all healthcare settings and are determined by the circumstances of the patient, the environment and the task to be performed (PHAC, 2013).

Tuberculin skin test (TST) – A diagnostic tool used to identify people infected with *Mycobacterium tuberculosis* (TB). It is a measure of cell mediated immune responsiveness and possible infection with the TB organism. It is the intradermal injection of five tuberculin units (TU) of purified protein derivative (PPD) into the anterior aspect of the forearm (Mantoux technique).

Two-step TST – A procedure used for the baseline skin testing of persons who will receive serial TSTs to reduce the likelihood of mistaking a boosted reaction for a new infection. If an initial TST result is classified as negative, a second step of a two-step TST should be administered one – four weeks after the first TST was read. There is no indication for two-step TST testing in the setting of a contact investigation (PIC-NL, 2010).

1. Responsibilities

1.1. Employers

- Implement and maintain an infectious disease assessment, education, and immunization program for employees, including new hires
- Provide employees with adequate information to make informed decisions about assessment results, screening processes and recommended immunizations
- Establish guidelines for the placement of HCWs who remain non-immune due to: failure to seroconvert, medical contraindications to immunization, or immunization refusal
- Maintain a database/file that contains details of HCW vaccine preventable disease history, serological test results, immunizations received, consents, and refusals
- Ensure that the database/file is maintained in a confidential manner and is accessible by authorized personnel when needed
- Ensure that all newly employed HCWs are immunized against vaccine preventable diseases for which they are at risk of exposure
- Consider a “catch-up” program for other HCWs employed in departments deemed high risk for specific communicable disease; workplaces may vary in how they put this into operation
- Activate an expert panel when a HCW who performs exposure-prone procedures is found to be infected with a bloodborne pathogen

1.2. Occupational Health Nurses/Designate

- Complete a pre-placement assessment of all HCWs
- Provide HCWs with the appropriate education regarding the recommended vaccines and administer them
- Follow the Newfoundland and Labrador (NL) Immunization Manual for the latest recommendations on immunizations available at:
www.health.gov.nl.ca/health/publichealth/cdc/health_pro_info.html#immunization
- Provide HCWs, deemed to have high risk conditions, with the recommended vaccines
- Obtain informed consent or refusal for recommended screening and immunizations
- Document screening and immunizations in the HCWs confidential health file/database
- Provide HCWs with a record of all screening results and immunizations completed

1.3. Healthcare Workers

- Provide previous records of health assessment and immunization history to OH prior to placement
- Comply with the employer's screening, education, immunization program, and acknowledge in writing either consent for immunizations or refusal of immunizations
- Inform OH of any exposure to an infectious disease
- Abide by the recommendation of OH regarding work restriction due to an infectious disease

2. Assessment Protocol

2.1 Preplacement Assessment

- OH will perform the following assessment:
 - Complete a health and immunization history
 - Review documented records of immunizations
 - Utilize serology to determine antibody status
 - Document the immune status
 - Determine if the HCW has any contraindications to vaccines or previous adverse reactions to vaccines

2.2 Consent

- An informed written consent must be obtained from the HCW prior to screening and immunization
- Consent must be documented on the HCW's health screening record
- If recommended vaccines are refused, a signed documentation of refusal must be obtained including evidence that the HCW understands the implication involved in refusal (e.g., work restrictions)

2.3 Personal Immunization Record

- HCWs will be provided with a copy of his/her immunizations

2.4 Confidentiality

- OH/Designate staff work within strict guidelines of confidentiality
- OH/Designate staff are obliged ethically and professionally not to release information without the informed written consent of the HCW, except when required by law

3. Disease Specific Recommendations

3.1 Diphtheria/Tetanus/Polio

- Ensure that HCWs have completed a primary series of three doses of a combined tetanus toxoid-reduced diphtheria toxoid and inactivated polio vaccine
 - Administer vaccine to complete the primary series
- Provide a booster dose of tetanus toxoid-reduced diphtheria toxoid (Tdap) every 10 years.

3.2 Hepatitis B

- All HCWs at risk of exposure to blood and blood-contaminated body fluids should be vaccinated against hepatitis B infection
- The assessment protocol for hepatitis B is available in Appendix A
- Routine booster doses are not necessary for HCWs following achievement of serological confirmed immunity
 - After documentation of anti-HBs level of ≥ 10 IU/L antibody levels do not require monitoring
- If any employee is infectious with hepatitis B he/she must not perform EPP

3.3 Influenza

- Consider HCWs to be susceptible to influenza if they have not received the current season's vaccine
- Educate HCWs on the importance of annual influenza vaccine
- Offer all HCWs the influenza vaccine prior to/during influenza season

3.4 Measles

- Consider HCWs immune to measles if they have one of the following:
 - Laboratory evidence of immunity
 - History of laboratory confirmed measles disease
 - Written documentation of immunization with two doses of measles containing vaccine administered at least four weeks apart (first dose given on or after the first birthday)
 - Any HCW without written documentation of immunization with two doses of measles vaccine {usually given as measles, mumps and rubella (MMR)} should be provided vaccine to ensure two doses have been received
 - These HCWs do not need to have serology performed to determine immunity either prior to immunization or following immunization

- Do not exclude from work recently vaccinated HCW who develop a vaccine-related rash
- Advise susceptible HCWs that they must not work with patients suspected or confirmed to have measles
 - In circumstances where this is unavoidable, Airborne Precautions must be followed; a respirator must be worn

3.5 Meningococcal Disease

- Immunize clinical microbiologists, research microbiologists and clinical laboratory personnel who process cultures of *Neisseria meningitides* on a regular basis with one dose of quadrivalent meningococcal conjugate (Men-C-ACYW135) vaccine
- The vaccine does not provide complete protection, therefore, laboratory safety practices must be maintained
- Provide booster doses as per the NL Immunization Manual
- Provide the vaccine to HCWs with high risk medical conditions as recommended in the NL Immunization Manual
- Routine meningococcal vaccine is not recommended for all HCWs

3.6 Mumps

- Consider HCWs immune to mumps if they have one of the following:
 - History of laboratory confirmed mumps disease
 - Written documentation of immunization with two doses of mumps containing vaccine administered at least four weeks apart (first dose given on or after the first birthday)
 - Any HCW without written documentation of immunization with two doses of mumps containing vaccine should be provided vaccine (MMR) to ensure two doses have been received
 - These HCWs do not need to have serology performed to determine immunity either prior to immunization or following immunization
- Advise HCWs who are susceptible that they must not work with patients suspected or confirmed to have mumps
 - In circumstances where this is unavoidable, Droplet Precautions must be followed; facial protection (a mask and goggles) should be worn

3.7 Pertussis

- Consider HCWs susceptible to pertussis since natural and acquired immunity wanes
- Provide a single dose of pertussis-containing vaccine (Tdap) to all healthcare workers regardless of age if not vaccinated with Tdap in adulthood (i.e., ≥18 years)

- Give the adult Tdap ten years after the adolescent Tdap booster dose
- Refer school aged volunteers to the Public Health Nurse if they have not received the adolescent dose of Tdap
- Advise HCWs they must follow Droplet Precautions if caring for patient with pertussis

3.8 *Pneumococcal polysaccharide vaccine*

- Provide pneumococcal vaccine to HCWs with high risk conditions as identified in the NL Immunization Manual

3.9 *Rubella*

- Consider HCWs immune to rubella if they have one of the following:
 - Laboratory evidence of immunity
 - History of laboratory confirmed rubella disease
 - Written documentation of immunization with one dose of rubella containing vaccine administered on or after the first birthday
 - Any HCW without written documentation of immunization should receive one dose of rubella containing vaccine
 - Due to the two dose requirement for measles and mumps, the use of MMR will result in the majority of HCWs receiving two doses of rubella-containing vaccine
 - These HCWs do not need to have serology performed to determine immunity either prior to immunization or following immunization
- Advise susceptible HCWs that they must not work with patients suspected or confirmed to have rubella
 - In circumstances where this is unavoidable, Droplet Precautions must be followed; facial protection (mask and goggles) should be worn

3.10 *Tuberculosis*

- All HCWs must be assessed for tuberculosis (TB)
- The assessment protocol is outlined in Appendix B
- HCWs with active TB must be excluded from work until:
 - Three AFB smears are negative with substantial improvement in symptoms
 - Clearance from the Occupational Health Nurse is required before returning to work
- HCWs with extrapulmonary TB may work if concurrent pulmonary tuberculosis has been excluded
- HCWs with latent tuberculosis infection (LTBI) can report to work unless symptoms develop

3.11 Typhoid Fever

- Immunize microbiologists and others who work frequently with *Salmonella* (S.) *Typhi*
- Typhoid is rare in Canada, so routine microbiology laboratories process *S. Typhi* only rarely, i.e., not frequently

3.12 Varicella

- Consider HCWs immune to varicella if they have one of the following:
 - Laboratory evidence of immunity
 - History of a laboratory confirmed varicella infection
 - Healthcare provider diagnosis of varicella or herpes zoster or a reliable self-reported history of varicella, if infection occurred prior to the implementation of a one-dose immunization program (2005 in NL). If a self-reported history of varicella occurred prior to the start of a one-dose immunization program, laboratory confirmation of immunity is not necessary.
 - Written documentation of immunization with two doses of varicella containing vaccine administered at least four weeks apart (first dose given on or after first birthday)
 - A second dose of varicella vaccine should be offered to HCWS who have received only one dose of vaccine
 - These HCWS do not need to have serology performed to determine immunity either prior to or following the immunization
- OH should exclude HCWs with a post immunization varicella-like rash, for the duration of the rash, if the rash cannot be covered and if the HCWs are involved in the care of high-risk patients, e.g., immunocompromised and newborn patients,
- Obtain recommendations for the immunization of a susceptible immunocompromised HCW from his/her attending physician
- Advise HCWs who are susceptible that they must not work with patients suspected or confirmed to have varicella or zoster
 - In circumstances where this is unavoidable, Airborne Precautions must be followed; a respirator should be worn

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Appendix A

Table 1: Healthcare worker baseline assessment and testing for Hepatitis B

Hepatitis B immunization status	Action
No hepatitis B vaccine, or 1 or 2 doses of series received	- Complete a three dose hepatitis B series - Test for anti-HBs 1-6 months after final dose
Documented HB vaccine series Post immunization anti-HBs serology is ≥ 10 IU/L	No further action
Documented HB vaccine series No post immunization anti-HBs documented	- Test for anti-HBs - Possible Results: - anti-HBs ≥ 10 IU/L – no further action - anti-HBs < 10 IU/L – Action 1 or 2 - Action 1 - If anti-HBs testing done 1-6 months after series completed - administer a second HB series - retest in 1-6 months - If anti-HBs remains < 10 IU/L consider a non-responder - Action 2 - If anti-HBs testing done > 6 months after series completed - administer one dose of vaccine - retest in one month - if still < 10 IU/L complete series
Unsure if HB vaccine series completed	- Test for anti-HBs - If anti-HBs < 10 IU/ml - vaccinate with hepatitis B series - If anti-HBs ≥ 10 IU/ml - no further action
Two hepatitis B series completed Anti-HBs < 10 IU/L	- Document as non-responder - No further doses recommended - Post exposure prophylaxis required
HBsAg positive	Refer to expert review committee if HCW performing EPP

Legend

Anti-HBs = antibody to hepatitis B

HBsAg = hepatitis B surface antigen

Primary hepatitis B series = 3 doses of vaccine

IU/L=International Units per Liter

Appendix B

Table 2: Healthcare worker pre-employment screening for tuberculosis

TST Status		Action
Unknown or no previous TST		Do two-step TST (second test 1 – 4 weeks after the first test) Note: If 1st step is negative and there are no identified risk factors, can be cleared to work while awaiting 2nd step
Documented prior negative TST, <u>within the last year</u>, with no previously documented two-step		- If no risk factors, can be cleared to work - Do one TST and consider this the second step of the two-step method
Documented prior negative TST, <u>greater than one year</u>, with no previously documented two-step		Do two-step TST Note: If 1st step is negative and there are no identified risk factors, can be cleared to work while awaiting 2nd step
Previously documented two-step TST <u>greater than one year ago</u> and no TST testing within the last year		Do one TST
Previously documented two-step TST <u>greater than one year ago</u> and a negative TST within the last year		Assess for recent exposure to TB or symptoms and if negative, TST not required at this time
Documented prior positive or baseline positive TST		See follow-up action below¹
Previous treatment for TB /preventative treatment for LTBI		See follow-up action below¹
Prior positive TST, inadvertently tested (for example -documentation of previous TST not known)		- If ≥10 mm, do not repeat - If <10 mm, use result as test #1 of two-step TST; and complete the two-step process
Follow-up Action		
If TST negative	Document – No further action required	
If TST positive	- If positive, consider previous BCG immunization and non-tuberculosis mycobacterium infection - It may be helpful to rule out a false-positive TST result by performing an interferon-gamma release assays (IGRA) ¹Review history for TB disease or infection and assess for signs and symptoms of TB - Refer to attending medical provider for chest x-ray, medical exam if signs and symptoms present, and/or new conversion noted. Discuss with medical provider if there is an indication for LTBI treatment. - Document action	

Table 3: Interpretation of tuberculin skin test results and cut-points in various risk groups

TST result	Situation in which reaction is considered positive
0-4 mm	• In general this is considered negative, and no treatment is indicated • Child under 5 years of age and high risk of TB infection
≥5 mm	• HIV infection • Contact with infectious TB case within the past 2 years • Presence of fibronodular disease on chest x-ray (healed TB, and not previously treated) • Organ transplantation (related to immune suppressant therapy) • TNF alpha inhibitors • Other immunosuppressive drugs, e.g. corticosteroids (equivalent of ≥15 mg/day of prednisone for one month or more; risk of TB disease increases with higher dose and longer duration) • End-stage renal disease
≥ 10 mm	• All others, including the following specific situations: • TST conversion (within 2 years) • Diabetes, malnutrition (<90% ideal body weight), cigarette smoking, daily alcohol consumption (>3 drinks/day) • Silicosis • Hematologic malignancies (leukemia, lymphoma) and certain carcinomas (e.g. head and neck)

8.5 Immunization for Individuals New to Canada

Background Information

Immunization for individuals who have newly arrived in Canada is often challenging because immunization records may not exist or may be difficult to interpret because of language barriers. Schedules, products and the number of doses of vaccines may vary from those used in Canada.

Policy

Individuals new to Canada who are considered refugees or immigrants may be eligible for immunization with publicly funded vaccines based on their age and/or previous immunization status. Every effort should be made to complete a vaccine series and/or ensure that age appropriate vaccines are given according to the provincial schedule at the earliest opportunity.

Recommendations

- All individuals new to Canada should have their immunization status assessed by public health.
- If any question exists about whether vaccines were administered or if there is concern about vaccine potency, re-immunize any child immunized outside of Canada. Generally, the potency of vaccines given in other countries can be assumed to be adequate.
- Only **written** documentation of immunization should be considered valid of prior immunization. Translated documents should be reviewed by the public health nurse or designate for accuracy and consistency.
- Routine serologic testing of children and adults without records to determine immunity is **not** practical thus not recommended.
- In some instances serologic testing may be useful in determining which vaccines are needed e.g. hepatitis B, varicella (if individual from tropical area) and rubella for women of child bearing age.
- If an individual has experienced a significant local reaction after a dose of tetanus containing product serology screening may also be indicated.

Rationalization

Immunizations received outside Canada can be considered valid if written documentation indicates the vaccine types, dates of administration, number of doses, interval between doses and the age of the client at the time of immunization. Check specifically for vaccines compatible with the current Canadian recommendations.

Immunization records for children adopted from some international orphanages may not be accurate, products administered may be missing a component for example MMR may just be MR.

Children who have resided in refugee camps prior to resettling in Canada may have had access to immunization in the camp.

In developing countries the following vaccines are used infrequently or not at all thus individuals from such areas are unlikely to have received them:

- Hib conjugate
- Meningococcal conjugate
- Pneumococcal conjugate
- Hepatitis B vaccine
- Varicella vaccine
- Mumps and rubella vaccine (measles vaccine is often given alone)

Information on vaccination schedules in other countries can be found at http://apps.who.int/immunization_monitoring/en/globalsummary/ScheduleSelect.cfm

Translation of foreign terms for immunization products can be found at <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/foreign-products-tables.pdf>

The following questions will assist the public health nurse in assessing the immunization status of an individual who is new to Canada:

- What country has the individual(s) come from?
- Were they in a refugee camp?
- Were they in an orphanage?
- What vaccines were given prior to arrival and when?
- Were the vaccines comparable to Canadian recommendations, particularly:
 - Vaccine type
 - Dates of administration
 - Numbers of doses
 - Interval between doses
 - Age of person at time of vaccination?
- Has oral polio vaccine ever (OPV) been given?
- Has BCG been given?
- What diseases are endemic in the country of origin? For example individuals born in developing countries are more likely to be hepatitis B carriers thus necessitating the need for assessment and vaccination of household or sexual contacts

Vaccination guide for individuals new to Canada with no available records:

Recommended vaccines for individuals new to Canada	
Diphtheria, tetanus ,acellular pertussis, polio, and Hib containing vaccine	• Individuals < 7 years of age • Immunize according to routine schedule
Tetanus, diphtheria, acellular pertussis (Tdap)	• Individuals 7 to 18 years of age • Complete routine series according to routine schedule
Tetanus, diphtheria vaccine (Td)	• Individuals ≥18 years of age • One dose of Tdap followed by 2 doses of Td. (If not available, Tdap can be used in place of Td).
IPV	• Individual's ≥ 18 years of age who have had contact with other refugees / immigrants from areas of countries where wild polioviruses are circulating. • Two doses 4 weeks apart followed by third dose 6-12 months later.
Hepatitis B vaccine	• All individuals born on or after January 1,1986 • All individuals < 12 years of age who have immigrated to Canada from areas of high hepatitis B prevalence(e.g. Asia and Africa) are eligible for hepatitis B vaccine prior to entering grade 6 • Other individuals with specific health conditions or risk factors
Meningococcal vaccine	• Individuals born after January 1,2004 • Men-C-C (1 dose) up to grade 4 • Grade 4 & after one dose Men-C-ACYW135 if born after January 2004
MMRV & MMR vaccine	• All individuals born January 1,1970 and those who are ≥ 12 months of age at time of presentation 2 doses of MMR one month apart; depending on age and susceptibility • Administer MMRV as first dose if eligible by age and MMR or MMRV as second dose if eligible as determined by date of birth.

	January 1 st 2013
Pneumococcal vaccine	• Conjugate vaccine: all individuals 2 months up to 59 months of age. • Polysaccharide vaccine: all individuals ≥ 65 years of age • All individuals ≥ 2 years with applicable health conditions
Varicella vaccine	• All susceptible individuals ≥ 12 months up to 12 years of age, one dose; • ≥ 13 years of age, one dose of a univalent Var • Depending on age and susceptibility and less than 13 years of age dose may be administered as MMRV

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