Immunization of Specific Populations (Immunosuppressed and Chronic Health Conditions)

Revision Date: January 4, 2018

Health Conditions Requiring Special Considerations for Immunization

Transplant Immunization Guidelines. See:

- Principles of Immunization in HSCT and SOT
- Immunization of Child HSCT
- Immunization of Adults HSCT
- Immunization for Children SOT Before 18 Months of Age
- Immunization of Children SOT After 18 Months of Age
- Immunization of Adults SOT

General Principles[1]

1. Maximize benefit while minimizing harm.[1]

2. The safety and effectiveness of vaccines in immunocompromised individuals are determined by the type of immunodeficiency and the degree of immunosuppression.[1] The relative degree of immunodeficiency is variable depending on the underlying condition and can vary over time in many individuals.[1]

3. Case-by-case medical consultation with the individual's attending physician is recommended in order to determine the individual's degree of immunosuppression or immunodeficiency and whether or not immunization is appropriate for the individual. In complex cases, referral to a physician with expertise in immunization and/or immunodeficiency is advised.[1]

4. There may not be complete protection even when there is a history of childhood infection or previous immunization[1]. Monitor vaccines carefully and boost aggressively. The magnitude and duration of vaccine-induced immunity are often reduced/suboptimal in immunocompromised individuals. The individual may remain susceptible despite appropriate immunization.

5. The decision to recommend for or against any particular vaccine will depend upon a careful analysis of the risks and benefits. There is potential for serious illness and death if immunocompromised individuals are under-immunized and every effort should be made to ensure adequate protection through immunization; however, the inappropriate use of live vaccines can cause serious adverse events in some immunocompromised individuals as a result of the uncontrolled replication of the vaccine virus or bacterium.[1]

6. Immunize at the time when maximum immune response can be anticipated.
   - Immunize early, before immunodeficiency begins, if possible.
   - Delay immunization if the immunodeficiency is transient (if this can be done safely).
   - Stop or reduce immunosuppression to permit better vaccine response, if appropriate.

7. If possible, administer immunization at least two weeks (inactivated vaccines) or four weeks (live vaccines) before planned immunosuppression due to treatment or medications.[1]

8. Live vaccines are not generally recommended due to the risk of disease caused by the vaccine strains.[1] However, in some less severely immunocompromised individuals, the benefits of live vaccines may outweigh the risks.[1] Approval from the individual's attending physician must be obtained before proceeding with live vaccines.
   - Children with a known or suspected family history of congenital or hereditary immunodeficiency that is a contraindication to immunization with live vaccines should not receive a live vaccine until their immune competence has been established.[1] If the child has other than first-degree relatives with congenital immunodeficiency conditions or if multiple neonatal or infant deaths occurred within the child's immediate family, the provider should seek a medical consultation before proceeding with the administration of a live vaccine.

9. If serologic testing is available and there is a clear antibody correlate of protection, post-immunization antibody titres to determine the immune response and guide re-immunization and post-exposure management should be considered.[1] See Biological Products for specific vaccine recommendations.

10. Consider the immunization environment broadly. Immunize household/close contacts when appropriate. Strongly encourage up-to-date immunization, including annual influenza vaccine, for all health care workers (HCW) providing care to immunocompromised individuals
    Household contacts of immunocompromised individuals should receive all routine immunization as appropriate, including measles, mumps, rubella, rotavirus and varicella vaccines, if susceptible. as well as annual influenza immunization.

Immunocompromising Conditions

Acquired Complement Deficiency

- Individuals receiving terminal complement inhibitor (e.g. eculizumab [Soliris®]) should receive inactivated and live vaccines following routine immunization schedules as well as meningococcal vaccines (meningococcal conjugate ACYW and meningococcal B), pneumococcal vaccines (conjugate and polysaccharide) and *haemophilus influenza* type B vaccine.

Note: **Medical consultation is recommended before proceeding with immunization**.

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Recommended due to condition
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Recommended due to condition
MenC-ACYW	Recommended due to condition
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule. Contraindicated if on immunosuppressive therapy.
MMR-Var	Contraindicated
MMR	Recommended as per age eligibility and routine schedule. Contraindicated if on immunosuppressive therapy.
VZ	Recommended as per age eligibility and routine schedule. Contraindicated if on immunosuppressive therapy.

Congenital Immunodeficiency States

- **Medical consultation is recommended before proceeding with immunization.**
- Generally inherited and include defects in antibody production (e.g., agammaglobulinemia, isotype and IgG subclass deficiencies, and common variable immunodeficiency), complement deficiencies, defects in one or more aspects of cell-mediated immunity, and mixed deficits (combined immunodeficiency).[1] Individuals with defects in antibody and complement are highly susceptible to encapsulated bacteria such as *Streptococcus pneumonia, Haemophilus influenza type b, and Neisseria meningitidis*.[1] Individuals with mixed (combined immunodeficiency) and T cell defects are particularly susceptible to virtually all viruses and some bacteria.[1]
- Replacement immune globulin (IG) or pathogen-specific IG preparations may be used for individuals with antibody defects to provide protection from many vaccine-preventable infections but immunization is still recommended,[1] when possible, and not contraindicated. IG may interfere with the immune response to measles or varicella-containing vaccines.
- Inactivated vaccines should be administered according to routine schedules.[1] Additionally, hepatitis B, Hib and pneumococcal (conjugate and polysaccharide) vaccines are recommended.[1] Individuals with complement, properdin, factor D or primary antibody deficiencies should also receive meningococcal vaccines[1] (MenC-ACYW and Men-B).[1] See Biologicals for specific vaccines.
- Generally, live vaccines are contraindicated (particularly for individuals with T cell, natural killer T cell and mixed cellular and antibody defects (e.g., Severe Combined Immune Deficiency [SCID]), although some exceptions exist as indicated below:
  - **X-linked agammaglobulinemia**
    - ► All live vaccines are contraindicated.
  - **Common Variable Immunodeficiency (and known intact T cell immunity).**[1]
    - ► MMR and univalent varicella vaccines may be considered although regular immune globulin replacement therapy may affect the efficacy of the vaccines.[1]
    - ► All other live vaccines (e.g., rotavirus, BCG, live attenuated influenza vaccine and oral typhoid) are contraindicated.[1]
  - **IgA deficiency with no concomitant defects in T cell function** can receive most live vaccines.[1]
    - ► Live mucosal vaccines (rotavirus, LAIV, oral typhoid) are likely safe though there may be a lack of mucosal response. Some experts may prefer to use inactivated vaccines if available (e.g., inactivated influenza vaccine, parenteral typhoid vaccine).
    - ► Individuals with **IgG subclass deficiencies** can receive live vaccines although the response may be suboptimal. In addition, regular IG replacement therapy may diminish the vaccine response.[1]
  - People with **phagocytic and neutrophil disorders** (e.g. congenital neutropenia, leukocyte adhesion and migration defects, chronic granulomatous disease) may be vaccinated with MMR, rotavirus, univalent varicella, herpes zoster, LAIV or yellow fever vaccine, if indicated. Live bacterial vaccines (BCG and oral typhoid vaccine) are contraindicated.[1]
  - Individuals with **complement deficiency** (e.g., properdin or factor D deficiency) may receive any live vaccine if indicated.[1]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended due to condition. Recommended as per age eligibility and schedule
Hib	Recommended due to condition
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended

Men-B	Recommended only for individuals with complement, properdin, factor D or primary antibody deficiencies.
MenC-ACYW	Recommended only for individuals with complement, properdin, factor D or primary antibody deficiencies
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule. Contraindicated for individuals with B cell deficiency with X-linked agammaglobulenemia and Common Variable Immunodeficiency.[1] Contraindicated for individuals with T cell, natural killer T-cell mixed cellular or primary antibody deficiencies.[1]
MMR-Var	Contraindicated
MMR	Recommended as per age eligibility and routine schedule. Contraindicated for individuals with T-cell, natural killer T-cell and mixed celluar or primary antibody deficiencies.
VZ	Recommended as per age eligibility and routine schedule. Contraindicated for individuals with T-cell, natural killer T-cell and mixed celluar or primary antibody deficiencies.

HIV Infection

- **Medical consultation is recommended before proceeding with any immunization.** Timing of immunization is important in order for the individual to receive an optimal response to the vaccines.[4]
- Screening for HIV infection is not necessary prior to immunization. When possible, vaccines should be administered early in the course of HIV infection. Although there is no contraindication to the use of inactivated vaccines at any time.[1]
- The degree of immune suppression varies widely among HIV-infected individuals, reflecting disease stage and response to antiretroviral therapy. Immune suppression is approximately predicted by a recent CD4 count and CD4 percentage. Elevated viral loads may diminish the effectiveness of some vaccines although this is not a reason to delay vaccination.
- HIV positive individuals may be considered for routine age-appropriate immunization with inactivated vaccines as well as pneumococcal (conjugate followed by polysaccharide), meningococcal (meningococcal conjugate ACYW and meningococcal B), *Haemophilus influenzae* type b and hepatitis B vaccine. Hepatitis A and other inactivated vaccines may also be recommended based on risk factors. See Biological Products for vaccine-specific information.
- There are no contraindications to the use of some live vaccines (MMR, VZ, rotavirus) early in the course of the illness.[1] BCG, small pox, and oral live typhoid vaccines are contraindicated and LAIV is not recommended.[1] As the disease progresses, the risk of using live vaccines increases and consensus "cut-offs" based on clinical and immunologic categories have been determined for the use of MMR and univalent varicella vaccines[1] as follows:
  - Measles-mumps-rubella vaccine (MMR): HIV-infected children 12 months of age and older, and with Centers for Disease Control and Prevention (CDC) clinical category N, A or B and immunologic category 1 or 2 (i.e., CD4 counts ≥15%) may receive two doses of MMR vaccine 3 - 6 months apart. Immunization with two doses of MMR vaccine administered three months apart may be considered for susceptible HIV-infected adolescents and adults with CD4 cell count ≥200 x 10^6/L and CD4 percentage ≥15%. MMR vaccine is contraindicated in persons with advanced HIV/AIDS.
  - Univalent varicella vaccine: HIV-infected children 12 months of age and older, and with CDC clinical category N, A or B and immunologic category 1 or 2 (i.e., CD4 percentage ≥15%) may receive two doses of univalent varicella vaccine 3 - 6 months apart. There are no published data on the use of varicella vaccine in susceptible HIV-infected adolescents and adults. HIV-infected adolescents and adults should be asked for a history of varicella disease or vaccination, and if negative for both, serology should be requested to confirm susceptibility. Based on expert opinion, immunization with two doses of univalent varicella vaccine administered three months apart may be considered for susceptible HIV-infected adolescents and adults with CD4 cell count ≥200 x 10^6/L and CD4 percentage ≥15%. Varicella vaccine is contraindicated in persons with advanced HIV/AIDS.
  - Children with symptomatic HIV/AIDS sometimes receive intramuscular immune globulin as prophylaxis against infection. The immune globulin may interfere with their antibody response to live vaccines; therefore, it may be advisable to delay administration of vaccines as long as possible after immune globulin receipt. This situation should be discussed with the child's physician(s) and parents.
  - Children with symptomatic HIV infection (i.e. low CD4 count or presence of opportunistic infection) should receive immune globulin if exposed to measles, even if they have received MMR vaccine. Children who have received immune globulin intravenously within two weeks of exposure to measles do not require additional passive immunization. Unimmunized children who receive immune globulin for measles exposure should not receive measles immunization for six months following the administration of immune globulin[1]. Consult with physician for immune globulin when measles IgG positive and HIV symptomatic.[4]
  - Rotavirus vaccine: Follow routine infant schedule after approval from the infant's attending physician is obtained (consultation with expert in immunization and/or immunodeficiency is advised).[1]

See Biological Products – for specific vaccines.	
Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended due to condition. Recommended as per age eligibility and schedule
Hib	Recommended due to condition
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Recommended due to condition
MenC-ACYW	Recommended due to condition
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule if not significantly immunocompromised.[1]
MMR-Var	Contraindicated
MMR	Usually recommended only if within acceptable clinical and immunologic categories. Recommended as per age eligibility and routine schedule.
VZ	Usually recommended only if within acceptable clinical and immunologic categories. Recommended as per age eligibility and routine schedule.

Immunosuppressive Therapy

- **Medical consultation with the individual's physician(s) is recommended regarding the appropriateness of immunization for individuals whose immune status may be suppressed** within the past three months **by immunosuppressive therapy** (such as, long-term steroids, cancer chemotherapy, radiation therapy, total body irradiation, azathioprine, cyclosporine, cyclophosphamide and infliximab).[1]
- The following corticosteroid therapies do not generally result in immunosuppression that would contraindicate immunization:
  - Short-term therapy (less than 14 days)[1]
  - Low to moderate dose of prednisone or equivalent (less than 2 mg/kg/day) or less than 20 mg/day if weight is greater than 10 kg.[1]
  - Long-term, alternate-day treatment with short-acting preparations.[1]
  - Maintenance physiologic replacement therapy.[1]
  - Administered topically, inhaled, or locally injected (e.g., joint injection).[1]
- Long-term immunosuppressive therapy is used for organ transplantation and a range of chronic infections and inflammatory conditions (e.g., inflammatory bowel disease, psoriasis, systemic lupus erythematosis).[1] These therapies have their greatest impact on cell-mediated immunity, although T-cell dependent antibody production can also be adversely affected.[1]
- Immunization status should be reviewed prior to the initiation of immunosuppressive therapy and any age-appropriate vaccines recommended should be administered prior to the initiation of immunosuppressive therapy so that optimal immunity is achieved.[1]
- Inactivated vaccines:
  - Inactivated vaccines should be administered at least 14 days before the initiation of immunosuppressive therapy, when possible, to optimize immunogenicity or delayed until at least three months after immunosuppressive medications have stopped. Although they can be administered safely at any time before, during or after immunosuppression every effort should be made to time immunization so that optimal immunogenicity will be achieved.[1] Immunization should be delayed until at least three months after immunosuppressive drugs have been stopped or until such therapy is at the lowest possible level.
  - Active verification of immune status and aggressive re-immunization may be important for some individuals.
  - Routine immunization is recommended as well as pneumococcal (conjugate and polysaccharide) vaccines.
- Live vaccines:
  - Live vaccines should be administered at least four weeks before immunosuppressive therapy begins to reduce the risk of disease caused by the vaccine strain.[1] Live vaccines are generally contraindicated during and for at least three months after the immunosuppressive drugs have been discontinued.[1] However, vaccines may be administered four weeks after discontinuation of high-dose systemic steroids.[1]
  - Generally only high-dose systemic steroids (e.g., 2 mg/kg or more per day for a child or 20 mg or more of prednisone or its equivalent per day for an adult) can interfere with vaccine-induced immune responses.[1]
  - Do not give inactivated or live vaccines for at least one month after stopping high-dose steroids unless needed for post-exposure or outbreak management.[1] Medical consultation should be sought before proceeding with immunization.
- Some chronic cancer therapies are hormonal (such as tamoxifen, gonadotropin release inhibitors) and have no significant immunologic effects. Some therapies for inflammatory conditions (such as hydroxychloroquine, sulfasalazine, or auranofin) are not considered immunosuppressive.[1]
- Hepatitis B vaccine should be offered to individuals with inflammatory bowel disease anticipating the initiation of long term immunosuppressive therapies.[4]

- Monoclonal antibodies:
  - Are laboratory-produced substances that can bind to specific molecules with the purpose of modulating or inhibiting immune responses.
  - As with other immunosuppressive therapy, immunization should be administered prior to beginning the therapy or delayed until at least 3 months after the therapy has ended[1]. Consultation with physician is recommended.
  - Monoclonal antibodies taken during pregnancy will be transferred to the fetus and their effects may persist after birth up to 12 months of age.[1]
  - Infants, who have been exposed to rituximab, during pregnancy, should have a medical consultation with child's physician prior to immunization.
  - Immune responses to live vaccine that are administered after one year of age (e.g. MMR or MMRV vaccine) are not considered to be affected by utero exposure to monoclonal antibodies. Infants exposed to monoclonal antibodies in utero should receive all inactivated vaccines according to routine schedule.

    NOTES from CIG:
    - Rituximab taken during pregnancy is associated with B cell depletion in both mother and fetus. A longer interval of 6-12 months should be observed following rituximab therapy.
    - Infliximab can be detected in infants up to 6 months after birth.
    - Palivizumab which is specific for the prevention of respiratory syncytial virus (RSV) infection; will not interfere with the response to a live vaccine.
    - There are no data at this time regarding the potential risk associated with rotavirus (RV) vaccine in these infants therefore rotavirus vaccine should not be given.
  - Monoclonal antibodies administered to the mother during breastfeeding are thought to have very little or no impact on the infant. Transfer of monoclonal antibodies through breast milk is limited, and the minimal quantities that are ingested are likely to be broken down in the infant's gastrointestinal tract. Infants of breastfeeding women receiving monoclonal antibody treatment should therefore be immunized with both live and inactivated vaccines according to routine schedules[1].

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended due to condition. Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition and Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Generally contraindicated. Consultation with physician is recommended.
MMR-Var	Contraindicated
MMR	Generally contraindicated. Consultation with physician is recommended.
VZ	Generally contraindicated. Consultation with physician is recommended.

Malignant Hematological Disorders

(e.g., leukemia, lymphomas, or other malignant neoplasms affecting the bone marrow or lymphatic systems)

- **Medical consultation is recommended before proceeding with immunization**.
- During active chemotherapy and shortly thereafter, antibody responses are impaired; therefore, ensure that at least three months have passed since the completion of chemotherapy before immunizing. Inactivated vaccine doses administered during cancer chemotherapy should not be considered valid doses unless there is documentation of a protective antibody response.[2]
- In addition to routine inactivated vaccines, pneumococcal (conjugate and polysaccharide) and Hib vaccines are also recommended.[1] If asplenic, meningococcal vaccines (meningococcal conjugate ACYW and meningococcal B) are recommended.
- Live vaccines are contraindicated for individuals with severe immunodeficiency due to blood dyscrasias, lymphomas, leukemias of any type or other malignant neoplasms affecting the bone marrow or lymphatic systems and those undergoing immunosuppressive treatment for malignancy.[1] Children with Acute Lymphocytic Leukemia (ALL) in remission for at least 12 months may be considered for MMR vaccine with or without varicella vaccine providing that certain criteria are met.

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Recommended due to condition
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Generally contraindicated. Consultation with physician is recommended.
MMR-Var	Contraindicated
MMR	Generally contraindicated. Consultation with physician is recommended.
VZ	Generally contraindicated. Consultation with physician is recommended.

Malignant Solid Tumours (and on immunosuppressive therapy)

- Inactivated vaccines according to routine immunization schedules should be administered. Pneumococcal vaccines (conjugate and polysaccharide) are recommended before individuals begin immunosuppressive therapies.[1] See Biological Product – Pneumococcal vaccines.
- Live vaccines are contraindicated in people undergoing immunosuppressive treatment for any malignant solid tumours.
- In general, if an individual is 3 months post-chemotherapy and the cancer is in remission, the person is no longer considered immunocompromised[1] .
- Medical consultation is advised.

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Contraindicated
MMR-Var	Contraindicated
MMR	Contraindicated
VZ	Contraindicated

Other Chronic Health Conditions:

Asplenia or Hyposplenia

- Asplenia or hyposplenism may be congenital, surgical or functional. A number of conditions can lead to functional asplenia (e.g., sickle-cell anemia, thalassemia major).[1]
- Individuals with asplenia/hyposplenia are at increased risk of fulminant bacterial infection which is associated with a high mortality rate. Risk is highest in the first 2 years following splenectomy but remains elevated for life. When emergency splenectomies are performed, vaccines are best administered two weeks following surgery for optimal response. Particular attention should be paid to ensuring optimal protection against encapsulated bacteria (*Neisseria meningitidis*, *Streptococcus pneumoniae*, *Haemophilus influenzae* type b) to which these individuals are highly susceptible.[1]
- Immunization status review is critical when an elective surgical splenectomy is planned so that all the necessary vaccines can be administered at least two weeks prior to surgery.[1]
- Individuals who are asplenic/hyposplenic should receive all routine immunization. Two doses of varicella vaccine if needed should be administered with an interval of at least three months between doses instead of six weeks apart as routinely recommended for adolescents and adults.[1] In addition, it is important that they receive Hib, meningococcal (meningococcal conjugate ACYW and meningococcal B) and pneumococcal (conjugate followed by polysaccharide) vaccines according to recommended schedules.[1] See Biological Products for information on the specific vaccines. Some individuals receiving repeated blood transfusions should receive hepatitis B vaccine.
- Parents of children with asplenia and adults with asplenia should be aware that all febrile illnesses are potentially serious and that they should seek immediate medical attention for all febrile events.[3]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended due to condition if receiving repeated blood products. Recommended as per age eligibility and schedule
Hib	Recommended due to condition
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Recommended due to condition
MenC-ACYW	Recommended due to condition
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and schedule
MMR-Var	Recommended as per age eligibility and schedule
MMR	Recommended as per age eligibility and schedule
VZ	Recommended as per age eligibility and schedule

Cardiac Disease (chronic)	
Individuals with chronic heart disease should receive pneumococcal vaccine (conjugate followed polysaccharide for children and polysaccharide for adults) as well as routinely recommended vaccines.[1]	
See Biological Products – for specific vaccines.	
Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition for individuals under 18 years of age. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and schedule
MMR	Recommended as per age eligibility and schedule
VZ	Recommended as per age eligibility and schedule

Chronic Inflammatory Diseases

- Includes individuals with inflammatory arthropathies (e.g. systemic lupus erythematosus [SLE], rheumatoid of juvenile arthritis etc.) inflammatory dermatological conditions (such as psoriasis, severe atopic dermatitis and eczema); and inflammatory bowel disease (Crohn's disease, ulcerative colitis).
- Individuals with chronic inflammatory diseases not being treated with immunosuppressive drugs are not considered significantly immunocompromised and can receive all recommended routine immunization. (Rheumatic disease modifying agents, such as hydroxychloroquine, sulfasalazine, or auranofin are not generally identified as immunosuppressive).[1]
- If being treated with immunosuppressive therapy, should ensure routine immunizations are up-to date. Refer to section in this document on *Immunosuppressive therapy* for guidelines and immunization indications.
- If possible, individuals should receive all routinely recommended vaccines and pneumococcal vaccine (conjugate and polysaccharide) prior to starting immunosuppressive therapy.
    - Live vaccines are generally contraindicated for individuals on immunosuppressive therapy. Live vaccines should be administered at least 4 weeks prior to initiation of immunosuppressive therapy to reduce the risk of disease caused by the vaccine strain. Consult with individual's physician prior to giving live vaccines when immunosuppressive therapy is planned.
    - Inactivated vaccines should be given at least 14 days prior to the start of immunosuppressive therapy so that optimal immunogenicity is achieved. However, when this is not possible inactivated vaccines can be safely administered at any time before, during or after immunosuppression.

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition if starting on immunosuppressive therapy and Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition if starting on immunosuppressive therapy. Recommended for individuals age 65 years and older
Live Vaccines	
Rotavirus	Generally contraindicated if on immunosuppressive therapy.
MMR-Var	Generally contraindicated if on immunosuppressive therapy.
MMR	Generally contraindicated if on immunosuppressive therapy.
VZ	Generally contraindicated if on immunosuppressive therapy.

Cochlear Implant Candidates and Recipients

- Individuals approved for cochlear implant surgery as well as past implant recipients should be considered at risk for bacterial meningitis. They should receive all routine immunizations and Hib and pneumococcal vaccines (conjugate followed by polysaccharide).[1]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Recommended due to condition
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule
MMR	Recommended as per age eligibility and routine schedule
VZ	Recommended as per age eligibility and routine schedule

Endocrine and Metabolic diseases	
• Individuals with diabetes should receive pneumococcal vaccine (Children should receive conjugate followed by polysaccharide vaccine and adults should receive polysaccharide).	
See Biological Products – for specific vaccines.	
Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Recommended as per age eligibility and schedule
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition under 18 years of age. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule
MMR	Recommended as per age eligibility and routine schedule
VZ	Recommended as per age eligibility and routine schedule

Liver Disease (chronic)

- Individuals with chronic liver disease, including hepatitis B carriers, anti-HCV positive individuals and those with chronic liver graft versus host disease, should receive hepatitis A vaccine, hepatitis B vaccine and pneumococcal vaccine (conjugate and polysaccharide vaccines for children and polysaccharide for adults).[1]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Recommended due to condition.
HBV	Recommended due to condition. Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition for individuals under 18 years of age. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule.
MMR	Recommended as per age eligibility and routine schedule.
VZ	Recommended as per age eligibility and routine schedule.

Neurologic Conditions

- Individuals with pre-existing neurological disorders should receive all routinely recommended immunizations with the exception of repeat doses of any vaccine administered within six weeks of the onset of GBS.[1]
- Individuals with chronic cerebrospinal fluid (CSF) leak should receive all routine immunizations and pneumococcal vaccines (conjugate and polysaccharide). Those with neurologic conditions that may impair clearance of oral secretions should receive all routine immunizations and pneumococcal vaccines (conjugate followed by polysaccharide vaccine for children and polysaccharide for adults).[1]
- Immunization should be deferred for 24 hours following significant head injury to avoid confusion between head trauma symptoms and AEFI.

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended for individuals with a CSF leak and for individuals under 18 years of age with neurologic conditions impairing oral secretions. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule
MMR	Recommended as per age eligibility and routine schedule
VZ	Recommended as per age eligibility and routine schedule

Non-malignant Hematologic Disorders (anemia, hemoglobinopathy, and bleeding disorders)

- If a bleeding disorder is present, it should be optimally managed prior to immunization to minimize the risk of bleeding. For example, hemophiliacs may receive clotting factor concentrates to optimize their clotting factor level before they receive a parenteral vaccine or a passive immunizing agent[1].
- In addition to routine immunization, they should receive hepatitis A and hepatitis B vaccines. Intramuscular vaccines should be administered with a small gauge needle (23 gauge or smaller) with firm pressure applied to the injection site for 5 – 10 minutes following the injection.[1]

Notes:

- Anemia due to sickle cell disease see Asplenia/hyposplenia.
- Individuals receiving long-term anticoagulation therapy with warfarin or heparin are not considered to be at higher risk of bleeding complications following immunization.[1]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Recommended for individuals with hemophilia A or B receiving plasma-derived clotting factors.
HBV	Recommended due to condition if receiving repeated blood products. Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended for individuals with hemoglobinopathy. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended for individuals with hemoglobinopathy Recommended for individuals 65 years of age and older
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule
MMR	Recommended as per age eligibility and routine schedule
VZ	Recommended as per age eligibility and routine schedule

Pulmonary Disease (chronic)

- Individuals with chronic lung diseases such as asthma, chronic obstructive pulmonary diseases (COPD) or cystic fibrosis are at increased risk of complications from influenza and invasive pneumococcal disease. As well as routine immunizations, these individuals should receive pneumococcal vaccines (conjugate followed by polysaccharide vaccines for children and polysaccharide for adults).
- Individuals with cystic fibrosis are at increased risk of complications from varicella infection.[1]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition for individuals under 18 years of age. Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule.
MMR	Recommended as per age eligibility and routine schedule.
VZ	Recommended as per age eligibility and routine schedule.

Renal disease (chronic)

- Bacterial and viral infections are a major cause of morbidity and mortality in individuals with renal disease and those undergoing chronic dialysis (hemodialysis or peritoneal dialysis) [1]. In addition to routine immunization, hepatitis B (higher dose), and pneumococcal (children should receive conjugate followed by polysaccharide and adult polysaccharide) vaccines are recommended. Adults with nephrotic syndrome should receive both pneumococcal conjugate and polysaccharide vaccines.[1] See Biological Products for vaccine specifics.
- Susceptible individuals 12 months and older should receive two doses of univalent varicella vaccine with an interval of at least three months between doses.[1]

See Biological Products – for specific vaccines.

Inactivated Vaccines	
dTap/Td/dTap-IPV/ DTaP-IPV/DTaP-IPV-Hib	Recommended as per age eligibility and schedule
HAV	Not routinely recommended
HBV	Recommended due to condition. See hyporesponsive schedule. Recommended as per age eligibility and schedule
Hib	Not routinely recommended
HPV	Recommended as per age eligibility and schedule
Influenza	Routinely recommended
Men-B	Not routinely recommended
MenC-ACYW	Not routinely recommended
PNEU-C13	Recommended due to condition under 18 years of age and for adults with nephrotic syndrome[1] Recommended as per age eligibility and schedule
PNEUMO-P	Recommended due to condition
Live Vaccines	
Rotavirus	Recommended as per age eligibility and routine schedule.
MMR-Var	Recommended as per age eligibility and routine schedule.
MMR	Recommended as per age eligibility and routine schedule.
VZ	Recommended as per age eligibility and routine schedule.

References

[1] National Advisory Committee on Immunization. (2016). *Canadian Immunization Guide* (evergreen ed.). Ottawa, ON: Public Health Agency of Canada. www.canada.ca/en/public-health/services/canadian-immunization-guide.html

[2] Rubin, L. G., et all. (2014, February). 2013 IDSA clinical practice guidelines for vaccination of the immunocompromised host. *Clinical Infectious Diseases,* 58(3), 309-318

[3] American Academy of Pediatrics, Committee of Infectious Diseases. (2015). *Red Book: 2015 Report of the Committee on Infectious Diseases* (30th ed.). In D. W. Kimberlin, M. T. Brady, M. A. Jackson & S.S. Long eds. Elk Grove Village, IL

[4] Expert opinion of Alberta Infectious Disease, Immunologist, and Medical Officer of Health physicians October 5, 2017.

