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Guidelines for Immunisation of Children Following Treatment with High Dose Chemotherapy and Haematopoietic Stem Cell Transplantation (HSCT)

Version	5.0
Approved by	Haematology/ Oncology Senior Clinical Management team
Date Approved	August 2023
Ratified by:	
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Name of responsible committee/individual	Dr Jenkinson
Date issued:	August 2023
Review date:	August 2025
Target audience	All Haematology/Oncology staff, POSCUs, GPs, Practice Nurses

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Guidelines for immunisation of children following treatment with high dose chemotherapy and Haematopoietic Stem Cell Transplantation (HSCT)

Department of Haematology & Oncology
Birmingham Women's and Children's Hospital

Adapted from Vaccinations for Paediatric Patients Treated With Standard-Dose Chemotherapy And Hematopoietic Stem Cell Transplantation (HSCT) Recipients.
Dr Soonie R. Patel, Professor Paul T. Heath and Prof R. Skinner (CCLG April 2023)
And the Joint consensus statement on the vaccination of adult and paediatric haematopoietic stem cell transplant recipients: Prepared on behalf of the British society of blood and marrow transplantation and cellular therapy (BSBMTCT), the Children's cancer and Leukaemia Group (CCLG), and British Infection Association (BIA) by Miller et al November 2022.

General Principles

- Within weeks of haematopoietic stem cell transplant (HSCT) there is a decline in antibody titres against vaccine preventable diseases (VPD) and an increased risk of morbidity and mortality from influenza, measles, Streptococcus pneumoniae, Haemophilus influenzae type b, and Bordetella pertussis is reported. Conferring immunity through vaccination at the earliest opportunity is therefore important.
- All children should be considered for re-vaccination after allogeneic or autologous HSCT.
- In comparison to recipients of allogeneic HSCT, autologous HSCT recipients are less immune suppressed. However, both transplant types follow the same vaccination schedule content.
- The use of live vaccines is potentially dangerous until the child has been off all immunosuppressive treatment for at least 12 months and has no evidence of active chronic GvHD.
- Chronic GvHD and its treatment cause immune suppression, therefore these patients are at high risk of infectious complications.
- COVID-19 vaccination is a separate guidance as it is continually being updated. Please refer to CCLG website for the most updated version of the guidance.
- BCG vaccination is contraindicated and not generally recommended.
- Travel vaccines-a risk assessment is needed. Live vaccines are generally contraindicated.

All Haematopoietic Stem Cell Transplant (HSCT) recipients:

- Must be 6 months after any HSCT (transplant team can review this on case by case basis)
- Should not have any evidence of active chronic GVHD
- Should be off all immunosuppressive treatment for at least 6 months
- Should be off intravenous immunoglobulins for at least 3 months

- Should not be given any live vaccines until 24 months post HSCT and been off all immunosuppressive treatment for at least 12 months and fulfil the other above criteria.
- For revaccination of patients with chronic GVHD or those still on systemic steroids or receiving DLI, please refer to the Joint consensus statement on the vaccination of adult and paediatric haematopoietic stem cell transplant recipients by Miller et al.

Vaccination of Household Contacts of Children Treated with HSCT

To protect immunocompromised patients from VPD (Vaccine Preventable Disease), immunocompetent family members and household contacts should be encouraged to receive all age-appropriate vaccinations as per the national vaccination schedule, with the following caveats-

- **Seasonal inactivated Influenza vaccine (SIIV):** should be offered annually. Given the theoretical risk of transmission of live attenuated virus, the live attenuated influenza vaccine (LAIV) should not be administered to household contacts of HSCT recipients within 2 months of transplant or if the HSCT-recipient has active GvHD
- **Rotavirus vaccine: Rotavirus vaccine should not be given to the patient** but can be given to siblings aged 6-24 weeks. Avoid Rotavirus vaccine in household contacts within two months of transplant or if the HSCT recipient has active GvHD. There is potential for transmission from the infant to immunocompromised contacts through faecal-oral route for at least 14 days post-vaccination. Good personal hygiene should be observed following administration of Rotarix. Given the theoretical risk of transmission of live attenuated virus, if an infant household member or close contact receives the rotavirus vaccine, HSCT recipients who are within 2 months of transplant or have active GvHD should avoid contact with the infant's stool for 4 weeks
- **VZV vaccine**: should be offered to healthy susceptible siblings (and adult family members who are VZV seronegative) of VZV seronegative HSCT-recipients. There is a theoretical risk of transmitting the attenuated vaccine virus to a susceptible individual; as a precautionary measure, any person who develops a vesicular rash after receiving VZV vaccine should avoid direct contact with the patient until the rash is dry and crusted.
- **Herpes zoster (shingles) vaccines**: are offered to adults aged 70-79 years. Rarely the transmission of vaccine virus may occur between those vaccinated who develop a varicella-like rash and susceptible contacts. As a precautionary measure, any person who develops a vesicular rash should avoid direct contact with the patient until the rash is dry and crusted.

Vaccination schedule for High dose chemotherapy and Haemopoietic Stem Cell Transplant Recipients(HSCT)

	Pathogens Protected Against	Vaccine	Trade Name (Equivalent alternative may be used)
Annually from 6 months (consider from 4 months)	Seasonal Influenza SARS-C0V-2	Seasonal inactivated Influenza vaccine SARS-C0V-2 vaccine (as per national recommendations)	Various Various
6 months	Diphtheria, tetanus, pertussis, polio, Haemophilus influenzae b, Hepatitis B Meningococcal B Streptococcus pneumoniae Human Papillomavirus [1]	DTaP/IPV/Hib/HepB (dose 1) MenB (dose 1) PCV13 (dose 1) Quadrivalent HPV (dose 1)	Infanrix hexa or Vaxelis Bexsero Prevenar 13 Gardasil
7 months	Diphtheria, tetanus, pertussis, polio, Haemophilus influenzae b, Hepatitis B Streptococcus pneumoniae Human Papillomavirus [1]	DTaP/IPV/Hib/HepB (dose 2) PCV13 (dose 2) Quadrivalent HPV (dose 2)	Infanrix hexa or Vaxelis Prevenar 13 Gardasil
8 months	Diphtheria, tetanus, pertussis, polio, Haemophilus influenzae b, Hepatitis B Meningococcal B Meningococcal ACWY[2] Streptococcus pneumoniae	DTaP/IPV/Hib/HepB (dose 3) MenB (dose 2) Men ACWY (dose 1) PCV13 (dose 3)	Infanrix hexa or Vaxelis Bexsero Nimenrix or Menveo Prevenar 13
12 months	Human Papillomavirus [1]	Quadrivalent HPV (dose 3)	Gardasil
18 months	Meningococcal ACWY [2] Meningococcal B Human Streptococcus pneumoniae	Men ACWY (dose 2) MenB (Booster) PCV13 or PPSV23[3]	Nimenrix or Menveo Bexsero Prevenar 13 or Pneumovax
19 months	Haemophilus influenzae b	A Hib containing vaccine[4]	
24 months	Measles, Mumps, Rubella [5,6] Varicella -Zoster virus[5,7]	MMR (dose 1) live vaccine Live attenuated Varicella Vaccine (LAVV)	MMR VaxPro or Priorix Varivax or Varilrix
26 months	Varicella -Zoster virus[5,7]	Live attenuated Varicella Vaccine (LAVV)	Varivax or Varilrix
30 months	Measles, Mumps, Rubella	MMR (dose 2) live vaccine	MMR VaxPro or Priorix
3 years	Diphtheria, tetanus, pertussis and polio	DTaP/IPV (Booster 1)	Repevax or Boostrix IPV
14 years	Diphtheria tetanus, polio	Td/IPV (Booster 2)	Revaxis

[Vaccines: DTaP = Diphtheria/ Tetanus/ acellular Pertussis, dT = Low dose Diphtheria/ Tetanus/, Hib = *H.influenzae b* conjugate, HepB =Hepatitis B, HPV = Human papillomavirus, IPV = Inactivated polio virus vaccine, Men B = Meningococcal B conjugate, Men C = Meningococcal C conjugate, Men ACWY = Menincococcal ACWY conjugate, MMR = Measles/Mumps/Rubella, PCV13 = 13 valent Pneumococcal conjugate, PnPS 23 = 23 valent pneumococcal polysaccharide]

[1] All HSCT recipients aged 12 years and over, should be offered a primary course of 3 doses of HPV vaccine at 6, 7 and 12 months post HSCT as recommended by Miller et al.
[2] HSCT Patients are at risk from meningococcal disease therefore 2 doses of quadrivalent conjugate vaccine are recommended beginning at 8 months post HSCT.
[3] PCV13 is given if the recipient has active GvHD, or PSV23 (Pneumovax) is given if they do not have GvHD, as recommended by Miller et al.
[4] A Hib containing vaccine in combination with Meningococcus C conjugate vaccine.
[5] Criteria for administration of live vaccines. i) 24 months post HSCT ii) No GvHD iii) No Immune suppressive therapy for 12 months iv) In remission v) No IVIg in last 3 months.
[6] Paediatric patients – If criteria for live vaccines are met, can consider vaccinating from 18 months post HSCT if there is community outbreak.
[7] If criteria for live vaccines are met and patients are VZV seronegative, consider 2 doses of LAVV administered 2 months apart at 24 and 26 months.
[8]Where two or more injections need to be administered at the same time, they should be given at separate sites, preferably in a different limb. If more than one injection is to be given in the same limb, they should be administered at least 2.5cm apart (Green book guidance)
[9]The site for vaccination is either the deltoid muscle in upper arm or the anterolateral aspect of the thigh. Please refer to the routine immunisation schedule on the gov.uk website