New BSH Paediatric Guidelines – Laboratory Considerations

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BLOOD BANK SERVICE LEAD

SHEFFIELD CHILDREN'S NHS FOUNDATION TRUST

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Transfusion Laboratory Paediatrics

What's so special? Why so different? Why important?

Sampling and patient identification issues

Maternal samples for neonates

Specific components

Additional laboratory testing

Compatibility testing

Prescription volumes

Adult centres managing children

SHOT data – high proportion of paediatric SHOT cases related to IBCT, delays, under/over transfusion.

Paediatric Samples

Key practice point: Minimise phlebotomy where possible: agree a local policy on the frequency and types of regular blood tests required, collecting small samples, and using small-volume laboratory analysers and near-patient testing.

What to reject

Wrong name / DOB / Hospital number

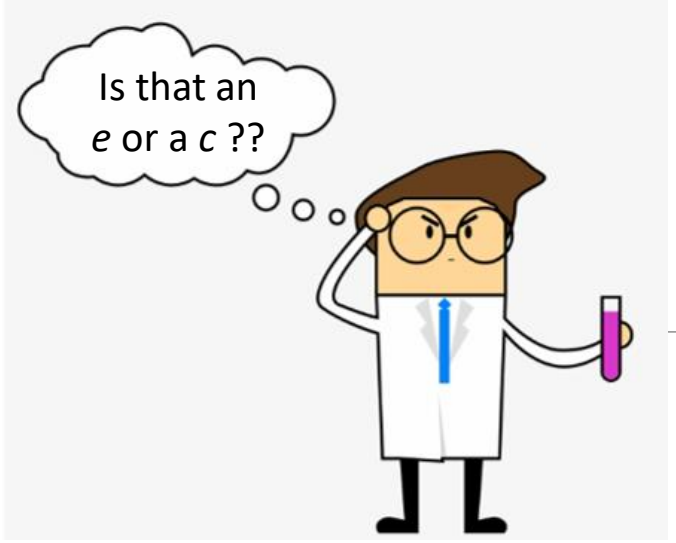
Billie / Billy

Year of birth current year

Smudged / illegible

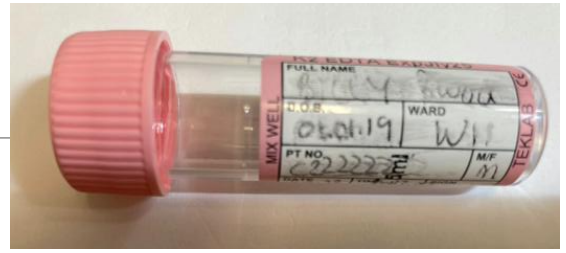
Crossed through

SHOT
Serious Hazards of Transfusion



Would you accept?

C222222
BLOOD, Billy
01/01/2019



724 528 994 2663
HOLLINGSWORTH-CHRISTIANSON, Alexander – Christopher
01/01/2019

Slight smudge

Extra long names

Part of double barrelled name missing

No signature / date bled

Poor hand writing

Name on form different to name on sample

How do I get all that on there!!

Consequences of poor sample labelling

Did you know…

A 0.5 ml blood sample in a 500 g infant (1 ml/kg), is roughly equivalent to a 70 ml sample in a 70 kg adult, (Lin et al, 2000).

Sample needs to retaken!

- Upset patient
- Angry parents
- Grumpy Dr
- Phlebotomy associated anaemia
- Extra work for lab staff
- Extra work for ward staff
- Delay to transfusion?
- Longer attendance in hospital
  - Use of a hospital bed for longer
  - Away from home for longer

Paediatric samples

Phlebotomy is a minor surgical procedure and can be quite upsetting and sometimes traumatising for children

Phlebotomy must be kept to a minimum in children

Ensure a good incident reporting and patient safety culture in place

Zero tolerance

Understanding of consequences is important

There must be an agreed process for temporary name changes e.g. change of name ‘baby’ to ‘Joe’

SHOT
Serious Hazards of Transfusion

Minimising donor exposure

Key practice point: Hospitals should develop policies that help to minimize exposure of infants to multiple donors

Hospitals should develop these policies based on their usage to also minimise wastage

Different hospitals may have different specialities and different usage

No one size fits all protocol

So what's so different about Neonates?

Patients under 4 months of age

- ABO grouping in neonates differs from that in adults
  - Neonates have approximately 1/3 of A and B red cell antigens compared to adults
  - Shared care patients and transfusions at other hospitals – always investigate DP reactions
  - Reverse group A and B antigens are not well developed
  - Maternal ABO antibodies may be detectable
- Red cell antibody screening
  - Red cell antibodies are not usually produced in the first 4 months of life
  - Maternal IgG antibodies are actively transported across the placenta providing acquired immunity. This includes maternal red cell antibodies.

Pre transfusion testing in neonates up to 4 months of age

Baby

- ABO/D forward group
- DAT if blood transfusion is likely
  - Routinely performing a DAT is not recommended unless transfusion is required or when haemolysis / HDFN is suspected. DAT's should not be routinely performed.

Mother

- ABO/D group
- Antibody screen (sample collected within 3 days of delivery or post delivery)
- Antibody identification if antibody screen is positive.

In the absence of a maternal sample the neonate's sample can be used for antibody screening and identification.

Why use a maternal sample?

- Antibodies of clinical significance that can cause HDFN will be in the maternal plasma
- The neonate is unlikely to make clinically significant alloantibodies before 4 months of age
- Easier to obtain a sufficiently large sample from the mother to allow antibody screening and identification if required
- Sample collection in the neonate can cause iatrogenic anaemia and exasperates anaemia of prematurity
- Maternal antibody in the neonate can be bound to neonatal cells, resulting in a lower concentration in the plasma and can lead to false a negative antibody screen

Compatibility testing

If the neonatal DAT and antibody screen (maternal or neonatal) are negative and the confirmation ABO and D groups are not anomalous, then no further pre-transfusion testing is required until 4 months of age

If there is an atypical red cell antibody in maternal or neonatal plasma and/or a positive DAT on the neonate's red cells further investigations should be undertaken to identify the following:

- Has the maternal antibody the potential to cause HDN?
- Is the neonate antigen-positive for the maternal antibody?
- Is there ABO incompatibility between mother and infant?
- Has the mother received prophylactic anti-D?
- Consider elution studies if DAT is positive and there is evidence of haemolysis
- Crossmatch required
- See BSH(2025) **Guideline for the investigation and management of red cell antibodies in pregnancy: A British Society for Haematology guideline** https://onlinelibrary.wiley.com/doi/full/10.1111/tme.13098 for clinically significant red cell antibodies that cause HDFN
- *Note: care must be taken when interpreting a DAT result. It can sometimes be negative during acute haemolysis or be positive for no obvious clinical or serological reason. It may be positive due to anti-D Ig given to D-negative mothers as part of routine antenatal prophylaxis.*

Blood requirements and selection

Recommendation: It is recommended that recipients under 1 year of age be transfused with components with neonatal/infant specification (1C).

Intra-uterine transfusion (IUT) red cells and platelets

Neonatal/infant small volume red cells (‘paedipacks’)

Neonatal/infant large volume red cells (‘LVT’s)

Neonatal exchange red cells

Neonatal/infant platelets

Neonatal/infant FFP

Neonatal/infant Cryo

Blood requirements and selection – up to 1 year

Additional testing for neonatal/infant specification blood

Haematocrit

- IUT 0.5-0.6 (NHSBT 0.5-0.55)
- Exchange 0.7-0.85
- Pedi split/LVT 0.5-0.7

Paediatric antibody screen ‘PANTS’ tested negative

HT-

CMV-

- required up to 28 days post EDD
- 6 months of age to compensate for prematurity

Donors have given at least 1 donation in the last 2 years and negative on current and previous donation for all mandatory microbiology markers

Other considerations

- Exchange units have a high plasma content. Need to consider haemolysis if given to non-ABO identical patient.
- Irradiated for IUT
- Irradiated for exchange post IUT or does not cause delay
- Previous IUT irradiated until 6 months old

Blood requirements and selection – up to 4 months of age

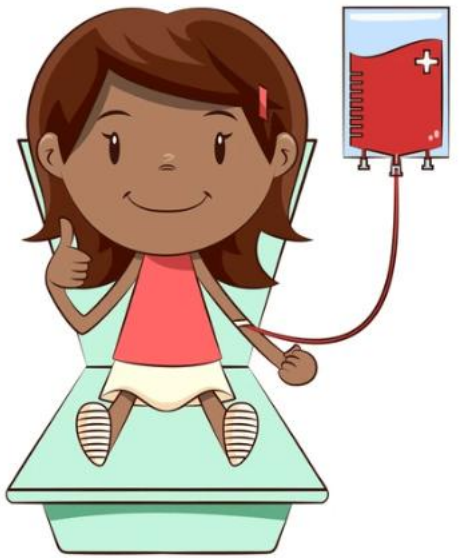
- Unless local policy is to issue only group O to neonates, red cells must be of an ABO group which is compatible with both mother and neonate.
- 7.17.3.If the maternal group is unknown or uncertain, group O red cells should be selected.

BSH 2012 **Guidelines for pre-transfusion compatibility procedures in blood transfusion laboratories**

Blood requirements and selection

Patients from 1 year of age

- Adult units can be used
- Special requirements as for adult patients
- Prescription is still in mls



Age of blood summary

	Non-irradiated	Irradiated
IUT	Not recommended	Up to end of day 5. Use within 24 hours of irradiation
Neonatal exchange	Not recommended	Up to end of day 5. Use within 24 hours of irradiation
Neonatal resuscitation (up to 20 ml/Kg)	Less than 14 days old	Less than 14 days old
Neonates/infants up to 1 year of age – large volume transfusion	Up to end of day 5	Up to end of day 5. Use within 24 hours of irradiation
Neonates – top up	Up until expiry	Up until expiry
Patients from 1 year of age top up	Up until expiry	Up until expiry
Sickle cell, Thalassemia and other transfusion dependant patients	Please refer to relevant national guidelines (158, 184) and 2023 statement.	

Blood requirements and selection Haemoglobinopathy and transfusion dependant patients

Joint Statement from NHS Blood and Transplant, National Blood Transfusion Committee, United Kingdom Thalassaemia Society and Sickle Cell Society (2023) Removal of maximum age requirements for red cells transfusion to patients including those with Haemoglobinopathies

“A literature review has identified limited evidence to support the recommendation of transfusing fresh blood to adult patients”

“Red cell maximum age requirements are not in place in other countries that use red cell exchange in sickle cell disorders”

“This recommendation to remove the maximum age requirement for red cell transfusion primarily applies to Haemoglobinopathy patients. It should also be emphasised that red cells up to standard shelf-life are considered appropriate for transfusion to all other patient groups (apart from neonates and infants receiving large volume transfusions)”

“You should continue to match for ABO and extended Rh and K type (D,C,c,E,e,K antigens) for patients with haemoglobinopathy disorders, as recommended in national guidelines”

Blood requirements and selection Haemoglobinopathy and transfusion dependent patients

Patient type	Other considerations	Recommendation to continue apply age restriction to red cell units	
		Top up	Exchange
Sickle Cell Anaemia	over 1 year old	No	No
Thalassaemia		No	No
Cardiac surgery, Major haemorrhage one-off	over 1 year old	No	No
Diamond-Blackfan anaemia	over 1 year old	No	No
Other transfusion dependent patients	MDS	No	No
	AML	No	No
Neonates and Children less than 1 year		Yes	Yes

Sickle patients

- Blood provided for SCD patients should be HbS negative and, where possible, should be <10 days old for simple transfusion and <7 days old for exchange transfusion but older blood may be given if the presence of red cell antibodies makes the provision of blood difficult (Grade 1C).

BSH (2016) Guidelines on red cell transfusion in sickle cell disease. Part 1: principles and laboratory aspects

Other transfusion dependent patients

- Where possible, red cell survival post-transfusion should be maximised by selection of 'fresh' red cells. NHS Blood and Transplant recommends using blood less than 14 days from date bled

BSH (2012) Guidelines for pre-transfusion compatibility procedures in blood transfusion laboratories

Blood group selection of plasma-based components

Patient's ABO Group	ABO Group of Plasma Components to be Transfused		
	Platelets	FFP & SD FFP¥	Cryoprecipitate¥
O			
1st choice	O	O*	O*
2nd choice	A, B or AB	A or B or AB	A or B or AB
A			
1st choice	A	A	A
2nd choice	AB	AB	AB
3rd choice	B†	B¥	B¥
4th choice	O†	-	-
B			
1st choice	B	B	B
2nd choice	AB	AB	AB
3rd choice	A†	A¥	A¥
4th choice	O†	-	-
AB			
1st choice	AB	AB	AB
2nd choice	A†	A¥	A¥
3rd choice	B†	B¥	B¥
4th choice	O†	-	-
Unknown			
1st choice	AB	AB	AB
2nd choice	A†	A¥	A¥
3rd choice	B†	B¥	B¥
4th choice	O†	-	-

Platelets

† Tested and negative for HT antibodies: here denoted on the component label this indicates that the component has been tested and contains a low titre of anti-A or anti-B in the plasma.

- Group B or AB platelets may not be available.
- Group O platelets for non-O patients should be avoided as much as possible.
- Platelets should be compatible for D.
- If a patient requires HLA-matched platelets, HLA match usually takes precedence over ABO group

FFP, SD FFP and cryoprecipitate

* Group O FFP and cryoprecipitate should **only** be given to group O patients.

¥ Group compatible plasma should be used wherever possible. FFP and Cryo must be HT negative. SD FFP is not tested for HT antibodies. Non-compatible groups should only be used in emergencies when compatible groups are not available.

- AB plasma, though haemolysin free and suitable for patients of any ABO group, should be conserved for group AB patients or emergency transfusions where the patient's groups is unknown. Group AB cryoprecipitate has limited availability

Blood requirements and selection

Granulocyte transfusions

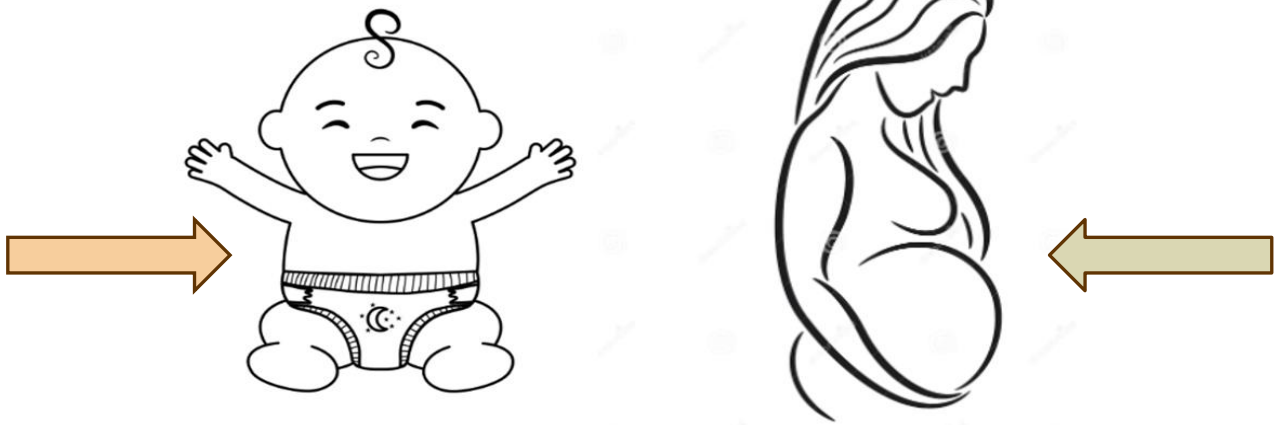
- ABO/D identical or compatible (HT- for anti-A / B if non identical)
- Irradiated
- CMV- for those at risk of CMV disease
- Electronic issue or immediate spin crossmatch
- No further matching is required, including to prevent sensitisation or for antibodies
- Not of neonatal specification for patients <1 year old

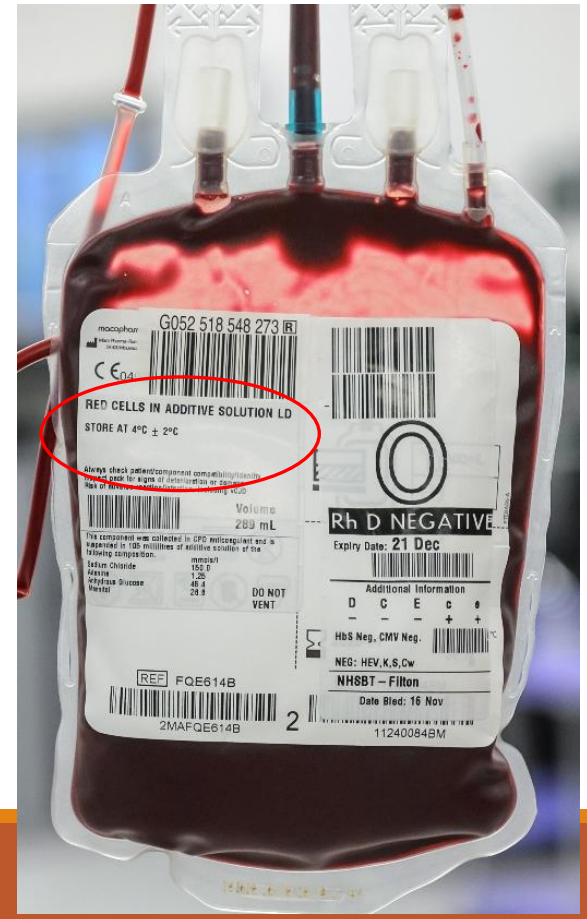
Emergency neonatal units

Key practice point: Hospital policies should ensure that paedipacks are available for emergency use by maternity and neonatal units

It is important to allow clear distinction between emergency adult and neonatal units

Consideration should be given to the age of emergency neonatal units used for neonatal resuscitation to reduce the risk of hyperkalaemia.

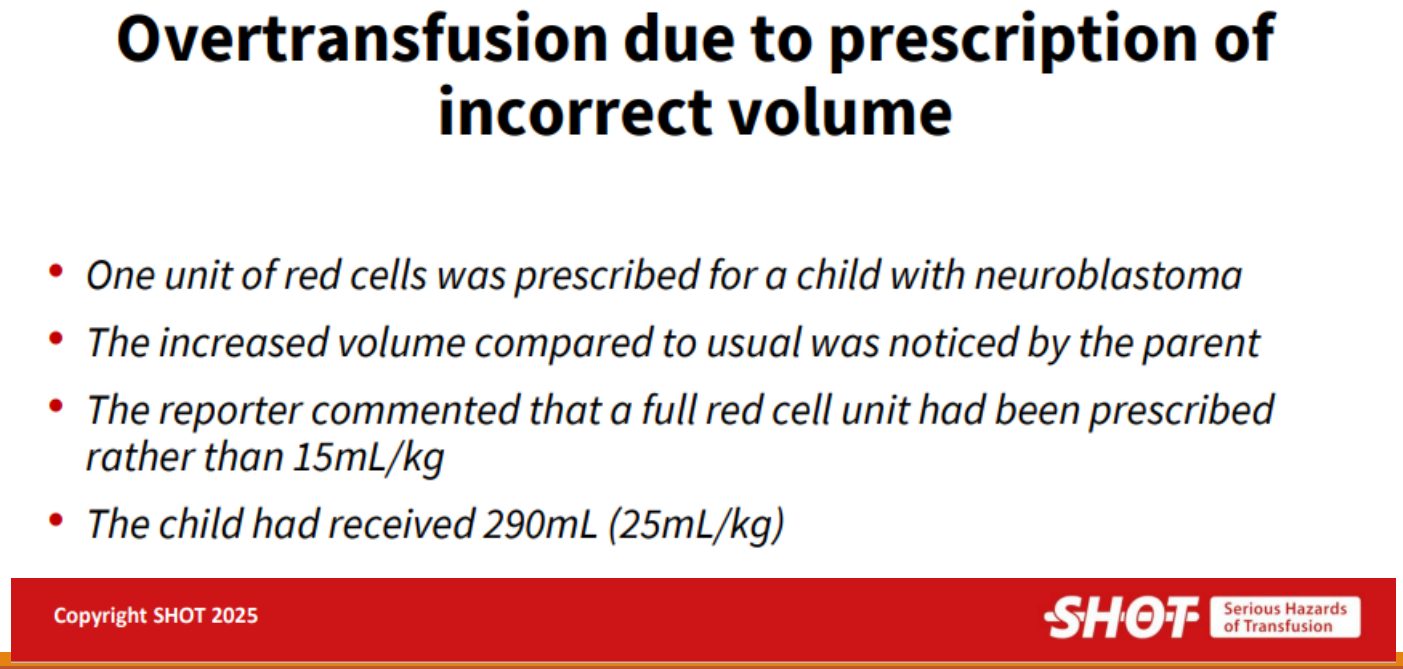




Volume and prescription

Neonatal, infant and children transfusion volumes should be prescribed in mls

- Platelets – normally up to 1 adult unit
- Challenge potentially inappropriate requests



Concessionary release

*<u>Recommendation</u>: In order to avoid delays in blood provision, if specific components are not available in an emergency, use **pre-agreed hierarchies** of alternative components **and communication pathways** (1C)*

<u>Recommendation</u>: It is recommended that recipients under 1 year of age be transfused with components with neonatal/infant specification

- Neonatal specification components may not always be available in emergencies or urgent situations

Suggested Hierarchy:

1) ABO compatibility with mother and infant
2) Antigen-negative for maternal antibodies
3) Age of unit
4) Irradiation status
5) CMV negativity: there is acceptance that, in an emergency situation, leucodepleted components may be provided for recipients who would normally receive CMV-negative components
6) A component that satisfies the neonatal specification e.g. paedi packs, LVT units

Other considerations

- Adult group O unit with unknown HT antibody status there is a very low risk of haemolysis from HT antibodies given the small volume of plasma in SAGM units.
- Pre agreed vs concessionary issue
- Concessionary release of components for older children should follow a similar hierarchy as appropriate

Delay in concessionary release of adult specification platelets for a neonate with significant bleeding

- *Emergency platelet transfusion was requested for a severely thrombocytopenic neonate with liver failure and both rectal and intracranial bleeding*
- *Neonatal/infant specification platelets were not available on site*
- *The clinical team asked for standard adult specification platelets but there was a 2-hour delay in authorising their release due to difficulty in contacting the haematology medical team and the laboratory's inability to authorise emergency release*

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Recommendation: Red cells specific for intrauterine transfusion (IUT) should be used whenever possible. Fetal Medicine Units in conjunction with Hospital Transfusion teams should develop local written protocols and provide education regarding the hierarchy of possible alternatives for emergency IUT

Suggested alternatives

Urgent

- Where there is unexpected anaemia requiring an IUT within a few hours, but not an immediate life-threatening emergency
    1) Irradiated IUT units (may be delayed for maternal antibodies)
    2) Irradiated neonatal exchange units

Emergency

- Requiring immediate IUT in order to prevent fetal death
    1) Irradiated neonatal units <5 days old <24 hours of irradiation
    2) Non irradiated neonatal units
    3) Non irradiated adult 'flying squad'

Consider

- Planning for high-risk cases
- Maternal antibodies
- Haematocrit of units (different for LVT/splits, IUT and exchange units)
- Age of blood and risk of hyperkalaemia

Shared care

Recommendation: Obtain the neonatal and maternal transfusion history (including fetal transfusions) for all new neonatal admissions. Obtain a maternal sample for initial testing when possible and use this for crossmatching if required.

Sick neonates are often transferred between multiple hospitals so it is vitally important to obtain a full transfusion history and communicate this to the transfusion laboratory

Reset Form

Endorsed by: National Blood Transfusion Committee | SHOT Serious Hazards of Transfusion

BLOOD TRANSFUSION SHARED CARE FORM: IRRADIATED / SPECIALIST BLOOD COMPONENTS & SPECIALIST TREATMENT COMMUNICATIONS DOCUMENT

Sections A: To be completed by a Senior member of the Referring Clinical Team and sent to the Transfusion Lab. Email:

Patient Details		Referring Hospital		Specialist Requirements		ABO/D Group & Transplant Details	
First Name		Shared Care Hospital		Irradiated:		Date of Transplant	
Last Name		Additional Site		CMV:		Patient Group	
DOB		Diagnosis		Washed RBCs:		• Non-Transplant patient • Autologous Transplant • Allogenetic Transplant	
NHS Number (MRN)	( )	Sickle Cell Disease? Thalassemia?		Washed platelets:		Donor Group 1	
Address		Specialist Treatment Required/Received:		Platelets: HLA HPA		Donor Group 2	
Patient informed of Special Requirements?		Select treatment for 'Special Requirements' needed: Click Here for List Overleaf		Other:		D Selection:	
Completed by: (name)	Date:					RBC ABO Selection	
Contact details:						Plasma ABO (*HT-)	

Sections B: To be completed by the Referring Hospital Transfusion Laboratory: Ensure top section has been completed in full

ABO / D of last blood component transfused			Lab Results				Phenotype
Component type	ABO/D	Last transfused	Historical antibodies:				RhK:
Red Cells			Current antibodies:		Last tested:		Additional results available on Sp-ICE:
Plasma Products	HT-		DAT:		Last tested:		
Platelets			Additional Flags:				
Anti D Ig							

I confirm all special requirements stated in Section A have been entered on the LIMS as requested

Date entered on LIMS:

Completed form to be sent by email to shared care hospital laboratory **Email:**

Date email sent:

Section C: To be completed by Shared Care Hospital. Please document below the Confirmation of receipt & transfer of data

Date entered on LIMS:		Print name:	

Thank you: By encouraging as many transfusion laboratories to use this form and increase communication between labs, we aim to reduce IBCT's and improve patient safety

With thanks to the East of England RTC

Review date: September 2028

Endorsed by: National Blood Transfusion Committee SHOT Serious Hazards of Transfusion

BLOOD TRANSFUSION SHARED CARE FORM: IRRADIATED / SPECIALIST BLOOD COMPONENTS & SPECIALIST TREATMENT COMMUNICATIONS DOCUMENT

Irradiated (IRR) blood components

Indication (Select all that apply)		Duration of requirement
☐	Patients receiving transfusions from a first or second-degree relative	For each transfusion episode
☐	• For intrauterine transfusions (IUT) and neonatal exchange blood transfusions (EBT) • For neonatal top-up transfusions of red cells and platelets following IUT	Until 6 months post expected delivery date (40 weeks gestation)
☐	Patients with known or suspected severe congenital T-lymphocyte immunodeficiency syndromes, such as DiGeorge or CHARGE syndrome	Once a diagnosis of severe T-lymphocyte immunodeficiency has been suspected, irradiated components should be given while further diagnostic tests are undertaken
☐	Recipients of allogeneic haemopoietic stem cell transplantation (HSCT) or If chronic GvHD is present or The patient is taking immunosuppressants	From the start of conditioning therapy until all the following criteria is met: 1. >6 months post-transplant, 2. Lymphocyte count is >1.0 x 10^9/l, 3. Patient is free of active chronic GvHD and 4. Patient is off all immunosuppression Indefinitely
☐	BMT/PBSCT donors (for allogeneic transplantation)	For 7 days prior and during the harvest
☐	Recipients of autologous stem cell transplantation (ASCT)	For 7 days prior and during the harvest From the start of conditioning therapy until 3 months post-transplant (6 months if total body irradiation was used in conditioning)
☐	Patients with Hodgkin lymphoma, at any stage of the disease	Indefinitely
☐	Patients receiving, or who have previously received purine analogues e.g., fludarabine, cladrabine, bendamustine and pentostatin	Indefinitely
☐	Patients with a haematological diagnosis receiving Alemtuzumab Patients with aplastic anaemia receiving ATG or Alemtuzumab Patients with rare types of immune dysfunction conditions receiving ATG	Indefinitely
☐	CAR-T cell treatment including peripheral blood lymphocyte collection and infusion **Date commenced:**	For 7 days prior and during the harvest, and until 3 months post-infusion

Cytomegalovirus (CMV) negative blood components

Indication (Select all that apply)		Duration of requirement
☐	IUT and neonates	Up to 28 days post expected delivery date
☐	Elective transfusions during pregnancy	Where possible for duration of pregnancy (not during labour or delivery)

*Monoclonal antibody therapy	Date commenced:		Date finished:	
☐ anti-CD38 ☐ anti-CD47 ☐ anti-CD45 ☐	Patients with relapsed or refractory multiple myeloma (MM), acute myloid leukaemia (AML) or myelodysplastic syndrome MDS) may be treated with monoclonal antibody therapies, currently **Daratumumab** (Darzalex), **Isatuximab** (anti-CD38) and **CAMELLIA**; **MAGROLIMAB** (anti-CD47). These therapies have the potential to interfere with serological investigations and compatibility testing in blood banks. Where possible, the patient's extended phenotype should be tested prior to the commencement of therapy and transfusion laboratories **must** be notified of patients receiving these treatments, including finish dates, as interference can last for up to 6 months after the last infusion.			

Information on irradiated products derived from BSH Guidelines on the use of irradiated blood components, 2020 . Information on CMV negative components from SaBTO.

Notes on completion of form overleaf:

- Selection of any of the above Specialist Treatments will auto populate 'YES' Under 'Specialist requirements' Irradiated and/or CMV Neg
- For all other Special requirements, Select YES or NO. Or document under 'Other'
- If a patient's requirements change, please complete another form

Acknowledgements

SHOT – SERIOUS HAZARDS OF TRANSFUSION

References

BSH (2012) **Guidelines for pre-transfusion compatibility procedures in blood transfusion laboratories.** https://b-s-h.org.uk/guidelines/guidelines/guidelines-for-pre-transfusion-compatibility-procedures-in-blood-transfusion-laboratories

BSH (2016) Guidelines on red cell transfusion in sickle cell disease. Part 1: principles and laboratory aspects. https://onlinelibrary.wiley.com/doi/10.1111/bjh.14346

BSH (2016) **Guidelines on transfusion for fetuses, neonates and older children.** https://b-s-h.org.uk/guidelines/guidelines/guidelines-on-transfusion-for-fetuses-neonates-and-older-children

BSH(2025) **Guideline for the investigation and management of red cell antibodies in pregnancy** https://onlinelibrary.wiley.com/doi/full/10.1111/tme.13098

JPAC. **Guidelines for the Blood Transfusion and Tissue Transplantation Services in the UK.** https://www.transfusionguidelines.org/red-book

Joint statement NHSBT, NBTC and UKTS (2023) **Removal of maximum age requirements for red cells** transfusion to patients, including those with haemoglobinopathies. https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/31405/20231101-nhsbt-removal-of-maximum-age-requirements-for-red-cells-transfusion-to-patients-including-those-with-haemoglobinopathies.pdf

NHSBT (2021) **Clinical Guidelines for the use of Granulocyte Transfusions.** https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/25196/clinical-guidelines-for-the-use-of-granulocyte-transfusions.pdf

SHOT **Shared care form** https://www.nationalbloodtransfusion.co.uk/sites/default/files/documents/2025-09/Blood-Transfusion-Shared-Care-Form-Irradiated-Specialist-Blood-Components-%26-Specialist-Treatment-Communications-Document.pdf

Thank you for listening

Any questions?