University Hospitals Bristol NHS Foundation Trust

North Bristol NHS Trust

Bristol Blood / Blood Component Transfusion Guideline - 2017

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Specific staff groups to whom this policy directly applies	**Likely frequency of use**	**Other staff who may need to be familiar with policy**
All those who prescribe blood	Dependant on frequency of blood use	All staff who administer blood

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1. Red Cell Transfusion

Dose – in the absence of active bleeding, use the minimum number of units required to achieve target haemoglobin (Hb).
Consider the size of the patient; assume an increment of 10g/L per unit for an average 70 kg adult.
The reason for anaemia should be known/under investigation.

Number	Indication	Hb threshold	Hb Target	Special points
R1	Acute bleeding			When normovolaemic frequent Hb measurement / near patient testing required. Use thresholds below.
R2	Acute anaemia Stable patient	70g/L	70-90g/L	Post cardiac surgery, traumatic brain injury and acute cerebral ischemia – follow local guidelines.
R3	Acute anaemia Cardio vascular disease	80g/L	80-100g/L	
R4	Chronic Transfusion Dependant Anaemia	80g/L	To prevent symptoms	Transfuse to prevent symptoms; use initial threshold of 80g/L and adjust as required. Haemoglobinopathy patients require individualized Hb thresholds depending on age and diagnosis.
R5	Radiotherapy	110g/L	≥ 110g/L	Limited evidence for maintaining Hb of ≥ 110g/L in patients receiving radiotherapy for cervical and possibly other tumours.
R6	Exchange transfusion			

- Consider reduction in Hb target and transfusion rate in patients at risk of Transfusion Associated Circulatory Overload (TACO) e.g. elderly, cardiac failure, renal impairment, chronic anaemia, or evidence of fluid overload.
- Patients with sickle cell disease (SCD), thalassaemia, autoimmune haemolysis, myelodysplastic syndrome and others requiring long term transfusion support should have Rh and Kell matched blood.
- Patients with white cell count > 50 x 10^9 /L, paraprotienaemia, chronic severe anaemia or SCD may develop complications. Red cell transfusion threshold in these disorders should be discussed with a haematologist.

2. Fresh Frozen Plasma (FFP)

Dose – 15 ml/ Kg body weight, often equivalent to 4 units.
The reason for coagulopathy should be known/under investigation.

Number	Indication	Dose	Threshold	Special points
F1	Major haemorrhage	At least 1 unit FFP : 2 units RBC		In trauma 1 unit FFP: 1 unit of RBC recommended. Once bleeding under control, FFP use should be guided by timely tests for coagulation as indicated below.
F2	PT Ratio / INR > 1.5 with bleeding	15 ml/Kg body weight	PT & APTT ratio ≤ 1.5	Clinically significant bleeding without major haemorrhage; FFP required if coagulopathy.
F3	PT Ratio / INR > 1.5 and pre-procedure	15 ml/Kg body weight	PT & APTT ratio ≤ 1.5	Prophylactic use when coagulation results are abnormal Eg; DIC, and invasive procedure is planned with risk of clinically significant bleeding.
F4	Liver disease with PT ratio / INR > 2 and pre-procedure	15 ml/Kg body weight	PT ratio / INR ≤ 2	FFP should not be routinely administered to non-bleeding patients or before invasive procedures when PT ratio / INR is ≤ 2. Unless departmental guidelines specify otherwise.
F5	TTP / Plasma exchange			Not usually required unless TTP, when the patient is bleeding or following recent biopsy/surgery.
F6	Replacement of single clotting factor deficiency			When factor concentrate not available or inappropriate. Guided by haemostasis expert.

- Vitamin K deficiency causing prolonged clotting times should be managed with vitamin K – 10mg x3/week.
- Prothrombin complex should be used to reverse warfarin.
- Use virally inactivated FFP if single clotting factor deficiency, in patients born in or after 1996 (VCJD precaution), in TTP/HUS.

3. Prothrombin Complex Concentrate (PCC)

Usually used with vitamin K. Dose of PCC should be determined by the situation and INR. Use local guidelines.

Number	Indication
PCC1	Emergency reversal of vitamin K antagonist (VKA) for severe bleeding or head injury with suspected intracerebral haemorrhage
PCC2	Emergency reversal of VKA pre-emergency surgery

4. Cryoprecipitate

Dose – 2 pooled units, equivalent to 10 individual units, will increase fibrinogen by approximately 1 g/ L. Cryoprecipitate is usually used with FFP unless there is an isolated deficiency of fibrinogen.
Response and further replacement guided by coagulation monitoring.

Number	Indication	Threshold	Special points
C1	Clinically significant bleeding	Fibrinogen <1.5 g/L	Transfuse if fibrinogen < 2 g /L in obstetric bleeding
C2	Pre-procedure	Fibrinogen <1 g/L	
C3	Bleeding associated with thrombolytic therapy		
C4	Inherited hypofibrinogenaemia when fibrinogen concentrate not available		

5. Platelet Concentrates

Number	Indication	Threshold	Special points
Prophylactic platelet transfusion			One adult therapeutic dose required.
P1	Reversible bone marrow failure (BMF), including allogenic SCT Consider no prophylaxis strategy in autologous SCT Critical illness Chronic BMF receiving intensive therapy Chronic BMF to prevent persistent WHO grade ≥2 bleeding * Chronic stable BMF	10×10^9 /L 10×10^9 /L 10×10^9 /L 10×10^9 /L Count variable Not indicated	 Prophylactic, unless stated otherwise, defined as either transfusion when no bleeding or WHO bleeding grade 1. Therapeutic to treat bleeding grade ≥ 2 - see below
P2	With risk factors for bleeding eg; sepsis / haemostatic abnormality	$10 - 20 \times 10^9$ /L	
P3 Prior to invasive procedure or surgery		Consider size of the patient, previous increments and target count.	
P3a	Central venous line	$<20 \times 10^9$ /L	
P3b	Pre-lumbar puncture / spinal anaesthesia	$<40 \times 10^9$ /L	
P3c	Pre-liver biopsy / major surgery	$<50 \times 10^9$ /L	
P3d	Epidural anaesthesia	$<80 \times 10^9$ /L	
P3e	Pre-critical site surgery eg; CNS	$<100 \times 10^9$ /L	
	Prior to bone marrow biopsy/ PICC insertion/ traction removal of central line/ cataract surgery, platelet transfusion is not indicated.		
P4 Therapeutic use to treat bleeding (WHO bleeding grade 2 or above *)			
P4a	Severe bleeding	$<50 \times 10^9$ /L	
P4b	Pre-critical site bleeding eg; CNS / traumatic brain injury	$<100 \times 10^9$ /L	
P4c	Clinically significant WHO grade 2 bleeding *	$<30 \times 10^9$ /L	A higher threshold may be required
P5 Platelet consumption/destruction			
P5a	DIC – Pre-procedure or if bleeding.		Consider threshold counts above but may not be achievable. Individual case review required.
P5b	Primary Immune thrombocytopenia. Emergency treatment pre-procedure or if severe bleeding.		Consider threshold counts above but may be unachievable or unnecessary. Individual review required.
P6 Platelet dysfunction			
P6a	Acquired platelet dysfunction (eg; cardiac surgery, anti-platelet agent)		Consider only if critical bleeding
P6b	Inherited platelet disorders		Directed by specialist in haemostasis

SCT – Stem cell transplant, DIC – Disseminated intra vascular coagulopathy, PICC – Peripherally inserted central catheter, CNS – Central nervous system

*** See Appendix for modified WHO bleeding grades**

6. Human Albumin Solution (HAS)

There are 2 concentrations available for clinical use – 4.5% HAS (Contain 4.5g of albumin in 100ml) and 20% HAS (Contain 20g of albumin in 100ml).

Concentration	Indication
4.5% HAS	Management of burns Replacement for plasma exchange Replacement for paracentesis
20% HAS	Replacement for paracentesis (See the table below) Treatment of diuretic resistant oedema in hypoalbuminaemic patients Treatment of hypoalbuminaemic patients with ovarian hyperstimulation syndrome

UHB paracentesis guideline;

100 ml 20% HAS for 2 L of paracentesis volume removed.

7. Management of Rh D -ve women of childbearing potential who have received Rh D +ve blood products

Platelet transfusion

Rh D -ve products should be provided for Rh D –ve girls and women of childbearing potential. If unavailable and Rh D +ve platelets used give anti-D. If platelet count < 30 give anti-D by subcutaneous injection or intravenous route.

500 IU anti-D will cover 10 adult therapeutic doses (ATD) platelets over a 6-week period.

Inadvertent transfusion of Rh D-positive RBCs

Discuss with a Transfusion Medicine specialist.

Renal allograft

Rh D -ve women of child-bearing potential who are receiving a Rh D +ve kidney should be given 500 IU of anti-D by IM injection at the time of transplant.

8. Summary of Blood Products Available For Neonatal/Paediatric Use

N.B. All are leucocyte depleted (less than 5x 10^6 per unit). Paediatric packs recommended for top-up transfusion in children less than one year.

Red cell products

	CMV status	Mean Volume (Range)	Clinical uses
Paediatric packs	Negative	43 ml (30-70 ml)	Top-up transfusions. Hct ~ 0.5-0.7; **Must be irradiated if previous IUT.** Multi-packs from same donor should be requested if repeated top ups are anticipated.
Red cells for exchange transfusion (Ex Tx)	Negative	341ml (180-420 ml)	Exchange transfusion, usually for HDN. Hct 50-55%; **Should be irradiated.** Available from NHS Blood & Transplant.
Red cell for IUT	Negative	244 ml (150-350 ml)	Intra-uterine transfusion of anaemic fetus due to HDN, parvovirus etc. Hct > 70%; **Must be irradiated.** Available from NHS Blood & Transplant.
Large volume red cell transfusion in neonate / infant (excluding Ex Tx)	Negative	294 ml (220 – 300 ml)	Less than 5 days old Hct 0.5 – 0.6
Red cells in additive solution	Select negative	274 ml (220-340 ml)	Correction of anaemia, replacement of blood loss. Hct ~ 57% **Must be irradiated if previous IUT.**

Platelet product

	CMV status	Mean Volume (Range)	Clinical uses
Paediatric Apheresis platelets (equivalent to 0.25 adult dose)	Negative	53 ml (30-120 ml)	Treatment of thrombocytopenia or bleeding. **Must be irradiated if previous IUT.**
Platelets for IUT - Hyper concentrate	Negative	73 ml (50-100 ml)	NAITP. **Must be irradiated;** Use within 24hrs of collection.
Platelets- apheresis	Select negative	199 ml (150-400 ml)	Treatment of thrombocytopenia or bleeding. **Must be irradiated if previous IUT.** Stock item (standard apheresis adult unit) unless irradiation required.

FFP and Cryoprecipitate product – see also section on Clinical Use of FFP.

	CMV status	Mean Volume (Range)	Clinical uses
FFP – (methylene blue treated)	Not required	59 ml	Defined in Clinical use of FFP.
FFP – (methylene blue treated)	Not required	226 ml (200-320 ml)	Defined in Clinical use of FFP.
FFP (Solvent detergent treated)	Not required	200 ml	Defined in Clinical use of FFP.
Cryoprecipitate Methylene Blue	Not required	38 ml (20-60 ml)	Defined in Clinical use of cryoprecipitate.

9. Selection of Special Blood Components for Transfusion

Record requirement in the medical notes, email NBT (TransfusionSeniors@nbt.nhs.uk) / UHB (Transfusionlab@uhbristol.nhs.uk) and indicate on transfusion request form.

Indications for irradiated cellular blood components

Patient group	Irradiated blood components advice
HLA matched/donation from 1st or 2nd degree relative	Irradiated products must be used.
Recipients of allogeneic Haematopoietic Stem Cell Transplantation (HSCT)	From the start of conditioning chemo-radiotherapy. Continue if receiving GvHD prophylaxis (usually 6 months post-transplant). If chronic GvHD or on immunosuppressive treatment, continue irradiated blood components.
Bone marrow or peripheral blood HSC harvesting for autologous reinfusion	Provide irradiated cellular components during and for 7 days before the harvest.
Autologous HSC transplant patients	From start of conditioning chemo-radiotherapy until 3 months post-transplant (6 months if total body irradiation used).
Hodgkin lymphoma	Irradiated cellular components indefinitely.
Congenital T cell immunodeficiencies	Irradiated cellular components indefinitely.
Intra uterine transfusion (IUT)	Irradiated products must be used.
Neonatal exchange transfusion	Essential if previous IUT. Recommended if does not delay the procedure.
Neonatal top up transfusion	Only if previous IUT (until 6 months after expected date of delivery).
Patients treated with purine analogues & related drugs (fludarabine, cladribine, pentostatin, clofarabine, bendamustine),	Irradiated cellular components indefinitely.
Alemtuzumab (anti-CD52)	Irradiated cellular components indefinitely.
Anti-thymocyte globulin (ATG)	Irradiated cellular components indefinitely.

Indications for Cytomegalovirus (CMV) negative blood components

Granulocyte transfusion	CMV seronegative granulocytes if recipient CMV negative/unknown.
Intra uterine transfusion (IUT), Neonates	CMV seronegative products indicated for all IUTs and neonates up to 28 days post expected date of delivery.
Pregnancy	Elective transfusion. In an emergency standard components should be given to avoid delay.
All other transfusion recipients*	Standard pre-storage leucodepleted components are suitable.

* Including HSCT patients, organ transplant patients and immune deficient patients, including those with HIV.

10. Monitoring Effectiveness

This guideline will be overseen by the Trust Transfusion Committee (TTC) and will be reviewed on an annual basis or before if national guidance changes. The following elements will be monitored –

What will be monitored	Monitoring/ Audit method	Monitoring responsibility *(individual/group/ committee)*	Frequency of monitoring	Reporting arrangements *(committee/group the monitoring results are presented to)*	Where the monitoring has identified deficiencies how will actions be taken and disseminated to ensure improvements and learning
1. The NICE Quality Standard QS138 Blood Transfusion	Review of quality statements and metrics	The Trust Transfusion Committee (TTC)	6 monthly basis	Trust Clinical Effectiveness Committee (CEC)	Through an agreed and defined SMART Action Plan
	Review the local action plan	The Trust Transfusion Committee (TTC)	Following approval from CEC - 6 monthly basis (until all actions are complete)	Trust Clinical Effectiveness Committee (CEC)	Through an agreed and defined SMART Action Plan Escalate to Quality Committee / Divisional Management Teams (DMT) if there are areas of concern or good practice
2. Divisional/Specialty Risk Registers	Update risk register entries in light of any changes in practice	Clinical Divisions/Specialties	At least every 3 months	Divisional Management Teams (DMT) Patient Safety, Assurance & Audit Service (PSAAS)	Patient Safety & Clinical Risk Committee (PSCRC) H&S Committee Quality Risk Management Committee (QRMC)
4. Serious Incidents	Review of serious incidents if failures in policy	The Trust Transfusion Committee (TTC) Patient Safety, Assurance & Audit Service (PSAAS)	TTC meeting – every three months	Divisional Management Teams (DMT) Patient Safety & Clinical Risk Committee (PSCRC)	eAims 72-hour report Conduct a Root Cause Analysis (RCA) Reported to STEIS/ SABRE/ SHOT CCG

What will be monitored	Monitoring/ Audit method	Monitoring responsibility *(individual/group/ committee)*	Frequency of monitoring	Reporting arrangements *(committee/group the monitoring results are presented to)*	Where the monitoring has identified deficiencies how will actions be taken and disseminated to ensure improvements and learning
5. National guidance (NICE quality standard)	Review national guidance	The Trust Transfusion Committee (TTC)	At least every 3 months	Divisional Management Teams (DMT) Trust Clinical Effectiveness Committee (CEC)	Local guidance to be amended in light of changes in guidance

Appendix

MODIFIED WHO BLEEDING GRADES

Modified WHO bleeding grade 0 or 1
Type of bleeding included:

- No evidence of bleeding
- Mild/moderate petechiae, purpura
- Mild/moderate oropharyngeal bleeding, epistaxis <30 minutes in duration

Modified WHO bleeding grade 2
Type of bleeding included:

- Melaena, haematemesis, haemoptysis, fresh blood in stool, musculoskeletal bleeding or soft tissue bleeding ***not requiring red cell transfusion within 24 hours of onset and without haemodynamic instability***
- Profuse epistaxis or oropharyngeal bleeding i.e. > *30 minutes in continuous* duration
- Symptomatic oral blood blisters *i.e. bleeding or causing discomfort*
- Extensive petechiae, purpura *i.e. numerous in number and/or positioned on either face or abdomen and/or spreading by comparison to previous assessment*
- Visible blood in urine
- Bleeding from invasive sites requiring 2 ≥ changes of dressings in a 24 hr period
- Unexpected vaginal bleeding saturating 2 ≥ pads with blood in a 24 hr period
- Red cells in body cavity fluids obvious macroscopically
- Retinal haemorrhage with/without visual impairment

Modified WHO bleeding grade 3
Type of bleeding included:

- Melaena, haematemesis, haemoptysis, haematuria – including intermittent gross bleeding without clots, abnormal vaginal bleeding, fresh blood in stool, epistaxis, and oropharyngeal bleeding, bleeding from invasive sites, musculoskeletal bleeding, or soft tissue bleeding ***requiring red cell transfusion specifically for support of bleeding within 24 hours of onset and without haemodynamic instability.***
- Body cavity fluids reported as grossly bloody in laboratory, nursing, or medical notes.
- CNS bleeding noted on CT (computerized tomography) without clinic consequences

Modified WHO bleeding grade 4
Type of bleeding included:

- Debilitating bleeding including retinal bleeding with visual impairment*
- Non-fatal CNS bleeding with neurological signs and symptoms
- Bleeding associated with haemodynamic instability (hypotension, > 30mm Hg change in systolic or diastolic BP)
- Fatal bleeding from any source.

**visual impairment is defined as a field deficit, and patients with suspected visual impairment require an ophthalmologic consultation*