Name of policy: Transfusion Policy for Neonates and Children

Effective from: 24/04/2013

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<th>03/12/2012</th>
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<tr>
<td>Ratified</td>
<td>Hospital Transfusion Committee</td>
</tr>
<tr>
<td>Review date</td>
<td>01/12/2014</td>
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<tr>
<td>Sponsor</td>
<td>Director of Nursing, Midwifery and Quality</td>
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<td>02/12/2015</td>
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This policy supersedes all previous issues
Version Control

<table>
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<tr>
<th>Version</th>
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<th>Date</th>
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<td>24/04/2013</td>
<td>Dr Annette Nicolle Dr Bozman, Dr Sally Evans</td>
<td>Hospital Transfusion Committee</td>
<td>03/12/2012</td>
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TRANSFUSION POLICY FOR NEONATES AND CHILDREN

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1. **Introduction**

Neonates and children should not be regarded as small adults. They sometimes require specific blood components that need to be requested through the National Blood Service (NBS). They also require different pre-transfusion test in the first 4 post-natal months as they are unable to produce allo-antibodies at this young age.

This policy is in place to ensure that current clinical guidelines are followed when transfusing neonates and children.

2. **Policy Scope**

The policy for transfusion in neonates and children will be followed by clinical staff in this area, and laboratory staff when selecting the correct components for this age group.

3. **Aim of the policy**

This policy aims to provide staff with information about recommended transfusion thresholds, pre-transfusion testing, selection of specific products, such as irradiated blood, according to current guidelines.

4. **Duties - roles and responsibilities**

4.1 **The Trust Board**
To support the Hospital Transfusion Committee and transfusion practitioners in their role in promoting safe transfusion practice in neonates and children

4.2 **The Hospital Transfusion Committee (HTC)**
- To provide an evidence based policy based on national guidelines
- To monitor the appropriate use of blood components
- To monitor practice through audit
- To support the Transfusion practitioners in their role

4.3 **The Clinical staff**
- To maintain competency in blood transfusion
- To promote the appropriate use of blood through observing the Haematology Guidelines, HTC recommendations and Trust policy
- To discuss the risks and benefits of transfusion with the patient and/or parents and obtain verbal consent whenever possible
- To prescribe blood components appropriately
- To maintain patient safety throughout the transfusion process
- To report any adverse events to the Transfusion laboratory as soon as possible

4.4 **Laboratory Staff**
- To maintain competency in blood transfusion practice
5. **Definition of terms**

ABO, RhD  Refers to patient blood groups  
ATG  Anti-thymocyte Globulin  
BCSH  British Committee for Standards in Haematology  
CMV  Cytomegalovirus  
CLD  Chronic lung disease  
CPAP  Continuous positive airways pressure ventilation  
DAT  Direct Antiglobulin test (Coombs test)  
ET  Exchange transfusion  
FiO2  Percentage of inspired oxygen  
HDN  Haemolytic disease of the new born  
HLA-matched  Matched to recipient’s tissue type  
HPA  Human platelet antigen  
HTC  Hospital Transfusion Committee  
IAT  Indirect Antiblobulin test (indirect Coombs test)  
IUT  Intra uterine transfusion  
IVH  Intraventricular Haemorrhage  
NAIT  Neonatal alloimmune thrombocytopenia  
NBS  National Blood Service

6. **Transfusion policy for Neonates and Children**

All blood components are covered by this policy.

6.1 **Once infant is over 4 months old the pre-transfusion testing requirements are the same as for adults: see Transfusion Policy for Adults**

6.2 **Pre transfusion testing for neonates and infants within the first 4 post-natal months.**

Wherever possible, samples from both the mother and infant should be obtained for initial ABO and RhD group determination.

Investigations for the Maternal sample:
- ABO/Rh and Antibody screen

Investigations for the Infant sample:
- ABO/Rh (carried out twice)  
- DAT  
- If maternal sample absent, screen infant’s serum for atypical antibodies by IAT (Diamed)

*A positive DAT on the neonate’s red cells or an atypical red cell antibody in maternal or neonatal sera suggests possible HDN. In such cases serological investigations will be necessary to allow selection of appropriate blood.*
6.3 Crossmatching

- If patient less than 4 months old with no (maternal) antibodies present, DAT is negative and there have been no previous transfusions, a serological crossmatch is NOT required.
- Blood will not be selected for electronic crossmatch if maternally derived ABO antibodies are present in the neonate’s plasma. ABO-identical adult blood transfused to an infant with maternal anti-A or anti-B may haemolyse, even if the pre-transfusion DAT is negative, due to stronger ABO antigen expression on adult cells.
- After the post natal age of 4 months, compatibility tests should be carried out in accordance with national guidelines for pre-transfusion testing in adult practice (BCSH, 1996).

6.3.1 Take at least 2 blood spots for screening tests (sickle cell disease, cystic fibrosis etc) prior to transfusing blood.

6.4 Irradiation of blood products for Neonates, Infants and Children

Universal irradiation of blood products for neonates, infants and children is NOT required eg cardiac surgery, acute leukaemia, common viral infection, HIV. However it is MANDATORY in certain circumstances.

For full guidance please refer to BCSH Guidelines on the use of Irradiated Blood Components 2010

- All blood and platelets for intrauterine transfusions (IUT) should be irradiated.
- All blood for neonatal exchange transfusions (ET) should be irradiated if there is a previous history of IUT or if donation comes from first- or second-degree relative. For other neonates requiring ET, irradiation is recommended provided it does not cause undue delay.
- Neonates who have received a previous IUT of either red cells or platelets should receive irradiated blood products until 6 months after their expected delivery date (40 weeks gestation).
- All HLA-matched platelets or donations from first- or second-degree relative must be irradiated
- It is not necessary to irradiate red cells for routine “top-up” transfusions of premature or term infants unless there is a prior history of IUT, or the donation has come from a first- or second-degree relative
- All children with Hodgkin lymphoma at any stage of the disease should have irradiated red cells and platelets for life
- All children with aplastic anaemia receiving immunosuppressive therapy with ATG (and/or alemtuzumab) should receive irradiated blood products
- All children with severe T lymphocyte immunodeficiency syndromes should receive irradiated blood products from the time the diagnosis is first suspected, whilst further diagnostic tests are undertaken. In cases of uncertainty a clinical immunologist should be consulted.
6.5 Selection of blood products for Neonates, Infants and Children

6.5.1 Red Cells

- Neonate’s own ABO and RhD group or an alternative compatible ABO and RhD group
- Compatible with any ABO or atypical red cell antibody present in the maternal or neonatal plasma
- Leucodepleted (all red cell units are leucodepleted)
- CMV negative (not essential if emergency situation)
- Blood less than 1 week old (not a guideline, however please select freshest unit)
- Paediatric split packs are available from NBS (each pack contains approx 40-50mls if only small volume needed)
- The amount of blood required should be included on the request form (it is calculated from infant’s weight) NB: The initial 20mls will be discarded so account for this when ordering packs.
- A full unit can be given if blood requirement is >100mls. (Surplus will be wasted)

6.5.2 Fresh Frozen Plasma

- Neonates with significant coagulopathy should receive a recommended dose of **15 mls/kg** of FFP

  *Prothrombin time* >18 seconds
  *Activated partial thromboplastin time* >42 seconds

- In the absence of bleeding FFP may not be required unless the neonate or child is to undergo a significant bleeding challenge eg. surgery
- Correction of the prolonged coagulation screen is unpredictable and should be re-checked following administration of FFP at dose of 15mg/kg.
- Consideration should also be given to replacing Vitamin K
- A stock of neonatal non-UK MB (methylene blue) treated FFP is available in the Transfusion laboratory and from NBS. This should be use first-line for all neonates and children **under the age of sixteen** before issuing adult FFP units.

*Points to consider:*

- FFP should NEVER be used as simple volume replacement and it is not clearly superior to crystalloids or colloids in the management of neonatal hypotension
- Routine administration to preterm infants for prevention of periventricular haemorrhage (PVH) should be avoided.

6.5.3 Platelets

Platelets for neonatal transfusion
- ABO identical or compatible and Rh identical or compatible
• HPA compatible in infants with alloimmune thrombocytopenia
• Infused in a volume of 10-20mls/kg (ask for APHERESIS)

6.6 Clinical indications for transfusion of blood components

6.6.1 The NHS Executive Circular HSC2002/009 “Better blood transfusion: appropriate use of blood” is as applicable to children as it is to adults.

The decision to transfuse depends on clinical judgement, taking into account the child’s general condition, the presence or absence of bleeding and whether or not there are signs of haematological recovery.

6.6.2 For children with aplastic anaemia, red cell transfusions are usually reserved for symptomatic patients with Hb values less than 7g/dl since sensitisation as a result of large numbers of transfusions reduces the chance of a successful outcome.

6.6.3 Red Cells

*Suggested transfusion thresholds for the administration of red cells to infants less than 4 months old*

<table>
<thead>
<tr>
<th>Consider transfusion</th>
<th>Transfuse at</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaemia in the first 24 hours</td>
<td>Hb 12g/dl</td>
</tr>
<tr>
<td>Cumulative blood loss in 1 week, neonate</td>
<td>10% blood volume</td>
</tr>
<tr>
<td>Neonate receiving intensive care</td>
<td>Hb 12 g/dl</td>
</tr>
<tr>
<td>Acute blood loss</td>
<td>10 % blood volume</td>
</tr>
<tr>
<td>Chronic oxygen dependency</td>
<td>Hb 11 g/dl</td>
</tr>
<tr>
<td>Late anaemia, stable patient</td>
<td>Hb 7 g/dl</td>
</tr>
</tbody>
</table>

Using Haematocrit thresholds to guide transfusion may be preferred by some clinicians. The following thresholds are taken from the Newcastle Neonatal Services Guidelines (Gateshead is a part of the Northern Neonatal Network).

6.6.3.1 Transfuse for Haematocrit <35-40%
• Infants requiring mechanical ventilation
• If receiving >35-40% supplemental oxygen (stable babies with CLD in FiO2 > 35% or in more than 0.2L/min oxygen will often tolerate haematocrit >30%)

6.6.3.2 Transfuse infants at Haematocrit <30%
• CPAP
• If receiving supplemental oxygen (up to 35%)
• Problematic apnoea of prematurity
• Sustained tachycardia or tachypnoea
• Poor weight gain despite adequate calories
• Breathlessness or going off feeds
• If undergoing surgery

6.6.3.3 Asymptomatic babies or babies in nursery
• It is important to check the reticulocytes count before considering transfusion
• Transfuse infants with Hct less than or equal to 20% even if asymptomatic if reticulocyte count is <100000/ml

6.7 Platelets

6.7.1 Suggested transfusion thresholds for the administration of Platelets for infants less than 4 months old

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Neonate with major bleeding</td>
<td>&lt;100 x 10^9/l</td>
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<tr>
<td>Preterm or term neonate, with bleeding &lt;1000g and &lt;1 week old</td>
<td>50 x 10^9/l</td>
</tr>
<tr>
<td>Clinically unstable (high ventilation requirements or fluctuating BP/ hypovolaemia)</td>
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</tr>
<tr>
<td>Previous major bleeding tendency (eg grade 4 IVH)</td>
<td></td>
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<tr>
<td>Concurrent coagulopathy</td>
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<tr>
<td>Surgery or exchange transfusion NAIT (see below)</td>
<td></td>
</tr>
<tr>
<td>Sick preterm or term infant, not bleeding non-bleeding neonate in first week of life NAIT (see below)</td>
<td></td>
</tr>
<tr>
<td>Stable preterm or term infant, not bleeding</td>
<td></td>
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</table>

* this threshold is taken from the BCSH guidelines. There are paediatric guidelines which recommend platelet transfusion in all infants with a platelet count <30 x 10^9/l. The threshold used should be at the discretion of the treating consultant.

6.7.2 Children with thrombocytopenia

Consider platelet transfusion if
• Low platelets <10 x 10^9/l (N.B. Not in ITP)
• Platelet count <20 x 10^9/l with one or more of the following:
  DIC: (Always seek medical advice from a Haematology Consultant first)
  Severe mucositis
  Anticoagulant therapy
  Platelets likely to fall <10 x 10^9/l before next evaluation
  Risk of bleeding due to local tumour infiltration
6.7.3 Neonatal Alloimmune Thrombocytopenia:
- Refer to Haematology Consultant and NBS
- NBS may request samples from neonate and mother
- HPA 1a/5b negative platelets required (random donor platelets only if no compatible platelets available)
- High dose intravenous immunoglobulin.
- In such patients, a minimum platelet count of 30x10^9/l is recommended. Paediatric guidelines recommend transfusion threshold of 50 x 10^9/l for non-bleeding patients and 100 x 10^9/l if major bleeding.

6.8 Component volume and specification for red cell and platelet transfusions

6.8.1 Top-up transfusion: Red Cells

Desired Hb (g/dl) - actual Hb x weight (kg) x 3
(Usually 10 to 20 ml/kg)

Rate approx 5ml/kg/hr

No red cell exchange transfusions, intra-uterine blood transfusions (IUT) or extra- corporeal membrane oxygenation (ECMO) take place on site at the Queen Elizabeth Hospital. All neonates/ infants requiring such advanced support are transferred to either the Royal Victoria Infirmary or Freeman Hospital, Newcastle upon Tyne for specialist care in the Fetal Medicine Unit or Paediatric Intensive Care Units.

The specific blood product requirement for these procedures is detailed in the appendix for information purposes only.

6.8.2 Top-up transfusion: Platelets

Children under 15kg: 10-20ml/ kg

Children over 15kg: single apheresis unit

ALWAYS REQUEST APHERESIS UNITS FOR TRANSFUSION TO CHILDREN

7 Training and competency assessment

See the Trust learning needs analysis

8 Equality and diversity

The Trust is committed to ensuring that, as far as reasonably practicable, the way we provide services to the public, staff and visitors reflects their individual needs and does not discriminate against individuals or groups on the grounds of any protected characteristic. The Human Rights Act (1998) places a positive duty upon ‘public bodies’ to act compatibly with the 1950 European Convention on Human Rights. This includes a duty to intervene
proportionately to protect the rights of citizens, including Article 2: ‘The right to life’ This policy enables staff to ensure safe and appropriate blood products are given to all patients who may require a blood transfusion.

Whilst the policy does not aim to promote disability equality, it does enable the Trust to make reasonable adjustments to ensure that the different needs of the patients are met.

This policy has been appropriately equality impact assessed.

9 Process for monitoring compliance with the policy

<table>
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<th>Monitoring and audit</th>
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<td>National audit</td>
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<td>Snapshot</td>
<td>local</td>
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<tr>
<td>MHRA</td>
<td>Compliance report</td>
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<tr>
<td>Sample errors</td>
<td>Continual surveillance</td>
</tr>
<tr>
<td>Ad hoc</td>
<td>Audit</td>
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10 Consultation and review of this policy

This policy has been approved by the Hospital Transfusion Committee (HTC). The policy will be reviewed every two years and when new guidelines become available to ensure compliance with current legislation.

11 Implementation of this policy

This policy will be circulated by the Trust secretary as detailed in OP27 policy for the development, management and authorisation of policies

12 References


Blood Transfusion policy RM36, Gateshead Health NHS Foundation Trust
Pre-transfusion testing for neonates and infants within first 4 post natal months

**Maternal sample**: ABO/Rh and Antibody screen.

**Infant sample**:
- ABO/Rh (carried out twice)
- DAT (carried out on neonates red cells)
- If maternal sample absent, screen infants serum for atypical antibodies by IAT (Diamed)

Group selection

- Neonates own ABO and RhD group or an alternative compatible ABO/RhD group.
- Compatible with any ABO or atypical red cell antibody present in maternal or neonatal plasma
- Not appropriate to include neonates for electronic crossmatch, if maternal antibodies are present.

Crossmatching

- Neonates less than 4 months old with no maternal antibodies and a negative DAT - No crossmatch is required

*Serological crossmatch required if...*
- Maternal antibodies are present
- Positive DAT
- Child older than 4 months
- Previous transfusions

Selection of blood products for Neonates, Infants and Children

- **Leucodepleted** (all red cell units are leucodepleted)
- **CMV negative** (not essential if emergency situation)
- **Blood less than 1 week old** (not a guideline anymore, however please select if available)
- Paediatric Split packs are available from BTS (each pack contains approx 40-50mls if only small volume needed)
- The amount of blood required should be included on request form (it is calculated from infants weight) NB: The initial 20mls are usually wasted so account for this when ordering packs.
- A full unit can be given if blood requirement is >100mls or if the request is URGENT
13 Appendix 2

No red cell exchange transfusions, intra-uterine blood transfusions (IUT) or extra-Corporeal membrane oxygenation (ECMO) take place on site at the Queen Elizabeth Hospital. All neonates/infants requiring such advanced support are transferred to either the Royal Victoria Infirmary or Freeman Hospital, Newcastle upon Tyne for specialist care in the Fetal Medicine Unit or Paediatric Intensive Care Units. Please telephone the RVI Blood bank (282 4335) to inform them of the transfer and the mother’s blood group if available.

For completeness the specific requirements are listed below:

13.1 Exchange Transfusion

Volume depends on clinical indication- refer to guidelines and clinicians request eg single or double volume exchange

- Term Infant 80-160mls/kg
- Pre term infant 100-200mls/kg

13.1.1 Red cells for Exchange Transfusion

- Group O or ABO compatible with maternal and neonatal plasma, Rh D negative (or Rh D identical with neonate)
- Negative for any red cell antigens determined by maternal antibody status
- Crossmatch compatible with maternal plasma
- 5 days old or less
- CMV negative
- Irradiated
- Transfused within 24 hours of Irradiation
- Irradiation is essential if infant has had previous IUT and is recommended for all exchange transfusions.
- Irradiation for ET in the absence of IUT is not essential if this would lead to clinically significant delay.
- Blood should be warmed to 37°C immediately prior to transfusion.
- (see section 2 for volume)

13.2 Intrauterine Transfusion (IUT)

- Always contact Consultant Haematologist
- Always liaise with NBS
- Refer to guidelines for further information (Blood Bank file 2, Guideline Y)
- The red cell transfusion programme starts as late as possible before hydrops develops, to enable the pregnancy to advance to a safe gestational age (36-37 weeks)
- Volume calculated:
  Desired HCT – fetal HCT x fetoplacental blood volume
  Donor HCT – desired HCT
13.2.1 **Red Cells for IUT** (available from NBS)

- Group O (low titre haemolysin) or ABO identical with foetus (if known) and Rh D negative
- K negative blood is recommended but not essential.
- IAT-crossmatch compatible with maternal serum and negative for relevant antigen(s) determined by maternal antibody status.
- Blood less than 5 days old in CPD anticoagulant
- CMV negative
- Irradiated
- HCT below 0.75
- Warmed to 37°C immediately prior to transfusion
- Transfused at a rate of 5-10ml/min
- (see section 2 for volume)

13.3 **Platelets for IUT**

- Group O negative (low titre haemolysin) or group specific/compatible if known.
- Human Platelet specific alloantigen (HPA) compatible with maternal antibody
- Preferably Apheresis
- Irradiated
- CMV negative
- Warmed to 37°C immediately prior to transfusion
- Transfused at a rate of 1-5ml/min
- Volume calculated:

\[
\text{Desired platelet increment} \times \text{fetoplacental blood volume} \\
\text{Platelet count of concentrate}
\]

13.4 **Extra Corporeal Membrane Oxygenation (ECMO)**

- ECMO is highly specialised respiratory support in which there is a high risk of intra-cranial haemorrhage.
- This procedure is normally carried out at the Freeman Hospital
- Blood products are specific and should always be obtained from the NBS.
- Inform a Consultant Haematologist immediately if this procedure has been requested.
- Consult BCSH guidelines for further information.