Northern Ireland Blood Transfusion Service ***POLICY DOCUMENT***

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Document Title: POLICY FOR TRANSFUSION OF NEWBORN INFANTS AND EXCHANGE TRANSFUSION

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Document Authorisation

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CROSS REFERENCES

This Policy refers to the following documents:

Doc Type	Doc. No.	Title
SOP	BP:058	Preparation of red cells for exchange transfusion

Key Change from Previous Revision:

References to imported MB products have been removed. This is no longer a requirement for those born after 1st January 1996. Updated guidance from SaBTO (Position Paper issued March 2019). NIBTS now manufacture frozen components for all patients, including neonates and infants.

4.1 Table 2: units changed from g/dl to g/L

4.1 and 4.2: Detail added regarding the splitting and irradiation time frames for RBC paedipacks in NIBTS.

4.2 and 4.3: More detail added to include full specification of RBCs required for these patients. This includes requirement for blood from accredited donors; K negative; HT negative; CMV negative; HbS negative (NIBTS now introduced test); and RBCs for large volume transfusion – maximum age requirement clarified for patients < 1 year old only (updated guidance 2023)

4.3: More detail added regarding the selection of appropriate units to ensure the blood is cross-match compatible with both the maternal and neonatal plasma. The maternal blood group must be confirmed.

4.5.2: Clotted sample added in from mother for FNAIT investigation.

4.5.5: Updated to reflect current recommendation on Cranial USS in suspended FNAIT cases.

5 MEDICAL COORDINATION: added this new section

1 STATEMENT

This policy addresses the transfusion requirements of newborn infants and the special requirements surrounding exchange transfusion and management of Fetal Neonatal alloimmune thrombocytopenia (FNAIT).

NIBTS policy reflects BSH guidelines, available at www.b-s-h.org.uk/guidelines

2 INTRODUCTION

The transfusion of neonates, infants and children differs in many aspects from transfusion in adults. This policy discusses best practice guidelines for transfusion of neonates and infants, and in particular the management of special transfusion needs such as exchange transfusion (ET) and FNAIT.

Normal values for pre-term infants depend on gestational age. The normal values for Hb vary during infancy and childhood, with a nadir in Hb of 90 g/L at two months of age increasing to 100-110 g/L by six months of age. The levels of coagulation

proteins also alter and results of coagulation assays are technique-dependent and the local laboratory's reference range should be referred to.

Table 1: Normal haematological ranges for term and pre-term babies

	Term	Pre-term	Adult
Haemoglobin g/L	140-240	140-240	115-180
Platelets x 10 ^{9}/l	150-450	150-450	150-400
PT (sec)	10-16	11-22	11-14
APTT (sec)	31-55	28-101	27-40
TT (sec)	19-28	19-30	12-14
Fibrinogen g/l	1.7-4.0	1.5-3.7	1.5-4.0

3 RESPONSIBILITY

3.1 NIBTS Medical Consultants.

4 POLICY

4.1 PRINCIPLES OF TRANSFUSION IN NEONATES AND INFANTS

The following principles for transfusion to neonates should be followed:

1 Minimise blood loss:

- Most red cell transfusions are given to replace blood drawn for monitoring: micro-techniques, non-invasive monitoring and avoidance of unnecessary testing should be used to reduce transfusion needs.

2 Minimise donor exposure:

- Neonates who may require several red cell transfusions within a few weeks should be allocated to a 'paedipack' system, where one donation is divided into six small packs that can be used for sequential transfusions over the shelf life of the red cells (five weeks shelf life; but note paedipacks in NIBTS need to be split by day 14, and if irradiation required need irradiated by day 10). By this means, the number of donors whose blood is transfused to the neonate is minimised.

- Close liaison between the neonatal intensive care unit and blood bank is essential to achieve optimal use of 'paedipacks' and ensure that all babies likely to receive more than one transfusion are identified.

3 Use of a local transfusion protocol

- This local transfusion protocol is available in RJMS, NICU/ SCBU and is referred to below:

Table 2: RJMS NICU/SCBU protocol – clinical indications for red cell transfusion

Clinical situations:	Transfuse at:

Neonate receiving mechanical ventilation	Hb <120 g/L
Acute blood loss	10% blood volume lost
Oxygen dependency (not ventilated)	Hb <80-100 g/L
Late anaemia, stable patient (off oxygen)	Hb < 70 g/L

4.2 Blood components for neonatal transfusion

Table 3: Blood components for neonatal transfusion

Component	Volume	Infusion rate
Red cell *Exchange transfusion* Plasma-reduced whole blood in citrate phosphate dextrose from accredited donations that are: processed on day 0 and are: ≤ 5 days old; CMV negative; free from clinically significant irregular RBC antibodies including high-titre negative; negative for HbS; K negative (unless maternal anti-k present); haematocrit (Hct) 0.5-0.6; irradiated and used within 24 hours of irradiation.	80-100 ml/kg (for anaemia) 160-200 ml/kg (for hyperbilirubinaemia)	Depends on stability of the baby – discuss with NICU consultant
Top-up transfusion Red cells suspended in saline-adenine glucose-mannitol Hct 0.5-0.7; ≤ 35 days old (note need split by day 14 in NIBTS, and irradiated by day 10 if required); 'paedipack' if likely to need repeated small-volume transfusions; CMV negative; free from clinically significant irregular RBC antibodies including high-titre negative; negative for HbS; K negative (unless maternal anti-k present); irradiated if neonate had intrauterine transfusion.	10-20 ml/kg	5 ml/kg/hr

Component	Volume	Infusion rate
Large volume transfusion e.g. cardiac bypass surgery Infants are effectively having ET, therefore similar specification used for RBC as above. Red cells up to the end of Day 5 if used for large volume transfusion for neonates and infants less than 1 year of age	10-20 ml/kg	As per local policy
Platelet concentrate (Adult apheresis packs split into 50 ml)	10-20 ml/kg	10-20 ml/kg/hr
FFP	10-20 ml/kg	10-20 ml/kg/hr
Cryoprecipitate	5-10 ml/kg	10-20 ml/kg/hr

Table 4 Blood components volumes and rates of administration for infants and children

Component	Volume	Rate
Red cell concentrates	Vol (ml) = desired Hb rise (g/dl) x wt (kg) x 3	5 ml/kg/hr (usual max, rate 150 ml/hr)
Platelet concentrates	Children < 15 kg 10-20 ml/kg Children > 15 kg single apheresis unit (approx. 300 ml; actual volume on pack)	10-20 ml/kg/hr
FFP	10-20 ml/kg	10-20 ml/kg/hr
Cryoprecipitate	5-10 ml/kg or 15-30 Kg = 5units >30 Kg = 10 units	10-20 ml/kg/hr (i.e. over 30-60 mins)

4.3 Exchange Transfusion

Exchange transfusion (ET) may be used to manage severe anaemia at birth, particularly in the presence of heart failure, and to treat severe hyperbilirubinaemia, usually caused by Haemolytic disease of the Newborn (HDN). ET is a specialist procedure, associated with the potential for serious adverse effects, and as such, should only be undertaken by staff who are experienced in the procedure.

NIBTS prepares blood for exchange transfusion as semi-concentrated red cells as first choice. 6-9 day old SAG-M red cells can be processed if no ≤5 day red cells available, however these units must be issued via PULSE AND the concessionary release process. Red cell exchange is required:

- For treatment of anaemia, a single volume (80-100 ml/kg) exchange is generally adequate.
- For management of hyperbilirubinaemia, a double volume exchange (160-200 ml/kg) is preferred.
- Plasma-reduced red cells from accredited donors (processed on day 0) semi-concentrated or resuspended red cells of Hct 0.5-0.6 are prepared by NIBTS for this indication.
- **Red cells for ET should be group O or ABO compatible with maternal and neonatal plasma**, be negative for any red cell antigens to which the mother has antibodies including high titre negative, and **be IAT cross-match compatible with maternal plasma.** The cross-match is performed by the hospital blood bank. If units < 5 days old are not cross-match compatible with maternal and neonatal plasma, units re-suspended in SAGM 5-9 days old compatible with the maternal and neonatal plasma will be required to be issued via concession. The maternal blood group must be confirmed before selecting the appropriate units.
- K-negative (unless maternal anti-k (cellano) is present, then k-negative must be provided)
- Red cells for ET must be CMV seronegative and 5 days old or less (to ensure optimal red cell function and low supernatant potassium levels). > 5 days old blood will be issued via concessionary release.
- Haemoglobin S (sickle screen) negative
- SOP: BP:058 'Preparation of red cells for exchange transfusion' requires irradiation in all cases. BSH guidelines advise irradiation is essential if baby has had previous intra-uterine transfusion and recommended for all ETs. Blood should be transfused within 24 hours of irradiation.
- ABO HDN: ET is rarely required in ABO HDN. However, if ET is undertaken for this indication, group O red cells with low titre plasma anti-A and anti-B, or group O red cells suspended in AB plasma should be used (BSH guidelines)

4.4 Platelet Transfusion

Paediatric platelets are prepared from splitting an adult apheresis dose in four.

Platelets should be ABO identical or compatible and RhD identical or compatible. If RhD positive platelets must be transfused to an RhD negative female child, then the appropriate dose of prophylactic anti-D should be given

Table 5: Indications for platelet transfusion in term and pre-term neonates (Handbook of Transfusion Medicine 4th Edition)

Platelet count <25 x 10 ^{9}/l In otherwise well infants, including FNAIT if no evidence of bleeding and no family history of intracranial haemorrhage (ICH)
Platelet count < 50 x 10 ^{9}/l In infants with: • Clinical instability • Concurrent coagulopathy • Birth weight < 1000g and age < 1 week • Previous major bleeding (e.g. Germinal matrix haemorrhage/intraventricular haemorrhage) • Current minor bleeding (e.g. petechiae, venepuncture oozing) • Planned surgery or exchange transfusion • Platelet count falling and likely to fall below 30
Platelet count < 100 x 10 ^{9}/l Consider platelet transfusion if there is major bleeding and platelet count is falling rapidly.

4.5 Neonatal Allo-immune Thrombocytopenia (NAIT)

4.5.1 All suspected cases of FNAIT should be referred to an NIBTS Consultant for medical advice.

4.5.2 A 6 ml EDTA sample and 6ml clotted sample should be taken from mother; 6mls EDTA sample from father (if available) and 1ml EDTA sample from the neonate (or cord), to be sent to Blood Group Reference Laboratory for platelet antibody screening and HPA-1 and HPA-5 typing.

4.5.3 If FNAIT secondary to anti-HPA-1a or anti-HPA-5b is confirmed in the laboratory, donors who are HPA-1a / HPA-5b negative are called to donate. These may be issued as a concession on the same day or preferably on the following day when transfusion microbiology results are cleared. In exceptional circumstances where local donors are not available, suitable platelets may be imported from IBTS or a UK Blood Service.

4.5.4 If suitable typed platelets are not available random platelets and/or intravenous immunoglobulin therapy may be administered. IVIG should be given at a dose of 1g/Kg body weight on two consecutive days. There is generally a delay of 24-48 hours in the action of IVIG on the platelet count.

4.5.5 A cerebral ultrasound scan of the baby should be performed in all cases of suspected FNAIT within 24 hours of delivery.

MEDICAL COORDINATION

5.1 Requests for blood for exchange transfusion are sent from Hospital Blood banks to our NIBTS Hospital Services by email to bloodrequests@nibts.hscni.net. Mother and infant details including name, date of birth, blood group, antibody status, and volume of the blood required should be provided in the request by the hospital clinician through their hospital blood bank.

5.2 Prior discussion between hospital clinician and NIBTS medical team is important to alert NIBTS on the incoming request and to coordinate timing and appropriateness.

5.3 NIBTS medical team assist the BMS in selecting the most suitable component when standard components are not available, and in ensuring when concessionary release is considered, that discussion is made about the non-conformance with the hospital clinician that they are receiving non-conformant blood as concession, along with the estimated risk, including the assurance that this component must only be transfused to the intended patient. This should be documented in the DD:026 FORM.

5.4 Suitable start products AND blood group must be agreed with an NIBTS medical officer prior to preparation where standard component is not available.

6 EQUALITY SCREENING OUTCOME

This policy has been drawn up and reviewed in light of the statutory obligations contained within Section 75 of the Northern Ireland Act (1998). In line with the statutory duty of equality this policy has been screened against particular criteria. If at any stage of the life of the policy there are any issues within the policy which are perceived by any party as creating adverse impacts on any of the groups under Section 75 that party should
bring these to the attention of the Head of HR & Corporate Services.

The Northern Ireland Blood Transfusion Service is committed to the promotion of equality of opportunity for staff, donors and service users. We strive to ensure that everyone is treated fairly and that their rights are respected at all times. We believe that it is important that our policy is understood by all those whose literacy is limited, those who do not speak English as a first language or those who face communication barriers because of a disability. On request it may be possible to make this policy available in alternative formats such as large print, Braille, disk, audio file, audio cassette, Easy Read or in minority languages to meet the needs of those not fluent in English.'

6 TRAINING REQUIREMENTS

Medical Consultants and Specialty Doctor should read & understand.
Hospital Services and on-call Biomedical Scientist Staff should read & understand.