GOOD PRACTICE GUIDANCE V

PRE-TERM NEONATAL BLOOD MANAGEMENT

INTRODUCTION

GUIDELINES AND EVIDENCE

The National Comparative Audit of the use of red cells in neonates and children in 2010 shows that transfusions in neonatal units are frequent, particularly in very preterm infants (<32 weeks of gestational age). The audit showed that the number of transfusions increased with decreasing gestational age. As transfusions convey both benefits and risks to the patient, evidence is needed to guide appropriate use of blood.

There are several different reasons for anaemia in this patient population as described by Strauss in 2010 and iatrogenic blood loss through sampling is listed as a major cause.

The BSH Guidelines on Transfusion for fetuses, neonates and older children, published in 2016, states:

'Hospital transfusion laboratories should liaise with neonatal units to develop policies and procedures that help to reduce exposure of recipients to components from multiple donors by using paedipacks. For neonatal top-up transfusions paedipacks can be transfused until the expiry date (end of Day 35); ideally, the first paedipack allocation should have a long expiry date so that the multiple packs from the same donor can be used for the neonate as required. These measures further reduce the risk of transmission of infectious agents via the blood supply.'

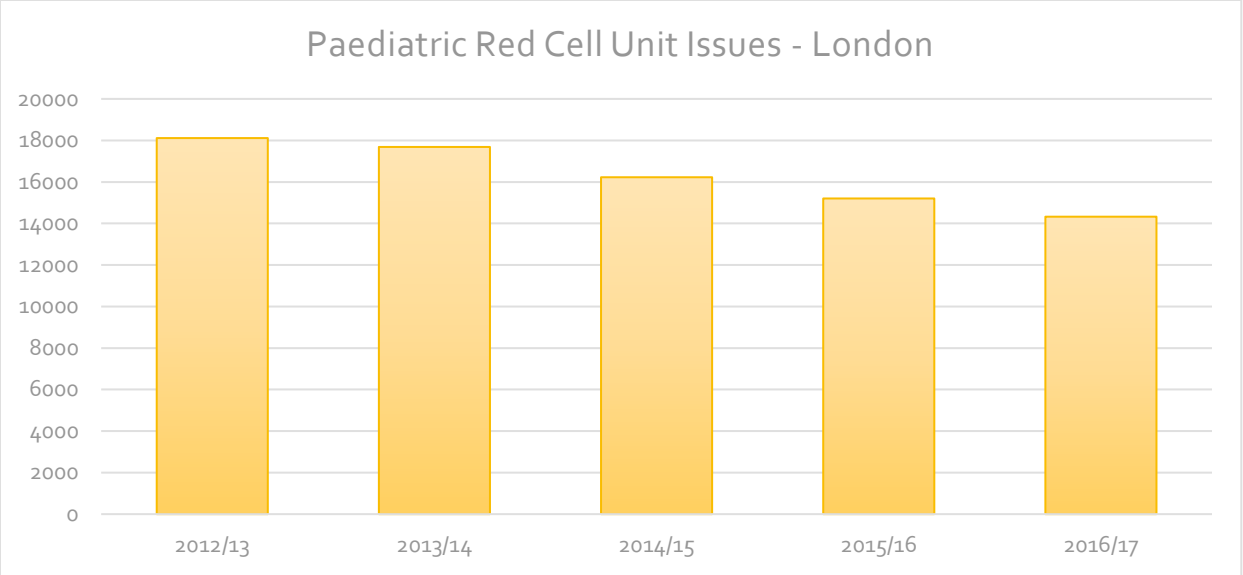
'Minimize phlebotomy where possible: agree a local policy on the frequency and types of regular blood tests required, collecting small samples, and using small-volume laboratory analysers and near-patient testing.'

NEONATAL BLOOD

Neonatal blood is provided by NHSBT in the form of paedipacks. Six paedipacks are made by splitting 1 adult donation and have a volume of 35-50ml per unit. Paedipacks are provided as CMV negative.

LONDON AND NEONATAL TRANSFUSIONS

In 2016/17 NHSBT issued 14326 paediatric red cell units to hospitals in the London Regional Transfusion Committee. This equates to 30% of all paediatric red cell unit issues in England over this 12-month period. In comparison to other regions London has seen a year on year reduction in paediatric red cell unit issues falling by 3.8% in 2016/17 compared with 2015/16. This decrease is illustrated in the graph below.



At the London Blood Transfusion Forum in May 2017, audit results by Dr Zorro from Kings College was presented. The audit looked at Packed Red Blood Cell Transfusions During the First Month of Life in Very Preterm Infants (<32 weeks).

THE AUDIT AT KINGS COLLEGE HOSPITAL (KCH)

AIMS

- Investigate current blood product transfusion practice in the Neonatal Intensive Care Unit (NICU)
- Investigate phlebotomy practice
- Reduce the number of blood transfusions received by very preterm infants
- Reduce uncomfortable procedures
- Reduce costs

STANDARDS

- Hospitals should develop policies that help to minimise exposure of infants to multiple donors
- Minimise phlebotomy where possible
- Hospital policies should ensure that paedipacks are available for emergency use by maternity and neonatal units

SAMPLE AND DATA COLLECTION

- Inclusion criteria:
  - All babies born <32 weeks gestational age (GA) between 01/01/2016 and 31/03/2016

  - Admitted to NICU (born at KCH or transferred from other trusts within the first week of life)
  - Remained as inpatients for at least two weeks
- Audit period: 01/01/2016-30/04/2016 (including a month for data collection and analysis).

RESULTS

PATIENTS

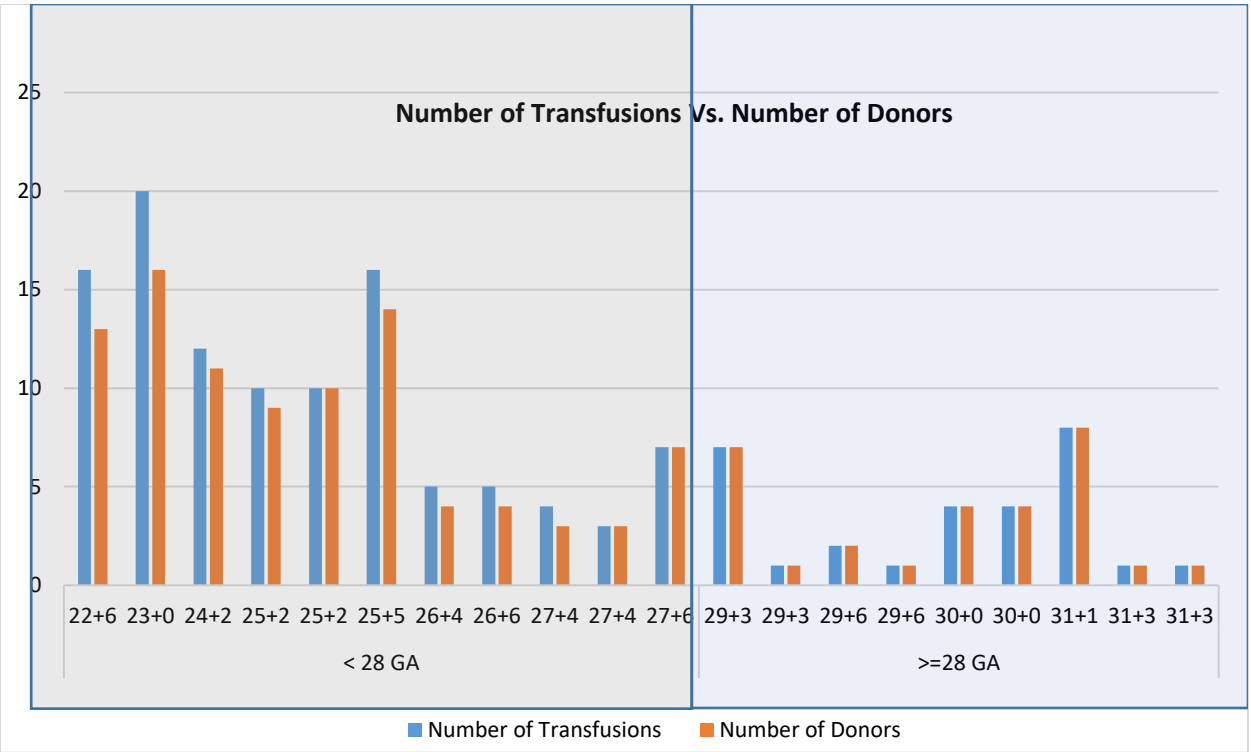
LABORATORY PRACTICE

Allocation of Paediatric packs at initial crossmatch: One paedipack is allocated per request, BTL not aware if neonates are premature (i.e. <32 weeks gestation)

Use of the paediatric packs from the same donor: Attempt made to allocate units from the same donor if a second request is made.

RED CELL UNIT TRANSFUSION

The graph below shows the number of units transfused per baby and the number of donors they were exposed to. This shows that the more premature babies are receiving more red cell unit transfusions and that for most transfusions the blood is from a different donor. The patient cohort was split into 2, <28 weeks and 28-32 weeks' gestation, as the babies born at <28 weeks gestation are at greater risk of transfusion.



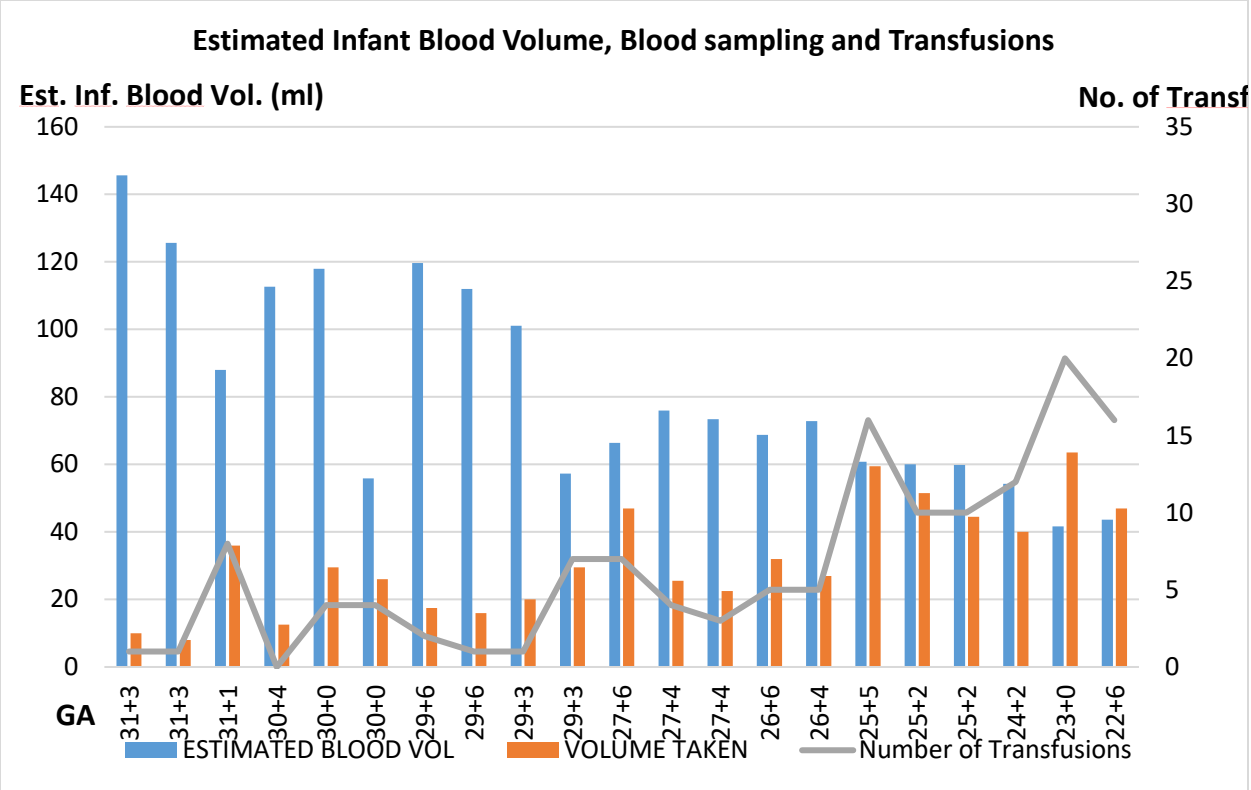
BLOOD SAMPLING

These babies have very small blood volumes because of their prematurity (80 ml/Kg which is approximately 40-80 ml for babies <1000 grams) and require frequent blood samples taken for pathology tests. For the most premature babies it was estimated that an average of 74% of their blood volume was taken for blood tests. The results are shown in the table and graph below.

	<28w	28-32
Estimated infant blood volume (ml)*	41.6 ml -73.4 ml (61.5 ml)	55.8 ml -145.6 ml (87.9 ml)
Estimated blood taken (ml)	22.5 ml - 63.5ml (41.7 ml)	3ml – 36ml (20.5ml)
% Estimated infant blood volume taken	31-153% (74%)	7-52% (24%)
Other phlebotomy loses†	20-35%	10-26%

*based on 80ml/Kg

† includes samples for blood gas tests, antibiotic levels, IV cannulation



ACTIONS

- New information fields were added to the Group and Screen sample request to include the gestational age and if the baby had previously received an intrauterine transfusion (if baby received IUT, blood has to be irradiated).
- Allocate paediatric packs from the same donor
  - 6 paedipacks for <28 weeks
  - 3 paedipacks for 28-32 weeks or multiple transfusions expected
  - Weekly communication between blood bank and NICU to review patient's predicted transfusion needs
- Delay cord clamping at birth where possible
- Optimise volume of blood required for transfusion and follow guidelines to calculate the volume of blood to be transfused
  - <28 weeks during the first 14 days of life: transfuse 10 ml/Kg
  - >28 weeks but unstable, with Patent Ductus Arteriosus (PDA) or risk of fluid overload: transfuse 10 ml/Kg
  - >28 weeks, stable, without PDA or risk of fluid overload: transfuse 15 ml/Kg

- Reduce the number of routine blood tests performed
- Use "near patient testing" for daily monitoring
- Update Trust "Guideline for blood products transfusion" and "Guideline for parenteral nutrition prescription"

RECOMMENDATIONS FOR THE REGIONAL

- Review transfusion laboratory procedures to ensure that blood is issued to reduce donor exposure
- Review blood sampling procedures on the wards with an aim to reduce frequency of testing where possible
- Review sampling procedures and use reduced volume sample tubes for neonate
- Optimise volume for transfusion. The BSH recommends a volume of 15ml/kg for non-bleeding babies and by giving the maximum recommended dose will help reduce the frequency of transfusion events and therefore further minimise the donor exposure. However, extreme premature babies during the first weeks of life, unstable or at risk of fluid overload might benefit of receiving transfusions at 10 ml/Kg
- Review current guidelines and ensure they are in line with national guidance and evidence.
- Lines of communication

REFERENCES

1. National Comparative Audit of Blood Transfusion. National Comparative Audit of the Use of Red Cells in Neonates and Children, 2010. http://hospital.blood.co.uk/media/26872/nca-red_cells_neonates_children.pdf
2. Guidelines on transfusion for foetuses, neonates and older children. BCSH 2016
3. Strauss RG. Anaemia of Prematurity: Pathophysiology and Treatment. 2010. Blood Reviews, 24(6); 221-225
4. Lin, J.C., Strauss, R.G., Kulhavy, J.C., Johnson, K.J., Zimmerman, M.B., Cress, G.A., Connolly, N.W. & Widness, J.A. (2000) Phlebotomy overdraw in the neonatal intensive care nursery. *Pediatrics*, **106**, E19.
5. Christensen RD, Carroll PD, Josephson CD. Evidence-based advances in transfusion practice in neonatal intensive care units. Neonatology 2014; 106: 245-253