SHOT Bite No. 4
Paediatrics (neonates, infants and children)

SHOT Serious Hazards of Transfusion

December 2025

Introduction

Neonates, infants and children have been shown to be over-represented in error reports[1]. Particular categories which are prominent each year are avoidable, delayed, under/over transfusion and incorrect blood component transfused. These errors relate to the complexity of transfusion in this age group and are particularly prominent in children < 1 year (see Figure 1). Risk factors are patient, component, complex prescription and administration-related or related to organisation of care into networks requiring transfer of patients between settings.

Definitions:
Neonates: ≤28 days.
Infants: 28 days-1 year old.
Children: >1 year old

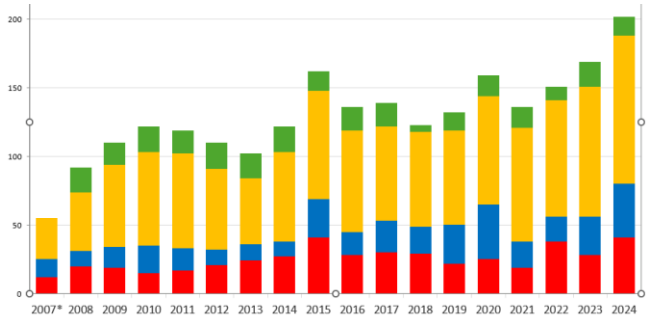

Figure 1: Paediatric reports to SHOT 2007-2024
* 2007 data included under 16 years only

Image from SHOT paediatric video

Prescribing

Prescribing errors continue to occur. Blood products should be prescribed in mL. Red cell prescribing for neonates is 15mL/kg. For children >28 days of age for top up transfusions ideally the transfusion formula (Figure 2) should be used to calculate the required rise in Hb. **The use of a back calculation to check that the volume prescribed does not exceed 20mL/kg will detect errors.** Once the volume of one adult component is reached then one adult unit can be prescribed.

Figure 2: Transfusion formula to calculate volume of red cells required in mL for an infant or child.

$$\text{Volume to transfuse (mL)} = \frac{[\text{Desired Hb (g/L)} - \text{actual Hb (g/L)}] \times \text{weight (kg)} \times \text{Factor (4)}}{10}$$

Full information around prescribing can be found in the Components app or in the British Society for Haematology (BSH) transfusion guideline[2]

Platelets: 10-20mL/kg.
FFP 15-20mL/kg.
Cryoprecipitate 5-10mL/kg.

Laboratory testing

Laboratory testing in infants < 4 months of age is more complex than in older children or adults. A maternal sample for group and antibody screen is required where possible. Neonates have reduced expression of ABO antigens and the corresponding antibodies. Communication between laboratories when neonates are transferred between hospitals is vital.

Under 4 months old	> 4 months old
Mother: ABO & D grouping, Antibody screen	Repeat samples as per adult guidelines
Infant: ABO on cells only, D group (antibody screen only if no maternal sample)	
If negative, top up until 4 months (no further testing)	

Specialist components and concessionary release

Specialist components exist for fetal use, neonates and infants < 1year: these have additional safety features for this more vulnerable group of patients.

SHOT Bite No. 4
Paediatrics (neonates, infants and children)

SHOT Serious Hazards of Transfusion

Specialist components and concessionary release. continued.:

Component name	Special features
Neonatal/infant red cell split pack or 'Paedipack'	Small volume (50mL) can give multiple aliquots from same donor; fulfils neonatal/infant specification*
Red cells for neonates and infants- large volume (known as LVT)	Adult sized pack but with neonatal/infant specification. Use when less than 5 days of age to reduce hyperkalaemia risk in the context of large volume transfusion or to usual expiry for small volume "top-up" transfusion in a larger infant.
Neonatal exchange unit	Neonatal/infant specification and in Citrate Phosphate Dextrose (CPD) (different anticoagulant), tighter haematocrit, irradiated
Neonatal/infant platelet unit	Small volume (50mL). Neonatal/infant specification
Neonatal/infant fresh frozen plasma (FFP)	Small volume neonatal/infant specification

**Neonatal infant specifications include the following: not from first time donors, additional antibody testing (paediatric antibody test - PANTS testing), high titre anti-A and B negative, sickle negative, processed more rapidly to 4° C. Cytomegalovirus (CMV)-negative (required for neonates up to 28 days post estimated delivery date (EDD) – but in practical terms neonatal/infant specification products are all CMV-negative).*

In an emergency, if a neonatal/infant specification component is not available for a for a patient under 1 year of age, then an alternative may need to be provided to prevent unnecessary delay. A suggested hierarchy for decision making is shown below[2]:

Critical/more important → **Less important**

1. ABO-compatible mother and infant
2. Antigen-negative , negative for maternal antibodies (if less than 4 months)
3. Age of unit
4. Irradiated
5. CMV-negative
6. Full neonatal/infant specification

Transfusion reactions in neonates, infants and children

Some transfusion reactions can be difficult to spot in small children such as transfusion-associated circulatory overload (TACO) or transfusion-related acute lung injury (TRALI) in neonates where there may be many causes of respiratory distress. There are some uncommon complications of transfusion which either only almost exclusively in pre-term neonates such as transfusion-associated necrotising enterocolitis (TANEC) or to which infants are more vulnerable due to their small size such as transfusion associated hyperkalaemia following large volume transfusion. Some reactions have a different pattern such as the prominence of febrile, allergic, hypotensive reactions (FAHR) to platelet components in children (see Figure 3).

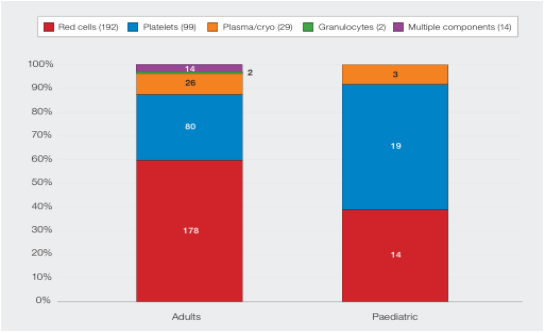

Figure 3: Adult vs paediatric reactions by component (2024)

Near miss reporting also provides important learning within neonates, infants and paediatrics for example in wrong blood in tube (WBIT) data showing prominent reports from a maternity setting such as mix-up between cord and maternal samples

References:

1. Stainsby et al. Br J Haematol. 2008;141(1):73-9.
2. New et al. BSH guidelines on transfusion for fetus, neonates and older children. Br J Haematol. 2016;175:784-828).
Addendum August 2020. Br J Haematol. 2020;191(5):725-7