Paediatric Cases n=202

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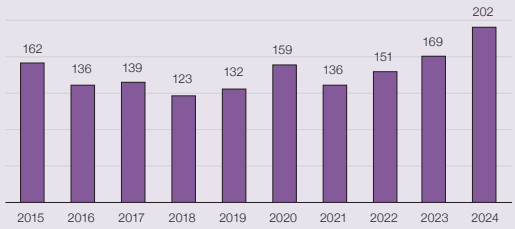
Headline data 2024

Number of reports n=202
Deaths n=2
Major morbidity n=25

Paediatric cases by year



Key findings:

- A large proportion of paediatric reports to SHOT were in infants <1 year
- Febrile, allergic, and hypotensive reactions (FAHR) continue to be a significant cause of morbidity in children

Gaps identified:

- Prescribing errors due to knowledge gaps around blood component prescribing. Protocols do not always consider the nuances for different patient groups such as those with sickle cell anaemia and neonates
- Transfusion-associated circulatory overload (TACO) may be under-reported in paediatrics due to difficulties in recognition

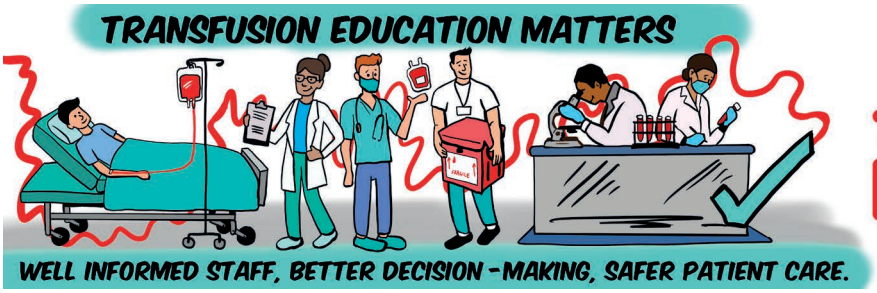
Good practice:

- Multi-disciplinary team meetings between clinical and scientific staff from Blood Services and hospitals facilitate timely management of complex cases
- The identification of a donor with pseudohyperkalaemia following a high potassium result in a blood component. This is an excellent example of the impact of transfusion research on direct patient care

Next steps:

- Ongoing education in the correct prescribing of blood components for infants and children is vital

For all abbreviations and references used, please see the **Glossary** and **Reference list** at the end of the full Annual SHOT Report. Please see the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/annual-shot-report-2024/).



SHOT
Serious Hazards of Transfusion

Definition:

Paediatric cases comprise all reports for patients under 18 years of age, including all paediatric cases from the other chapters in this report. Paediatric reports have been subdivided by recipient age group: neonates ≤28 days; infants >28 days and <1 year; children ≥1 year to <16 years and young people aged 16 to <18 years.

Introduction

The total number of paediatric cases reported to SHOT in 2024 has increased compared to 2023 (202 vs 169). Paediatric cases account for 202/2312 (8.7%) of total reports if near miss (NM) and right blood right patient (RBRP) are excluded and 340/3998 (8.5%) if NM and RBRP are included.

Figure 25.1: Trends in paediatric reports 2015-2024

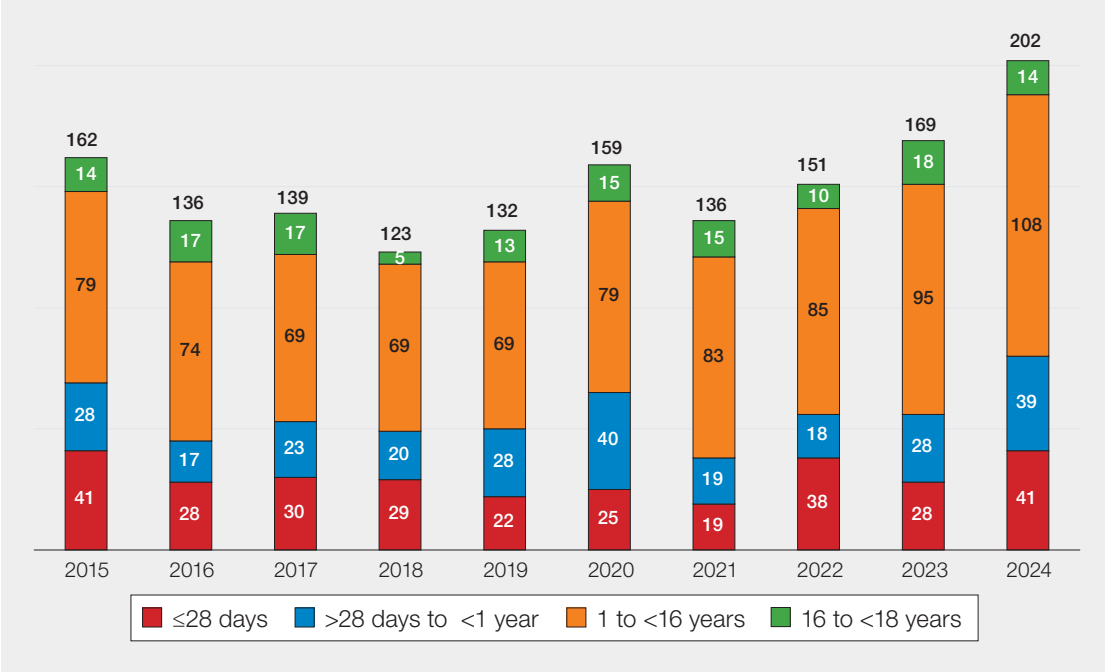
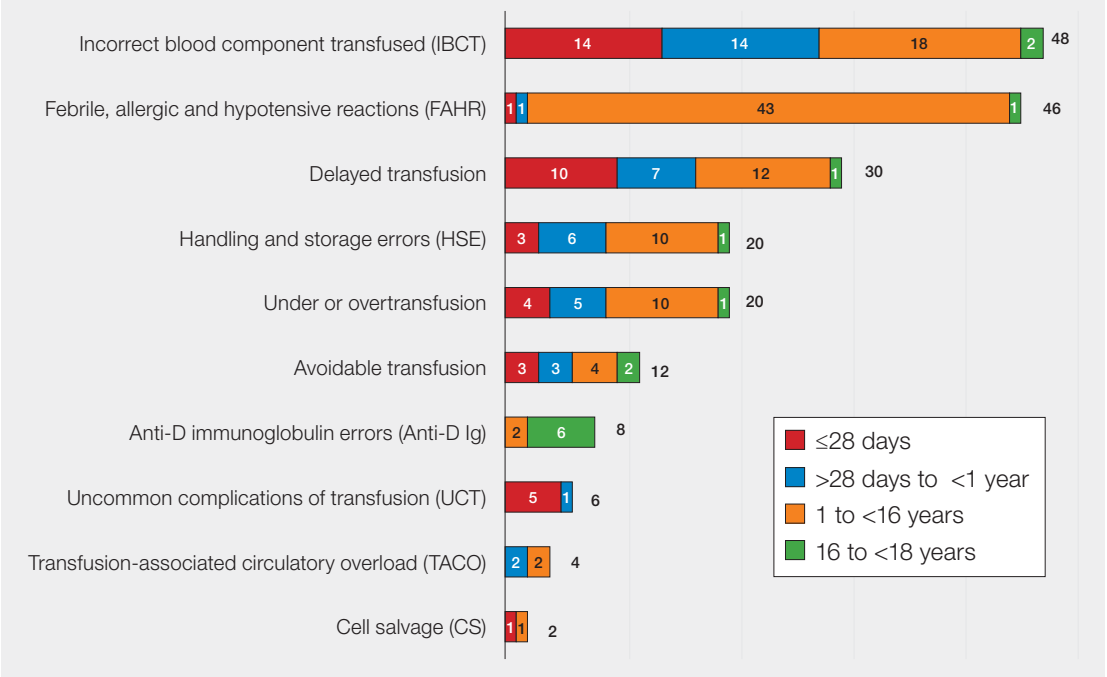


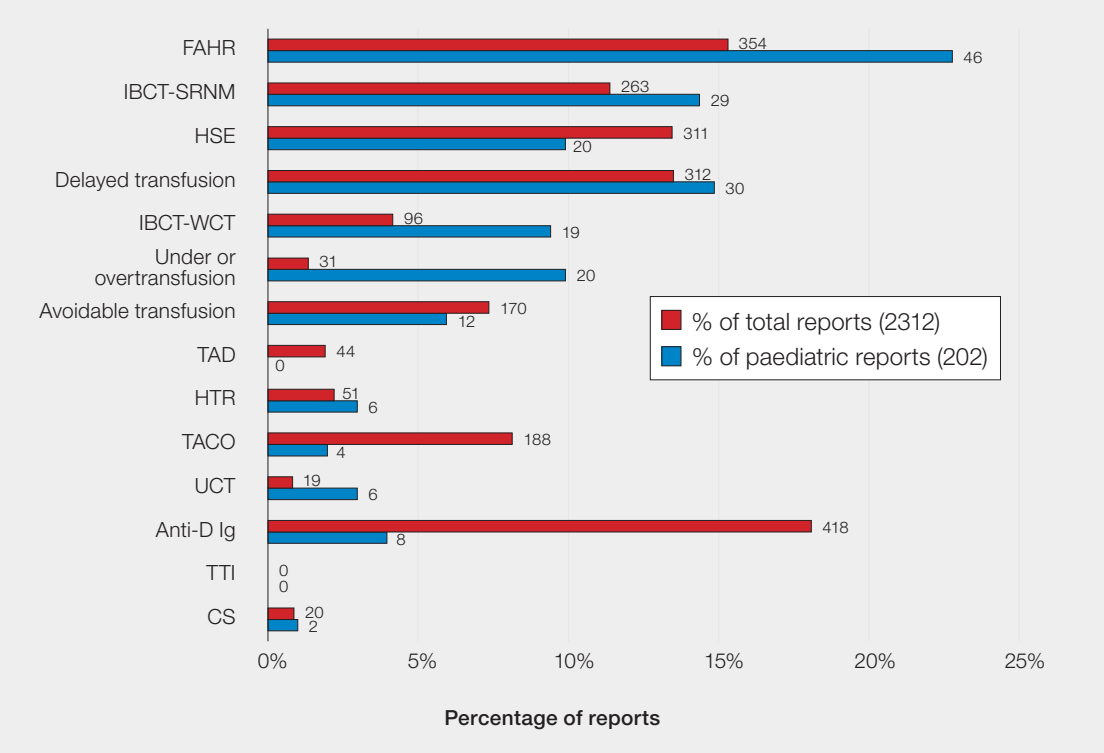
Figure 25.2: Summary of paediatric cases by category and age in 2024 (n=202)



Paediatric reports were over-represented in FAHR, incorrect blood component transfused (IBCT) (in both specific requirements not met (SRNM) and wrong component transfused (WCT)), delayed and under or overtransfusion, uncommon complications of transfusion (UCT) and also this year in haemolytic transfusion reactions (HTR) due to 3 reactions in 1 patient.

Clinical errors remain slightly more common than laboratory errors: 76/140 (54.3%) clinical versus laboratory errors 64/140 (45.7%). The most common categories for clinical errors remain avoidable, under and overtransfusion, delayed transfusion and handling and storage errors (HSE).

Figure 25.3: Percentages of paediatric and total reports in each category in 2024 (n=202)



CS=cell salvage; FAHR=febrile allergic and hypotensive reactions; HSE=handling and storage errors; HTR=haemolytic transfusion reactions; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfusion; Ig=immunoglobulin; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea; TRALI=transfusion-related acute lung injury; TTI=transfusion-transmitted infection; UCT=uncommon complications of transfusion

Deaths related to transfusion n=2

There were 2 paediatric deaths related to transfusion reported to SHOT in 2024. One in the delayed transfusion category and 1 in TACO.

Case 25.1: Lack of platelet concessionary release policy for a neonate with thrombocytopenia (imputability 2 – probable)

A very sick preterm neonate required a platelet transfusion prior to tertiary centre transfer. The baby had disseminated intravascular coagulation and required a central line. Platelets were requested but no neonatal/infant specification units were available on site. Due to a lack of concessionary release policy for emergency and failure of the clinical team to communicate the urgency of transfusion, 6 hours elapsed before an adult specification component was authorised. This delayed transfer and contributed to the death.

This case highlights both the importance of communication between clinical and laboratory teams around the urgency of transfusion and the need for pre-agreed hierarchies for the release of components in emergencies. The importance of concessionary release, particularly with relation to neonatal/infant specification components, was highlighted in the 2023 Annual SHOT Report (Narayan, et al., 2024).

Case 25.2: TACO following red cell transfusion in an infant with severe iron deficiency anaemia (imputability 2 - probable)

A 10kg infant was admitted to the emergency department with severe iron deficiency anaemia (haemoglobin (Hb)18g/L). The child received a total of 140mL (14mL/kg) of red cells in 3 aliquots over a 2.5-hour period. The post-transfusion Hb was 51g/L. The child had not received any other fluids and had no previous cardiac disease. Following transfusion, the child deteriorated with evidence of fluid overload and heart failure and was admitted to the paediatric intensive care unit (PICU). There was some response to furosemide, however, the child died.

Of note the volume and rate of red cells were appropriate for age and weight. It is not clear how symptomatic the child was pre transfusion but clearly transfusion was indicated for this patient.

Learning points

- For concessionary release of standard adult components to neonates and infants, laboratories are recommended to have pre-agreed hierarchies in place (New, et al., 2016; New, et al., 2020)
- TACO is likely under recognised in children. Although a formal TACO pre-transfusion risk assessment for children does not exist it is known from previous SHOT data that many of the same adult risk factors apply
- TACO can occur with small or appropriate volumes of component

Major morbidity n=25

There were 25 cases of major morbidity. In line with previous Annual SHOT Reports, the most reported category was FAHR (17) followed by HTR (4) under and overtransfusion (2) and TACO (2). One of the TACO cases is discussed in Case 25.3, and the undertransfusion case is described in Case 25.7.

Case 25.3: TACO causing major morbidity in an infant following overtransfusion of red cells

A 2.5kg infant received 121mL of red cells (48mL/kg) due to a prescribing and administration error. The infant became bradycardic and suffered a cardiac arrest. The pre-transfusion Hb was 77g/L, post-transfusion Hb 190g/L. Chest X-ray showed pulmonary oedema. The infant also developed hyperkalaemia with a potassium of 8.5mmol/L. Venesection and treatment for hyperkalaemia was required. The following pre-transfusion risk factors for TACO were also present: additional crystalloid, cardiac disease, and renal impairment.

Error-related reports n=140

Paediatric error reports continue to increase year-on-year. Reports were 140 in 2024, versus 120 in 2023 and 101 in 2022.

Incorrect blood component transfused (IBCT) n=48

More errors were laboratory, 35/48 (72.9%) than clinical, 13/48 (27.1%) in overall IBCT reports.

IBCT-wrong component transfused (WCT) n=19

IBCT-WCT clinical errors n=7

Three cases involved transfusion of adult specification components to infants or neonates. In all cases, the appropriate neonatal/infant specification blood components were available for emergency use in the same satellite refrigerator. In 2 cases, O D-positive red cells were given in error: one D-negative teenager post haemopoietic stem cell transplant (HSCT) due to an error on a transplant protocol and another D-negative teenager with major haemorrhage in the emergency department (ED) due to a collection error. In the final 2 cases, cryoprecipitate was given instead of fresh frozen plasma (FFP) due to prescribing errors.

IBCT-WCT laboratory errors n=12

There were 5 cases where D-positive red cells were transfused to D-negative recipients. These included a chronically transfused patient with an anomalous test result and an older child for whom the major haemorrhage protocol had been activated. In 2 cases adult specification components were transfused to infants or neonates; one of these was due to the maternity refrigerator being out of order and the other to miscommunication. Testing was incomplete in 2 cases, with components issued on only one valid sample. On 2 occasions, children post liver transplant (group B liver) received group O Octaplas® in error. The final case was a child who had received a HSCT overseas, with mixed field reaction on initial testing who received a unit of A D-positive platelets instead of A D-negative.

IBCT-specific requirements not met (SRNM) n=29

The majority, 23/29 (79.3%), of these errors were laboratory, and 6/29 (20.7%) were clinical.

IBCT-SRNM clinical errors n=6

Clinical errors included 4 failures to request irradiated components; 2 with Di George syndrome, 1 with severe combined immunodeficiency and 1 post HSCT. The remaining 2 cases involved failure to use a blood warmer in a major haemorrhage situation, and a failure to request phenotype-matched components for a sickle cell patient.

IBCT-SRNM laboratory errors n=23

There were 16 cases related to testing errors. In 10 cases testing was incomplete, which included failure to perform testing on a maternal sample in 6 cases, failure to investigate a mixed field (due to unreported previous transfusion) in a neonate and incomplete testing of a child with autoimmune haemolytic anaemia (AIHA) (Case 25.4). Other testing errors were 4 cases of inappropriate electronic issue; cases included a neonate with maternal antibodies, a neonate with a positive direct antiglobulin test (DAT), an infant post liver transplant. There were 2 further cases where components were issued without a valid sample.

Case 25.4: Incomplete testing for a child with AIHA

A young child presented to the ED with a Hb of 24g/L and a presumptive diagnosis of AIHA. The major haemorrhage protocol was activated, and the patient was appropriately transfused with group O D-negative red cells. A subsequent group and screen sample showed a dual population of group O and group A red cells. Antibody screen was weakly positive and DAT strongly positive for IgG and C3d. Antibody testing was reported as negative in-house on an alternative method and two units of red cells were manually crossmatched by the hospital transfusion laboratory and transfused to the patient. Samples should have been sent to the reference laboratory for further testing and antibody identification but instead the component was issued in the hospital.

Learning points

- The investigation of a positive DAT and antibody screen in a child can be complex. Unless appropriate skills exist in-house, liaison with specialist reference laboratory teams is vital
- Clinical teams therefore need to be aware of the potential delay in provision of best red cell component for the child
- Clear communication between clinicians and laboratory staff is required in urgent situations to ensure timely issue of blood components
- Transfusion laboratories require access to adequate senior support at all times

In 4 cases irradiated components were not provided for 2 infants post intrauterine transfusion, 1 infant post HSCT, and the last case involved a patient on purine analogues.

Phenotype-matched components were not selected for 2 patients (1 with HbSS and 1 with HbSC) and in the final case there was a failure to provide cytomegalovirus-negative components for a neonate.

Delayed transfusions n=30

Transfusion delays in children continue to be significant and occur at all stages of the transfusion process. The largest subcategory in delays was due to lack of availability of appropriate blood components (7 cases), with 1 case discussed in the transfusion-related deaths section (failure of concessionary release) and 3 following knowledge gaps about the component specification or patient requirement. One of these 7 cases involved a major haemorrhage situation.

Six delays were due to errors in request/prescribing. These included a case where appropriate follow-up for a neonate with a positive DAT was not arranged and they later presented with significant anaemia. Three cases involved testing errors, 1 of which is discussed below. A summary of all the cases of delays can be found in the supplementary material on the SHOT website.

Four cases involved exchange transfusion including: insufficient red cells for neonatal exchange; delay in a neonate with HDFN due to short expiry and delay for twin infants exchange transfusion for severe pertussis due to failure of communication of urgency and volume required.

Case 25.5: Confusion around the requirement for a maternal sample in a neonate

A neonate had symptomatic anaemia (pallor, tachypnoea, and desaturation, Hb 79g/L) and a paedipack was requested. The baby had been transfused 2 days previously. The maternal transfusion history had been checked (negative for antibodies) on an antenatal sample but a current maternal sample had not been obtained or tested. The laboratory picked up the earlier error when a new request for transfusion was made. At this point a maternal sample was requested. The mother was bought back into the hospital, a sample taken, and the red cells eventually transfused after a 7-hour delay.

In general, it is advisable to request a maternal sample. However, if the transfusion is urgent and the maternal sample not readily available then it is important not to delay transfusion and the testing can proceed on the neonatal sample.

Learning points

- In neonates (and infants <4 months of age) ideally an antibody screen should be performed on a maternal sample
- If a maternal sample is unavailable then the maternal transfusion history should be obtained, and an antibody screen performed on the baby's sample
- If the antibody screen is negative (and DAT if indicated) with no anomalous group, then no further pre-transfusion testing is required until the infant is 4 months old (New, et al. 2016; New, et al., 2020)

Avoidable transfusions n=12

Most of the avoidable transfusions in children were due to a decision based on inaccurate results.

There were 2 confirmed diluted samples; 1 due to an arterial line sampling device in a preterm baby and another due to an incorrect sampling technique in an infant on PICU. In another case, it was not clear whether the avoidable transfusion was following a diluted sample or inappropriate volume. This is discussed in Case 25.6. In 2 cases, the wrong patient's results were used (wrong blood in tube); a triplet was transfused based on a sibling's result and another child transfused based on a result from a different patient (the sample had been labelled away from the patient). Incorrect documentation was used in 2 cases: an inaccurate post-transfusion Hb, and a transcription error of a result from a telephone call. Platelet clumping resulted in 2 erroneous platelet counts, 1 with documented platelet clumps. One transfusion was based on an erroneous result as a repeat full blood count (FBC) prior to transfusion was normal but not checked until afterwards.

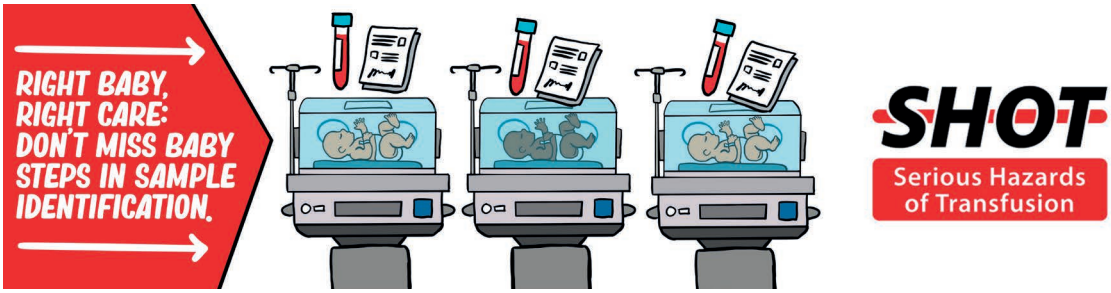
Finally, there were 2 cases with avoidable use of O D-negative components; 1 delay due to multiple issues in an infant with specific transfusion requirements and 1 delay in switching to fully crossmatched red cell units in a teenager with major haemorrhage.

Case 25.6: Avoidable red cell transfusion due to issues with a blood sample and not looking at trend

A teenager with sarcoma was undergoing proton beam therapy and was reviewed in the shared care centre. The Hb was noted to be 79g/L and a two-unit red cell transfusion was requested (a Hb of 100g/L was the transfusion threshold for proton beam). A FBC taken prior to the second unit was 131g/L but the result was not seen until after the unit was given. In retrospect, the initial Hb of 79g/L was considered unexpected based on the trend for the patient. In addition, there was miscommunication between the oncology centre and shared care as it was not realised that chemotherapy had been discontinued 4 months previously.

Learning points

- It is vital to consider whether a blood test result could be erroneous, for example by looking at the trend of blood results, other results obtained at the same time for a patient and the clinical context
- All relevant information that may impact on transfusion decisions must be communicated between tertiary and shared care centres
- In children as for adults (unless bleeding or chronically anaemic), the maximum transfusion volume should be single unit red cell transfusion and then Hb and patient reassessed (NICE, 2015)



Under and overtransfusion n=20

Undertransfusion n=9

One case of undertransfusion was associated with major morbidity. This case highlights again the risks of neonatal exchange transfusions, which are performed infrequently.

Case 25.7: Undertransfusion during exchange transfusion for a neonate

Insufficient red cells were administered to a neonate (pre-exchange Hb 136g/L) undergoing an exchange transfusion, resulting in a post-transfusion Hb of 108g/L. This was due to the use of a fluid giving set (with a smaller diameter) rather than a blood giving set which resulted in fewer red cells being transfused than anticipated. The neonate became hypovolaemic and had a cardiac arrest but survived.

The other cases were: a neonate was undertransfused due to insufficient volume supplied to allow for line priming; 4 cases due to incorrect calculation or use of the paediatric prescribing formula; 2 administration related, 1 of which was due to pump programming. There was also a failure of concessionary release in an exchange transfusion for a child with sickle cell anaemia (only six out of the eight red cell units were given).

Learning points

- Exchange transfusion in neonates remains a complex process which is now infrequently performed. Resources are available to support this (see 'Recommended resources')
- Exchange transfusion in neonates, infants and in older children requires close liaison between clinical and laboratory staff

Overtransfusion n=11

There were 5 administration errors, all of which were due to pump programming errors, with a combination of both volume and rate errors.

Prescribing errors occurred in 6 cases. In one case, a 7.5kg infant was admitted with bloody diarrhoea and Hb of 64g/L who received 40mL/kg of red cells (300mL) and required venesection. The post-transfusion Hb was 184g/L. An infant with thrombocytopenia suffered major morbidity due to bleeding following an overtransfusion of red cells. Two children were overtransfused due to not using the correct formula and prescribing in units rather than millilitres. A child with a congenital anaemia was overtransfused due to the inappropriate use of a thalassaemia protocol. The remaining case is described in Case 25.8.

Case 25.8: Overtransfusion in a child with sickle cell anaemia due to a prescribing error

An overtransfusion error was discovered in retrospect following an audit of practice. A teenager with sickle cell anaemia was admitted with diarrhoea and vomiting. Pre-transfusion Hb was 83g/L. The transfusion calculation was performed incorrectly and 1080mL (26mL/kg) of red cells were given. Post-transfusion Hb was not recorded. There was insufficient documentation to be able to judge whether the transfusion was indicated at all.

Learning points

- Children with sickle cell anaemia are particularly vulnerable to the risks of overtransfusion
- Factors to consider when prescribing red cells in this patient group are diagnosis, steady state Hb, HbS% and individualised transfusion targets and additional risks, such as hyperviscosity (Davis, et al., 2017a; Trompeter, et al., 2020b)

Cell salvage n=2

One case involved a neonate having cardiac surgery who only had a fraction of the salvaged blood reinfused while still on bypass and could not receive the rest due to mislabelling of the bag. The other case involved a teenager and was due to centrifuge failure.

Handling and storage errors (HSE) n=20

The majority of HSE errors were clinical errors 17/20 (85.0%).

There were 9 pump programming errors and 1 incorrect giving set used. Cold chain errors occurred in 4 cases; 3 refrigerator failures and 1 red cell unit was placed in a non-blood refrigerator. In 4 cases blood

components were transfused over a prolonged period (>5hours), in 1 case the reservation period due to sample validity was exceeded, and in the final case a time-expired unit of cryoprecipitate was transfused.

Anti-D immunoglobulin (Ig) errors n=8

There were 8 paediatric cases related to anti-D Ig errors. The age range of these cases was between 14 to 17 years old, all of them related to errors in pregnancy. Three cases resulted in omission or late administration of routine antenatal anti-D Ig prophylaxis. In 1 of these cases the review of the incident resulted in improvements in multiple areas; staffing, training, information technology and documentation. There were 3 cases where the cell free fetal deoxyribonucleic acid testing result was available (predicted D-negative fetus), but the result was not checked by clinical or laboratory staff prior to issuing and administration. All these unnecessary administrations of anti-D Ig were following potentially sensitising events. In 2 cases immunisation to the D antigen had already occurred, however the antibody status was not checked by the biomedical scientist prior to issuing anti-D Ig resulting in inappropriate anti-D Ig administration.

Transfusion-related reactions n=62

Febrile, allergic, and hypotensive reactions (FAHR) n=46

The majority of FAHR were in children between the ages of 1 year and 16 years, with only 1 being in a newborn and 1 in an older infant. Platelets were implicated in 25/46 (54.3%) cases, compared to 52.8% in 2023 and 68.6% in 2022.

Figure 25.4: Summary of paediatric FAHR reports by component from 2015-2024

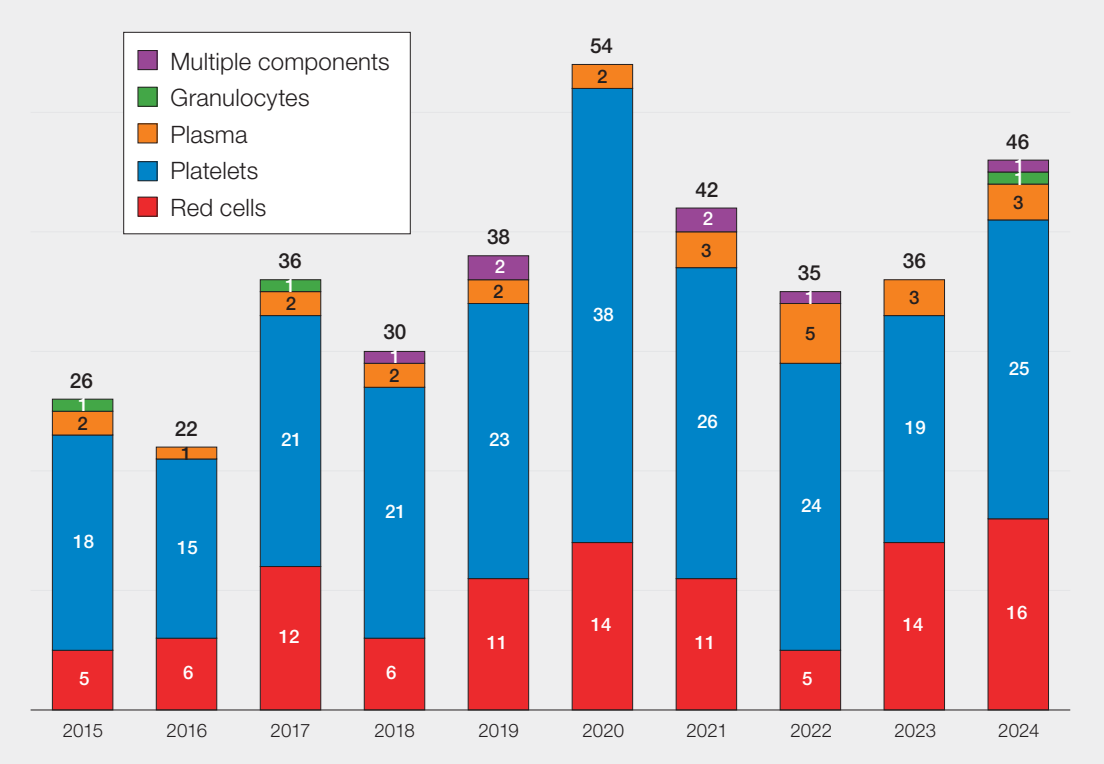
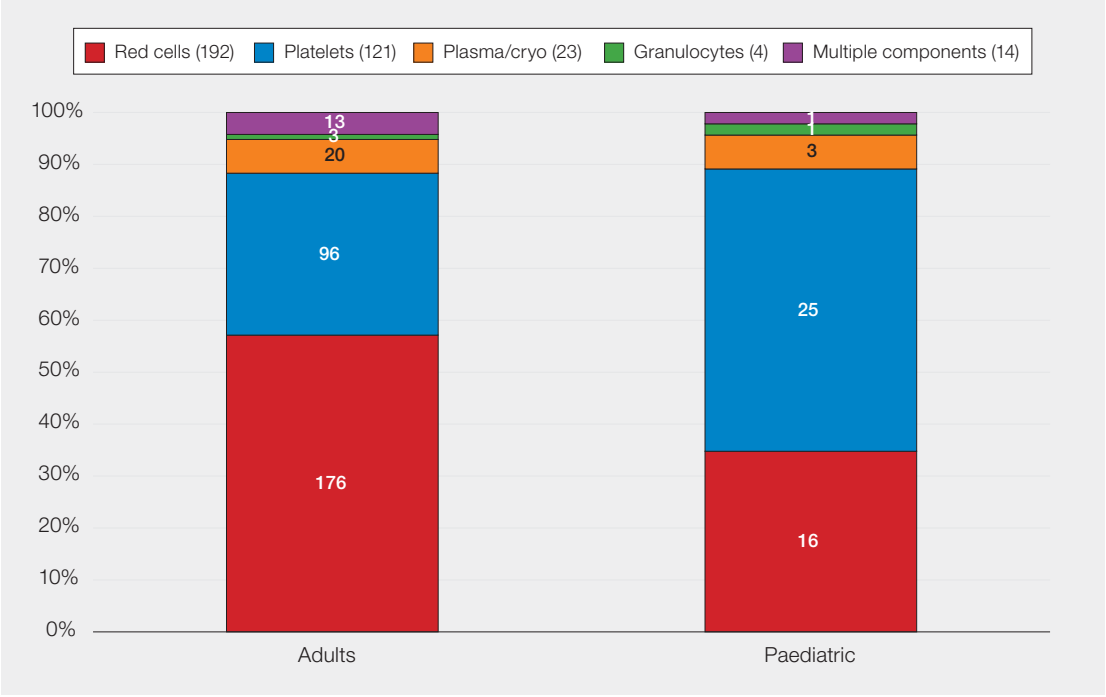
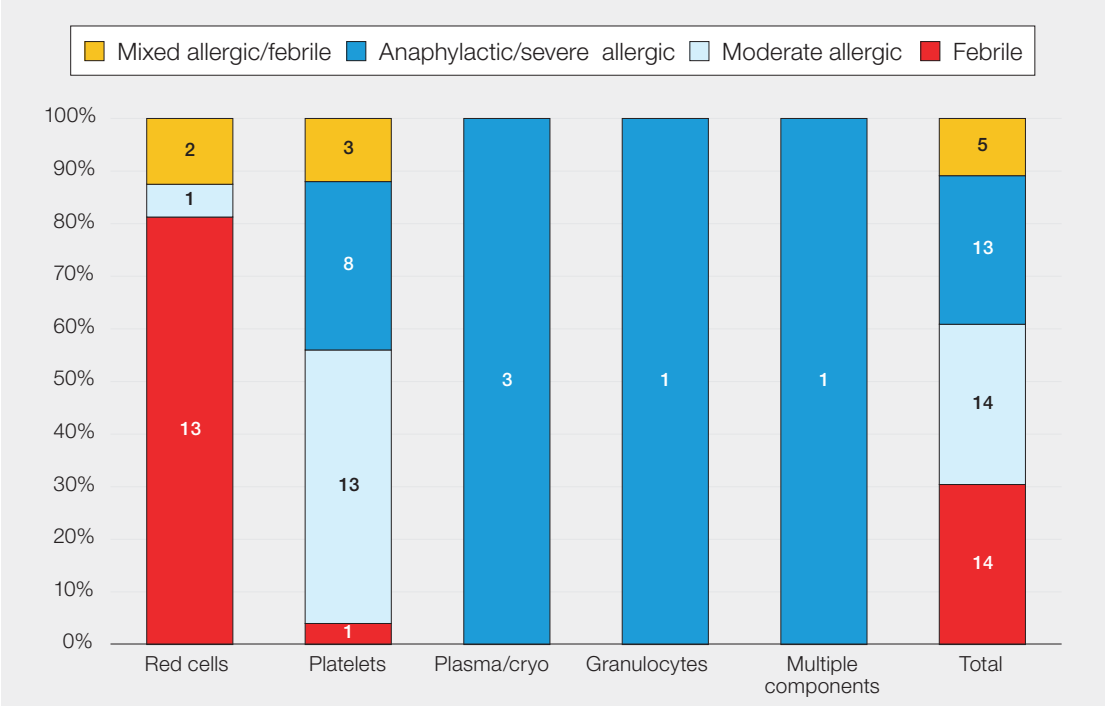


Figure 25.5: Paediatric FAHR reports in 2024 (n=46)
a: Comparison of proportions of adult and paediatric reports by component types



b: Percentages of reaction types in paediatric FAHR related to different component types



Haemolytic transfusion reactions (HTR) n=6

Three reactions were in older children with sickle cell anaemia. One was an acute haemolytic reaction with possible anti-Lu[a] and 1 delayed haemolytic transfusion reaction (no antibodies were identified). Both children were managed with intravenous immunoglobulin (IVIg) and steroids. The final case was a child with sickle cell disease who had hyperhaemolysis. The other 3 HTR all occurred in one patient (Case 25.9).

Case 25.9: Recurrent acute haemolytic transfusion reactions in a complex post HSCT child

A young child post HSCT for immunodeficiency had a gradually dropping Hb. The pre-transfusion DAT was positive (C3d) with investigations and crossmatch being performed by the Blood Service. Following

transfusion of only 60mL of red cells the child developed fever, abdominal pain and dark urine. The post-transfusion eluate was difficult to resolve with both an autoantibody and possible anti-E and anti-Jk^{b}. The child received two further red cell transfusions with sequential changes to management including: lowered transfusion threshold, phenotype-matched red cells, folate supplementation, treatment for mycoplasma, blood warmer, immunosuppression for presumed autoimmune haemolytic anaemia (steroids and IVIg). Post-transfusion investigations showed a pan-reactive red cell antibody with the only negative reaction being in the cord blood cell. Further serology from the International Blood Group Reference Laboratory (IBGRL) showed ongoing incompatibility with all cell types (including cord, In(Lu), adult ii and A1). Fortunately, the patient responded to immunosuppression and has not required further transfusion. A follow-up sample was planned to be sent to IBGRL 3 months from the last transfusion for further investigation.

This child with complex serology and clinical picture was managed via a series of multidisciplinary team meetings, facilitated by the Blood Service reference laboratory team. This allowed clinical and scientific staff from the Blood Service, hospital transfusion laboratory and the treating team to discuss and devise optimal care. This included an individualised transfusion threshold, consideration of erythropoietin and ongoing immunosuppression. In addition, a plan was developed for any future transfusion support including potential use of complement blockade, optimally matched components, and further testing.

Learning point

- Complex cases require multidisciplinary working across Blood Services and hospitals to provide optimal care for patients

Pulmonary complications of transfusion in neonates and children n=4

All pulmonary complications in 2024 were classified as TACO.

One case was associated with mortality (Case 25.2) and one with major morbidity (Case 25.3). A 3rd case involved a child with severe iron deficiency anaemia (Hb 30g/L) who developed signs of moderate fluid overload after an appropriate volume of red cells (13mL/kg).

The final case involved a 22kg child with leukaemia (pre-transfusion Hb 89g/L) who was also receiving hyperhydration. They were transfused with platelets and 25mL/kg of red cells prior to portacath insertion. One hour after the transfusions, a drop in saturations was noted together with an increase in temperature. A chest X-ray showed evidence of atelectasis and basal consolidation. The fluid balance was significantly positive (>1 litre). The child improved with supportive measures.

Transfusion-transmitted infections (TTI) n=0

There were no cases of TTI in children or neonates in 2024.

Uncommon complications of transfusion (UCT) n=6

Four cases involved neonates on the same neonatal unit. Three of these occurred during the same week and received a separate paedipack from the same blood donor. The red cell units were all transfused at between 24 and 30 days of shelf life. The neonates developed red urine post transfusion, but no other markers of haemolysis were found. The Blood Service investigated the donor thoroughly and no cause was found. The 4th case occurred 7 months later, on the same neonatal unit as the 3 previous cases. A cause has not been found and the blood on this occasion was from a different donor. All neonates recovered from this episode uneventfully.

There was also 1 case of transfusion-associated necrotising enterocolitis in a pre-term baby and a case of high potassium in a bypass circuit (Case 25.10).

Case 25.10: High potassium in a bypass circuit for a neonate undergoing cardiac surgery

High potassium levels (19 mmol/L) were found in an irradiated large volume transfusion unit when

performing equipment prime prior to bypass. The unit was day 3 post donation, and it was 15 hours post irradiation. The unit was filtered and washed and due to clinical urgency, was transfused once potassium levels were within normal/usual range. Subsequent testing of the donor by the Blood Service confirmed that the donor was heterozygous for a genetic variant, associated with familial pseudohyperkalaemia.

Familial pseudohyperkalaemia causes an increased leak of potassium from red cells during cold storage (Bawazir, et al., 2014).

Learning point

- This case illustrates the importance of checking the potassium in bypass fluids prior to connection to the child and is recommended in the British Society for Haematology guidance (New, at al., 2016)

Paediatric error reports with no harm n=138

The numbers of cases of no harm/near miss are summarised below.

Table 25.1: Paediatric error reports with no harm in 2024 (n=138)

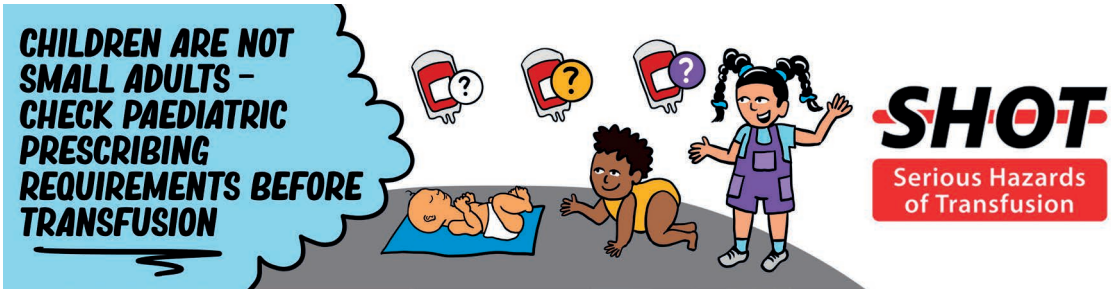
	≤28 days	>28 days-<1 year	1-<16 years	16-<18 years	Total
RBRP	3	4	7	2	**16**
NM	14	7	30	4	**55**
NM-WBIT	44	5	15	3	**67**
Total	**61**	**16**	**52**	**9**	**138**

Of note for the WBIT cases 44/67 (65.7%) were neonates which reflects some of the complexities of patient identification in this age group.

Conclusions

Paediatric transfusion safety requires meticulous attention to detail; small errors can have significant consequences. Weight-based prescribing, effective identity checks, and vigilant monitoring are essential at every stage. Children may present with subtle signs of transfusion reactions, so early recognition and clear communication between teams are vital. Paediatricians and neonatologists should be able to recognise transfusion reactions that can occur in various clinical settings and initiate appropriate management. Laboratory investigation in neonates and infants <4 months and children with antibodies can be complex.

Paediatric teams should have access to local paediatric transfusion guidelines, and these must be aligned with national guidelines. Induction training of paediatric staff should include specific requirements and weight-based prescribing to address errors in calculation of blood transfusion volumes and prescribing specific requirements (e.g., irradiation). Appropriate use of blood components with special requirements, and a culture that encourages reporting of both excellence and near misses all contribute to safer care. By learning from such events, safety of transfusions for our youngest and vulnerable patients can be improved.



Recommended resources

SHOT video: Paediatric SHOT
https://www.shotuk.org/resources/paediatric-shot/

SHOT webinar: Accurate and complete patient identification in paediatric transfusion
https://www.shotuk.org/resources/webinar-on-accurate-and-complete-patient-identification-for-safe-transfusion-in-paediatrics/

Exchange transfusion educational videos (HEE/NHSBT)
Videos describing manual red cell exchange for sickle cell for patient <40kg
https://www.youtube.com/watch?v=e2itKcfXQAE
and for patients >40kg
https://www.youtube.com/watch?v=5QFiLziDxbc