Paediatric Cases n=151

23

Authors: Anne Kelly and Helen New

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.

Abbreviations used in this chapter

ADU	Avoidable, delayed and under/overtransfusion	**NEC**	Necrotising enterocolitis
BSH	British Society for Haematology	**NM**	Near miss
CS	Cell salvage	**RBRP**	Right blood right patient
CMV	Cytomegalovirus	**SaBTO**	The Advisory Committee on the Safety of Blood, Tissues and Organs
EI	Electronic issue		
FAHR	Febrile, allergic and hypotensive reactions	**SCD**	Sickle cell disease
FFP	Fresh frozen plasma	**SRNM**	Specific requirements not met
Hb	Haemoglobin	**TACO**	Transfusion-associated circulatory overload
HSCT	Haemopoietic stem cell transplant	**TAD**	Transfusion-associated dyspnoea
HSE	Handling and storage errors	**TANEC**	Transfusion-associated NEC
HTR	Haemolytic transfusion reactions	**TRALI**	Transfusion-related acute lung injury
IBCT	Incorrect blood component transfused	**TTI**	Transfusion-transmitted infection
Ig	Immunoglobulin	**UCT**	Uncommon complications of transfusion
MHP	Major haemorrhage protocol	**WCT**	Wrong component transfused

Key SHOT messages

- Paediatric reports account for 263/3499 (7.5%) of all reports to SHOT including NM and RBRP. More than a third of reports involved neonates
- Five of the 8 overtransfusion reports were due to errors in administration and 3 were due to prescribing errors
- Transfusion delays with paediatric major haemorrhage continue to be reported. Ten of 22 delayed transfusions involved communication failure within teams and between clinical and laboratory areas
- The decision around whether to irradiate components for patients with known or suspected DiGeorge syndrome is based upon assessment of immune function and not all children with DiGeorge will require irradiated blood components
- The paediatric transfusion formula remains the best way to calculate the volume of red cells for transfusing a child

Recommendations

- Local guidelines for management of iron and haematinic deficiency in children should be developed and implemented
- Transient abnormalities of coagulation and platelet number are common following exchange transfusion and transfusion should only be given if within guidelines (BSH New et al. 2016, 2020)
- Specific paediatric MHP are required, and all members of staff involved need to be aware of their roles

Action: Hospital transfusion teams and paediatricians; Royal College of Paediatrics and Child Health; paediatric and nursing educators

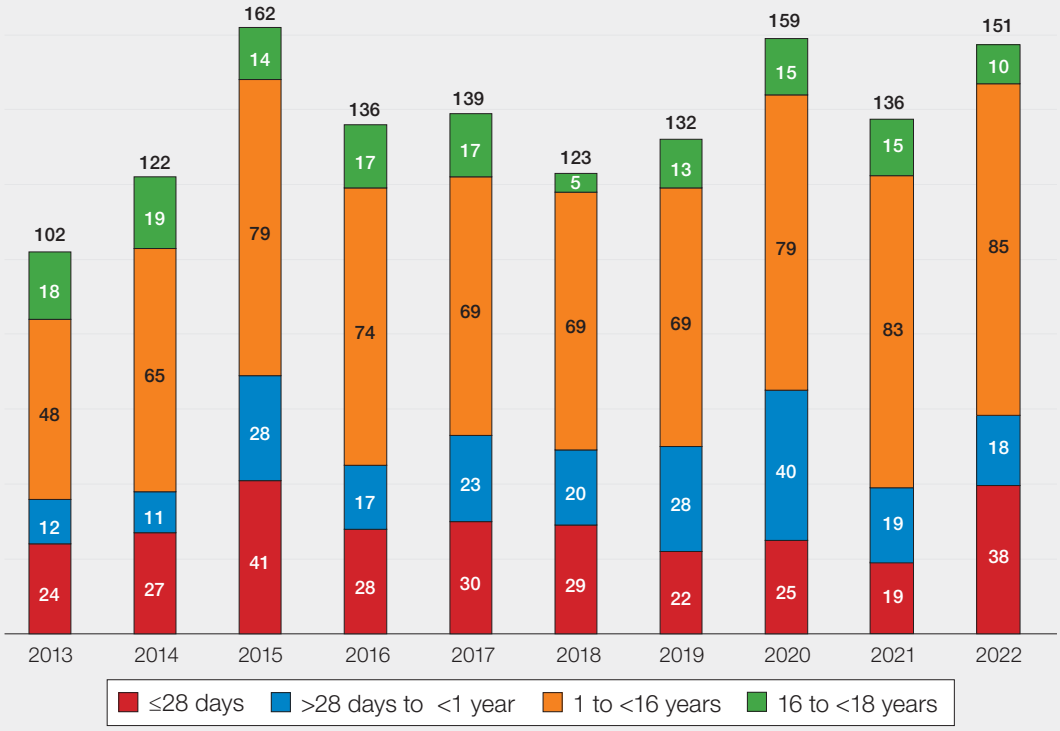
Introduction

Numbers of reports in 2022 are similar to those reported in 2020 and have increased compared to last year (151 vs 136). Paediatric cases were 151/1869 (8.1%) of total cases excluding NM and RBRP and 263/3499 (7.5%) if NM and RBRP are included. More than a third of reports involved neonates <28 days of age and infants <1 year old.

Once again there is over-representation of paediatric cases within the FAHR, ADU and IBCT categories. It is notable that this year in ADU, as well as overtransfusion, delay in transfusion is also over-represented.

The balance between clinical vs laboratory error was similar to last year with 60/101 errors being primarily clinical (59.4%) and 41/101 mainly laboratory (40.6%). Overall, in both adults and children the proportion of total clinical versus laboratory error reports was 918/1278 (71.8%) clinical. In children the two categories with the highest numbers of clinical errors were ADU and HSE. This is likely to reflect the complexities of both prescription and administration in these age groups.

Figure 23.1: Trends in paediatric reports 2013-2022



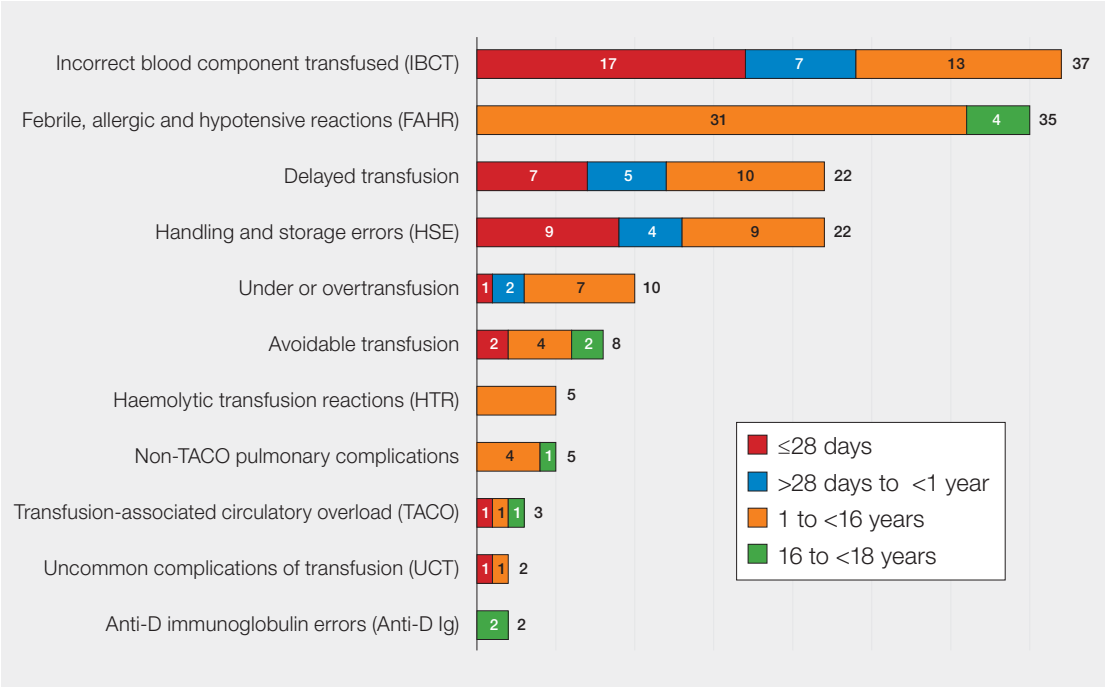


Figure 23.2: Summary of paediatric cases by category and age 2022

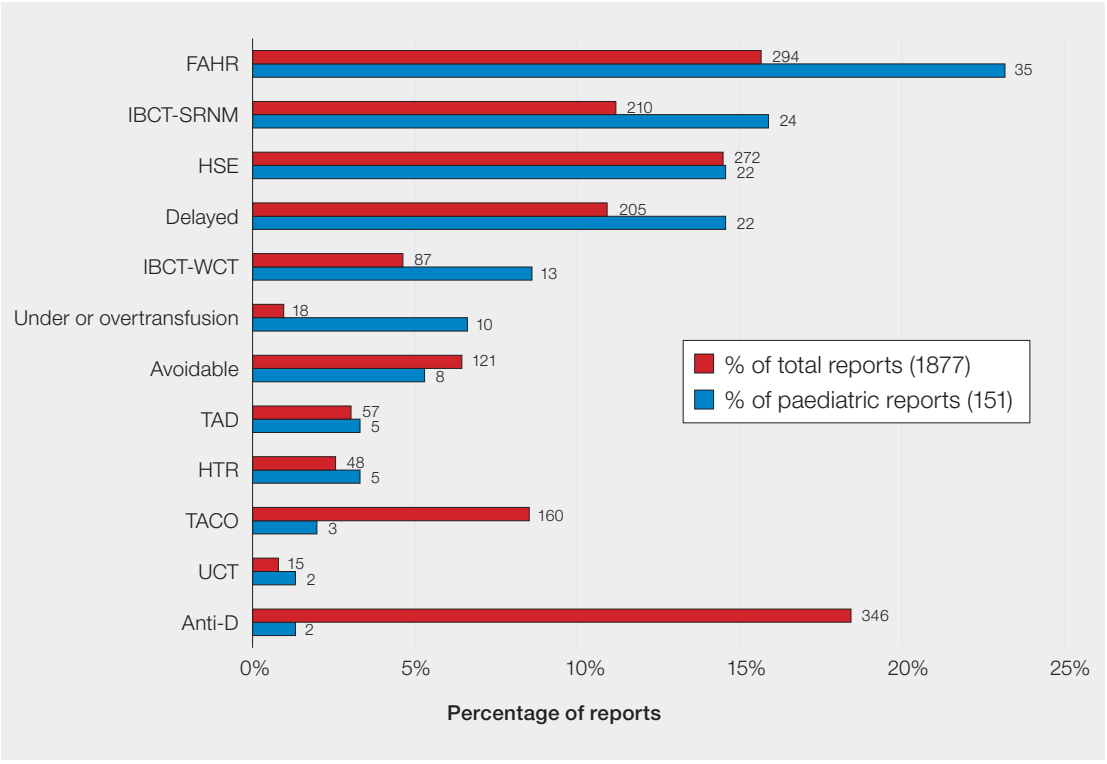


Figure 23.3: Percentages of paediatric and total reports in each category

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

Deaths related to transfusion n=0

There were no cases which met the criteria for transfusion-related deaths.

Major morbidity n=18

There were 18 cases of major morbidity associated with transfusion. Once again, the largest category

was in FAHR with 11 reports. There were also 2 cases of non-TACO pulmonary complications, 1 case of TACO, and a delayed HTR resulting from a new allo anti-Fy^a in a teenager with SCD. One child developed a subdural haematoma following a delay in platelet transfusion. The child had also sustained a head injury and it is therefore not clear to what extent the transfusion delay contributed to the bleed.

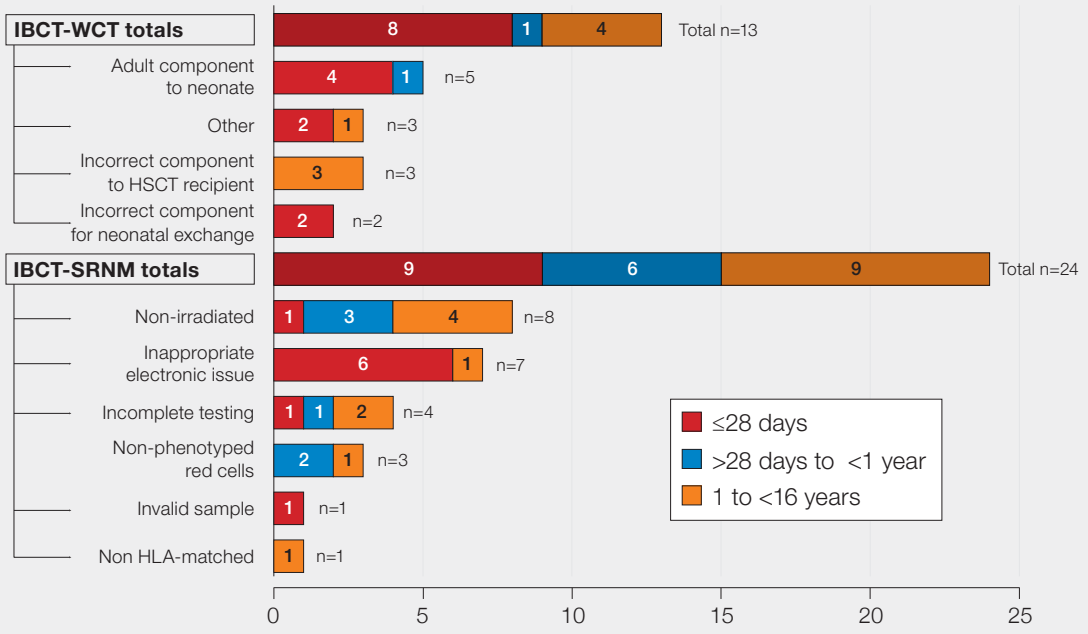
Error-related reports n=101

There was an increase in error-related reports compared to 2021 (101 vs 83). This increase was noticeable in IBCT (in particular IBCT-SRNM), HSE and ADU.

Incorrect blood component transfused (IBCT) n=37

The total number of reports remains similar to previous years. For IBCT-WCT half of reports are classified as clinical and half laboratory. However, for IBCT-SRNM there are significantly more laboratory reports compared to clinical ones. For a more detailed discussion of the IBCT laboratory errors see Chapter 9, Incorrect Blood Component Transfused (IBCT).

Figure 23.4: Breakdown of incorrect blood component transfused reports



IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSCT=haemopoietic stem cell transplant; HLA=human leucocyte antigen

IBCT-wrong component transfused (WCT) n=13

IBCT-WCT clinical errors n=7

Clinical teams should understand that there is a difference between adult and neonatal specification components in order to reduce errors in emergency situations.

Adult specification component to infant or neonate n=5

There were 5 cases where adult specification units were given to children under the age of 1 year, 4 of these were neonates. In 3 of these cases the units were red cells given for emergency neonatal resuscitation and in 1 case (described below) an adult platelet unit was used for a neonate.

Case 23.1: Preterm baby received an adult platelet component

A preterm baby who had sepsis and low platelets required an emergency platelet transfusion. An

adult platelet component was incorrectly collected from the transfusion laboratory. The neonatal intensive care unit team noted that the unit was much larger than usual and did not have the standard compatibility label. As it was the same blood group as the patient it was decided to transfuse to the baby. Part way through the transfusion the laboratory rang to inform the ward team of the error. Of note the unit was not CMV-negative.

Components which are provided for neonatal and infant use have additional safety requirements in view of the vulnerability of this patient group. It is recommended that these components are used for infants under 1 year of age (BSH New et al. 2016).

Incorrect component to HSCT recipient n=1

The transfusion laboratory was not informed of the transfusion requirements of a child who was post HSCT and as a result a D-positive component was given to a D-negative infant.

Other n=1

The final clinical case involved a maternal crossmatch sample which was labelled with the details of another mother.

IBCT-WCT laboratory errors n=6

There were 6 cases which were due primarily to laboratory errors.

Incorrect component for neonatal exchange transfusion n=2

Two of these cases involved the incorrect component provision for neonatal exchange transfusion. The 1st case involved a baby with haemolytic disease of the newborn secondary to anti-A. The patient received a neonatal large volume transfusion unit instead of a neonatal exchange specification component. The 2nd case involved a baby with a congenital haemolytic anaemia (hereditary pyropoikilocytosis) who was given an exchange transfusion using a non-exchange red cell component following incorrect ordering by the laboratory. On this occasion, a clinical decision was taken to avoid delay by using the non-exchange component provided as the only difference was in haematocrit and anticoagulant.

Incorrect component to HSCT recipient n=2

In 2 cases children whose requirements had changed following allogenic HSCT received the wrong component. The first received a D-positive platelet transfusion instead of D-negative. Fortunately, at this time the child had not engrafted and was still grouping as D-positive. In the 2nd case a teenager received group A rather than group O red cells as the biomedical scientist failed to check the laboratory information management system flag and issued based on the pre-transplant ABO group.

Other n=2

A neonate received group O plasma when only one historical group was present. The other case was a child who had previously reacted to apheresis platelets. The patient subsequently tolerated a pooled unit without any clinical reaction and was accidentally given a further apheresis unit and had a mild reaction.

IBCT-specific requirements not met (SRNM) n=24

IBCT-SRNM clinical errors n=6

Failure to provide irradiated components n=5

Five cases involved failure to provide irradiated components. Two of these were children who had previously received purine analogue (fludarabine). In 2 cases there was failure to provide irradiated components to children around the time of HSCT or harvest.

The final case is described below and was a failure to communicate a diagnosis of DiGeorge syndrome by the clinical team.

Case 23.2: Failure to provide irradiated blood component for a potentially immunodeficient infant with DiGeorge syndrome

Clinicians failed to communicate the diagnosis of DiGeorge syndrome to the laboratory for a child who was a few months of age, and they did not receive irradiated red cells. Of note the transfusion was urgent due to haematemesis. The child had not previously been known to the hospital and no assessment of immune function was recorded.

Learning points

- The 2020 BSH irradiation guidelines provide guidance on appropriate assessment of immune function in patients with known or suspected DiGeorge syndrome to rationalise the requirement for irradiated components (BSH Foukaneli et al. 2020)
- For children less than 2 years old and where there is time for immunological assessment prior to transfusion, if the T-lymphocyte count is >400cells/microlitre of which 30% are naïve T cells, there is no need for irradiated components. In the absence of assessment demonstrating adequate immunity, they should receive irradiated components
- For children over the age of 2 without any significant history of infections or history consistent with severe T-lymphocyte associated immunodeficiency irradiated components are not required

Failure to provide phenotyped component n=1

The transfusion laboratory was not aware of the thalassaemia diagnosis for a patient who subsequently made two allo antibodies (anti-c and anti-E) and had therefore not been receiving phenotyped, antigen-negative units.

IBCT-SRNM laboratory errors n=18

Inappropriate electronic issue (EI) n=7

In 4 cases, EI was used for neonates inappropriately. One case was a post liver transplant patient (of note this child also should have received irradiated blood components). One infant had inappropriate EI as there was maternal anti-E. This child should have received crossmatched antigen-negative red cells.

Failure to provide irradiated components n=3

There were 3 cases with a failure to provide irradiated components mainly due to laboratory errors. These were a child pre HSCT, a child with potential immunodeficiency and an infant who had received a previous intrauterine transfusion.

Incomplete testing n=4

There were 3 cases of incomplete testing due to missing maternal antibody checks and 1 case of a missing authorisation step.

Failure to provide phenotyped component n=2

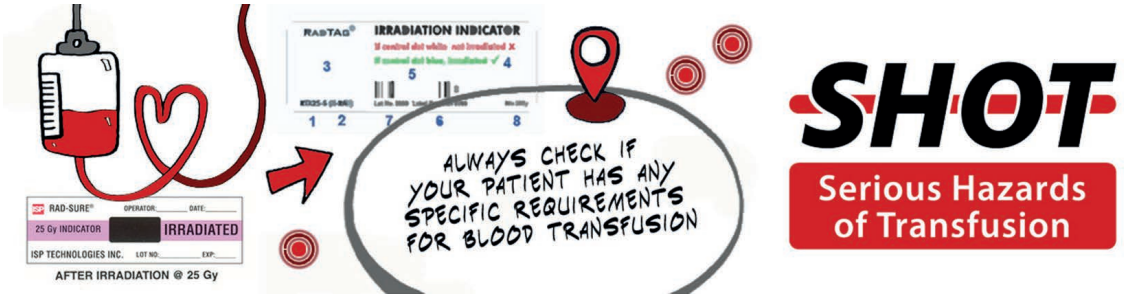
One child with SCD and 1 neonate with a known maternal anti-M did not receive phenotyped/antigen-negative red cells.

Invalid sample n=1

One child had red cells issued and the group and screen sample was more than 7 days old.

Failure to provide HLA matched component n=1

One child accidentally received non-HLA matched platelets.



Avoidable, delayed, under or overtransfusion (ADU) n=40

Avoidable transfusions n=8

The classification of avoidable cases follows that of the main ADU chapter (Chapter 11b, Avoidable Transfusion), and the majority fell within the category of a decision made upon the basis of inaccurate results. Of these, 6 cases were transfused following either an old result (n=3) or an inaccurate result such as platelet clumping (n=3). These cases highlight the importance of looking at the trend in a patient's results and asking for a repeat sample if results are unexpected or inconsistent with the clinical status.

The other 2 cases were both examples of flawed decision-making. The first was an example of treating a number without looking at the clinical status of the patient and is summarised below.

Case 23.3: Management of abnormal results following exchange transfusion

A term neonate received an exchange transfusion for hyperbilirubinemia. Following the procedure, the fibrinogen was found to have dropped to 0.8g/L. The neonate was given cryoprecipitate but was well with no bleeding and with no invasive procedure planned.

Learning point

- Transient abnormalities of coagulation and platelet count are common following exchange transfusion. In the absence of bleeding, these do not usually require correction by transfusion and BSH guidance should be followed (BSH New et al. 2016, 2020)

Another case was again a flawed decision to transfuse, with two units of red cells for iron deficiency given to a teenager without checking the full blood count. The pre-transfusion Hb was 60g/L and the second red cell unit could have been replaced by iron therapy.

There was a further case reported in which a second red cell unit could have been avoided. As this case involved delay in provision of the blood component, it is included in the delay section.

Delayed transfusions n=22

Delay to transfusion has again been prominent for paediatric recipients.

In 3 cases the delays were around the management of major haemorrhage; 2 of these were due to failure to activate the MHP by switchboard and 1 was a delay in obtaining the red cells from the emergency refrigerator.

Further discussion on MHP can be found in Chapter 11a, Delayed Transfusions, and the supplementary material for that chapter (https://www.shotuk.org/report-summary-and-supplement-2022/). One of the cases involving MHP is detailed below.

Case 23.4: Failure to activate MHP

A teenage patient was admitted with major bleeding. There was a delay in provision of FFP due to the switchboard team activating two trauma calls rather than activating the MHP call. This meant that a porter was not sent to collect the blood components.

Learning points

- It is vital that all staff involved in the MHP process are aware of the actions required
- MHP practice/simulation is important to ensure that potential problems are identified and rectified

Communication was a common theme in cases with transfusion delays. Ten cases involved problems with communication within teams and between clinical and laboratory areas.

There were 6 laboratory delays, 2 of which were due to broken refrigerators which was not communicated to clinical staff. There was a delay in provision of FFP for a child as the thawing devices were all in use for other patients at the time.

There were multiple factors involved in the delay of provision of red cells to a child with iron deficiency and this is discussed below.

Case 23.5: Management of iron deficiency

A teenager presented with symptomatic iron deficiency anaemia with Hb 65g/L. There was a delay in obtaining red cells due to problems with sample labelling, which resulted in the need for repeat samples and failure to request the red cells. This caused many hours of delay before the first unit was commenced.

Of note two red cell units were requested for this patient, the second unit could have been replaced with iron.

Learning point

- Asymptomatic children with haematinic deficiency anaemia can be safely managed with appropriate supplementation avoiding the need for transfusion. Children without significant co-morbidities and chronic anaemia can often tolerate a very low Hb without issues

Another case involved a delay in platelet provision for a child due to a request for apheresis platelets. It is important to note that following the SaBTO recommendation in 2019 either pooled or apheresis platelets may be used for children (SaBTO 2019).

Case 23.6: Delay to provision of platelets

There was a delay in provision of platelets to a child with an acute lymphoblastic leukaemia. This delay was due to communication issues around when the unit was required. The prescriber had specified that apheresis platelets should be provided.

Learning point

- For children >1 year of age either standard apheresis or pooled platelets may be used (BSH New et al. 2020)

The final case also involved confusion in the different components available for children.

Case 23.7: Delay in provision of red cells for a child with SCD due to incorrect exchange unit ordered

A young child with SCD required a red cell exchange. A neonatal exchange unit was erroneously requested for the child. This resulted in a delay in provision of the red cells.

Clinical and laboratory staff must be aware of the different transfusion component requirements based on age and indication. Components for red cell exchange transfusions differs according to age group. This case is counted in the numbers for ADU but could also have been included in IBCT-WCT as the child did receive neonatal specification units.

SHOT
Serious Hazards of Transfusion

Overtransfusion n=8

There were 8 cases of overtransfusion (age range 18 days to 5 years). Five of the 8 overtransfusion reports were due to errors in administration and 3 were due to prescribing errors. One had a haemoglobin disorder and received excessive red cells due to miscommunication.

One administration error involved cell salvage in a child undergoing elective cardiac surgery and is described below. The blood component was transfused at the incorrect rate in 3 cases with administration errors and were due to staff misreading the prescription. The final case was due to a pump programming error.

Case 23.8: Error with infusion line clamps resulted in overtransfusion following cell salvage

During transfer from theatres to the paediatric intensive care unit the clamps on the infusion line were left open which resulted in an overtransfusion and at too high a rate. The child required venesection/ dilutional exchange to reduce the Hb from 173g/L to 148g/L over the next 12 hours.

Of the 3 prescription errors, 1 involved prescribing 40mL/kg of platelets for an infant. This child subsequently required furosemide for pulmonary symptoms. One involved the prescription of a full unit of platelets for a child and the final report was of an over prescription of red cells and is described below.

Case 23.9: Overtransfusion due to prescription of incorrect volume

One unit of red cells was prescribed for a child with neuroblastoma. The increased volume compared to usual was noticed by the parent. The reporter commented that a full red cell unit had been prescribed rather than 15mL/kg. The child had received 290mL (25mL/kg).

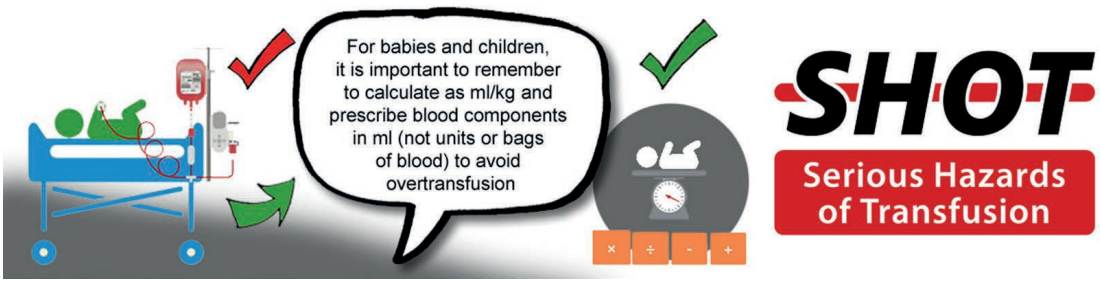
Of note 15mL/kg is a relatively high volume for a top-up transfusion in a non-bleeding child. It would be predicted to raise the post-transfusion haemoglobin by approximately 40g/L. In contrast, transfusion of a single unit to an adult is approximately 4mL/kg transfusion.

Learning points

- Volume of red cells to be transfused to children is best determined by utilising the paediatric transfusion formula. BSH guidelines (New et al. 2016) recommend aiming for a Hb 20g/L above transfusion threshold for non-bleeding patients and those without chronic anaemia (and maximum 1 red cell unit as for adults). The Hb rise expected if this formula is used is equivalent to approximately 8mL/kg transfusion
- The formula for estimating the volume of red cells required for transfusion is included here:

$$\text{Volume required (mL)} = \frac{(\text{Target/desired Hb (g/L)} - \text{current Hb (g/L)}) \times \text{weight (kg)} \times 4}{10}$$

- To reduce errors and prevent overtransfusions, clinicians should double check that the calculated final volume is not >20mL/kg for top-up transfusions



Undertransfusion n=2

There was 1 case where a severely thrombocytopenic child did not receive a platelet transfusion at the time of a nasogastric tube placement because a count of $16x10^9$/L was misheard as 60; the cut off for transfusion pre-procedure was a count of $50x10^9$/L. They were transfused later in response to bleeding.

The 2nd case was a major haemorrhage in a large infant with sepsis and bleeding. Standard adult components had been requested but neonatal components (platelets and FFP) were provided which were significantly less than the volume required for the child.

Cell salvage (CS) n=0

In 1 case, errors with cell salvage resulted in significant overtransfusion in the patient and has been discussed in the overtransfusion section.

Handling and storage errors (HSE) n=22

Clinical errors contributed to 20 HSE errors.

In 12 of these there were issues around the time to transfuse which were related to programming of pumps. The case below illustrates the complexities particularly in the neonatal age group. One case resulted in overtransfusion but as it did not result in patient harm, it is included in the HSE figures. There was 1 case of a component being administered with incompatible fluids.

Case 23.10: Infusion pump programming error in a neonate

A preterm baby received red cell transfusion at only 1.4mL/hour instead of 5mL/hour for the first 2.5 hours of a transfusion. The member of staff had not followed the unit policy of having a second check for pump programming.

Learning points

- Neonatal transfusion set up is complex and infusion pump programming errors are a common theme in paediatric SHOT reports
- The SHOT paediatric video discusses some of these issues (see 'Recommended resources')

In 6 clinical cases there were errors in the cold chain for example blood components being transfused after being out of the refrigerator for too long.

Of the 2 laboratory errors, 1 involved failure to quarantine a unit after a reactive screen was noted by the Blood Service. In the other case a loaned platelet incubator had not been subjected to usual change control and was subsequently found to have been out of temperature range.

Anti-D immunoglobulin (Ig) n=2

An older teenager who was carrying a D-negative fetus was erroneously given anti-D Ig and in the other case a teenager was administered anti-D Ig late.

Transfusion reactions n=50

Febrile, allergic, and hypotensive reactions (FAHR) n=35

FAHR reactions in children are largely due to platelet components similar to previous years. Most reports (19/24) related to apheresis units with only 5 cases that involved pooled platelets. There were no reactions reported in children less than 1 year of age.

Just under half, 14/35 (40.0%) of the overall reactions were allergic. Notably, 9/36 (25.0%) of all anaphylactic reactions reported to SHOT were in the paediatric age group (see Chapter 16, Febrile, Allergic and Hypotensive Reactions (FAHR)).

The use of antihistamine and hydrocortisone together is only required for moderate or severe allergic type reaction. For mild allergic reactions antihistamine only can be used. There is no role for either in the management of febrile only reactions (see 'Recommended resources').

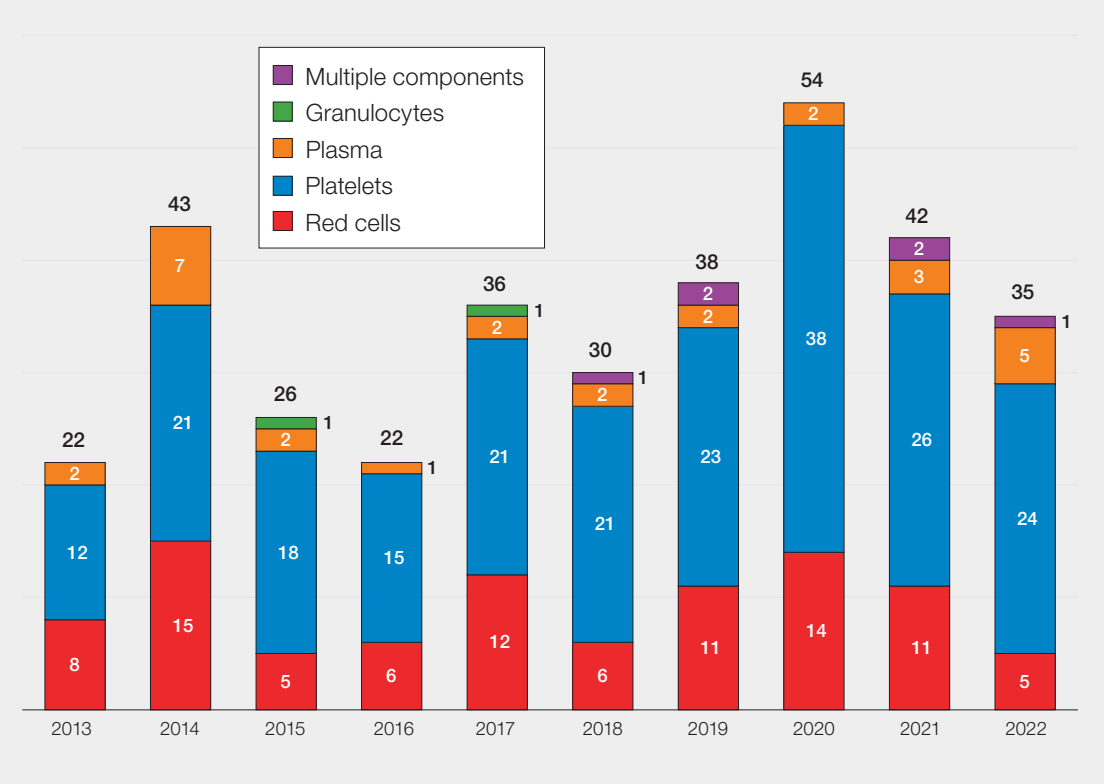


Figure 23.5: Summary of FAHR reports by component type from 2013 to 2022

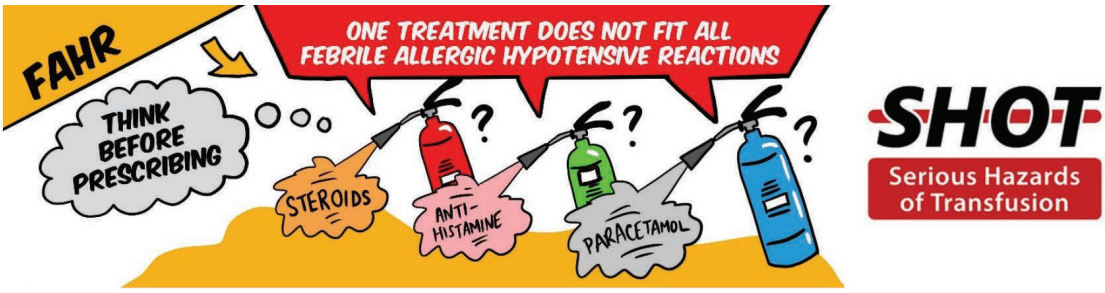
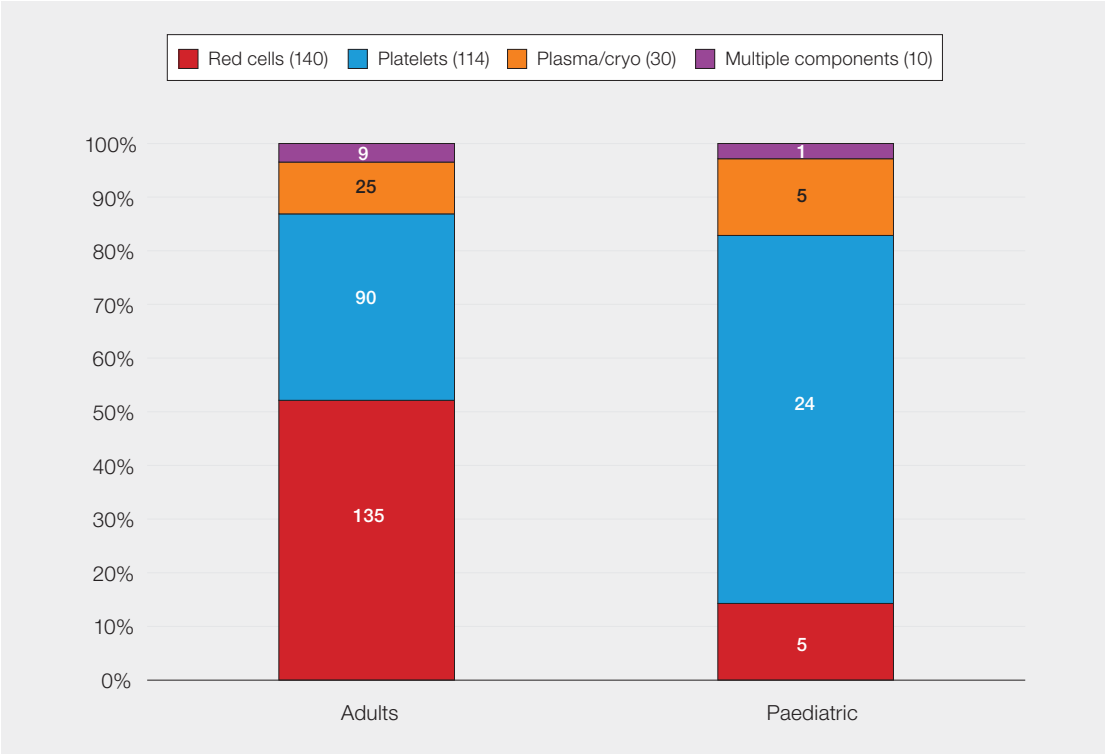
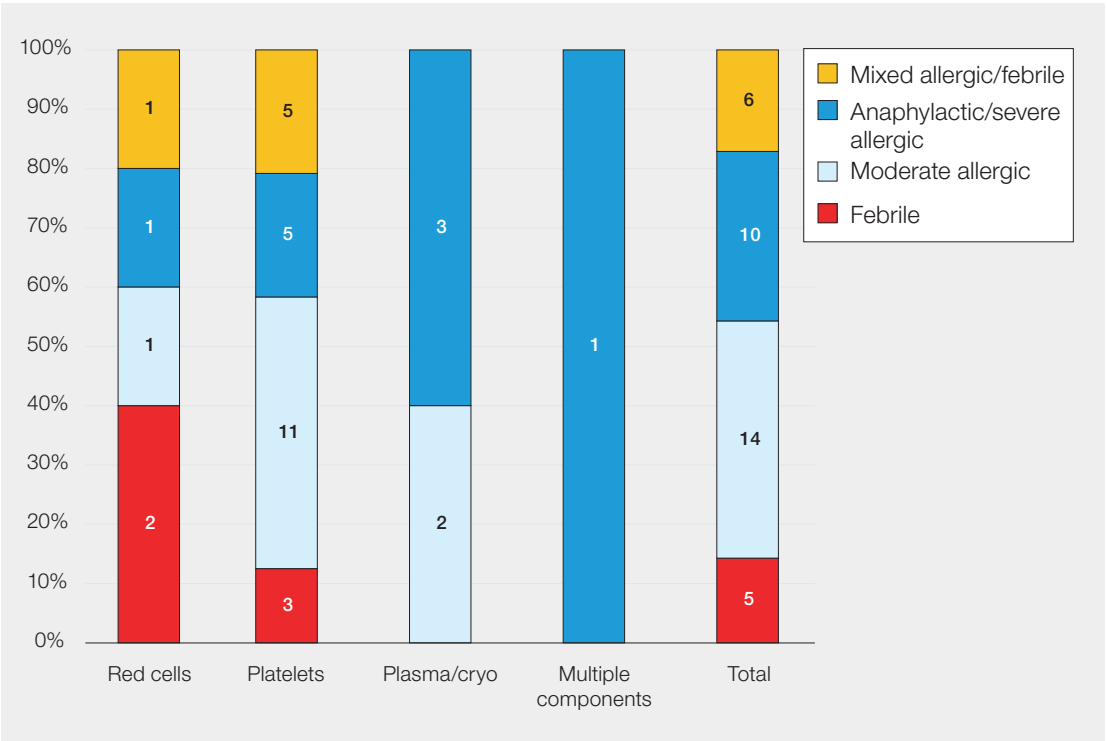


Figure 23.6: Paediatric febrile, allergic, and hypotensive reaction (FAHR) reports

a. Comparison of proportions of adult and paediatric FAHR related to different components



b. Percentages of reaction types of each component for paediatric reports



Haemolytic transfusion reactions (HTR) n=5

Of the 5 HTR cases, 4 involved patients with a diagnosis of SCD.

Two of the cases in young children with SCD involved hyperhaemolysis. Although in 1 of these cases a pan-reactive IgG autoantibody was also detected (auto anti-e).

The 3rd child with SCD developed a delayed HTR 10 days following an exchange transfusion. This patient was found to have developed an anti-S and anti-C and they had received an antigen-positive unit. The 4th case also involved the development of a new allo anti-Fy^{a} in a child with SCD. This patient had previously developed an allo anti-s and anti-N.

The final case involved a young child with hereditary spherocytosis who had previously been transfused 3 years ago. They developed a delayed HTR and an anti-Jk^{a} was subsequently found. This antibody was not detected on the initial antibody screen as the antibody titre had likely fallen below the limit of detection.

Pulmonary complications of transfusion in neonates and children

Diagnosis and classification of pulmonary complications in neonates and children remains difficult and still under-reported.

Transfusion-associated circulatory overload (TACO) n=3

There were 3 cases which met the criteria for classification as TACO. One of these is discussed in detail below.

Case 23.11: TACO following transfusion for severe anaemia in a neonate

A term neonate was born with a Hb of 44g/L secondary to severe fetomaternal haemorrhage. The neonate received an initial 18mL (5mL/kg) red cell transfusion via 'slow bolus' followed by 18mL/hr for 3 hours. Between 2-6 hours following transfusion the neonate developed increasing respiratory distress requiring intubation and ventilation. Furosemide was given with improvement in clinical status.

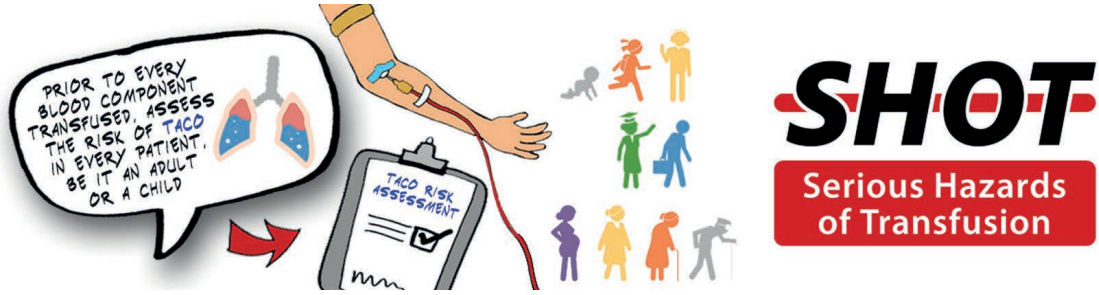
This case highlights that as for adult cases, severe anaemia can be a risk factor for TACO in neonates and children.

Of the other 2 cases, 1 involved a child with severe liver disease who developed pulmonary oedema after a red cell transfusion. This child had additional risk factors including low albumin, cardiac failure, renal impairment, recent pulmonary oedema and fluid overload. The final case was in a teenager who received massive transfusion of blood components following a major haemorrhage secondary to trauma/ penetrating injury.

Non-TACO pulmonary complications n=5

There were 4 cases of TAD. Two were following red cell transfusions, 1 following platelet transfusion, and 1 needed supplemental oxygen within 6 hours of granulocyte infusion.

One case was considered to meet the revised criteria for TRALI type II. This was a young child with neuroblastoma on chemotherapy.



Transfusion-transmitted infection (TTI) n=0

There were no cases of TTI in 2022.

Uncategorised complications of transfusion (UCT) n=2

There was 1 case of a neonate with Enterobacter sepsis who had an acute deterioration following a red cell transfusion. Transfused blood showed no growth of any pathogens. Enterobacter sepsis and prematurity were identified as causes of death on the death certificate. This was originally reported as a possible case of TANEC but had none of the clinical or radiological features of NEC.

The second case was an unusual report of a possible reaction during transfusion.

Case 23.12: Abdominal pain during transfusion

A young child developed abdominal pain part way through a transfusion and was subdued and lethargic. No other symptoms were reported, and the pain had settled following defaecation and 30 minutes after the end of the transfusion the child was back to normal. The team decided to give both chlorpheniramine and hydrocortisone prior to subsequent transfusions.

The relationship of the clinical features to the transfusion in this case is uncertain. The use of antihistamine and hydrocortisone prior to transfusions is discussed in the FAHR section above.

Paediatric error reports with no harm n=112

The paediatric figures for no harm/near miss events are summarised below but are not discussed in detail (see individual chapters for details).

RBRP n=20
Near miss cases n=40
Near miss-WBIT n=52

Correct patient identification is vital and these cases are discussed in Chapter 12a, Wrong Blood in Tube (WBIT), with patients in the maternity and neonatal setting being particularly at risk of these errors.

Conclusion

Key themes emerging from the reports submitted to SHOT and actions needed to improve transfusion safety include:

- 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)
- Gaps in staff knowledge regarding significance of test results and interpretation should be addressed

including actions to be taken in case of unexpected results, the significance of abnormal coagulation in children especially post exchange transfusion and when to seek specialist advice

- Effective, timely and clear communication between clinical teams and transfusion laboratories is especially important for children undergoing HSCT and patients with haemoglobinopathies as transfusion requirements can be complex
- Paediatricians and neonatologists should be able to recognise transfusion reactions that can occur in various clinical settings and initiate appropriate management

Recommended resources

SHOT Video: Paediatric SHOT
https://www.shotuk.org/resources/current-resources/videos/

SHOT Bite No. 4: Paediatrics
SHOT Bite No. 8: Massive Haemorrhage Delays
https://www.shotuk.org/resources/current-resources/shot-bites/

SHOT Video: Delayed Transfusions in Major Haemorrhage
https://www.shotuk.org/resources/current-resources/videos/

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