20. Paediatric Cases

Definition

Paediatric cases comprise all those occurring in patients under 18 years of age.

Paediatric cases 2010

This chapter analyses the data on paediatric cases from the other chapters in this annual report. All the cases are also included in the data in their respective chapters. All children <18 years of age are included and have been subdivided by age groups (neonates ≤28 days, infants >28 days and <1 year old, and children <16 years) because each of these has recommendations regarding blood components.

Table 49
Summary of paediatric cases 2010

Category of case	No. ≤28 days	No. >28 days to <1 year	No. 1 to <16 years	No. 16 to <18 years	Total paediatric cases
IBCT (total)	**8**	**7**	**15**	**2**	**32**
IBCT clinical	2	0	0	0	2
IBCT laboratory	4	4	7	0	15
SRNM (total)	2	3	8	2	15
Irrad/CMV negative	*1*	*2*	*4*	*2*	*9*
MB-FFP/SD-FFP/MB-cryo	*0*	*1*	*4*	*0*	*5*
Others	*1*	*0*	*0*	*0*	*1*
WBIT	0	0	0	0	0
IBCT misc.	0	0	0	0	0
I&U	**1**	**0**	**9**	**2**	**12**
HSE	**2**	**4**	**5**	**1**	**12**
Anti-D Ig related	**0**	**0**	**2**	**4**	**6**
ATR	**3**	**6**	**35**	**9**	**53**
HTR	**0**	**0**	**1**	**0**	**1**
TRALI	**1**	**0**	**0**	**0**	**1**
TACO	**0**	**0**	**0**	**0**	**0**
TAD	**0**	**3**	**1**	**1**	**5**
PTP	**0**	**0**	**0**	**0**	**0**
TA-GvHD	**0**	**0**	**0**	**0**	**0**
TTI	**0**	**0**	**0**	**0**	**0**
Autologous (cell salvage)	**0**	**0**	**0**	**0**	**0**
Total	**15**	**20**	**68**	**19**	**122**

Near miss	**12**	**1**	**26**	**2**	**41**
RBRP	**0**	**1**	**1**	**0**	**2**

NB Near miss and RBRP numbers are shown separately as they are not included in the overall reporting figures.

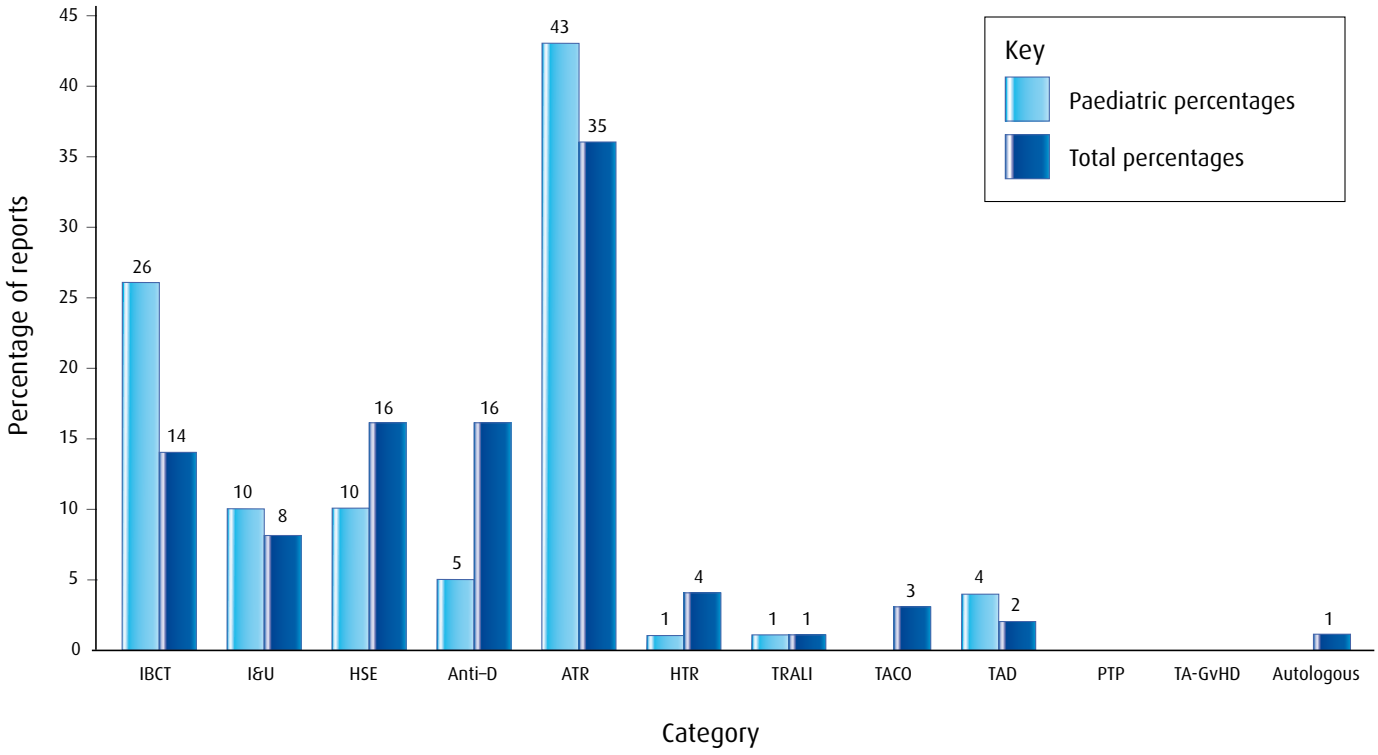
Introduction and overall trends

As has been highlighted in previous reports and by Stainsby *et al*. (2009),[1] there are a disproportionate number of cases in the paediatric age group, reflecting both clinical and laboratory issues. For 2010, paediatric reports were 122/1464 (8.3%) of the total, similar to previous years. If near miss and RBRP cases are added, paediatric cases are 165/2464 (6.7%). Of 122 paediatric reports 35 (29%) were in infants <1 year of age, of whom 15/35 (43%) were neonates ≤28 days old. The pattern of reports across categories is different for paediatrics as compared with the total, with a higher proportion of paediatric IBCT in particular (see Figure 21).

Error-related reports (IBCT, HSE, I&U and anti-D) were 62/122 (51%) of all paediatric reports and 22/35 (63%) of those in infants <1 year. Infant reports were 22/62 (35%) of all paediatric error reports and although the number of paediatric error reports overall has changed little over the last 3 years, reports in neonates ≤28 days decreased from 19 in 2008 to 11 in 2010. A total of 32 out of 62 (52%) paediatric errors originated primarily from the laboratory (26 IBCT, 3 HSE, 2 I&U and 1 anti-D). Of all paediatric reports 26% were laboratory errors, similar to 2009 (30% excluding anti-D).

The number of ATR reports in children has been showing a year-on-year increase, this year comprising 53/165 (32%) cases (compared with 25 in 2008 and 37 in 2009).

Figure 21
Percentages of paediatric and total reports in each category



Error-related reports *n* = 62

Incorrect blood component transfused *n* = 32

IBCT – clinical *n* = 2

There were only 2 reports; both related to sick neonates who subsequently died unrelated to the transfusion, and both are examples of ongoing problems with collecting the incorrect blood for neonatal emergencies. One report involved collection of the adult emergency unit rather than the paediatric emergency unit and the second, collection of crossmatched rather than emergency blood.

Case 1

Confusion between emergency blood and crossmatched blood

A preterm baby required an emergency transfusion at 6 days of life and should have been given O RhD negative emergency blood from the satellite fridge. The nurse inadvertently collected an O RhD negative unit that had been issued to an obstetric patient on the delivery suite. The blood group and CMV status of the unit was checked with another nurse, but they did not notice that the tag on the unit had a compatibility label on as opposed to an emergency blood label.

IBCT – laboratory error *n* = 15

There were increased numbers of paediatric laboratory error reports in 2010. Eight were from infants <1 year of age, with 3 relating to the laboratory not taking into account maternal antibodies when issuing blood for young infants, and 2 in infants 4–5 months old issued paedipaks without serological testing. Two involved RhD errors, 1 in RhD grouping and 1 where an RhD negative neonate was given RhD positive red cells. In the final infant report, paedipaks (CMV negative, irradiated) were issued for neonatal ET instead of neonatal exchange red cells (see Chapter 7, page 28, for further details of laboratory cases).

Case 2

Incorrect neonatal pre-transfusion compatibility testing procedures

A G&S/DAT request was received in the laboratory on a newborn preterm baby with a low Hb, and later that day blood was requested. The same request was repeated, twice, 2 days later. The first two requests were treated as EIs and the third request was treated as a crossmatch. However, the mother of the baby had an antibody and therefore the blood for the infant should have been crossmatched on all three occasions.

In the 7 reports in children ≥1 year old, 1 was a 15-month-old child for whom blood was issued without an antibody screen as the laboratory scientist had written on the request form that it was for a baby <3 months old. In 3 reports RhD positive platelets were given to RhD negative recipients, 2 female and 1 a male 1-year-old with a severe congenital immunodeficiency. Three reports involved issue of red cells following inadequate laboratory procedures: to a post bone marrow transplant (BMT) patient by EI only, to the ward prior to reading the crossmatch result and after crossmatch but with unauthorised group and screen results, missing a positive antibody screen.

Case 3

Example of laboratory error not detected by ward staff

A single unit of O RhD positive platelets was issued for an O RhD negative 2-year-old girl as a routine request. The RhD mismatch was not considered a problem by the laboratory scientist on-call, as 'this was common practice' in their previous hospital (an adult hospital). The nursing staff did not question the discrepancy and proceeded to transfuse the unit. The error was subsequently detected by laboratory staff and the child was prescribed anti-D Ig.

IBCT–SRNM *n* = 15

The number of paediatric SRNM reports was down in 2010 (25 reports in 2009). Eleven were defined as laboratory errors, of which 5 related to MB-plasma, 4 to CMV negative components, 1 was lack of provision of irradiated granulocytes by NHSBT and 1 was failure to provide platelet antigen negative platelets where the mother was suspected of having anti-platelet antibodies despite this having been documented on the request form. Three of the MB reports related to MB-cryoprecipitate, 1 relating to the transfusion of non-MB-cryoprecipitate stock to 4 separate paediatric patients. For the CMV negative components, 2 were age-related CMV requirements for infants <1 year, and 2 in older children with haematological diagnoses.

All the 4 clinical SRNM cases related to lack of proper requests for irradiated blood, and the lack of requesting was not specifically related to the patient being a child.

Case 4

Lack of communication between clinicians and laboratory

A baby was admitted to a paediatric ward for a top-up transfusion having previously received an IUT and an ET. The haematologist advised the ward of the need for irradiated blood. Blood was prescribed and the need for irradiation documented on the prescription pathway but not communicated with the transfusion laboratory. Non-irradiated blood was issued and transfused. The same thing happened a second time, and the error was only noticed by a nurse at a subsequent transfusion.

I&U transfusion *n* = 12

There were 5 reports of over-transfusion of children: 3 due to incorrect prescription and 2 to incorrect administration of red cells. One of these was to a neonate and the other patients ranged in age from 1 to 6 years, but in all cases the errors related to inadequate attention being paid to ensure safe blood administration to this age group.

Case 5

Administration error resulting in transfusion of entire paedipak

A 24-day-old baby in the neonatal unit was prescribed a transfusion of 14.3 mL of red cells. The baby's Hb rose from 9.7 g/dL pre transfusion to 20.0 g/dL post transfusion. On examination of the paedipak it was noted the bag was empty, suggesting that the baby had received the full 50 mL paedipak in error. This was felt to be due to the blood having been given via a neonatal Y blood-giving set and problems with the closure of the roller clamp, in the line connected to the roller clamp.

Case 6

Prescription error on PICU

A 6-year-old ventilated patient received 2 adult units of blood. The blood was prescribed by units not millilitres required. Hb pre transfusion 7.7 g/dL, post transfusion 13.8 g/dL (just above the top end of the age-related normal range of 13.5 g/dL). Calculation based on weight (30 kg) gave an increase to 11 g/dL from 270 mL of transfusion.

If this had been a patient with sickle cell disease, over-transfusion to this level could have resulted in significant morbidity.

The remaining 7 reports were not specifically related to the age of patient. They included 3 where either red cells or platelets were transfused inappropriately on the basis of an incorrect result. Two related to near-patient testing: 1 where a glucometer was used inappropriately to monitor the Hb (see Chapter 8) and 1 where a HemoCue® result may have led to over-transfusion of a 16-year-old with a postpartum haemorrhage. For a 3-year-old cardiac patient with significant bleeding and a high INR, FFP was given twice unsuccessfully to reverse a warfarin effect, contrary to BCSH guidelines,[2] before giving prothrombin complex concentrate. Finally, there were reported delays in availability of blood in A&E for a 16-year-old victim of an RTA.

HSE *n* = 12

Most of the paediatric HSE reports did not relate specifically to the recipients being children. There were 4 reports where red cells were not transfused within the accepted time out of temperature-controlled storage and this occurred among recipients aged between 9 days and 11 years. There were 3 other red cell cold chain errors and a 17-year-old received platelets over 1 hour and 2 minutes, against the Trust policy of 30 minutes. There were 3 technical administration errors, including a pump misprogrammed such that a 14-year-old received a unit of red cells over 1 hour rather than 2 as prescribed, and a further report associated with neonatal transfusion using a Y giving set.

Case 7

Neonate fails to respond to transfusion of red cells

A top-up transfusion of 14 mL of RBCs administered to a neonate failed to increase their Hb, despite receiving a second aliquot of 14 mL. On investigation it is thought that the roller clamp between the Y-connection and the syringe driver may not have been fully engaged, resulting in red cells being drawn back into the red cell unit.

Finally, there was a report where granulocytes for a 2-year-old were decanted into a sterile receptacle following difficulties with accessing the bag (see Chapter 9).

Anti-D Ig related events *n* = 6

There were 6 reports in pregnant paediatric patients, 2 of whom were under 16 years old. Apart from the age, there were not specific paediatric-related issues.

Transfusion reactions *n* = 60

ATR *n* = 53

The number of paediatric ATRs reported continues to steadily increase and comprises 10% of all ATR reports to SHOT. The proportion of reports for each component type was broadly similar to last year, with reactions to red cells 28/53 (53%), platelets 17/53 (32%) and plasma 8/53 (15%), which was slightly increased. The striking number of platelet reactions was highlighted in 2008 (18/25, 75% of paediatric ATRs), but these are similar in 2010 and it is red cell ATRs that make up the majority of the increase in paediatric ATR reports.

Most paediatric ATR reports were in age group ≥1 year, with only 9/53 (17%) in infants <1 year, including 3 from neonates. It is notable that in children from 1 year to <16 years, 21/31 (68%) reports where a diagnosis was given were from patients with malignancies and 26/31 (84%) were from haematology/oncology patients, including those with haemoglobinopathies. Two of the neonatal cases could not be classified according to type of reaction, illustrating the difficulty in recognising transfusion reactions in this often clinically unstable group of patients.

Case 8

Diagnostic difficulty in a preterm neonate

A 10-day-old preterm baby transfused with red cells developed profound apnoea and bradycardia during the transfusion, requiring bagging and oxygen. The transfusion was stopped and the red cells returned to the laboratory. The baby was DAT negative and a crossmatch was compatible. The baby was also unwell with problems to do with prematurity and it was not clear whether the symptoms should be attributed to the transfusion or not. The baby recovered after 2 hours and 55 minutes.

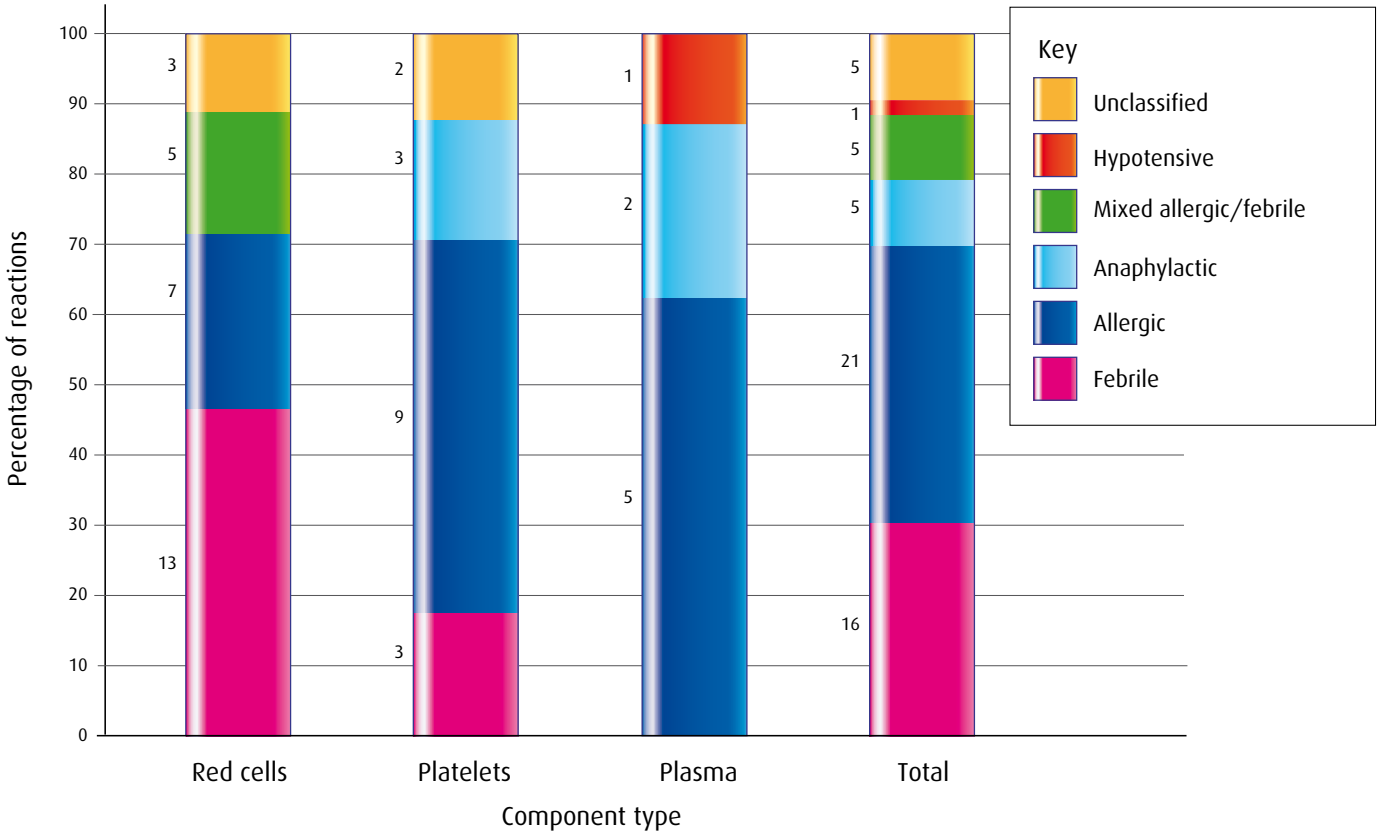
Paediatric reactions were classified as described in Chapter 11. Of the 48 that could be classified, 6 (13%) were severe, 27 (56%) were moderate and 15 (31%) were mild. The proportion of severe reactions was almost identical to the proportion of severe ATR in overall reports. However, there was a higher proportion of mild reactions in the paediatric group than overall (see Chapter 11). There were 5 anaphylactic reactions: 3 to platelets and 2 to MB-FFP.

The types of reactions and associated components are shown in Table 50 (see Chapter 11, page 73, for total numbers of reports in each category). The table illustrates that the majority of febrile reactions reported were to red cell transfusions, allergic reactions followed all types of components and anaphylactic reactions were restricted to platelets and plasma. Figure 22 illustrates the percentage of each type of reaction by component: the most common type of report for platelets and plasma was allergic, whereas for red cells it was febrile.

Table 50
Type of reaction for each component for paediatric reports

Reaction	Red cells	Platelets	Plasma	Total
Febrile	13	3	0	16
Allergic	7	9	5	21
Anaphylactic	0	3	2	5
Mixed allergic/febrile	5	0	0	5
Hypotensive	0	0	1	1
Unclassified	3	2	0	5
Total	**28**	**17**	**8**	**53**

Figure 22
Number and percentage of reactions by component type for paediatric reports



Of the 15 platelet reactions in the <16 year age group, 3 were stated to have been pooled platelets (to haematology/oncology patients), illustrating continued use of pooled platelets in this age group. Of the reactions to plasma, 1 was to cryoprecipitate and the rest to FFP, including both MB-FFP and SD-FFP.

Case 9

Severe reaction to prophylactic FFP

A 15-year-old patient was given FFP to correct a coagulation abnormality prior to a lumbar puncture. After approximately 50 mL of the third unit the patient developed facial rash, swelling, orbital oedema and tongue swelling with peripheral mottling. The patient was treated with antihistamines, steroids and 2 doses of IM adrenaline. The patient was admitted to HDU overnight and required inotropes for hypotension. The patient made a full recovery within 24 hours.

This case illustrates a severe reaction to FFP given for prophylaxis and therefore the need to scrutinise the appropriate use of prophylactic plasma transfusions.

HTR *n* = 1

There was only 1 paediatric report, in an alloimmunised patient with sickle cell disease, who died as a result of a hyperhaemolytic transfusion reaction (see Chapter 12, page 81).

Learning point

- Hyperhaemolysis is an uncommon but well-documented serious complication of transfusion in sickle cell disease in which there is destruction of both autologous and transfused red cells. If possible, further transfusion should be avoided since this may exacerbate the haemolysis and lead to a protracted clinical course or even death. The use of IVIg and/or steroids should be considered as a means of correcting the anaemia.

TRALI *n* = 1

Case 10

Difficulty in excluding TRALI in preterm neonate

A case of possible TRALI was reported in a 16-day-old extremely preterm baby who was ventilated and unwell, having needed high airway pressures for ventilation. Three hours 25 minutes following the start of a red cell transfusion the baby had an acute oxygen desaturation and fresh blood was aspirated from the endotracheal tube. The baby required high-frequency oscillatory ventilation and improved rapidly within 24 hours.

Although this was reported as possible TRALI, on expert review it was felt more likely to be a severe pulmonary haemorrhage, a recognised complication for a neonate developing chronic lung disease. This case again illustrates the difficulties of distinguishing transfusion reactions from other clinical problems in sick preterm babies.

TAD *n* = 5

There were 3 infants <1 year (youngest 3 months old) and 2 older children, the first paediatric reports in this category. Three cases were following platelets and 2 following red cells. It is likely to be difficult to distinguish TAD from other transient changes in the respiratory status of sick neonates, and there were no reports in neonates ≤28 days old. A further paediatric case report is given in Chapter 15.

Case 11

An infant case of TAD

An 11-month-old child presented in A&E generally unwell for the past few months, pale and tachycardic. The child was anaemic and thrombocytopenic, with an Hb of 5.2 g/dL, platelets 10 × 10^9/L and a raised WCC. The child was admitted to the paediatric ward for a platelet transfusion and during the transfusion developed a productive cough with subcostal recession. There was a slight increase in the RR from 30 per minute to 36 per minute but no oxygen desaturation or other changes in vital signs.

TACO, PTP, TA-GvHD, autologous transfusion

There were no paediatric cases in these categories.

Near miss *n* = 41

Paediatric near miss cases were 4.8% (41/863) of total cases. Neonatal reports were 12/41 (29%) of paediatric near misses and nearly all the others were in children between 1 and <16 years old. Most cases were due to errors not specific to paediatric patients. However, 3 of the WBIT reports were associated with the recipients being neonates: 2 where twin cord samples were mixed up, and 1 where a baby's sample was labelled with the mother's details. Finally, a 4-month-old infant was issued a paedipak without age-appropriate serological testing.

RBRP *n* = 2

There were 2 RBRP cases: a name misspelling on addressograph labels and a date of birth discrepancy between the patient information system and the laboratory information system.

COMMENTARY

- There are repeated cases of poor understanding by laboratory staff of procedures for neonatal and infant pre-transfusion compatibility testing and the need to take into account maternal antibodies, emphasising the requirement for adequate laboratory staff competency in paediatric transfusion.

- There are ongoing reports of confusion among clinical staff over blood availability for neonatal emergency transfusions. Local policies and training should be instituted to reduce the risk of this error.

- There were 3 reports of non-MB cryoprecipitate being issued. MB cryoprecipitate became available for children <16 years in 2009 in order to provide pathogen-inactivated cryoprecipitate as well as FFP from overseas. Although not all hospitals use MB cryoprecipitate for children, failure to use it where it has been implemented constitutes an error.

- There were 5 reports of over-transfusion of children. This is an ongoing problem despite having been highlighted in previous SHOT reports and addressed in the BCSH (2009) guidelines on the administration of blood components.[3] The issue of prescribing by units rather than millilitres for children was also highlighted by the results of the 2010 National Comparative Audit (NCA) of red cell transfusion in neonates and children,[4] which reported that 39% of red cell prescriptions on paediatric wards were in units.

- The use of neonatal Y blood-giving sets was implicated in 2 reports, one each of over- and under-transfusion, highlighting the need to be sure that equipment for paediatric transfusions is appropriate for purpose and set up correctly, and that the volume delivered should be monitored regularly throughout the infusion.[3]

- The number of paediatric ATR reports continues to increase, particularly following red cell transfusions where the largest category of reports is febrile reactions; this is likely to be due to changed reporting patterns but requires ongoing monitoring. Anaphylactic reactions were reported to both platelets and FFP, emphasising the need to transfuse these components only where clearly indicated.

Recommendations

- The 2009 SHOT recommendation on the need for local consideration of the design of prescription charts to facilitate the correct prescription of blood component volumes and rates for children is re-emphasised this year following ongoing SHOT reports in 2010 and the results of the 2010 NCA demonstrating frequent prescription of red cells for children in units as opposed to millilitres.

  Action: RTCs, HCTs, HTTs, pharmacists

- Laboratory staff competency on the issues surrounding neonatal and infant pre-transfusion compatibility testing should be targeted during training, particularly given the relatively low frequency of paediatric work in many laboratories. The revised BCSH guidelines on compatibility testing will clarify the requirements for neonates.

  Action: HTTs, hospital transfusion laboratories, consultant haematologists with responsibility for transfusion

For active recommendations and an update on their progress, please refer to the SHOT website.