

Serious Hazards of Transfusion for Children

What is SHOT?

The Serious Hazards of Transfusion Scheme (SHOT) provides an analysis of serious transfusion complications in the UK. It is a confidential, anonymised, scheme that collects reports of adverse events of transfusion of blood and blood components (red cells, platelets, fresh frozen plasma (FFP) and cryoprecipitate).

SHOT findings are used to:

- Inform policy within transfusion services
- Improve standards of hospital transfusion practice
- Aid the production of clinical guidelines for the use of blood
- Educate users on the hazards of transfusion and their prevention

Children are a vulnerable patient group and many have special transfusion requirements. Neonates in particular are often intensively transfused. Although SHOT analyses the hazards of transfusion in both adults and children, the requirements of children undergoing transfusion should be considered as a distinct identity from those of adults¹.



It is clear from some of the reported SHOT errors, that there is a lack of awareness amongst laboratory, nursing and medical staff of the special needs of paediatric recipients of blood and blood components.

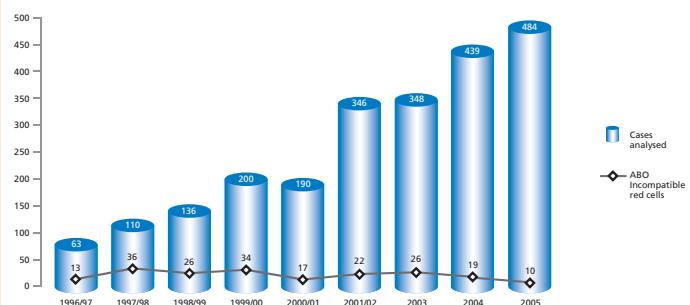
Why are there particular concerns with paediatric transfusion?

- Neonates are especially vulnerable to the potential infective and toxic effects of transfusion¹. They have immature immune and metabolic processes, and are still undergoing rapid neurodevelopment.
- The acute side effects of transfusion may be greater for small children than for adults, as a single unit of transfused blood with the potential to cause harm, may represent a much greater proportion of their blood volume than that in an adult¹.
- Consideration of the long-term side effects of transfusion for children is particularly important, as the majority will live for decades afterwards¹.
- In general paediatric wards, the transfusion of blood and blood components is less common and this may lead to a reduced awareness of transfusion related hazards.

How many transfusion incidents have been reported to SHOT?

Over 9 years, from 1996 to the end of 2005, 33 million components have been issued from the four UK Blood Services and there have been 3,239 incidents reported to SHOT and over 4,800 'near miss' events analysed.

Even though the number of incidents reported is going up every year, the downward trend in reports of ABO incompatible transfusions is encouraging and shows evidence of a growing safety culture with respect to transfusion in the UK.



It is likely that the appointment of Transfusion Practitioners and establishment of Hospital Transfusion Teams is resulting in increased awareness of errors and improved reporting.

How many transfusion incidents have been reported to SHOT in relation to paediatrics?

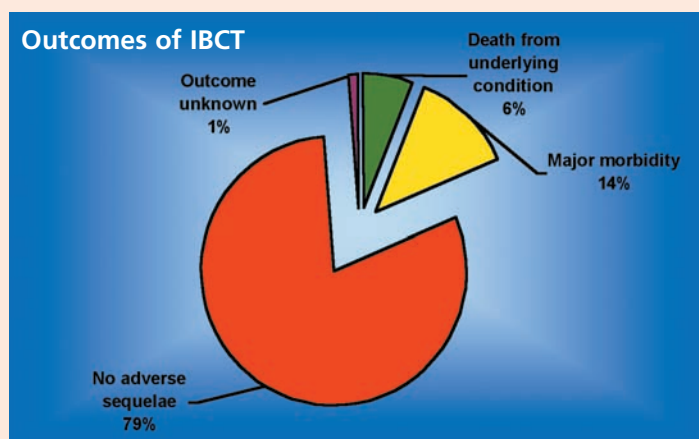
From 1996 to the end of 2004, 10% (264) of adverse incidents reported, have occurred in those under 18 years of age. 46% (121) of these incidents occurred in those under 12 months old. An epidemiological study of transfusion recipients in the North of England carried out in 2004, found that only 1.7% of red cells are transfused to infants under 1 year of age and 2.5% transfused to children aged 1 to 17 years inclusive².

There seems to be a disproportionately high incidence of transfusion adverse events in children, compared to adults.

The distribution of types of events reported to SHOT in children compared with those in adults is shown in the table below:

Category	Children	Adults
Incorrect blood component transfused (IBCT)	84%	61%
Acute transfusion reaction (ATR)	9%	8%
Delayed transfusion reaction (DTR)	0.4%	10%
Transfusion related acute lung injury (TRALI)	6%	6%
Transfusion associated graft versus host disease (TA-GVHD)	0.8%	0.4%
Transfusion transmitted infection (TTI)	0.8%	1.7%

All 'Incorrect blood component transfused' events are entirely preventable.



No deaths resulted from IBCTs, but 14% suffered major morbidity

The following errors in paediatric transfusion have been reported to SHOT:

- **Failure to meet special requirements** is the commonest error. Patients across the paediatric age spectrum often require special consideration of component selection or product manipulation because of age and/or underlying diagnosis/intervention. Errors might be due to a lack of knowledge of guidelines e.g. indications for irradiation, IT systems not being fully utilised or poor communication between hospitals in cases where care is shared.
- **Errors in the laboratory** occur due to the complex serology requirements of children e.g. the requirement to match blood for neonates against maternal antibodies.
- **Wrong selection of group O FFP and platelets.** Care must be taken in the selection of ABO compatible plasma products as there were 3 cases where group O platelets or FFP caused haemolysis in group A recipients in the SHOT Annual Report for 2003.

The erratum to the BCSH transfusion guideline for neonates and older children³ recommends that group O platelets should be avoided for non-group O children, although it refers to guidelines that acknowledge that in some situations, such as where it is necessary to match for HLA or HPA types, it may only be possible to use group O platelets.

- **Mis-calculated prescriptions:** Blood is sometimes prescribed for small children in 'units' assuming that 'paedipacks' will be provided, but if laboratories issue adult-sized units instead, children may be given vastly incorrect amounts of blood. Prescriptions can also be misinterpreted e.g. 50 ml over 4 hours interpreted as 50ml/hour.

The actual volume and length of time of transfusion must be written on the prescription chart.

Photograph comparing a unit of adult Group O Rh D negative red cells with one that has been split into 8 paediatric aliquots.

Donor exposure is reduced by using these designated 'paedipacks', where multiple neonatal small-volume transfusions can be given from the same donation up to the expiry date.



The importance of good and accurate communication at every level in transfusion practice must be emphasised to prevent unnecessary error. Laboratory, medical and nursing staff should all be aware of the special consideration of component selection and/or requirement for product manipulation for neonatal and paediatric transfusion.

Specific education of staff in paediatric transfusion practice is crucial.

- **Failure to correctly identify patients** at the time of blood sampling and administration. Neonates may not be fully named, may have the same or similar dates of birth to others on the ward or not yet have a hospital number or an identification band. Young children cannot identify themselves and older children may not co-operate. There can also be confusion between mother and baby samples when cord blood is sampled.

The wearing and checking of patient identification e.g. wristbands is essential in the paediatric age group. This is the last opportunity to identify an error arising earlier in the transfusion chain.

Immune transfusion reactions in children reported to SHOT between 1996 - 2004

A wide range of immunological reactions have been reported in children. Children may have difficulty communicating transfusion-induced distress, other than in a non-specific manner. Neonatal adverse reactions may be non-specific in their presentation (e.g. hypoxia, and acidosis occur as a non-specific reaction to a range of disorders), so a high index of suspicion is needed when neonates are transfused.

- Transfusion Related Acute Lung Injury (TRALI): there have been 15 cases of TRALI in this age group of which 3 died. None were reported in children less than 12 months of age.
- Acute and Delayed Transfusion Reactions (ATR and DTR): there have been 22 ATRs and just 1 DTR. DTRs are not common in children, partly because those transfused in the neonatal period rarely make antibodies and older children who are transfused may be transfused on only one occasion.
- Transfusion Associated-Graft versus Host Disease (TA-GVHD): there have been 2 cases of TA-GVHD and both were fatal.

Transfusion transmitted infections (TTIs) in children between 1996 - 2004

- There have been 2 TTIs reported and confirmed in the 8 years of data collection. One was due to bacterial contamination of platelets and one was a Hepatitis B infection.

BCSH guidelines on blood administration⁴ are as applicable to children as they are to adults and should be followed.

Children receiving components should be closely monitored for acute adverse reactions, as in adult practice, with appropriate baseline recordings, and an early check 15 minutes after commencing each unit.

Administration of blood and blood components

Special neonatal giving sets should be used for transfusion to neonates, or a screen filter used if the transfusion is being administered by syringe⁴. Electronic infusion pumps may damage blood cells, and should not be used for the administration of red cells unless they have been verified as safe to use for the purpose according to manufacturer's instructions⁴.

Appropriate Use and Alternatives

Appropriate use of blood components must be promoted and evaluated. Transfusion triggers for children remain an area of uncertainty and it is particularly difficult to extrapolate adult data to neonates¹. Education of both clinical and laboratory staff about paediatric transfusion is essential in order to minimise the selection of inappropriate components and guide appropriate use¹. The reasons for the transfusion and the outcome should be carefully documented in the medical notes. The Health Service Circular (HSC2002/009) Better Blood Transfusion - Appropriate Use of Blood stipulates that 'Trusts should ensure that a minimum dataset for each transfusion is documented in the clinical notes (indication for transfusion, amount of blood transfused, assessment of the effectiveness of the transfusion, and any adverse effects of their management).'

Patient Information

Discussion of the implications of transfusion with children and their families can be supplemented by the use of patient leaflets. The National Blood Service provide a leaflet for NHS use, for parents/guardians that contains booklets targeted for children of different age groups explaining why a blood transfusion may be necessary:



Reporting of serious adverse reactions and serious adverse events as defined by the Blood Safety and Quality Regulations 2005 became mandatory on 8th November 2005. For more information contact your Transfusion Practitioner or Transfusion Laboratory.

If you would like more information on SHOT please contact:

SHOT Office, Manchester Blood Centre, Plymouth Grove, Manchester M13 9LL

Tel: 0161 251 4208 Fax: 0161 251 4395

Email: shot@nbs.nhs.uk Website: <http://www.shot-uk.org>

References:

- 1 New HV Paediatric transfusion. Vox Sanguis 2006 1-9
- 2 Wallace JP Wells AW and Chapman CE. Changing indications for red cell transfusion from 2000 to 2004 in the North of England. Transfusion Medicine (in press)
- 3 BCSH Taskforce Transfusion guidelines for neonates and older children. British Journal of Haematology 2004 433-453 and Erratum 2005 www.bcsanguinelines.org
- 4 BCSH Taskforce The administration of blood and blood components and the management of transfused patients. Transfusion Medicine 1999 9, 227-238