The Serious Hazards of Transfusion Scheme (SHOT) is a UK-wide confidential enquiry that collects data on adverse events of transfusion of blood and blood components. These are red cells (including autologous and salvaged red cells), platelets, fresh frozen plasma (FFP, including SD-FFP) and cryoprecipitate, and errors associated with the issue of anti-D immunoglobulin.

**SHOT findings are used to:**

- Aid the production of national clinical and laboratory guidelines for the use of blood.
- Improve standards of hospital transfusion practice.
- Educate users on the hazards of transfusion and their prevention.
- Inform policy within the four UK transfusion services and via the EU Commission.
- Identify new trends in adverse events and stimulate research.

An annual report and a separate summary have been published by SHOT each year since 1998 and several general and specific recommendations made, which aim to improve transfusion safety. Recommendations are aimed at all levels from Chief Medical Officers, through professional bodies, Trust Chief Executive officers, and to each and every member of hospital staff involved in transfusion, as everyone has the opportunity to influence safe practice.

**What sort of incidents do SHOT collect data on?**

In 2007 the scheme captured data on the major complications of transfusion and categorised them into the following:

- Incorrect blood component transfused (IBCT)
- Administration of anti-D Immunoglobulin
- Immune Transfusion Reactions:
  - Acute transfusion reaction (ATR)
  - Haemolytic transfusion reaction (HTR), both acute and delayed
  - Transfusion-related acute lung injury (TRALI)
  - Post-transfusion purpura (PTP)
  - Transfusion associated graft-versus-host-disease (TA-GVHD)
- Transfusion transmitted infection (TTI)
- Transfusion Associated Circulatory Overload (TACO)
- Incidents associated with autologous transfusion (mainly cell salvage)

Over an 11-year period, from 1996 to the end of 2007, more than 36 million components have been issued from the four UK Blood Services, and there have been 4334 incidents analysed.

**What is the most frequent transfusion hazard reported to SHOT?**

Incorrect blood component transfused (IBCT), or ‘wrong blood transfusion’, remains the most frequent transfusion hazard reported to SHOT. These incidents make up more than 62% of all incidents reported and are all preventable. Sub-categories of IBCT include administration errors, laboratory errors, special requirements not met, inappropriate and unnecessary transfusion and handling/storage errors.
There was one death classified as probably related to transfusion in the 2007 report - a probable case of Transfusion Related Acute Lung injury (TRALI). Three further deaths were reported where the transfusion may have been a contributory factor – one acute reaction in a very sick baby, and two haemolytic reactions in patients with multiple co-morbidities.

The appointment of Transfusion Practitioners and the establishment of Hospital Transfusion Teams has resulted in an increased awareness of errors and a continuing improvement in reporting, (11.4 cases per 100,000 components in 2007 compared to 10.6 per 100,000 in 2006.) The encouraging downward trend in reports of ABO incompatible transfusions since 1999/2000 shows evidence of a growing safety culture in transfusion in the UK. However, there are still a significant number of hospitals (approximately 25% of registered reporters) who have not submitted a haemovigilance report in 2007, despite the legal requirement to do so, and this is of concern from both professional and regulatory viewpoints.

SHOT general recommendations this year focus on the education of junior doctors, and the need for qualified, trained and competent staff to be responsible for transfusion safety. In the 2007 SHOT report many cases demonstrate a lack of understanding of the reasoning behind the decision making process in transfusion. A large number of cases are process failures, but there are some showing a worrying disregard for protocol and a lack of attention to bedside checking.

**What are the figures for transfusion related mortality?**

**What does SHOT recommend we do to prevent these incidents occurring?**

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**So what are the key learning points for clinical staff in the 2007 report?**

- Correct patient identification is crucial in preventing ‘wrong blood’ incidents. Every patient must have an ID wristband or equivalent containing at least their last name, first name, date of birth and unique ID number. For unidentified patients there must be a policy in place stating the minimum acceptable identification data set.
- The patient must be asked to state their name and date of birth (if able) at all stages of the process, including at sample taking and at administration.
- The final identity check when taking a blood sample or administering blood MUST be done at the patient’s (bed)side against a wristband or equivalent form of identification. No other form of checking is acceptable under any circumstances, and all documentation such as prescription, pack details and patient identification details MUST match exactly.
The bedside check is the last chance to identify an error that may have occurred earlier in the transfusion process and that may kill the patient.

‘Wrong Blood’ errors

- There were 24 cases in which blood components were administered to the wrong patient as a result of clinical errors and omissions. Of these, 23 involved nursing and midwifery staff and one involved medical staff.
  - Nine ABO-incompatible transfusions resulted from these errors – one caused a life-threatening reaction requiring emergency exchange transfusion, three caused immediate reactions with signs and symptoms of intravascular haemolysis, and two caused a less dramatic reaction. In the three remaining cases there was no reaction.
  - 7/9 cases involved collection of the wrong unit of blood from the storage site and subsequent transfusion to the patient for whom the blood had been prescribed.
  - 2/9 cases involved the collection of a correct unit of blood for the patient for whom it had been prescribed, but subsequent transfusion to a different patient.
  - There were three cases in which the patient was transfused the wrong type of component despite a correct prescription.
  - There were seven reports where an incorrect patient was bled, resulting in incorrect or inappropriate transfusion.

Cases related to poor judgement or lack of knowledge

There were 50 cases of inappropriate or unnecessary transfusion, including errors at all stages of the patient evaluation, result interpretation, decision making and the prescribing process. On review, a junior doctor was found to be involved in 47 of these cases.

Immune Transfusion Reactions

Like other treatments blood can benefit or potentially harm a patient. Good treatment decisions balance the likely benefit against the potential risks for each individual patient. All staff caring for patients receiving a transfusion must make sure they know how to recognise the signs and symptoms of a transfusion reaction and be aware that they may occur after only 5-10 mls of the component has been transfused. In an unconscious patient only the signs will be evident.

- **Signs** include fever, hypotension, generalised oozing from wounds or puncture sites, haemoglobinaemia and haemoglobinuria.
- **Symptoms** include: feeling of apprehension or ‘something wrong’, agitation, flushing, pain at venepuncture site and pain in abdomen, flank, or chest.
Platelets are issued as ‘Adult Therapeutic Doses’ and BCSH guidelines advocate the use of one ATD as a standard treatment.

Platelets are associated with a sevenfold increased risk of acute reaction compared with red cells.

In 2007, two acute haemolytic reactions in young (<18 yrs) patients were due to ABO-mismatched platelets.

Transfusion reactions should be immediately reported to the local hospital transfusion team, so that appropriate investigations can be undertaken.

**Fresh Frozen Plasma** continues to be associated with a threefold increased risk of acute reaction compared with red cells and should only be used when clinically indicated in accordance with British Committee for Standards in Haematology (BCSH) national guidelines.

6/20 case reports in 2007 were associated with inappropriate use of FFP for warfarin reversal.

BCSH guidelines for the management of bleeding and excessive oral anticoagulation (warfarin) should also be followed.

- Every effort must be made to avoid unnecessary transfusion of plasma rich blood components including FFP and platelets
- Prothrombin complex concentrate (PCC) rather than FFP is the product of choice for the reversal of oral anticoagulation (warfarin) in patients with major bleeding
Group O platelets can cause acute haemolytic reactions even when tested and labelled negative for ‘high-titre haemolysins’. They should only be used for non-group O patients (particularly paediatric patients) as a last resort.

Transfusion Transmitted Infection (TTI)
There have been no cases of transfusion-transmitted viral infections for two years running (in 2006 and 2007). Transmission of viruses through transfusion may make the headlines, but the actual risk estimates for the UK in 2007 from the Health Protection Agency are very small;

- Hepatitis B 1 in 850,000
- HIV 1 in 5 million
- Hepatitis C 1 in 51 million
- HTLV 1 in 11 million

Although the risk of getting vCJD is probably very low with a single blood transfusion, the risk of any infection will increase with additional blood transfusions. Within the UK there have been just a handful of cases where patients are known to have become infected with vCJD from a blood transfusion.
There were three confirmed reports of bacterial infection by transfused components; one from platelets and two, more unusually, from red cells.
Since 1996, there have been 34 cases of transfusion-transmitted bacterial infection reported, of which eight recipients died due to the transfusion. The majority of these cases (28) relate to platelet units (10 apheresis and 18 pools).

Efforts to prevent bacterial contamination of blood components should continue including a visual inspection of all blood components for any irregular appearance immediately prior to transfusion, but do remember that infected components MAY NOT ALWAYS look abnormal and regular observations during the transfusion are essential to identify a patient who may be experiencing an adverse reaction. If in doubt about a blood component, ask your blood transfusion laboratory for advice.
It is important when reviewing any incident that investigators examine the events leading to the error to determine if improvements to the process, procedure or system can be made.

Learning from our mistakes

When reporting to SHOT, reporters are asked to identify whether a root cause analysis (RCA) was carried out, whether the event was reviewed locally, and what the outcomes of that review were.

There are a range of tools available on the SHOT website www.shotuk.org, and the NPSA website www.npsa.nhs.uk to assist practitioners undertake RCA, develop risk assessment processes, and implement corrective actions.

Reporting of serious adverse reactions (SARs) and serious adverse events (SAEs) to the MHRA is mandatory under the terms of the Blood Safety and Quality Regulations 2005. SABRE, the on-line reporting system, can be accessed via the SHOT website www.shotuk.org or via the MHRA website www.mhra.gov.uk.
If you would like more information on SHOT please contact;

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