LESSONS FOR CLINICAL TRANSFUSION STAFF
Update 2013 incorporating guidance from SHOT Annual Reports 2011 and 2012
KEY POINTS:

**Identify your patient** positively at every step of the transfusion process.

**Assess** before transfusion (is the patient fit for transfusion and are there specific requirements?)

Check the component against the prescription

Make sure you are transfusing the correct patient. **Identify at every step**

**What does SHOT do?**

The Serious Hazards of Transfusion UK (SHOT) haemovigilance scheme, founded in 1996, is a confidential enquiry which collects information about adverse incidents related to the transfusion of blood and blood components. It makes recommendations based on the findings and the Annual reports can be viewed at [www.shotuk.org](http://www.shotuk.org)

Good medical practice requires doctors (GMC requirement) and nurses to take part in confidential enquiries and to report critical and ‘near miss’ incidents. Each year SHOT identifies learning points and makes recommendations to improve transfusion safety.

The **key recommendations** from the 2011 and 2012 Reports are:

- **Correct patient identification** is essential. Patients should be positively identified (asked to say their name and date of birth, and not prompted with a question that requires a yes/no answer)

- **Zero tolerance is recommended for all pathology sample labelling.** Samples should not be accepted in the laboratory without at least the standard 4 identifiers of first name, last name, date of birth and hospital number or equivalent (the first line of the address is also required in Wales)

- **Communication and handover** templates need to be improved. Patients are particularly vulnerable with increased shared care, movement within hospitals across different shifts

- **The use of a transfusion checklist** is recommended and a model template can be found on the SHOT website

- **Knowledge** of transfusion medicine and prescribing of blood components are essential core requirements for all prescribers

Analysis of reports submitted in 2012 has shown that 62.4% (1026/1645) of incidents result from human error. This total excludes incidents where the patient received the correct component, but where mistakes were detected, such as some wrong identification details: ‘right blood right patient’ events. The 1645 also excludes 980 ‘near miss’ events (about 1/3 of all reports) where the error (for example, that the sample came from the wrong patient) was detected before transfusion of a wrong component. In both these groups no harm was done. When these two groups are included in the totals, the number of error related reports rises to **77.6% (2148/2767)**.

**What are the risks associated with transfusion?**

Fortunately deaths caused by transfusion adverse incidents are rare. Contrary to popular thinking, transfusion-transmitted infection from bacteria and viruses in particular is very uncommon (Table 1).

<table>
<thead>
<tr>
<th>Category</th>
<th>Risk related to number of components issued in the UK (2012 SHOT data, and infection risk estimates from PHE*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major morbidity</td>
<td>1 in 21,413</td>
</tr>
<tr>
<td>Death</td>
<td>1 in 322,580</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>1 in 1.3 million</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>1 in 28 million</td>
</tr>
<tr>
<td>HIV</td>
<td>1 in 6.7 million</td>
</tr>
</tbody>
</table>

Although viral transmission is very rare (none 2006 to 2010), 3 confirmed transfusion-transmitted viral infections were reported to SHOT in 2012: 1 parvovirus transmission to a child with sickle cell disease, and 2 hepatitis B transmissions (from a single donor).

Transfusion-associated graft versus host disease is now very rare indeed (not previously seen since 2001) and is largely prevented by leucodepletion. However, in 2012 an infant died after receiving maternal blood (therefore a related donor, non-leucodepleted and non-irradiated red cells) for an intrauterine transfusion to treat anaemia caused by maternal parvovirus infection. The neonate developed transfusion-associated graft versus host disease and died at 3 months of age. Maternal blood should not be used in this setting.

Although these are complications of transfusion not seen for several years, they are a reminder to remain vigilant and not to transfuse without a clear indication which should be recorded in the case notes.

## Death and Major Morbidity

Every year a few patients die from complications of transfusion, and others suffer major morbidity (Table 2) (for definition see [www.shotuk.org](http://www.shotuk.org)). Two deaths were attributed solely to transfusion: in 2011 a woman died in childbirth due to failure to adequately replace blood in the face of major haemorrhage, and in 2012 a death resulted from transfusion-associated graft versus host disease (see above).

### Table 2: Numbers of deaths and instances of major morbidity (e.g. admission to intensive care, dialysis or renal impairment or other life-threatening reaction)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deaths definitely or probably caused by transfusion</td>
<td>13</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Major morbidity</td>
<td>101</td>
<td>117</td>
<td>134</td>
</tr>
</tbody>
</table>

## What are the most common incidents reported to SHOT?

Cumulative reports over the last 16 years (Figure 1) show that acute febrile, allergic, or hypotensive transfusion reactions (ATR) are the most common unpredictable incidents which also carry the highest risk of causing serious harm to patients. This is one reason for careful monitoring, particularly at the start of a transfusion. Death from anaphylaxis may be prevented by prompt recognition and treatment with adrenaline.

### Figure 1: Cumulative data for SHOT categories 1996/7–2012 (n=11,570)

The largest groups are due to mistakes which should all be preventable. Errors resulting in an incorrect blood component transfused (IBCT) remain overall the largest group of reports (with ABO-incompatible transfusion the most serious). However, idiosyncratic transfusion reactions such as post-transfusion purpura and allergic reactions are not preventable.
How can transfusion complications be prevented?

Some serious complications may be preventable by good monitoring and improved practice:

- Some cases of **haemolytic reactions** particularly in patients with haemoglobin disorders who require specific red cell phenotypes. Provision of more closely matched red cell units (full Rh and K match) reduces the risk of development of red cell alloantibodies. Patients with sickle cell disease are particularly at risk. It is the clinician’s responsibility to ensure that the laboratory is informed of the diagnosis, and the laboratory staff must consult historical records for evidence of previous sensitisation.

- Many cases of **transfusion-associated circulatory overload** (TACO) could be prevented with a comprehensive pre-transfusion assessment and close monitoring for up to 24 hours after transfusion. TACO is a dangerous condition; in 49.2% (96/197) cases of transfusion-associated circulatory overload reported in the three-year period 2010–2012, the outcome was death or major morbidity. TACO was implicated in 50% (15/30) of all transfusion-associated deaths reported to SHOT 2010–2012.

Pre-transfusion assessment is essential for all patients (Table 3). This will determine whether transfusion is appropriate, and whether the patient has additional conditions or other factors which increase the risk of adverse incidents.

The decision to transfuse should be discussed with the patient where possible and supported by patient information leaflets. This discussion should be recorded in the case notes together with the rationale for transfusion, which components and the expected benefit.

Patients who are unable to give valid consent at the time of transfusion should be provided with information retrospectively. Please see The Advisory Committee on the Safety of Blood, Tissues and Organs (SaBTO) guidelines for patient consent for blood transfusion in 2011 [https://www.gov.uk/government/publications/patient-consent-for-blood-transfusion](https://www.gov.uk/government/publications/patient-consent-for-blood-transfusion).

### Table 3: Pre-transfusion assessment

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient should be interviewed and the case notes reviewed for the medical history, symptoms and most recent full blood count results. The patient should also be examined</td>
<td>To assess if transfusion is the most appropriate management. It is not the treatment for iron deficiency anaemia. To assess if there are other clinical risk factors such as congestive cardiac failure</td>
</tr>
<tr>
<td>Where possible, the indication for blood transfusion should be discussed with the patient including the risks and benefits, supported by patient information leaflets before obtaining informed consent which should be documented in the patient case notes</td>
<td>Ensure that the patient understands the need for a transfusion. The patient should be aware of the need to report any new symptoms they may experience, ESPECIALLY day case patients who leave the clinical area soon after transfusion and may need to seek medical attention later. Delayed reactions may occur as long as 14 days later.</td>
</tr>
<tr>
<td>Benefit versus risk of transfusion</td>
<td>What benefit is a transfusion intended to achieve? The intended benefit should be documented in the case notes together with the expected and actual outcome</td>
</tr>
<tr>
<td>Consider the patient age, weight and general condition</td>
<td>To calculate the appropriate rate and volume of transfusion, with particular care for children and adults of low body weight, and those at risk of transfusion-associated circulatory overload (TACO)</td>
</tr>
<tr>
<td>Does the patient have any specific transfusion requirements?</td>
<td>Some groups of patients have specific transfusion requirements such as a need for irradiated cellular components (immune deficiency) or specific red cell phenotypes (haemoglobinopathy and known antibody patients)</td>
</tr>
<tr>
<td>Does the patient require diuretic cover?</td>
<td>Prevention of transfusion-associated circulatory overload in patients at risk (e.g. elderly patients with evidence of congestive cardiac failure)</td>
</tr>
</tbody>
</table>
Prevention of avoidable transfusions

Is transfusion really the optimal management or is there an alternative to transfusion? Examples include:

- Iron or other haematonic deficiency
- Pre-operative optimisation
- Could cell salvage be used?
- Prothrombin Complex Concentrate and not FFP should be used for warfarin reversal
- Consider if the result is correct and if suspicious, re-check, for example blood samples taken from the same arm as a ‘drip’ may be diluted resulting in wrong haemoglobin results and unnecessary transfusion. Blood gas analysers may also give wrong results unless correctly quality assured
- In a case of thrombocytopenia make a diagnosis. Platelet transfusions are not the correct treatment for immune thrombocytopenia, heparin-induced thrombocytopenia or thrombotic thrombocytopenic purpura. Be careful that this is not a spurious result. Does it fit with the previous result and the clinical picture?

Advance directive

Patients with a religious or other objection to transfusion may carry an advanced medical directive advising their preferences. This information should be documented in the patient case notes in an accessible place with all staff being made aware.

Avoid transfusion-associated circulatory overload

Some patients have an increased risk of developing transfusion-associated circulatory overload, but it should be considered in all patients receiving a transfusion.

Risk factors for TACO:

- Age >70 years
- Concomitant medical conditions: cardiac failure, renal impairment, hypoalbuminaemia, fluid overload
- Too rapid transfusion
- Low body weight

Please follow the addendum (published in 2012) to the British Committee for Standards in Haematology (BCSH) guidelines on the administration of blood components (2009). It outlines measures to prevent the development of transfusion-associated circulatory overload, particularly in vulnerable patients including:

- Pre-transfusion assessment
- Rate of transfusion
- Fluid balance monitoring
- Regular monitoring of haemoglobin after 1 or 2 units
- Prescription of diuretics at the start of transfusion if required

What is the most common issue emerging from SHOT reports?

Human factors resulting in mistakes continue to be the greatest cause of transfusion complications. These can be prevented by proper care over the basic steps:

Correct patient identification (ID) is fundamental to patient safety. Failure to ensure correct patient ID can lead to ABO incompatible transfusion resulting in major morbidity or death. A wrong haemoglobin result due to misidentification may also lead to an unnecessary transfusion with the risk of death from circulatory overload.
SHOT KEY RECOMMENDATION – IDENTIFICATION

Correct and positive patient identification at every step remains absolutely essential, and is the responsibility of every member of staff. Hospitals/Trusts/Health Boards should review their identification procedures to ensure their patients are safely identified throughout their hospital journey. All UK patient safety programmes should take the identification agenda forward.

Positive patient identification ensures pathology samples are collected from the correct patient and that treatment, including transfusions, are given to the right person. You must ask the patient to state their full name and date of birth (and the first line of their address in Wales) and cross-reference this against the patient identity band and documentation. **DO NOT** state the patient’s details and ask him or her to confirm with a yes/no answer.

Critical points for patient identification in the clinical transfusion process are:

- Patient admission and identity band application
- Taking blood from the right patient with correct contemporaneous labelling of all samples at the patient’s side
- Collection of the correct blood or blood component from the storage site
- Pre-administration checks at the bedside to ensure that this is the correct unit for this particular patient

Identity bands ensure that patients are correctly matched to all aspects of their care and they should be applied according to the National Patient Safety Agency – Safer Practice Notice ‘Standardising wristbands’ (2007).

Death or serious harm as a result of receiving the wrong treatment due to a wrong identity band, or the inadvertent transfusion of ABO incompatible blood components, are classed as Department of Health ‘never events’. Further information is available at https://www.gov.uk/government/publications/the-never-events-list-2012-to-2013

Correct patient details are more critical when a patient is anaesthetised, unconscious or is otherwise unable to verify their identity and staff should consult their local policy in these situations.

The ‘Do you know who I am?’ campaign was launched in October 2012 to highlight the importance of correct patient identification. It was a joint campaign with education materials developed by the National Blood Transfusion Committee’s Patient Involvement Working Group and the UK Better Blood Transfusion Network. The two examples shown here relate to both conscious and unconscious patients.

More information is available at: http://www.transfusionguidelines.org/Index.aspx?Publication=NTC&Section=27&pageid=982
What happens if the sample gets muddled up with another patient?

‘Wrong blood in tube’ (WBIT) errors can result in death. These occur when the blood in the tube is from the wrong patient and is labelled with the intended patient’s details, or blood is taken from the intended patient but the tube is labelled with the wrong details.

In 2012 there were 6 red cell transfusions caused by wrong samples; 2 of these resulted in ABO incompatible transfusions with major morbidity. For every one of these, about another 100 are detected before transfusion (‘near miss’ events). Doctors, midwives and nurses are responsible for about 75% of these (Table 4). In addition, 9 full blood count samples labelled with another patient’s details led to unnecessary transfusions (with associated risks of transfusion-associated circulatory overload).

Table 4: Staff responsible for ‘near miss’ wrong blood samples in 2012

<table>
<thead>
<tr>
<th>Staff member responsible for taking sample</th>
<th>Number of cases</th>
<th>Percentage of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor</td>
<td>223</td>
<td>44.2%</td>
</tr>
<tr>
<td>Midwife</td>
<td>95</td>
<td>18.8%</td>
</tr>
<tr>
<td>Nurse</td>
<td>91</td>
<td>18.0%</td>
</tr>
<tr>
<td>Healthcare assistant</td>
<td>34</td>
<td>6.7%</td>
</tr>
<tr>
<td>Phlebotomist</td>
<td>20</td>
<td>4.0%</td>
</tr>
<tr>
<td>Medical student</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>Other/unknown</td>
<td>41</td>
<td>8.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>505</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Many of these occurred because the patient was not properly identified and/or the samples were labelled away from the patient’s side.

There were 505 near miss ‘wrong blood in tube’ events in 2012. Many of these were detected because the patient’s current grouping result was discrepant with their historical group on the laboratory information system. In 27/505 reports the person taking the sample informed the laboratory of the mistake and the sample was not processed. These ‘near miss’ events are important as they often have the same root cause as a serious adverse event.

Figure 5: Comparison of known ‘wrong blood in tube’ errors and potentially undetected errors

Approximately one incorrect blood component is transfused due to a ‘wrong blood in tube’ error for every 100 near miss incidents.

This proportion of about 1 in 100 has been consistent over the last three years of SHOT reporting, 2010-2012.
The most robust way to ensure that the current transfusion sample is from the correct patient is to implement the ‘group check’ sample as outlined in the BCSH ‘Guidelines for pre-transfusion compatibility in blood transfusion laboratories’ 2012. If the patient does not already have a historical group on record, a repeat sample is required to confirm that the ABO group of a first time patient is correct. However, this guidance to obtain a group check sample should not delay the provision of blood components in an emergency. For further information consult the transfusion guidelines at http://www.bcshguidelines.com/

There have been several initiatives to address patient identification and sample labelling errors, but it is the responsibility of the clinical staff taking phlebotomy samples to identify the patient positively and complete sample labelling before leaving the patient’s side. The details on the sample and request form should be correct and identical. Failure to do this may lead to the sample being rejected by the laboratory and the patient needing to be re-bled and a delay in transfusion.

TAKE CARE AND DO IT RIGHT FIRST TIME

In 2012, there were 10 ABO incompatible red cell transfusions and 3 instances of major morbidity as result of clinical error leading to a wrong component being transfused.

Figure 6: Incorrect blood components transfused (IBCT) 2003-2012 showing ABO incompatible red cell transfusions

Case study: Transposed patient identification during phlebotomy leads to ABO incompatible transfusion in one patient and a ‘near miss’ in another

Patient Y was transfused 2 units of A RhD positive blood during cardiac surgery (mitral valve replacement and coronary artery bypass grafting). On arrival in the critical care unit, he received two more group A units without apparent adverse events. Following transfusion, the patient showed evidence of haemolysis, with a fall in Hb requiring further transfusions, and a rise in bilirubin to 241 micromol/L within 6 days and an extended stay in the ITU.

Blood samples had been taken from Patient Y and Patient L at the same time in the preoperative clinic. The nurse was distracted in the middle of bleeding the first patient, did not complete the process at the bedside, and so the patient details were transposed when labelling the samples. Patient L’s mislabelled sample was detected by the biomedical scientist because a historical group was available. Patient Y had no historical group and was therefore not implicated in the mix-up. Patient Y’s repeat sample grouped as O RhD negative when he required further transfusion.
SHOT KEY RECOMMENDATION – ZERO TOLERANCE

A zero tolerance policy is recommended for the identification of all pathology specimens. In other words, samples should not be accepted by the laboratory for analysis without the standard 4 identifiers used for transfusion samples, first name, surname, date of birth and an identity number, ideally the NHS number or equivalent. All pathology samples should be taken only after positive confirmation of identity, and be labelled at the patient’s side.

An undetected wrong blood in tube sample may result in a fatal incompatible transfusion

It is essential that the final pre-transfusion identity check is conducted at the patient’s side to reduce the likelihood of a wrong blood component being transfused. It may be conducted by one or two people depending on local policy. In either scenario this should be an independent, uninterrupted check confirmed using positive patient identification.

The pre-administration transfusion check at the patient’s side is the FINAL opportunity to identify any discrepancies and prevent a wrong transfusion.

MISSED SPECIFIC REQUIREMENTS

Patients often have specific requirements in addition to the essential ABO and RhD Group. It is the clinician’s responsibility to know these and to inform the transfusion laboratory.

Failure to provide irradiated units continues to be the most common specific requirement not met (SRNM). Most of these are patients with immune suppression resulting from treatment with purine analogue chemotherapy or after organ or stem cell transplantation.

Irradiation of blood components inactivates any residual donor lymphocytes thus preventing engraftment of these in the recipient and so reduces the potential risk of developing transfusion-associated graft versus host disease.

The most common cause is failure of communication from clinician to the laboratory together with lack of knowledge of the specific transfusion requirements e.g. when irradiated components or phenotyped units are necessary. Information leaflets defining the patient groups who require irradiated components are available at http://hospital.blood.co.uk/library/pdf/factsheet_irradiated_blood_12_06_18.pdf

For further information consult transfusion guidelines at http://www.bcshguidelines.com/

Communication, communication, communication....

Failure of, or poor communication is repeatedly identified as the root cause of adverse events. Patients are cared for by a multi-disciplinary team of staff during their stay in hospital and beyond. As advocates for patients in their care, it is the responsibility of all staff to ensure that they communicate the patient’s needs when they handover care to someone else. They must be sure to communicate all relevant details in a clear and concise way without ambiguity or assumption. The information exchange in any handover is often complex and the use of handover templates is recommended.

Multiple errors are frequent in SHOT reports because each person in the transfusion chain assumes that the step before has been done correctly, thus misses one or more opportunities to detect and correct. The final check at the bedside is crucial.

The blood sample request form is a type of communication between the clinical and laboratory staff and advises whether the patient has any significant details which would determine whether the patient has any specific requirements. All relevant details including patient transfusion history, known antibodies, pregnancies should be included.
TRANSFUSION REACTIONS

The reason for observations during transfusion, particularly the 15 minute observations, is to detect and manage any adverse reactions. Transfusions should only be performed where there are trained staff and adequate facilities to monitor and manage adverse reactions. Do not transfuse patients during transfer between wards; this is potentially hazardous. Some reactions do not become apparent until several hours later. Warn your patients to report symptoms.

**Timing:**

- Immediate and life-threatening (e.g. ABO incompatibility or anaphylaxis)
- Within hours (e.g. pulmonary complications, bacterial infections, transfusion reactions)
- Within some days (e.g. delayed haemolytic transfusion reactions)
- Late – months or years (e.g. viral infections, iron overload)

**How do they present?**

Transfusion reactions may have overlapping symptoms and signs with varying severity, such as fever, chills, myalgia, nausea, itching, swelling, respiratory symptoms. Patients should be advised to report any adverse symptoms in at least the 24 hours after transfusion.

**What should you do?**

- Stop the transfusion; maintain IV access and check the ID of patient and blood component
- Rapid medical assessment (does the patient need oxygen, adrenaline?)
- Severe allergic/anaphylactic reactions: call for urgent medical help, treat anaphylaxis with adrenaline, investigate (see Table 5)
- Severe febrile reactions: inform laboratory, contact Blood Service to discuss recall of any other components from this donation. Investigate for possible bacterial contamination and other investigations
- For all severe reactions monitor the renal function (fluid balance, collect urine samples)
- Moderate febrile or allergic reactions – blood culture and return bag to laboratory
- Mild reactions – transfusion may be continued with appropriate observations
- Inform the transfusion laboratory

**NOTE:** If bacterial transfusion-transmitted infection is suspected, the component must be cultured and the blood service must be contacted so that associated components can be quarantined

For further information see Tinegate et al. Guideline on the investigation and management of acute transfusion reactions prepared by the BCSH Blood Transfusion Task Force available at www.bcshguidelines.com
Table 5: Outline of investigations recommended for different types of reaction:

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Investigations</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back pain or severe hypotension or fever and/or chills or rigors</td>
<td>Blood culture of patient and culture the samples</td>
<td>Exclude transfusion-transmitted bacterial infection</td>
</tr>
<tr>
<td></td>
<td>Full blood count, urea and electrolytes, liver function. Repeat group, antibody screen and direct antiglobulin tests</td>
<td>Exclude acute haemolysis</td>
</tr>
<tr>
<td>Severe allergic features</td>
<td>IgA levels and antibodies</td>
<td>Severe reactions are commoner in individuals with IgA deficiency: guides future blood component use</td>
</tr>
<tr>
<td>Suspected anaphylaxis: severe allergy plus circulatory collapse</td>
<td>Serial mast cell tryptase</td>
<td>A characteristic rise and fall suggests anaphylaxis: assess risk in all clinical situations</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>CXR, oxygen saturation</td>
<td>Exclude transfusion-related acute lung injury, transfusion-associated circulatory overload</td>
</tr>
</tbody>
</table>

Conclusions

Identify your patient positively at every step of the transfusion process.

Assess before transfusion (is the patient fit for transfusion and are there specific requirements?).

Check the component against the prescription.

Make sure you are transfusing the correct patient.

Identify at every step.
Further information can be found on the SHOT website: www.shotuk.org

The SHOT Office can be contacted at:

The SHOT Office
Manchester Blood Centre
Plymouth Grove
Manchester M13 9LL
Telephone: 0161 423 4208
Email: SHOT@nhsbt.nhs.uk

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Email: julie.ball@nhsbt.nhs.uk