10 Incorrect Blood Component Transfused (IBCT) n=307

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Definitions:

Wrong component transfused (WCT)

Where a patient was transfused with a blood component of an incorrect blood group, or which was intended for another patient and was incompatible with the recipient, which was intended for another recipient but happened to be compatible with the recipient, or which was other than that prescribed e.g. platelets instead of red cells.

Specific requirements not met (SRNM)

Where a patient was transfused with a blood component that did not meet their specific requirements, for example irradiated components, human leucocyte antigen (HLA)-matched platelets when indicated, antigen-negative red cell units for a patient with known antibodies, red cells of extended phenotype for a patient with a specific clinical condition (e.g. haemoglobinopathy), or a component with a neonatal specification where indicated. (This does not include cases where a clinical decision was taken to knowingly transfuse components not meeting the specification in view of clinical urgency).

Key SHOT messages

- Hospital transfusion teams should review their procedures for the collection of blood components to ensure that the necessary checks are always completed even when there is direct handover of components from laboratory to clinical staff
- Transfusion practitioners should ensure that knowledge of blood group compatibility is included and emphasised in training and competency assessments

Please see Chapter 7, Laboratory Errors for key messages related to laboratory staff

Deaths n=0

There were 19 deaths reported under IBCT (8 incidents due to clinical errors and 11 resulting from primarily laboratory errors), however none of the deaths were attributable to the transfusion.

Imputability 0: excluded or unlikely.

Major morbidity n=3 (3 laboratory errors)

Two women of childbearing potential developed anti-K following transfusion with K-positive red cells, as a result of component selection errors.

In the third case a D-negative 1-month old baby was transfused with a unit of D-positive red cells. In this case an interpretation error was made by four different biomedical scientists (BMS) who grouped the baby manually incorrectly on several occasions. The baby required exchange transfusion and anti-D immunoglobulin (Ig).

Case 10.1: A newborn baby (AB D-negative) was transfused with O D-positive red cells due to a manual interpretation error that went undetected on several occasions

Day 1 *- a newborn baby was admitted with cardiac and respiratory compromise due to tetralogy of Fallot. A group and screen (G&S) sample was received with an electronic tracking number as no unique number was yet assigned. The sample was labelled 'Baby' plus the last name containing one 'L'. BMS 1 processed the sample on the analyser. The analyser was unable to interpret the result. BMS 1 manually interpreted the result incorrectly as AB D-positive and entered this on to the laboratory information management system (LIMS). Patient identification (ID) check was carried out by BMS 2 and results authorised.*

Day 17 *- another sample was received with a unique number and labelled with a forename and the same last name as above but spelt with two 'L's. BMS 3 assumed that it was the same patient as detailed above because blood group AB D-positive was stated on the request form. The sample was processed on the analyser which was unable to interpret the result. BMS 4 incorrectly manually interpreted this again as AB D-positive. BMS 5 carried out the patient ID check and the results were authorised.*

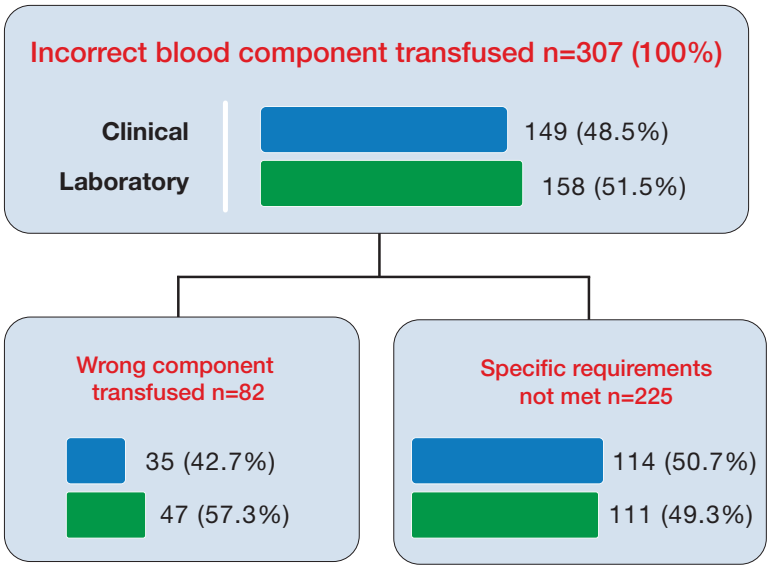
Day 34 *- the baby eventually required extracorporeal membrane oxygenation (ECMO) following sudden deterioration. A further sample was received labelled the same as the one from day 1. The request was for a G&S, four red cell units and two units of platelets according to the ECMO protocol. BMS 6 selected four O D-positive red cell units (no suitable AB D-positive available) for crossmatching. As the baby had a previous G&S on file an uncrossmatched O D-positive unit was prepared to prime the ECMO system because of low blood volume in newborn children. BMS 7 carried out the patient ID check and the unit was released. Once analysis of the sample was complete, BMS 7 identified a difference in blood group (AB D-negative) from that on file (AB D-positive). The clinical area was contacted who advised that the ECMO system had already been primed with the O D-positive unit. BMS 7 returned all other blood components and suitable O D-negative components were ordered (no suitable AB D-negative available).*

The baby had received 200mL of O D-positive red cells. The haematology consultant recommended exchange transfusion to avoid alloimmunisation to the D-antigen by removing the bulk of the D-positive red cells, followed up with measurement of residual D-positive red cells and administration of an appropriate dose of anti-D Ig. The baby was unstable for other reasons and was not fit enough for exchange until day 4 post D-incompatible transfusion. A 1.5 x blood volume exchange transfusion took place which reduced D-positive red cells to 2.8mL and a suitable dose of anti-D Ig was given. There were no side effects, however, the baby's underlying clinical condition deteriorated and the decision was made to withdraw organ support and the baby died.

This was an avoidable incident caused by human error by four different BMS staff.

This case demonstrates multiple opportunities to validate results including second checks that only verified patient demographics and not results of manual interpretations. Following the initial misinterpretation, the same error occurred in two further G&S samples involving manual interpretations. Historical SHOT data definitively indicate that human errors associated with manual techniques involving ABO/D grouping may result in a potentially lethal outcome (Mistry et al. 2013).

Figure 10.1: Overview of reports where an incorrect blood component was transfused in 2017 n=307

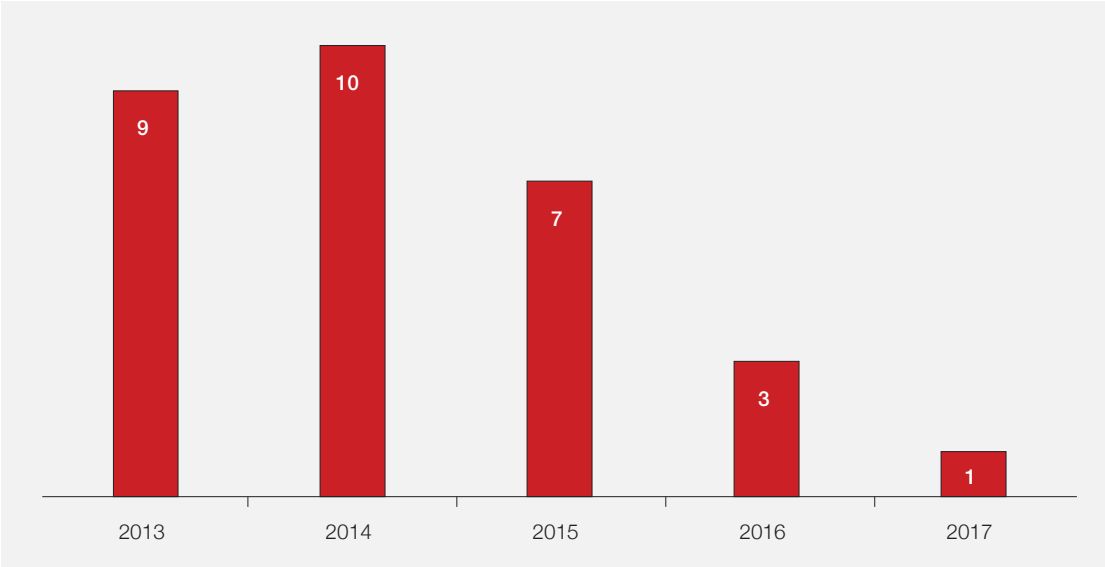


ABO-incompatible blood component transfusions n=7 (2 clinical and 5 laboratory errors)

Unintentional transfusion of ABO-incompatible blood components is a National Health Service (NHS) 'Never Event', (NHS England 2018). In Scotland these would be reported as 'red incidents' through the Scottish National Blood Transfusion Service clinical governance system and/or those of the Health Board.

Good news - the number of ABO-incompatible red cell transfusions has reduced further this year to one reported case, Figure 10.2.

Figure 10.2: Reduction in the number of ABO-incompatible red cell transfusions 2013-2017



The risk of haemolysis and serious harm is more likely with ABO-incompatible red cells than with other components, but there were 6 additional cases of unintentional ABO-incompatible transfusions, 4 of fresh frozen plasma (FFP), all laboratory errors, and 2 of platelets (one clinical and one laboratory error). These provide important lessons for both clinical and laboratory staff. These cases are also reportable as NHS England never events.

The use of a bedside checklist at the final step (administration) of the transfusion process has been recommended in three previous Annual SHOT Reports and in November 2017 the NHS England Chief Medical and Nursing Officer endorsed this by issue of a central alerting system (CAS) alert to Medical Directors of all NHS organisations in England for immediate action, (DH 2017). The actions required are shown below. This alert has also been issued by Chief Medical Officers in the devolved countries.

'Safe blood transfusion. Use a bedside checklist.'

- **Organisations should assess their bedside systems (including electronic systems) to ensure a confirmatory step is in place where the individual performing the checks must sign to say all steps have been followed**
- **This alert (and supporting information) should be circulated to all relevant staff, including to community nursing staff and midwives who may be involved in the transfusion of blood products in the community**

This is the final opportunity to identify an error before the component is transfused. It is important to note that a bedside checklist will not detect a wrong component due to a wrong blood in tube (WBIT). That may be detected by a difference in blood group from a previous sample and is the reason for the recommendation for two independent samples to be taken prior to a first transfusion of red cells (BSH Milkins et al. 2013).

SHOT conducted a survey of progress with implementation of the bedside checklist 6 months following the recommendation published in July 2017. This survey also asked if the publication of the CAS alert in November 2017 made a difference to the implementation of this recommendation.

The results of the survey showed 91/222 (41.0%) Trusts/Health Boards have implemented a bedside checklist and in a further 65/222 (29.3%) implementation is in progress or plan to implement one. The results can be viewed at https://www.shotuk.org/wp-content/uploads/2016-SHOT-Recommendations-Survey-report-FINAL-1.pdf.

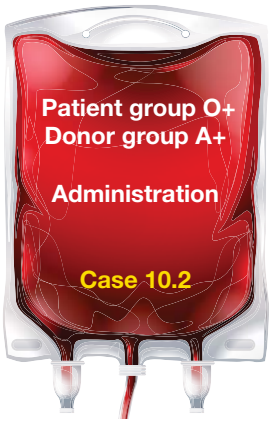


Figure 10.3: ABO-incompatible red cell transfusion n=1 (clinical error)

Case 10.2: Failure to complete the administration check at the bedside correctly leads to an ABO-incompatible red cell transfusion

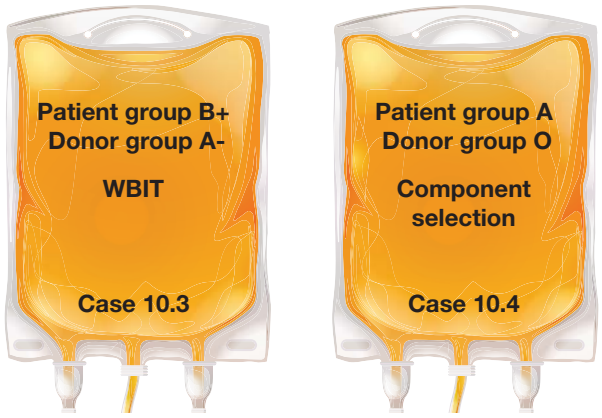
Two units of red cells were issued for Patient 1. A healthcare assistant collected the correct unit and took this to the correct ward and handed it to the nurse looking after Patient 1. Two nurses then checked the component against the prescription in the clinical utility room and not next to the patient. The nurse who was to administer the blood then went to the wrong side room and administered the blood (donation group A D-positive) to Patient 2 (group O D-positive).

Within 5-10 minutes the patient complained of lumbar pain, a general feeling of being unwell, a hot sensation on his back, and had developed tachycardia. Transfusion was stopped and the clinical team informed. The patient stabilised and recovered with minimal medical intervention. No further information was provided.

Learning points

- It is essential to identify the patient and complete all the final checks next to the patient immediately prior to administration
- If local policy states a two-person check, then both nurses must carry out the process next to the patient and independently of each other
- Completion of all necessary checks, including compatibility of the blood group of the component and the patient will prevent ABO-incompatible transfusions

Figure 10.4: Unintentional ABO-incompatible platelet transfusions n=2 (1 clinical, 1 laboratory error)



WBIT=wrong blood in tube

Case 10.3: Duplicate samples lead to unintentional ABO-incompatible platelet transfusion because of a wrong blood in tube error

A male patient post chemotherapy for a brain tumour was admitted via the emergency department with a fever but no obvious focus for infection. Two samples were obtained from the patient in the medical admissions unit and received in the transfusion laboratory from the same person but different times documented, both grouped as A D-negative. Platelets were issued based on these two results.

Seven weeks later a new request form and sample were received for this patient, which grouped as B D-positive. Due to the discrepancy in the group history a full blood count sample taken 3 days earlier was tested which grouped as B D-positive.

The duplicate samples from the original admission were from a different patient, i.e. WBIT, and led to the issue and subsequent transfusion of incompatible platelets; group A D-negative to a group B D-positive patient. The patient had no adverse outcome.

Learning points

- A wrong blood in tube error cannot be detected at the bedside. Clarity of the process and reasons for obtaining a second sample as confirmation for the patient's blood group should be emphasised with clinical staff at a local level
- Use of platelets across blood groups may be appropriate and is advocated in certain situations. These components should be tested and found negative for high-titre haemagglutinins (NHSBT 2017)

Case 10.4: ABO-incompatible platelets selected incorrectly by a BMS who was not paying attention to the task

A unit of platelets was requested for a patient with non-Hodgkin lymphoma and critical site bleeding. The laboratory staff issued group O platelets by mistake for a group A patient. The ward staff completed the pre-transfusion checks and transfused the unit. When the error was identified by the laboratory staff they contacted the ward staff and advised them not to transfuse the platelets but were informed that the transfusion had been completed.

The BMS issuing the platelets was experienced and had regularly worked in transfusion but was new to this laboratory. The BMS assumed that they were to take the platelets from the top shelf of the stock incubator. The LIMS flagged that group O platelets were being selected for a group A patient but the BMS overrode the warning. The BMS could not explain why they issued mismatched platelets but it was discovered that although the BMS had most competencies up to date they did not have competency for issue. The patient did not suffer any untoward harm.

In addition to the primary laboratory error, the bedside administration check was not performed correctly or was performed by staff with insufficient knowledge. The bedside check includes confirmation of compatibility.

Learning point

- Staff should be reminded that they should never perform any tasks for which they have not been competency-assessed

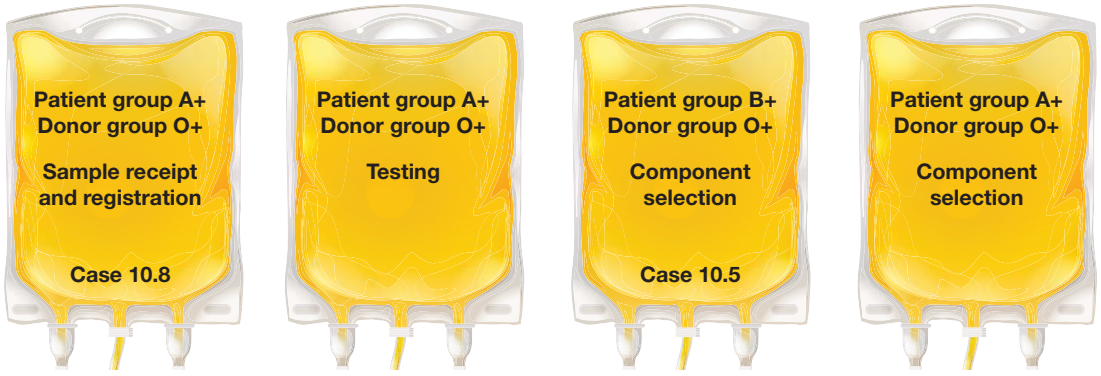


Figure 10.5: ABO-incompatible FFP transfusions n=4 (laboratory errors)

Case 10.5: A patient whose blood group was B was transfused with group O FFP resulting from poor communication during handover

A patient received multiple transfusions of red cells, FFP and platelets for recurring gastrointestinal (GI) bleeding in the presence of liver disease. The patient had been grouped as O due to the presence of donor red cells in the test samples (the patient's actual blood group was B).

Several messages had been hand written on a single sticky note by a junior member of laboratory staff undergoing transfusion training. During handover these messages were misinterpreted and in addition, no formal request form for FFP had been received from the clinical area. Unused, pre-thawed group O FFP prepared for an earlier patient was issued knowingly against national guidelines (BSH O'Shaughnessy et al. 2004) as the BMS thought that concessionary release had been approved.

The LIMS allowed major ABO mismatches for plasma components although it did display a warning flag that was overridden. The laboratory staff did not seek formal confirmation before handing the FFP to a porter. The patient was transfused the incompatible FFP. There was no reported clinical adverse outcome.

The incident was caused by poor communication at handover by an untrained/inexperienced member of staff and was further exacerbated by an experienced member of staff who made assumptions from the written note including approval of concessionary release (although they should know this incompatibility). The validation process had not been completed fully as a recent upgrade to the LIMS had not had ABO-incompatible prevention activated in the live system; the test worked in test mode but did not work in the live mode.

Clear documentation must always be available to the issuing BMS (i.e. request form, clearly documented telephone request and concessionary release form). This case clearly demonstrates the requirement for robust processes and communication during validation and handover, especially when junior/inexperienced members of staff are involved. It is also essential to ensure that the LIMS is fully validated in the live mode as well as the test mode when changes or software updates are made. The ABO-incompatibility should have been detected both by the BMS and at the bedside check.

See also Case 10.8.

Critical steps in the transfusion process

Errors occur at each of the nine steps in the transfusion process. Each step incorporates independent checks at every point that should, if carried out correctly and in full, be able to identify any errors made earlier.

Figure 10.6 illustrates the nine steps including both clinical and laboratory areas and the two critical points where positive patient identification is essential. The clinical cases in this chapter demonstrate where the incident initially occurred, the category of error and helps to understand why they happen and identify any learning points for clinical and laboratory staff.

Note: Errors associated with laboratory steps are discussed in more detail in Chapter 7, Laboratory Errors.

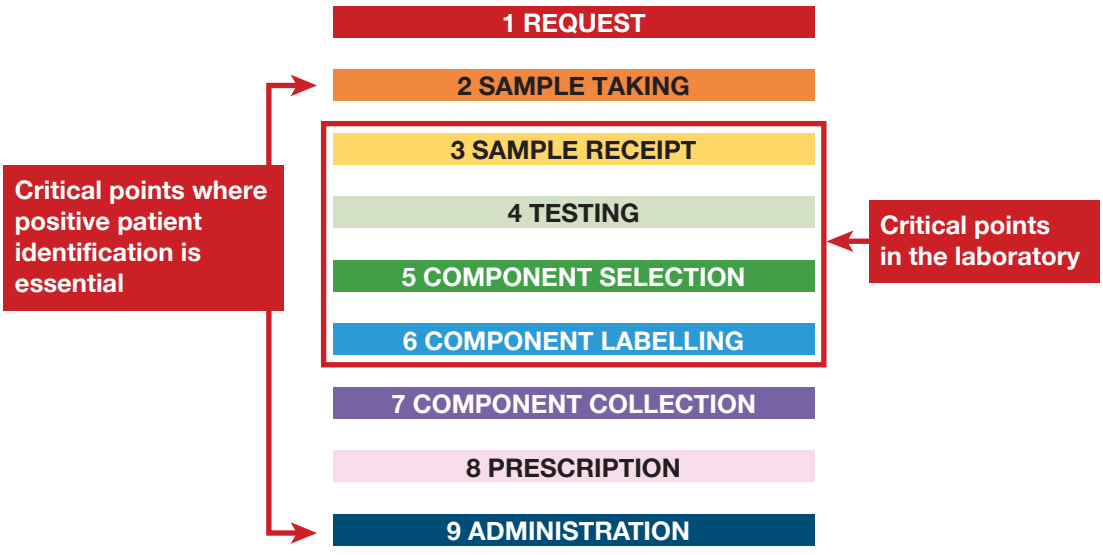


Figure 10.6: Transfusion process (nine steps)

Note: Once a decision to transfuse is made, the authorisation or prescription may be written at variable times during this sequence, but ***must be checked during the final stage***

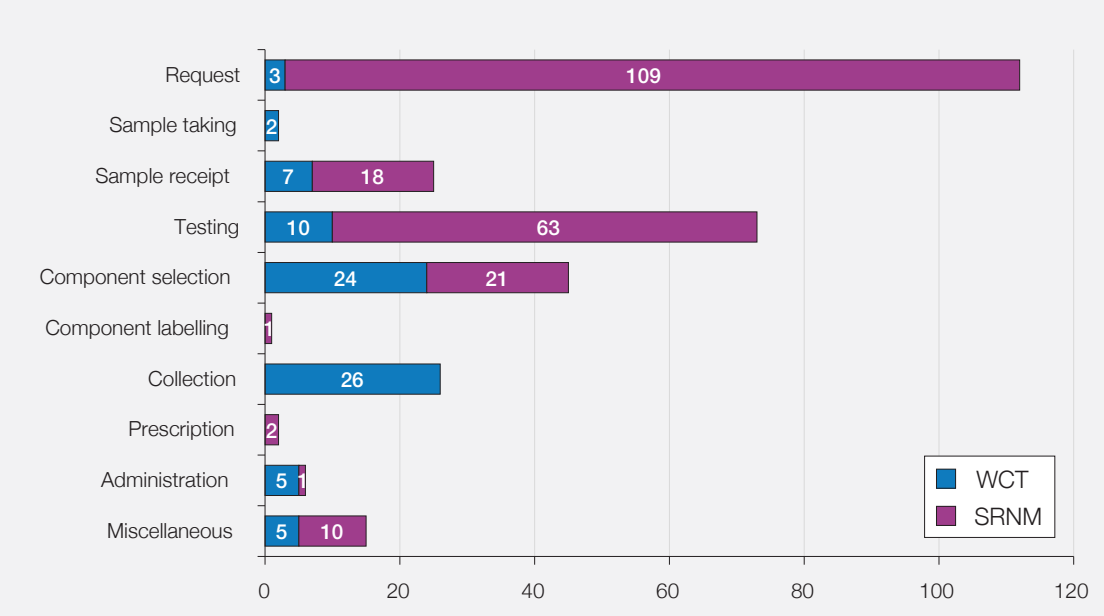


Figure 10.7: Points in the process where the first mistake occurred (clinical and laboratory) leading to wrong component transfusion or specific requirements not being met n=307

WCT=wrong component transfused; SRNM=specific requirements not met

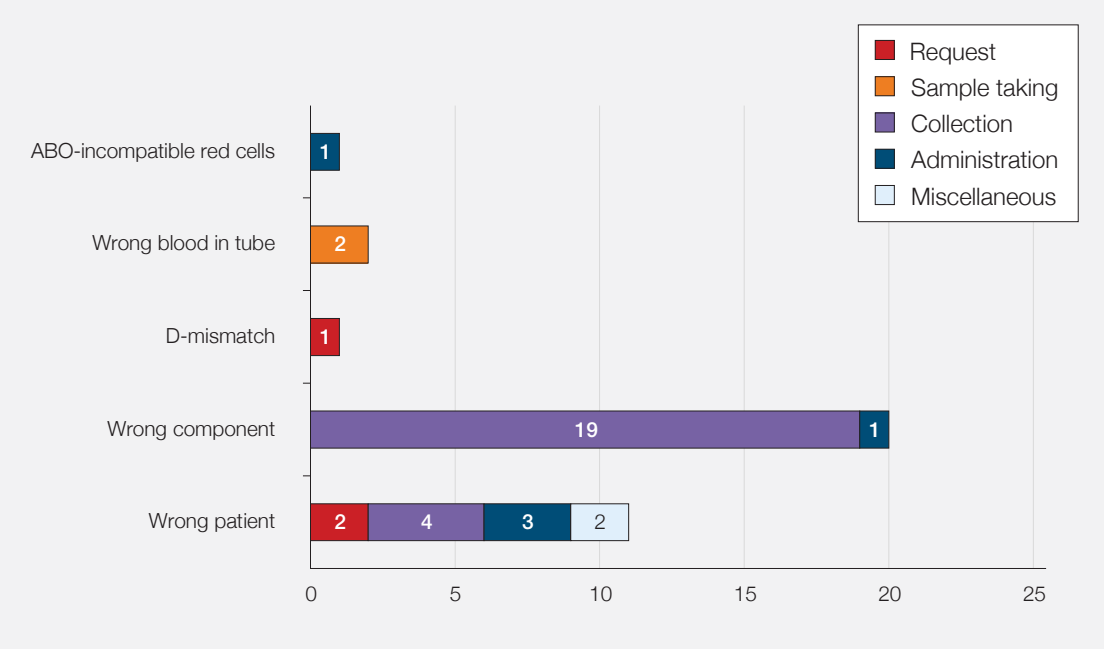
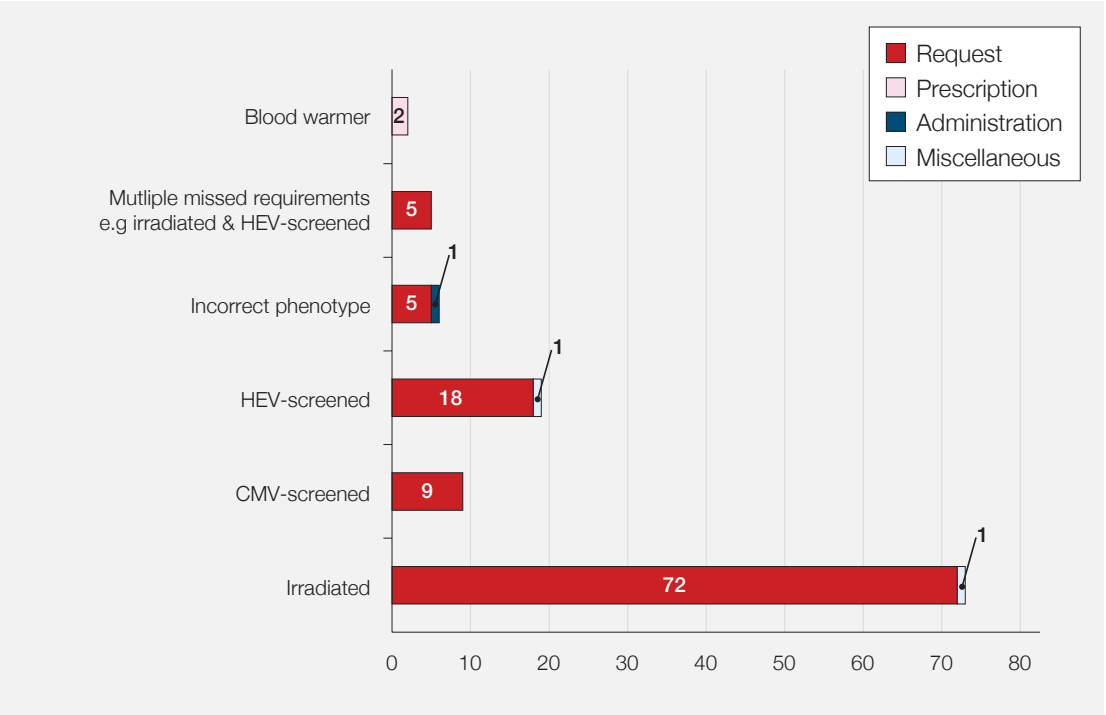


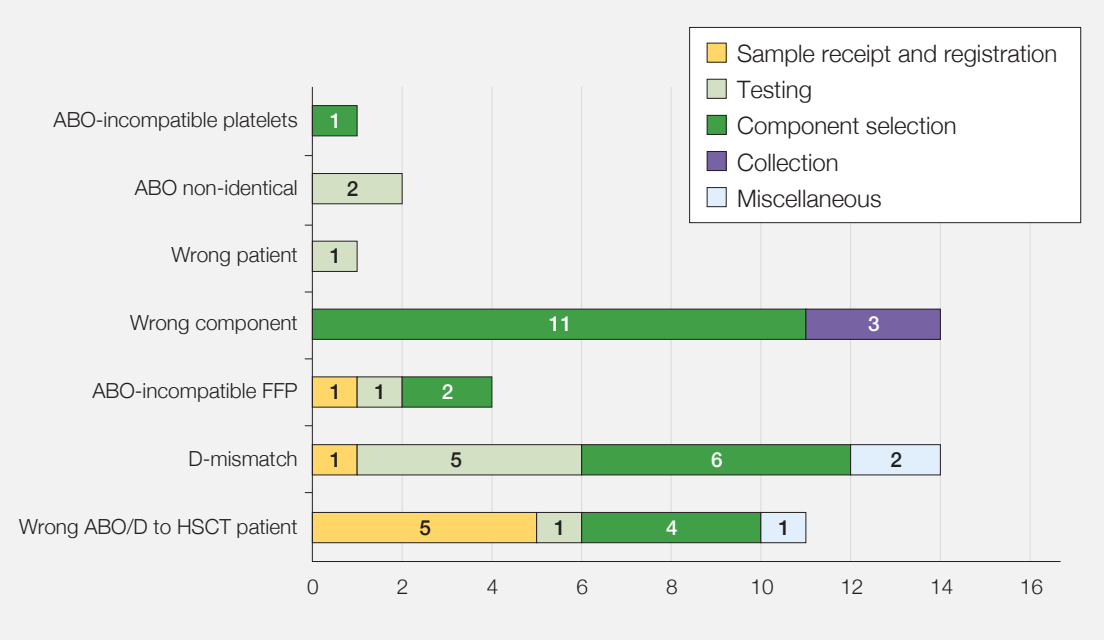
Figure 10.8a: Clinical errors resulting in wrong component transfused n=35

Figure 10.8b: Clinical errors leading to specific requirements not being met n=114



HEV=hepatitis E virus; CMV=cytomegalovirus

Figure 10.8c: Laboratory errors resulting in wrong component transfused n=47



FFP=fresh frozen plasma; HSCT=haemopoietic stem cell transplant

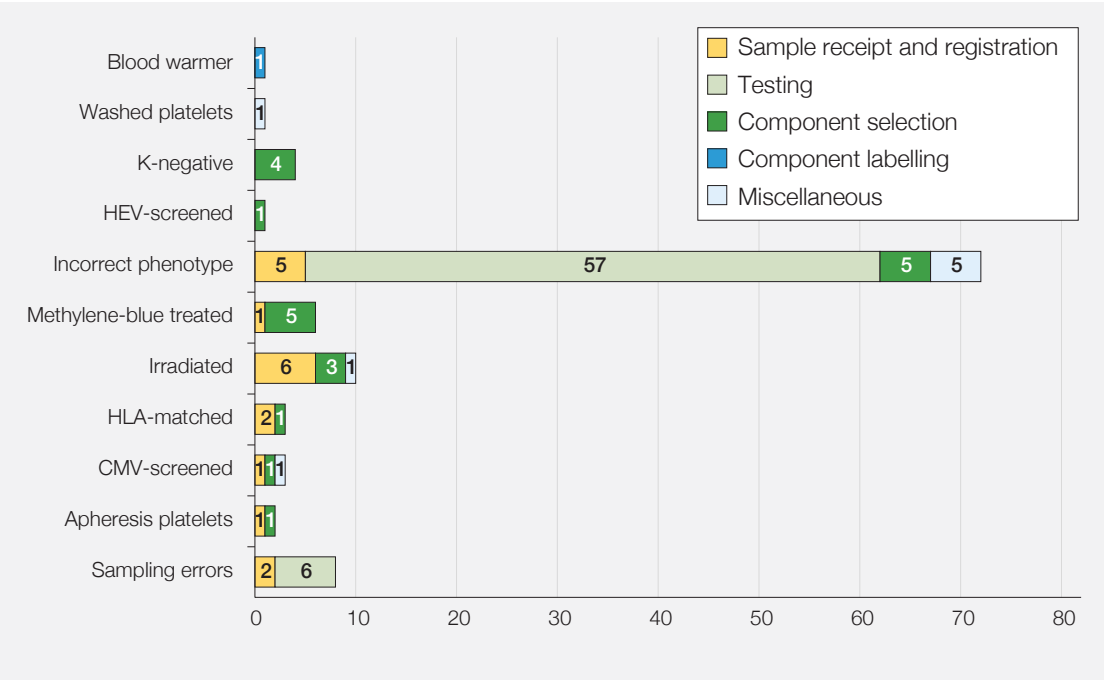


Figure 10.8d: Laboratory errors leading to specific requirements not being met n=111

HEV=hepatitis E virus; HLA=human leucocyte antigen; CMV=cytomegalovirus

Step 1: Request errors n=112 (109 SRNM and 3 WCT)

The request is the first of the nine steps in the transfusion process following the decision to transfuse. The request for the selection and release of components must include patient core identifiers and should also include gender, reason for request and any relevant factors which influence transfusion, e.g. current diagnosis, any comorbidities, pregnancy status and any clinical requirements (BSH Robinson et al. 2018).

Specific requirements not met account for 109/112 (97.3%) of primary request errors and this is similar to previous years. The introduction of universal screening of all components for HEV by UK Blood Services in late spring 2017 is reflected in the lower number of reported missed specific requirements compared to 2016. There were 128 primary request errors in 2016 of which 123 (96.1%) were SRNM.

The common themes resulting in request errors are similar to those in previous years:

- Failure of communication between clinical and laboratory areas
- Failure of communication between shared care hospitals
- Failure to identify a historical diagnosis of Hodgkin lymphoma
- A lack of knowledge and awareness of specific requirements
- Failure to provide full clinical details on request forms e.g. pregnancy as a requirement for CMV-screened components

There is an opportunity to detect omission of irradiation at other steps in the transfusion process if staff complete their part of the process correctly and in full. Haematology and oncology nursing staff should be very knowledgeable about specific requirements for their patients and before commencing administration of blood components should always check that any additional clinical requirements have been met particularly irradiated (BSH Robinson et al. 2018).

Learning points

- Hospital transfusion teams should review their procedures for identification of specific requirements to ensure these reduce the possibility for error locally
- Hospital transfusion teams should explore ways to improve communication between themselves and with other hospitals with which patient care may be shared

Step 2: Taking the blood sample n=2

Taking a blood sample for pre-transfusion compatibility testing is one of two critical positive patient identification steps in the transfusion process. The collection of the blood sample from the patient and subsequent completion of details on the sample must be performed as one continuous, uninterrupted procedure, involving one patient and one trained, competent and authorised member of staff. The minimum sample tube information requirements are patient core identifiers, date and time sample taken and identification of member of staff taking the sample. Sample tubes must be immediately labelled at the patient's (bed)side by the individual who took the sample (BSH Robinson et al. 2018).

In both cases there was a failure to follow the correct procedure for obtaining two samples for pre-transfusion compatibility testing resulting in WBIT and consequently the wrong component transfused.

- ABO-incompatible transfusion of platelets, **Case 10.3**
- ABO-non identical transfusion of red cells to a neonate

Step 3: Sample receipt and registration n=25

Correct procedures for sample receipt and registration are essential to ensure that the right investigation is performed for the right patient on the right sample at the right time (dependent on the patient's transfusion history).

- Missed information on request form n=8 (6 specified irradiated, 1 CMV-screened and 1 recorded that this was a patient with sickle cell disease)
- Demographic data entry error n=2
- Available historical information not heeded n=15

Learning point

- Laboratory staff must heed patient history and adhere to a zero-tolerance policy during sample receipt and registration, see Chapter 7, Laboratory Errors for further information

Step 4: Testing n=73

The correct tests/analyses are required to ensure the safe provision of blood components and should be undertaken in full compliance with local and national guidelines for pre-transfusion testing (BSH Milkins et al. 2013).

- Technical error n=6
- Transcription error n=6
- Interpretation error n=10
- Procedural error n=51

Learning point

- All policies and procedures must be robust and strictly adhered to by laboratory staff without deviation. They must be validated and reviewed regularly (review, improve and rewrite if changes are needed); Chapter 7, Laboratory Errors, provides further information

Step 5: Component selection n=45

This step ensures that the correct components (together with the specific requirements) are selected to comply with the patient's requirements and the clinical request.

Learning point

- Care needs to be taken when selecting components to ensure they are compatible and meet the specific requirements of the patient; Chapter 7, Laboratory Errors provides further information

Step 6: Labelling, availability and handling and storage errors n=1

The correct component needs to be labelled with the correct four (or five) key patient identifiers; first name, last name, date of birth (DOB), unique patient identifier (and first line of address in Wales) (BSH Milkins et al. 2013). Components need to be accessible and available for the time required, if this is not attainable then the clinical staff need to be informed. The components need to be handled and stored correctly as defined in national guidelines (JPAC 2013).

Step 7: Collection n=26 (23 clinical, 3 laboratory errors) 19/26 (73.1%) were urgent/emergency transfusions

This step ensures that the correct component is collected from the storage site and delivered to the correct clinical area. The blood component must only be collected and received by trained, competent and authorised members of staff. Authorised collection documentation must contain the patient's verified core identifiers and details of the component to be collected. These details must be checked against the details on the laboratory-generated label attached to the blood component pack (BSH Robinson et al. 2018).

Further checks must include the correct component type, expiry date and on receipt in the clinical area a check that the correct blood component has been delivered.

Collection as the primary error accounted for 23/35 (65.7%) clinical WCT. This year there were a further 3 collection errors where laboratory staff handed over components to clinical staff that were incorrect or intended for a different patient (Case 10.7). Collection of blood components may be carried out by several different healthcare workers as shown below for these 26 cases:

- Healthcare assistant n=5
- Porter n=4
- Nurse n=5
- Midwife n=2
- Unknown n=10

In 16/26 (61.5%) staff were trained and competency-assessed to carry out this step in the transfusion process but it was unknown for the remaining 10/26 (38.5%). Several cases demonstrated lack of knowledge about different blood components both in cases that involved unregulated healthcare workers and also (surprisingly) registered staff also lacked sufficient knowledge in this area.

It should be noted that 11/26 (42.3%) cases were categorised as emergency transfusions and 8/26 (30.8%) as urgent (together 19/26, 73.1%). These were required for high stress/busy clinical areas including intensive therapy units, theatres, obstetrics and emergency departments.

Case 10.6: Staff under pressure to collect and administer platelets before surgery results in WCT

A woman in her 50s was admitted for planned dental surgery and required platelets. Platelets were prescribed but the healthcare assistant thought she had been asked to collect red cells and was unaware there were other types of components. The staff nurse administered the red cells following the correct identity checks but failed to notice it was the wrong component according to the prescription.

The patient was an unexpected admission to the ward and was due in theatre after the platelet transfusion; there was pressure and distraction from several calls from theatre asking if the patient was ready.

Case 10.7: Laboratory staff removed blood from a satellite refrigerator and handed over incorrect blood components to clinical staff

A male patient in his 20s required red cell transfusion in theatre following major trauma. Ten units were crossmatched and available in the remote issue theatre refrigerator. Clinical staff were unable to gain access to the refrigerator; it was 'thinking' so they asked the attending laboratory staff for help. The laboratory staff managed to open the refrigerator and removed two O D-negative units (that were designated for remote allocation) rather than the available crossmatched components.

The correct procedure for removal of units from the kiosk did not take place. The units were given directly into the hands of the clinical staff instead of being scanned. Completing the correct step of scanning the units following their removal from the kiosk would have alerted both the clinical and laboratory staff that the incorrect components had been removed.

Learning point for the laboratory

- **Direct handover**: if laboratory staff are responsible for directly handing components to a collecting nurse/porter, they need to ensure that the component(s) meets the requirements of the clinical request and the collection slip. Any additional units must be confirmed with a traceable clinical request

Learning points for clinical staff

- If laboratory staff hand blood components over directly to clinical/portering staff, then the correct checks should still take place before leaving the storage site, for both electronic and manual collection systems
- When components are required for urgent or emergency transfusions it is essential that time and care is taken to carry out checks correctly and in full
- Ensure that blood component type and specification is emphasised in collection training

Step 8: Prescription (written authorisation) n=2

This step is identified in Figure 10.6 as step 8, but although the prescription may be written at different points in the transfusion process it should be completed and checked prior to the final administration step.

Blood components should only be authorised by an appropriately trained, competent and locally designated registered regulated health care professional (HCP). Blood component authorisation must include the patient's core identifiers, the component to be transfused, date of transfusion, the volume/number of units, the rate of transfusion, any other clinical requirements or instructions required and must be signed by the authoriser (BSH Robinson et al. 2018).

Two primary errors occurred at this step; in both the specific requirement for a blood warmer was not documented on the written authorisation. However, this was evident on the transfusion laboratory documentation and could have been identified at the administration step.

Learning point for clinical staff

- The prescription is not the only place where specific instructions for administration may be documented. If there is any discrepancy between laboratory and clinical instructions, check before commencing the transfusion

Step 9: Administration n=6 (5 WCT, 1 SRNM)

Administration is the final opportunity to prevent patients receiving the incorrect component or missing their specific requirements due to errors earlier in the transfusion process. It is essential that the final administration check is conducted by trained, competent and authorised, registered regulated HCP.

This final administration check must be performed next to the patient. The donation number, blood group and expiry date on the component pack label must match the laboratory-generated label attached to the component and the component blood group must be appropriate for the patient. Check that any additional clinical requirements have been met e.g. irradiated or CMV-screened components (BSH Robinson et al. 2018).

Transfusion to the wrong patient in 4/6 cases was attributable to a failure to follow policy for correct patient identification. In these 4 cases two registered HCP were involved in the checking procedure.

The blood group of the recipient and blood component of all clinical WCT collection and administration errors show the outcome as:

- 13/28 (46.4%) ABO-identical (3 FFP, 2 platelets, 7 red cells, 1 combination)
- 7/28 (25.0%) ABO-non-identical (6 red cells, 1 platelets)
- 1/28 (3.6%) ABO-incompatible (red cells)
- 7/28 (25.0%) unknown (5 red cells, 2 unknown)

The blood group check at the final step is essential to prevent transfusion of components with the wrong ABO or D-group. If this had been noticed and challenged, 8/28 (28.6%) wrong transfusions may have been prevented (7 red cells and 1 platelets).

26 of the primary errors in collection progressed to the bedside and the number of people who were involved in this final administration step is shown below:

- Two registered HCP n=12 cases
- One registered HCP n=5 cases
- Unknown n=9 cases

The participation of two registered HCP at the administration step seems common practice however, there is no confirmation this is carried out properly by double independent checking as recommended in guidelines (BSH Robinson et al. 2018).

The 2016 Annual SHOT Report included a learning point to explore a two-person dependent check by use of a verification checklist. A pilot is currently in progress.

Figure 10.9: Example of blood group compatibility chart for use at the bedside, Guys and St Thomas' hospital NHS Foundation Trust

PRE-TRANSFUSION ADMINISTRATION ABO D BLOOD GROUP CHECK

Group O FFP/ Octaplas / Cryoprecipitate
MUST only be administered to Group O Patients

Compatibility of plasma components differs from red cells

When performing the pre-transfusion bedside check, you must check the blood component (Red Cells, Fresh Frozen Plasma, Octaplas, Cryoprecipitate, or Platelets) is compatible.

If the blood component blood group is **not** the same as the blood group of the patient, you must check the compatibility table below or contact the transfusion laboratory if unsure (STH ext 84774, Guy's ext 82766, bleep 0201).

This check is only one part of the full bedside pre-transfusion checks – see overleaf

Patient ABO D blood group	Compatible RED CELLS	Compatible FRESH FROZEN PLASMA / OCTAPLAS / CRYOPRECIPITATE	Compatible PLATELETS
Unknown	O	AB, A*, B*	AB, A*, B*, O*
O	O	O, A, B, AB	O, A, B, AB
A	A, O	A, AB, B*	A, AB, B*, O*
B	B, O	B, AB, A*	B, AB, A*, O*
AB	AB, A, B, O	AB, A*, B*	AB, A*, B*, O*
Pos	Pos or Neg	Not applicable	Pos or Neg
Neg#	Neg#	Not applicable	Neg#

Compatible blood groups are listed in order of preference

*Issued when permitted due to component availability

D positive red cells & platelets may be issued for D negative women over the age of 50yrs and D negative males of any age according to availability and urgency of transfusion

Version 1.2 February 2018 Review Date: May 2018

Miscellaneous n=15 (4 clinical and 11 laboratory errors)

In some cases, the error was not related to the defined nine steps in the transfusion process, Figure 10.6.

Laboratory n=11

In 3 cases the patient received the wrong component. Two patients received D-mismatched components. In 1 case the BMS did not activate a flag for a patient with a variant D group to highlight that they required D-negative components. The patient history was not available in the 2nd case due to a cyber-attack where information technology (IT) systems were down. In the 3rd, the wrong ABO group was given to a haemopoietic stem cell transplant (HSCT) patient because the patient record had not been updated.

In 8 cases the patients' specific requirements were not met. In 6 cases IT was a contributing factor: 2 were due to a cyber-attack, other causes were LIMS failure, and the BMS having no access to the reference laboratory antibody database, ordering the wrong component and not maintaining the patient record.

The Blood Service supplied wrong components in 2 cases that were not detected by the transfusion laboratory staff prior to issue. Case 7.10 in Chapter 7, Laboratory Errors.

Clinical errors n=4

In 2 cases specific requirements were not met when blood was required in an emergency (HEV-screened in 1 because the Blood Centre was unable to meet the request, and irradiated in the other case when emergency O D-negative units were transfused).

In 2 cases wrong components were transfused where blood was required in an emergency:

- Incorrect unit number used to access the electronic collection system
- Configuration of software of the blood refrigerator resulted in the kiosk not asking for the patient's age when accessing for emergency blood

Working as a team

The following incidents demonstrate that in cases with multiple errors there were missed opportunities to detect an earlier error that could prevent IBCT.

- 19/158 (12.0%) errors that originated in the laboratory could have been detected in the clinical area
- 132/307 (43.0%) errors could have been detected in the clinical area at the administration step and in 12/132 (9.1%) the errors could have been detected in the laboratory before reaching the clinical area
- There was a total of 1020 near miss IBCT cases (899 WCT and 121 SRNM) of which 839 (82.3%) resulted from clinical errors early in the process at request or sampling. Most of these near miss errors (684/839, 81.5%) were detected by laboratory (n=653) or clinical procedures (n=31) later in the process, although 155/839 (18.5%) were only discovered accidentally, e.g. by an individual realising their earlier error or someone else involved in the process noticing something unusual. See also Chapter 12, Near Miss Reporting (NM)

Multiple errors:

Case 10.8: A demographic data entry at sample receipt results in a patient receiving ABO-incompatible FFP

Five units of FFP were ordered by telephone for Patient 1. During the laboratory IT process, the copy and paste function was used to populate the sample identification number field. However, the sample ID number pasted into the sample ID field belonged to the previous patient (Patient 2).

At collection, the porter noted the discrepancy between patient details of the person he was sent to collect for and those on the FFP that was given to him by the BMS.

The FFP was then re-labelled for Patient 2, but the BMS failed to note that the FFP was incompatible. The nurse administering the FFP noted the group was different to the patient but believed that group O components were compatible for all patients. This resulted in group O (Patient 2) FFP being administered to Patient 1 (group A).

Sample receipt and registration: a telephone request was taken, and the BMS selected the wrong patient.

Component selection: the BMS did not identify that the wrong patient had been selected.

Component labelling: the BMS did not check the label against the request. When the porter noticed the discrepancy the BMS took the FFP and re-labelled it for Patient 2 however the BMS failed to note that the FFP was incompatible.

Collection: at collection, the porter noted the discrepancy between patient details of the person he was sent to collect for and those on the FFP that was given to him by the BMS.

Administration: the nurse administering the FFP noted the group was different to the patient but believed that group O components were compatible for all patients.

To maintain the integrity of the request, the sample barcode should always be used to request components; copy and paste should not be used. When labelling components, especially re-labelling, the patient request should be reviewed against the demographic and blood group data. This case again demonstrates the lack of knowledge in the clinical area which is the last opportunity to stop the transfusion.

Learning point

- Staff involved in the transfusion process need to understand **all** component types including their storage conditions but most importantly their blood group **compatibility** with the patient and restrictions for specific patient groups e.g. gender, age, pregnancy and taking disease status into consideration

Case 10.9: Failure at multiple points in the transfusion process both in clinical and laboratory steps leads to a patient receiving CMV-unscreened red cells

A request form was received in the transfusion laboratory for red cells, diagnosis stated as 'at risk of PPH' (postpartum haemorrhage) and was marked as 'urgent'. There was no indication that the red cells were required for antenatal anaemia and the laboratory staff assumed the red cells were required during or at delivery. A new request form was completed, but the transfusion laboratory was not contacted by telephone to inform them of the change. The pneumatic tube system was not working so the original form was printed by the BMS and used to issue CMV-unscreened red cells. At both collection and administration staff failed to notice the requirement for CMV-screened blood despite this being evident on the prescription.

Request: initial failure to understand the indication for CMV-screened components by the requesting clinician and provision of misleading information to the laboratory. Failure to contact the laboratory to confirm the second request and explain the transfusion was required prior to delivery.

Sample receipt and registration: no revision received and assumption from the given diagnosis that the transfusion was required post delivery.

Component selection: the BMS printed the original request and selected unscreened red cells unaware the transfusion was required pre delivery.

Collection: specific requirements should be checked at this step as identified on the blood collection slip.

Prescription: CMV-screened blood was indicated on the prescription.

Administration: the midwife failed to complete the full checks at the bedside which should include the specific requirements on the blood component against the prescription.

Learning points

- Clear instructions communicated to the transfusion laboratory are essential to ensure the correct components are selected and issued
- Clinical staff must ensure that the bedside check is completed in full and includes specific requirements

Near miss IBCT-WCT cases n=899

As in previous years, most near miss cases that could have led to IBCT were WBIT incidents n=789/899 (87.8%).

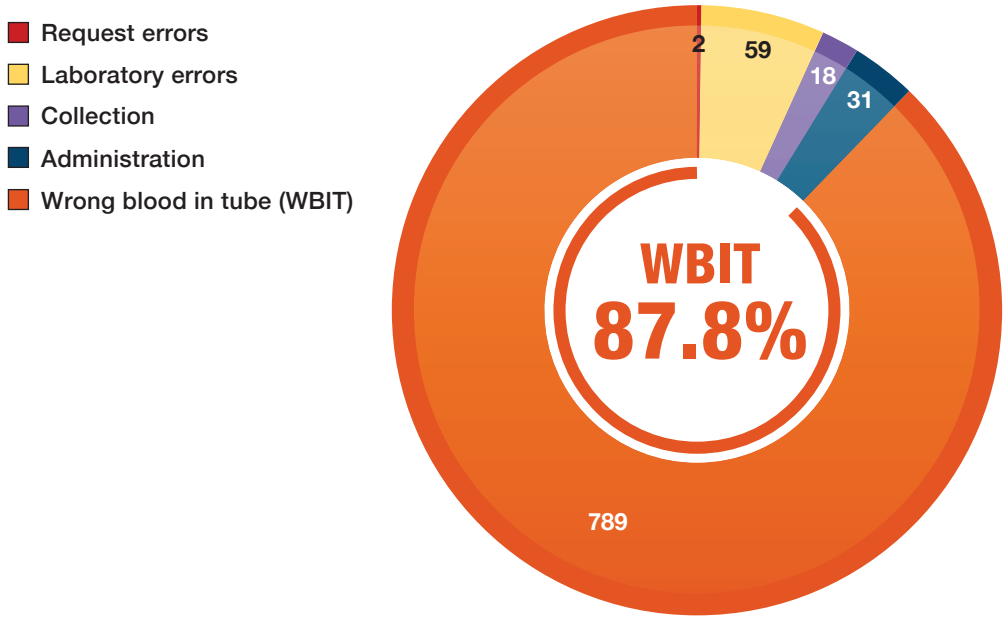


Figure 10.10: Most near miss IBCT were WBIT

WBIT potentially leading to IBCT n=789

Definition of WBIT incidents:

- Blood is taken from the wrong patient and is labelled with the intended patient's details
- Blood is taken from the intended patient, but labelled with another patient's details

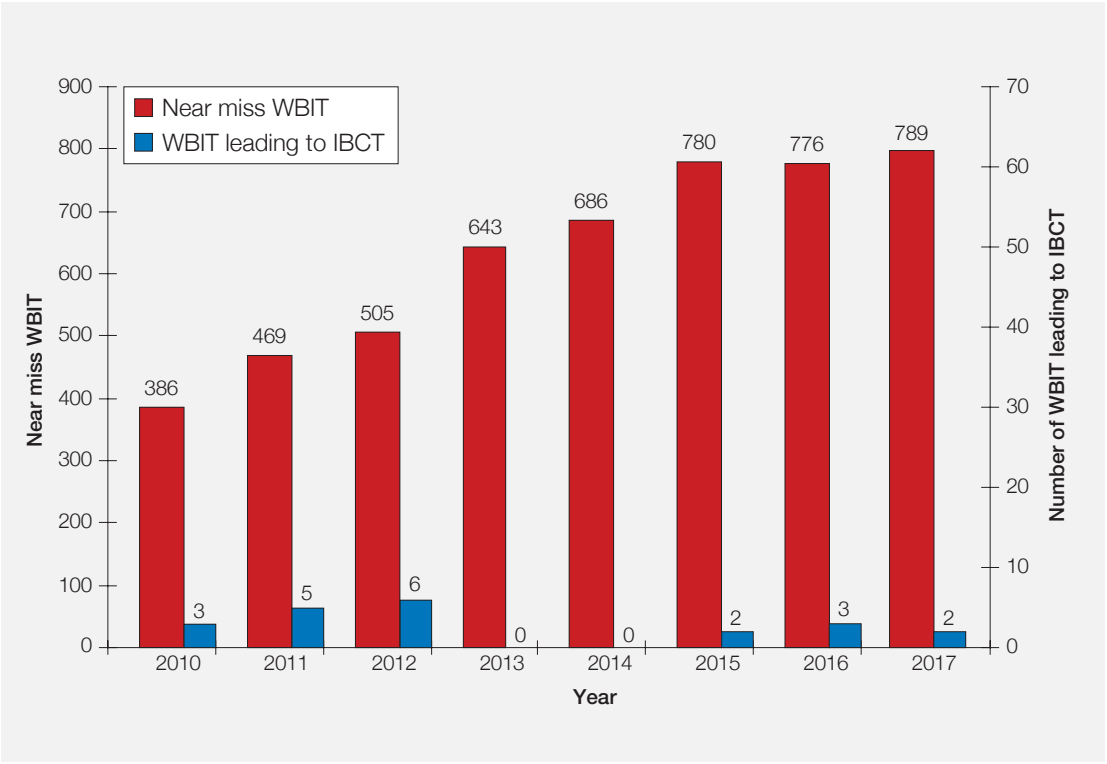
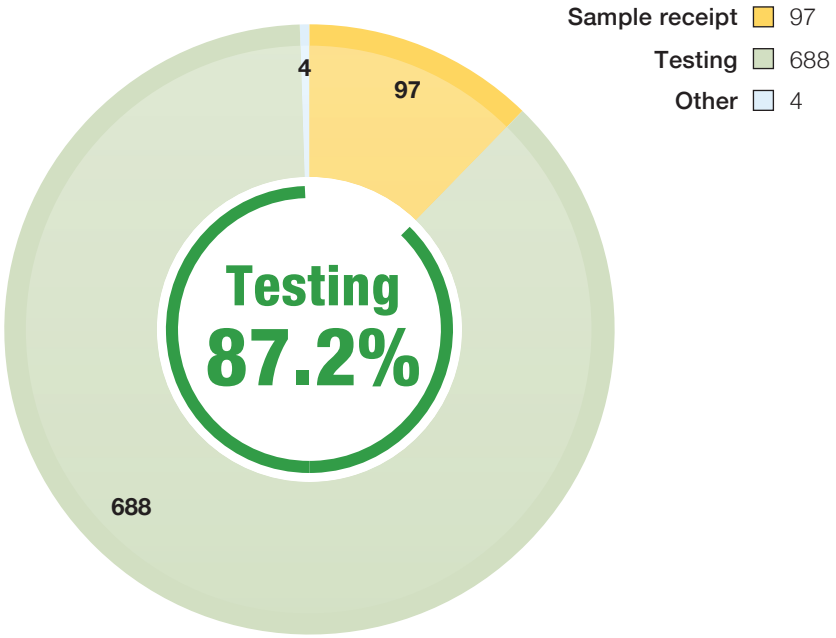


Figure 10.11: Cumulative comparison of near miss WBIT and those leading to IBCT

Detection of WBIT incidents

Most WBIT incidents, 688/789 (87.2%), are detected during laboratory procedures, although sometimes the detection is fortunate, such as the sample taker realising their error while the sample is being processed. Patient safety relies on vigilance or quality management by all staff involved in the transfusion process. However, these detection measures should ideally be unnecessary if sample taking is always carried out accurately with positive patient identification.

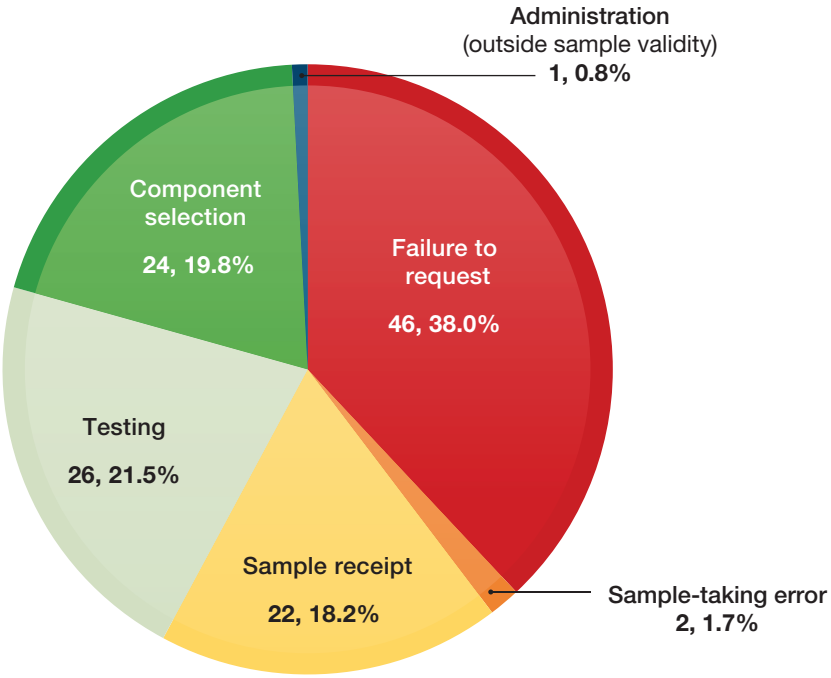
Figure 10.12: Point in the process where a wrong blood in tube (WBIT) incident was detected



Near miss IBCT-SRNM cases n=121

The near miss incidents related to patients' specific requirements show similar learning points to the full incidents that led to transfusion of components where specific requirements were not met.

Figure 10.13: Near misses that could have led to IBCT-SRNM n=121



IT-related IBCT-WCT cases n=21

Laboratory n=17 and clinical n=4

There were 10/21 (47.6%) 'wrong blood' incidents that were in HSCT or solid organ transplant patients.

Use of warning flags or alerts n=7

There were 5 cases where a warning flag was in place but not heeded and 2 cases where the flag was not updated.

Failure to consult the historical record n=7

In 7 cases there was a failure to consult the historical record; 2 cases because the wrong record was selected on the LIMS or patient administration system (PAS); 4 cases where the historical record was not consulted; 1 case occurred as a result of a failure to link or merge records.

Incorrect result entered manually n=3

Wrong blood was transfused from three manual entry errors. In one a manual group was performed following anomalous ABO/D testing on the analyser but the incorrect D group was assigned at data entry and O D-positive red cells were administered instead of O D-negative in a male patient in his 60s. In another case group AB solvent detergent-treated FFP for plasma exchange was issued to the wrong patient following a verbal request where only the last name was given. This hospital commented that they were exploring electronic ordering of components as a future development. Incorrect entry of the blood groups required for a HSCT patient led to the wrong red cells being transfused, although there was no harm to the patient.

Electronic blood management systems n=3

Two errors in this category related to removing emergency blood for critically ill neonates from a remote issue refrigerator. In 1 case, instead of using the emergency procedure, the midwife used the mother's hospital number to obtain an adult unit of blood and in the 2nd case the emergency programme was used but a recent software upgrade meant that the age of the recipient was not required to remove emergency blood so adult (not neonatal) blood was collected.

Case 10.10: Wrong blood transfused despite having a full electronic blood management system

Incorrect but compatible blood was transfused to a day-case patient in a hospital with a full electronic blood management system including both refrigerator collection and bedside safety checks. The same nurses were caring for two patients. The health care assistant was asked to collect blood for Patient 1 (B D-positive). She was given the compatibility tag from the first unit to collect the second unit for Patient 1 (incorrect practice). At the same time, she was given the compatibility tag from Patient 2 (O D-positive) to return to the laboratory for traceability purposes. She used the blood audit and release system (BARS) to collect blood from the refrigerator but used Patient 2's details on the compatibility tag in error. Back on the day-case unit, the BARS system was available but was not used. The error was not detected at the beside with manual checking so the O D-positive blood labelled for Patient 2 was transfused, fortunately without adverse event. The error was detected when someone went to collect the next unit of blood for Patient 2, and it was found to be missing.

Learning points

- Failure to use electronic transfusion systems when available at critical points in the transfusion process, increases risk of error. Staff must retain the skills to perform the necessary checks manually and not rely on the checks performed earlier in the process
- If the blood group compatibility has been checked as recommended at the bedside, and the blood group of the component does not match with the recipient this should trigger the question ***'is this compatible?'*** The practitioner should then establish whether this is the correct unit for the patient about to be transfused

Computer downtime n=1

Despite the high-profile cyber-attacks against NHS computers in the last year there was only 1 wrong blood event in this category. D-positive platelets were inadvertently issued to a D-negative patient but this was a male over 70 years of age.

IT-related IBCT-SRNM cases n=112

Laboratory n=53 and clinical n=59

Use of warning flags or alerts n=83

Not in place n=42, not heeded n=12, not updated n=29

The information was most frequently not provided to the laboratory to activate a warning flag on the LIMS. Even when provided, the updating of the LIMS warning flag in response to clinical information was not always timely. The mode of presentation of warnings is inconsistent between different specific requirements and also varies between different LIMS which can lead to flags being ignored or misinterpreted. Some systems will prevent issue of the wrong component specification whereas others will provide the information in a field that can be ignored or overridden. As a result of failure of the warning flags as described above, in 41 cases irradiated components were not provided and in 22 cases phenotyped/antigen-negative blood was not provided.

Failure to consult the historical record n=17

Use of the historical computer record n=6 and failure to link, merge or reconcile computer records n=11

In many of these cases, the relevant information about specific requirements was not available on the current LIMS because the data had not been migrated from a legacy system and a manual process was in place to look up each patient prior to issuing blood or blood components. Manual look-up processes are time consuming and subject to errors of omission as well as transcription.

Incorrect result entered manually n=1

There was 1 case where incorrect manual transcription of data in the laboratory led to the wrong phenotype being issued to a patient.

Other computer system failures n=10

During this reporting year there were some notable cyber-security incidents and healthcare IT systems were affected. A number of errors related to specific requirements were reported because of IT failure; 1 where a woman was not known to be pregnant and was provided with CMV-unscreened blood, 1 failure to provide irradiated components and 8 where the exact red cell phenotype required was not issued.

The following two examples are of incorrectly configured or validated systems.

Case 10.11: LIMS not correctly configured for sample validity

The transfusion laboratory identified that the incorrect sample validity had been set up in the LIMS. This was correct at the time of configuration but had not been changed when new British Society for Haematology guidelines were issued in 2012 (BSH Milkins et al. 2013). In a look-back over 2 months it was identified that 30 units of red cells were transfused to 12 previously transfused individuals using 7-day rather than 3-day sample validity.

Case 10.12: Specific requirements message does not transmit from the hospital information system (HIS) to LIMS

A patient for solid organ transplant required irradiated blood components. Although there was no specific requirements form provided to the laboratory, the request for blood was made electronically and the requirement for irradiated blood components was indicated in that request. Unfortunately, this message did not auto-populate the specific requirement field on the LIMS. Investigation showed that a recent update to the specific requirement wording on HIS had not fully been tested to see if it still auto-populated.

Online blood ordering system (OBOS) n=1

There was 1 case where the laboratory selected the wrong component on OBOS.

Electronic issue n=13

Electronic issue should be entirely dependent on the LIMS algorithm and there were 13 cases in 2017 where blood was issued electronically where the patient was not eligible. Most of these resulted in blood of the wrong phenotype being issued to patients with current or historical antibodies. One case should not have been eligible for remote electronic issue and another case should have been ineligible because of a recent solid organ transplant. These cases have already been included within the numbers in the subheadings above.

Commentary

There are many opportunities to prevent incorrect blood components being transfused. Analysis of both clinical and laboratory cases demonstrates gaps in blood component knowledge that are contributing to the errors.

Although hospitals deliver blood transfusion training and complete competency assessments to a high standard both in clinical and laboratory settings there is a need to place greater emphasis in training about the different component types, their specific indications, importance of specific requirements especially those related to age and gender, and training must include an understanding of blood group compatibility.

The importance of the bedside check must also be emphasised in training as the final opportunity to ensure the patient receives the correct component and as one of two critical steps in the process that must be completed correctly and in full every time. It is especially important during emergency and urgent situations when additional pressure and distractions are evident.

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