Incorrect Blood Component Transfused (IBCT) n=266

9

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Definition:

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).

Abbreviations used in this chapter

ABOi	ABO-incompatible
BMS	Biomedical scientist
BSH	British Society for Haematology
CAPA	Corrective and preventative action
CMV	Cytomegalovirus
DOB	Date of birth
ED	Emergency department
FFP	Fresh frozen plasma
Hb	Haemoglobin
HLA	Human leucocyte antigen
HSCT	Haemopoietic stem cell transplant
HSIB	Healthcare Safety Investigation Branch
IBCT	Incorrect blood component transfused
ID	Identification
IT	Information technology
LIMS	Laboratory information management system
MHP	Major haemorrhage protocol
NHS	National Health Service
NM	Near miss
PPE	Personal protective equipment
PPID	Positive patient identification
Sp-ICE	Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment
SOP	Standard operating procedure
SRNM	Specific requirements not met
WCT	Wrong component transfused

Key SHOT messages

- All ABO-incompatible cases reported in 2021 were related to plasma components. No ABO-incompatible red cell transfusions were reported in 2021. Transfusion of ABO-incompatible red cells can be fatal
- Available LIMS functionality and algorithms should be used to their full potential to meet patients' specific requirements
- LIMS alerts should be relevant, understandable to the user, not easily overridden and actionable. These should be regularly reviewed and updated where appropriate
- Clear, timely and comprehensive communication between all teams and hospitals involved in patient care is vital to ensuring safe transfusions
- Reporting and investigating near miss error expediates early risk identification and provides valuable opportunities to improve transfusion safety
- SOP need to be simple, clear, concise and explain the rationale for each step. This will facilitate staff engagement and increase compliance
- Positive patient identification must be carried out prior to obtaining the pre-transfusion blood sample and before administering any blood component

Recommendations

- Incident investigations must be systematic and thorough, proportionate to the risk and impact, identifying systems-based corrective and preventative actions

Action: Risk management departments, governance groups, transfusion service managers, transfusion practitioners

- LIMS should be configured to support safe release of all blood components, including ABO/D compatibility, red cell antigen matching, irradiated, CMV-negative and other specific requirements

Action: Transfusion service managers, LIMS suppliers

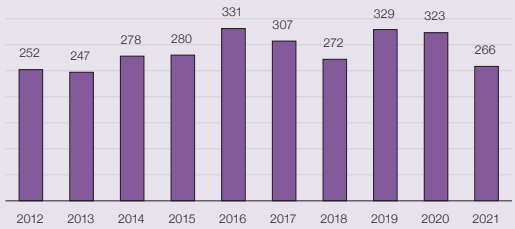
- Collection of blood components must include checks to ensure correct blood components are collected for the right patient. Electronic checking systems and smart refrigerators should be used to support safe practice

Action: Transfusion service managers, risk management departments, hospital transfusion teams

Headline data 2021

Number of reports n=266
Deaths n=0
Major morbidity n=3

IBCT reports by year



Demographic data

Male n=116
Female n=144
Unknown n=6

Adults n=226
Paediatric n=31
Unknown n=9

Blood component data

Red cells n=205
Platelets n=23
Plasma n=15
Multiple components n=19
Granulocytes n=3
Cryoprecipitate=1

Introduction

SHOT acknowledges the pressures clinical and laboratory staff have faced, and continue to face, during these challenging times as a new 'normal' begins to be realised. The Annual SHOT Report highlights areas where practices can be enhanced throughout the transfusion process to improve patient safety.

IBCT events have the potential to cause major morbidity or death and are often due to multiple errors in the transfusion process. These errors accounted for 266/3161 (8.4%) of all reports to SHOT in 2021 representing a decrease in both number and proportion of reports from 2020 (323/3214 (10.0%)). The total number of IBCT-WCT reports has slightly increased in 2021 (87 in 2020 to 93 in 2021), however there has been a substantial decrease in the number of IBCT-SRNM reports from 236 in 2020 to 173 in 2021. This decrease could partly be attributed to the decision at SHOT to stop creating duplicate reports for cases where more than one patient was affected (i.e., 1 report per patient), however, this only accounted for 29 additional SRNM reports in 2020.

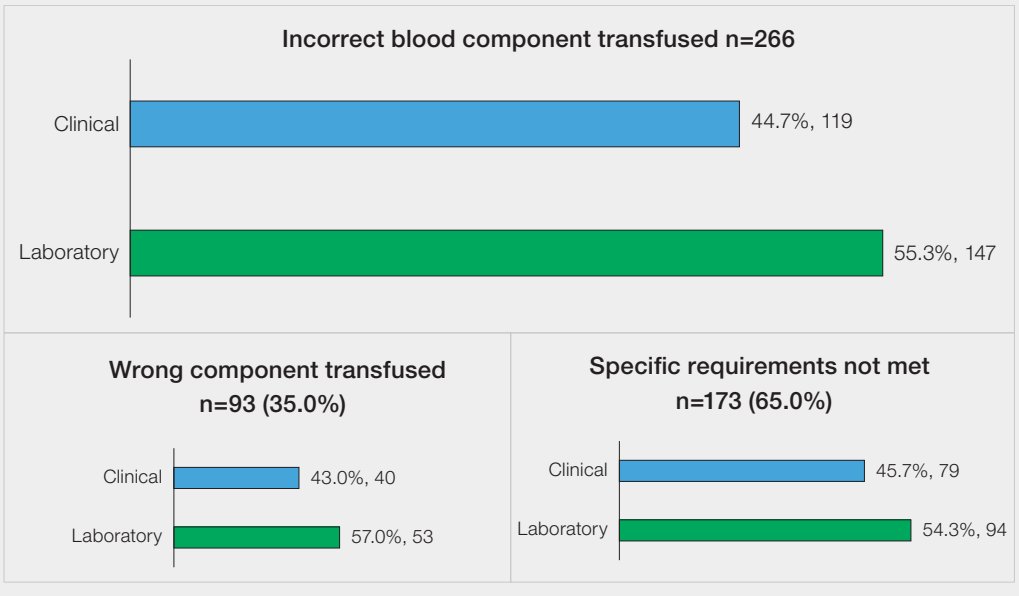
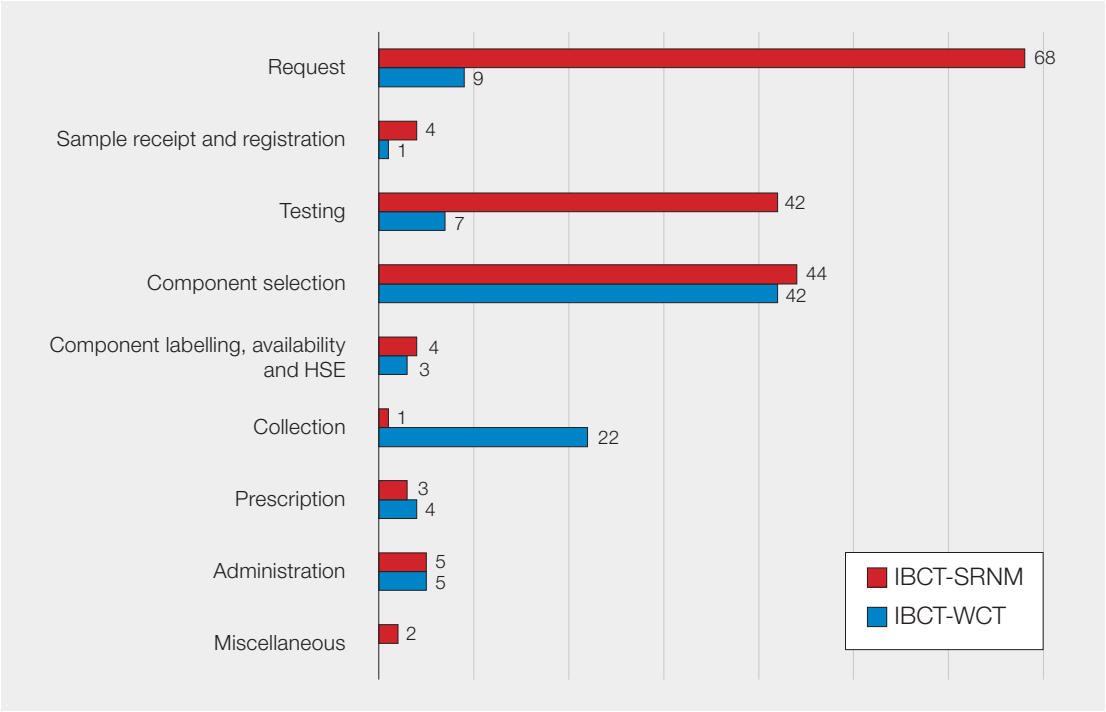


Figure 9.1: Overview of reports where an incorrect blood component was transfused in 2021 n=266

The majority of clinical errors occurred at the request step of the transfusion process with 77/119 (64.7%) reports followed by 23/119 (19.3%) at collection. There were 10/119 (8.4%) administration errors and 7/119 (5.9%) prescription errors.

In the laboratory the majority of errors occurred at the component selection, 86/147 (58.5%) and testing, 49/147 (33.3%) stages.

Figure 9.2: Total IBCT errors categorised by the step where the error occurred n=266



IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors

Patient identification errors and omissions continue to be of concern. In the clinical IBCT-WCT errors reported, 6/40 (15.0%) events were caused by not properly identifying the patient. Patient misidentification in the transfusion laboratories have also been reported in 4 cases of IBCT-WCT and IBCT-SRNM each, all of these were mainly at the sample receipt and registration stage. In addition, there was one report where patient identification at testing was stated as the primary error. Accurate patient identification is fundamental to patient safety. One of the main SHOT recommendations in the 2019 Annual SHOT Report was that organisations must review all patient identification errors and establish the causes of patient misidentification (Narayan et al. 2020). Recognising gaps in existing processes, use of electronic systems, empowerment of patients and staff will reduce these errors.

Undertaking PPID must be done at each step of the transfusion process when at the patient's bedside. This should be done using the ID band attached to the patient and wherever possible the patient should be included in the process. In emergency situations the patient's ID band, containing the core identifiers, must be used to confirm PPID prior to administering the transfusion.

Not performing these checks at critical points such as pre-transfusion blood sampling or administration increases the risk of error and of an ABOi transfusion which could result in the death of the patient. Blood is a 'living transplant' and should be treated with the same attentiveness as the transplant of a solid organ, administration of controlled drugs or provision of chemotherapy.

When PPID is not performed properly it is crucial not to simply attribute fault to the staff member for the omission, but to investigate system factors allowing these errors to happen, for instance poor transfusion policies, inability to print an ID band in a timely manner, poor training and lack of staff or skill mix.

Deaths related to transfusion n=0

There were no deaths reported in the IBCT category related to transfusion error.

Major morbidity n=3

There were 3 cases of major morbidity, all resulting from errors originating in the laboratory where K-positive red cells were issued to women of childbearing potential who later developed anti-K.

There were a further 5 cases of K-positive red cells being transfused to this patient group, with 4/5 cases due to K-positive emergency red cells being issued in error. In all these cases there was a potential for sensitisation leading to major morbidity.

ABO-incompatible (ABOi) transfusions n=3

ABOi transfusions have the potential to cause severe clinical consequences including patient death.

In 2021 there were 3 ABOi transfusions all resulting from laboratory errors. There were no cases related to red cell transfusions in 2021, all 3 were to plasma transfusions. Table 9.1 provides an overview of each case as provided by the reporters and these are detailed further below.

Case 9.1: ABOi error related to convalescent plasma

A male in his 60s with a blood group of A D-positive was issued a unit of O D-positive CCP in error by the transfusion laboratory. The LIMS alerted the BMS to the ABO discrepancy, but this was overridden, and the unit issued. The nurse administering the CCP noted the ABO discrepancy but believed O plasma could be transfused to group A recipients. Within 17 minutes of the transfusion commencing the patient began complaining of loin pain and the transfusion was stopped and patient was medically reviewed. It was felt the loin pain was consistent with previous medical history and given pain relief. The pain settled and the transfusion was restarted. Following administration of the CCP unit the patient complained again of loin pain, and the ABO discrepancy was detected. The patient was monitored closely and fully recovered.

This case emphasises the role LIMS flags and alerts can play in preventing the issue of ABOi blood components, but that conversely excessive alerts can result in alert fatigue with the potential to lead to patient harm. The primary error occurred at the component selection stage, and efforts must be made to clearly differentiate stock based on blood group and component type.

Case 9.2: ABOi error due to misunderstanding of instructions on LIMS

A MHP was initiated for a male in his 40s following transfer from an outlying hospital where he had received group O D-negative emergency red cell units. Blood grouping results indicated a mixed field population of both O and A, and D-negative and D-positive red cells. The ABO/D group was entered into the LIMS as A D-positive, with a note in the patient record stating to crossmatch and issue group O D-positive components until the group could be confirmed by further samples. A request was made to the transfusion laboratory for FFP and group O FFP was selected and issued as per instructions. The patient received 3 units of ABOi FFP. There was no mention of clinical harm to this patient.

This case reiterates the importance of clear instructions for component selection and should have differentiated between red cells and other blood components.

Case 9.3: ABOi error due to miscommunication during handover

A telephone call was received in the transfusion laboratory requesting two units of cryoprecipitate for a male in his 40s. During the same telephone call two units of cryoprecipitate were also requested for another patient. Both patients were group A.

The telephone order was taken during handover between the day and night shifts. In an informal conversation between the two BMS staff the day shift BMS mentioned that there were only two units of group A cryoprecipitate remaining in stock and the night shift would need to order more group A or find out if another group (group O) would be a suitable substitute.

The night shift BMS misunderstood the day shift BMS and thought they had been instructed to issue group O to the second patient and proceeded to issue group O cryoprecipitate units to the patient.

The laboratory IT system warned the BMS that the units they were issuing were 'incompatible'. At this point the BMS acknowledged and overrode the warning to proceed with the product issue. No harm was detected in the patient.

This case enforces the importance of clear handover procedures, and the use of appropriate LIMS alerts which are not easily overridden and are appropriate to the task.

Commentary

These cases were all related to incorrect plasma component selection by the laboratory, of which 2 involved staff inappropriately overriding LIMS flags which should have acted as safety mechanisms to the prevent the issue of ABOi components. Each of the errors could have been prevented by robust pre-administration checks and better understanding of ABO compatibilities and substitutions for all staff involved in the transfusion process.

Previous SHOT recommendations (Bolton-Maggs et al. 2018) have outlined the importance of all staff in the transfusion process having awareness of ABO and D blood group compatibility principles in relation to red cells and plasma. The use of technologies such as the Blood Assist app, developed by the Patient Blood Management Team at NHS Blood and Transplant, can aid in supporting safe and appropriate blood component administration (see 'Recommended resources').

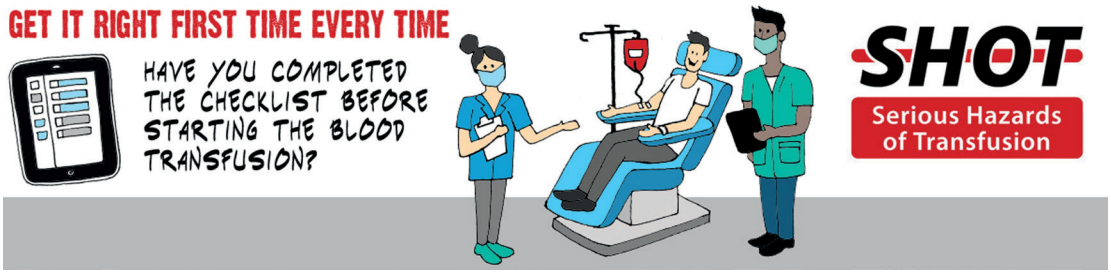
A recent HSIB national learning report on 'Never Events' highlighted the importance of reporting and investigating significant safety events by NHS organisations without apportioning blame or liability, using a recognised systems-based approach such as the Systems Engineering Initiative for Patient Safety (SEIPS) (HSIB 2021). In 2020, one of the ABOi cases reported to SHOT was worked through using the new SHOT human factors investigation tool (HFIT) (incorporating the Yorkshire Contributory Factors Framework) and SEIPS model to illustrate the benefits of applying human factors principles and systems thinking to incident investigations. Both these re-worked investigation reports can be accessed online (https://www.shotuk.org/shot-reports/report-summary-and-supplement-2020/).

There were 5 cases of NM ABOi which are discussed later in the chapter.

SHOT
Serious Hazards of Transfusion

	Case 9.1	Case 9.2	Case 9.3
Component transfused	CCP group O 	FFP group O 	Cryoprecipitate group O 
Patient group	Group A	Group A	Group A
Primary error	Component selection	Component selection	Component selection
Where did the error originate?	Laboratory	Laboratory	Laboratory
No. of units	1 unit	3 units	2 units
IT warning flags in place	Yes, overridden	Manual note in LIMS, not heeded	Yes, overridden
When was error detected	Within 20 min as patient complained of loin pain	By laboratory staff post transfusion	By laboratory staff post transfusion
Patient impact and outcome	Minor morbidity, patient recovered	No reaction	No reaction
Urgency	Emergency	Routine	Urgent
In hours/out-of-hours	08:00-20:00	08:00-20:00	20:00-24:00

Table 9.1: ABO-incompatible transfusions in 2021 n=3



ABOi transfusions involving plasma components

ABOi plasma reports received by SHOT from 2012 to 2021 were analysed to determine patient and plasma blood groups involved and the extent of patient harm.

A total of 29/88 (33.0%) ABOi errors involved plasma. In 26/29 (89.7%) group O plasma was transfused to non-group O patients. There were 9/29 (31.0%) events that occurred in paediatric patients. No ABOi plasma events directly caused major morbidity, haemolytic events, or death.

Plasma components (e.g., cryoprecipitate and CCP) should be compatible with the ABO group of the recipient to avoid potential haemolysis caused by donor anti-A or anti-B. ABO group identical FFP should be given whenever possible; if not possible, FFP of a different ABO group may be acceptable as per BSH guidelines (BSH Green et al. 2018). ABO compatibility for plasma components is different to that of red cells and group O FFP/cryoprecipitate must only be given to group O recipients. Group AB plasma is haemolysin free and may be used if the patient's group is unknown but is in short supply and should only be used for non-AB recipients if absolutely essential. It is important to recognise that these decisions must be taken after considering the clinical indication, urgency of the transfusion request and availability of appropriate components. Only those instances where plasma components of the wrong ABO group were transfused inadvertently are reportable to SHOT.

Haemolysis after the transfusion of ABOi plasma is rare but is of particular risk to infants (JPAC 2013). A standardised titration method with an agreed definition of a safe low-titre component is likely to prevent the most severe haemolytic reactions. Guidelines for the Blood Transfusion Services in the UK recommend that 'there should be a procedure in place to collect and review testing and patient outcome data and to implement changes in policy in the light of continuing clinical experience with the plasma containing blood products issued'. The risk of haemolysis due to passively transfused anti-A and anti-B is small but present and should be considered in any situation in which relatively large volumes of incompatible plasma is transfused (including platelet components). It is important to recognise that, although testing for high-titre ABO antibodies in blood donors may reduce the risk of HTR in 'out of group transfusion', it cannot be eliminated through this route.

In two large retrospective studies of trauma patients, no differences in mortality were observed between those who received ABO-identical or compatible plasma versus those who received ABO-incompatible plasma (Seheult et al. 2020; Dunbar and Yazer 2017).

Clinical IBCT events n=119

There were 119 cases reported in 2021 which is a decrease from 149 in the 2020 Annual SHOT Report.

Clinical IBCT-WCT events n=40

This is a slight decrease in cases from 43 in the 2020 Annual SHOT Report.

The majority of WCT errors 22/40 (55.0%) occurred at the point of collection of the component from the storage area, where the wrong unit was selected for the patient. This step must only be carried out by a trained and competency-assessed healthcare worker but in 5/22 (22.7%) reports this was not the case. The staff member is required to take documentation containing the patient's core identifiers to the designated storage device. This must be checked against the laboratory-generated label attached to the blood component (BSH Robinson et al. 2018) before the component is transported to the clinical area. Details about how many of these collections were from storage devices with IT control was not available.

Whilst the primary error occurred at collection for these incidents, there were additional missed opportunities to detect and rectify the error prior to administration had the pre-administration checklist been applied or used correctly. There were 12/40 (30.0%) reports where a checklist had not been used. In 27/40 (67.5%) of cases the checklist had indeed been utilised but not properly, with all the relevant checks not being completed. In 1 report there was no information about the use of a checklist. A pre-administration checklist is vital in identifying errors before the component is transfused, this has been promoted by SHOT recommendations and the CAS alert: 'Safe Transfusion Practice: Use a bedside checklist' (Department of Health 2017).

Of the remaining cases 9/40 (22.5%) errors were made with the request, 5/40 (12.5%) at administration and 4/40 (10.0%) at prescription. The majority of WCT errors occurred between 08:00-20:00, 23/40 (57.5%). The urgency of the transfusion was classed as elective in 17/40 (42.5%) of reports, with 12/40 (30.0%) emergency and 11/40 (27.5%) urgent. There were 6/40 (15.0%) paediatric cases.

Learning points

- All staff involved in the transfusion process must be up to date with relevant transfusion theoretical training and be competent in whichever part of the process they are involved in
- On arrival in the clinical area, the blood component should be checked by the member of staff who requested the collection to ensure it is for the correct patient

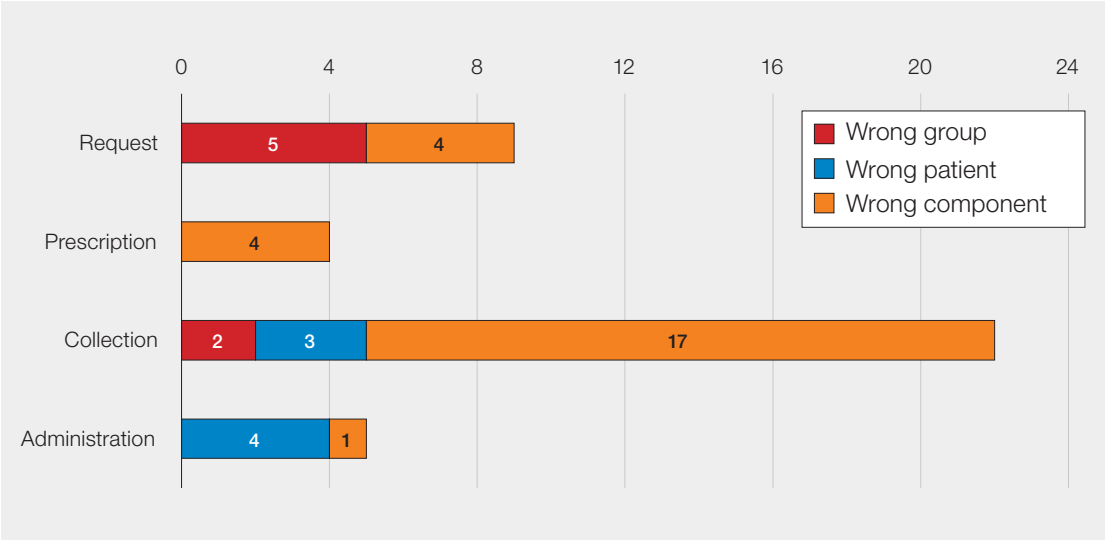


Figure 9.3: Categorisation of clinical IBCT-WCT errors by transfusion step where the primary error occurred (n=40)

Learning points

- Staff should ensure local processes are followed to ensure collection of the correct component from the laboratory or the satellite storage area
- All the final checks must be carried out by the patient's side immediately prior to administration using a pre-administration safety checklist
- While the use of an electronic blood transfusion system facilitates safe transfusion practice, clinical staff should avoid an over reliance on these systems when undertaking PPID and the final pre-administration check

Illustrative cases

Case 9.4: Patient given red cells instead of platelets

A male patient in his 60s with acute myeloid leukaemia, neutropenic sepsis and a low platelet count of 15x10^9/L was admitted to a medical ward. A platelet transfusion was prescribed. Nurse 1 went to the platelet agitator, but it was not operational at the time (nurse had not been informed of this), the patient had red blood cells in the issue refrigerator, so these were collected instead of the platelets. The nurse checked the unit with a colleague but not at the patient's bedside. Nurse 2 read the prescription and questioned if this was the correct component as she was concerned that it had been prescribed to be administered over 30 minutes. Nurse 1 sought the advice of the prescribing doctor (but did not show the doctor the unit of red cells) and was reassured platelets can be transfused over 30 minutes. The patient raised his concerns about what he was being given due to the colour of the component, but despite this, Nurse 1 started the transfusion without Nurse 2 present to complete the checks. Nurse 1 realised she had made an error after 10 minutes and the transfusion was stopped. There was no harm to the patient.

In this case the ward staff had not been informed that the platelet storage device was not operational, the nurse's transfusion training and competency-assessments were up to date, but there remained a lack of knowledge about platelet transfusion. They had never been asked to collect or administer platelets in the past and did know what they looked like. The nurse was unwell before starting the shift but came to work anyway as there were already staffing issues in the hospital. The final pre-administration checks were not carried out at the patient's side and the hospital did not use a pre-administration bedside checklist, which should have picked up the omission. It appears also that the patient's concerns were dismissed. There were multiple missed opportunities where the error could have been identified and multiple factors contributed to this error, including ineffective training and competency-assessment of staff, inappropriate supervision, and suboptimal pre-transfusion checks.

Learning points

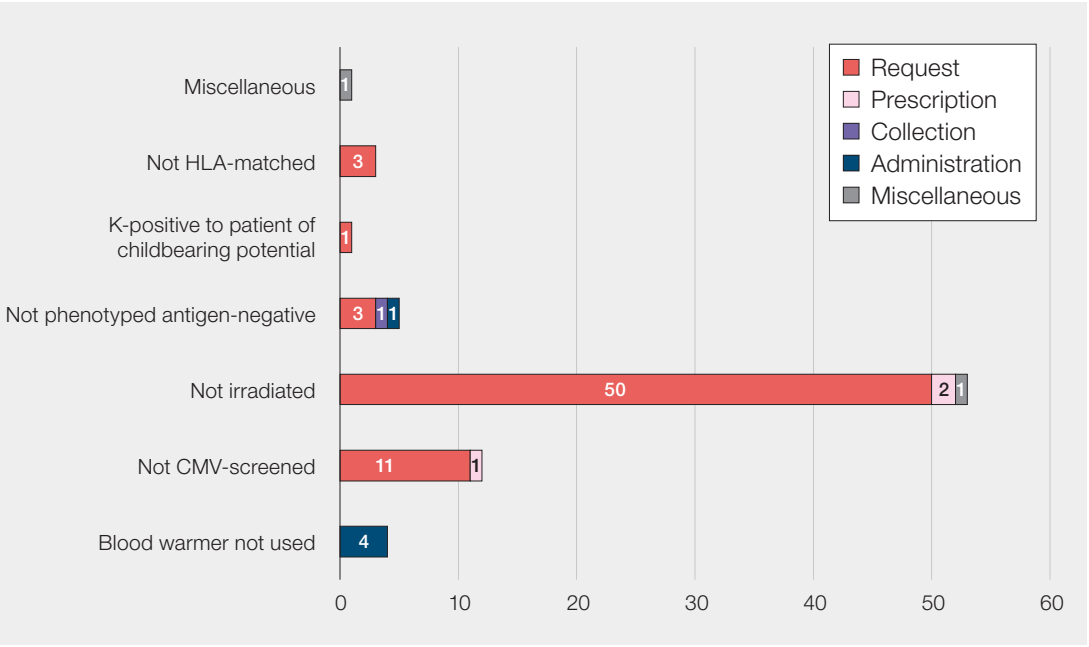
- Systems for collection of blood components should include fail safes which prevent collection of the wrong component
- A robust checking process at the administration step immediately prior to transfusion remains a critical step to support safe transfusion
- Training and competency-assessment for collection and administration must cover all blood components and ABO compatibility

Clinical SRNM events n=79

This is a marked reduction from the 106 events in the 2020 Annual SHOT Report.

The most common error in this category was failure to provide irradiated components 53/79 (67.1%), which has been the case for several years (Elliot et al. 2021). There has been a slight increase in the numbers of cases where the requirement for CMV-negative components was missed 12/79 (15.2%) compared to 9 reports in 2020. An incorrect phenotype was transfused in 5/79 (6.3%) of cases and there were 4/79 (5.1%) reports of a blood warmer not being used when required.

Figure 9.4: Clinical IBCT-SRNM errors and transfusion step where the primary error occurred (n=79)



HLA=human leucocyte antigen; CMV=cytomegalovirus

The most common point in the ten-step process where the error occurred was at the request stage 68/79 (86.1%). In 20/68 (29.4%) of these cases there was a communication failure between the clinical area and the laboratory where the clinical staff were aware of the need for the specific requirements but did not request them or where the transfusion laboratory was not informed of the requirement in a timely manner.

There were 53/79 (67.1%) cases where the requirement for irradiated components was missed and in 31/53 (58.5%) cases the patient had a previous diagnosis of Hodgkin's lymphoma which was either not on the patient's records or not communicated to the laboratory team. This is an increase from 21 cases in the 2020 Annual SHOT Report. Reasons for these omissions were the same as in previous years where there was a lack of knowledge of the requirement, poor communication through shared care and clinical electronic systems not being updated.

Errors occurred at administration in 5/79 (6.3%) cases. These included 4 instances of a blood warmer not being used and 1 case where the unit was not phenotyped as per patient requirement.

There are opportunities to detect omissions at several steps in the transfusion process, but only if staff complete their part of the process correctly. The use of an aide memoire for specific requirements on the reverse of written request forms, prescription forms, on electronic request systems or at the final pre-administration check may help reduce the numbers of SRNM reports (see 'Recommended resources').

Illustrative cases

Case 9.5: Non-irradiated component administered despite the patient highlighting the specific requirement to the administering nurse

A female patient in her 60s with acute myeloid leukaemia was admitted to a haematology ward for chemotherapy (purine analogue). As she had symptomatic anaemia, neutropenic sepsis and a Hb of 76g/L she was transfused two units of red cells and 1 unit of platelets. The units issued and transfused did not meet the specific requirements as they were not irradiated.

Fludarabine had been prescribed and issued from pharmacy without an irradiated components registration number, which should have been the correct process for ensuring a patient receives irradiated components if a transfusion is required. The transfusion laboratory was not informed that the patient required irradiated components and as there was no flag on the LIMS to alert the BMS to the irradiation requirements, standard units were issued.

The patient asked staff to check that the components had been irradiated but this was not acted upon. Nursing staff did not accurately complete the pre-transfusion checks when administering the transfusion and it was commenced. A pre-administration bedside checklist had been used ineffectively and it was recorded that specific requirements had been met when they hadn't. They had also failed to respond to alerts on the ward handover and the electronic prescription which highlighted the need for irradiated components. Staff had assumed that the components were irradiated but did not check.

The error was detected after the transfusion was complete and the patient had no clinical reaction.

Case 9.6: Requirement for irradiated red blood cells missed

A male patient in his 50s with non-Hodgkin's lymphoma in shared care was prescribed bendamustine. The transfusion laboratory in hospital 1 had been informed about the need for irradiated blood components. Patient attended hospital 2 where the transfusion laboratory was not aware of the specific transfusion requirement. Irradiated blood components were not requested appropriately on the transfusion request form and as the LIMS had not been updated with the irradiated blood requirement this was not flagged in the transfusion laboratory. Two units of non-irradiated red cells were issued. The nurses checking the first unit at the patient's side were unaware that irradiated red cells were required as it was not on the prescription, and the whole unit was transfused. It was only on checking the second unit by a junior member of the clinical team who had recently attended transfusion training, which had detailed specific requirements for patients treated with bendamustine, that the error was discovered. The second unit was not transfused and returned to the laboratory.

Learning points

- Where possible the patient should be asked if they are aware of any specific requirements at the time of giving consent for transfusion and during pre-administration checks
- Communication of specific requirements to the laboratory is key to provision of appropriate components
- The transfusion laboratory should ensure that the specialist blood product requirements are flagged on the laboratory IT system appropriately
- The need for specific requirements should be documented on the patient's prescription and if it is not clear, then the blood should not be given until the requirements of the patient have been established

Patients should be viewed as partners in their care. This promotes a proactive approach to safety with better communication skills, particularly regarding one's expectations and risk situations (potential and actual). It also reinforces the notion of shared responsibility. The recognition of patients and their relatives as full members of the care team facilitates them to identify any situation that may impact their safety. This approach helps develop a shared responsibility between patients and healthcare professionals which will complement vigilance that professionals may lack (due to blind spots, fatigue, or other unexpected circumstances) and avoid a blame culture.

Laboratory errors n=147

In 2021 there has been a slight decrease in reports of incorrect blood components transfused from 174 in 2020 to 147 in 2021. There has been a 20.5% increase in WCT from last year from 44 to 53. There has been a 27.7% reduction in SRNM events from last year from 130 to 94.

In 28/53 (52.8%) of WCT events, the error occurred outside of normal working hours, with 18/53 (34.0%) reports stating the error occurred when there was a lone worker. In 41/94 (43.6%) SRNM events the error occurred outside of normal working hours, with 29/94 (30.9%) of reports stating the error occurred when there was a lone worker. In proportion to the number of units issued during core working hours versus out-of-hours, it is clear that a disproportionally high proportion of IBCT events occur when there is a lone member of staff. Factors which may influence this include insufficient training and knowledge for lone working, distractions, multitasking, increased workload, and decision fatigue. Previous SHOT recommendations have detailed the need to examine current lone working conditions to reduce distraction where possible. Staff should not be allowed to work alone until they have passed a robust competency-assessment. Staff capacity planning should be regularly reviewed to ensure staff numbers and skill mix meet the demands of the service. Transfusion laboratories should have written protocols in place which define the responsibilities of all staff in dealing with urgent requests (BSH Milkins et al. 2013).

Laboratory IBCT-WCT events n=53

Table 9.2: Laboratory WCT errors in 2021

Error subcategory	Sample receipt and registration	Testing	Component selection	Component labelling, availability and handling and storage error
				
Number of error reports	**1**	**7**	**42**	**3**

Laboratory IBCT-WCT are discussed in more detail in Chapter 14, Laboratory Errors.

The majority of IBCT-WCT laboratory errors occurred during the component selection stage, 42/53

(79.2%). Most IBCT-WCT reports involved the issue of the component with the wrong ABO/D group (39/53), and issue of the wrong component type (9/53).

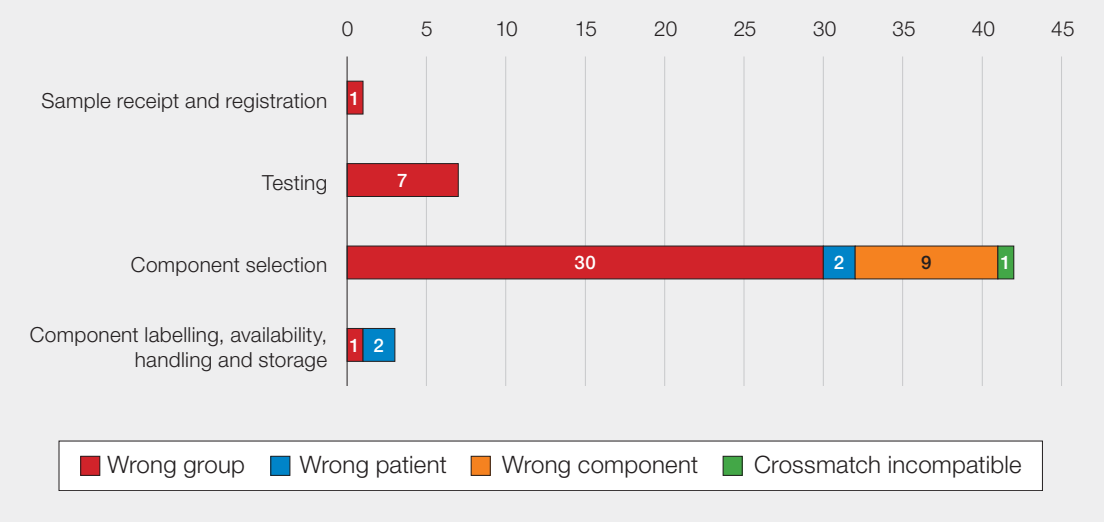


Figure 9.5: Laboratory WCT errors by transfusion step (n=53)

Cases of incorrect ABO/D group being transfused to solid organ and HSCT recipients persist. These are discussed further in Chapter 24, Transfusion Errors in Transplant Cases.

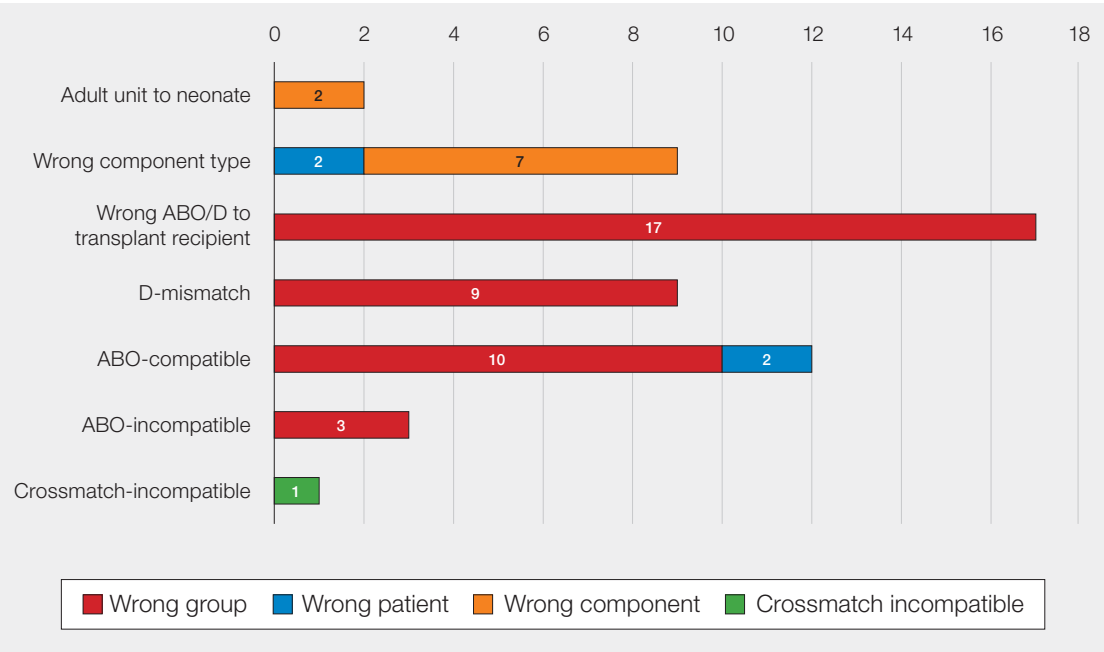


Figure 9.6: Laboratory WCT errors by category (n=53)

Poorly configured LIMS not reflecting current guidelines, or staff not heeding information readily available in LIMS can lead to patient harm. Component selection errors should be prevented at the point of selection. Staff selecting and collecting the blood components must be able to differentiate easily between the various component types from stock or issue refrigerators. Following transplant, patient's new requirements should be updated on the LIMS in a timely manner, which should include appropriate LIMS alerts that are not easily overridden.

Learning points

- LIMS should be kept up to date with the patient's blood group requirements, and clear instructions and algorithms to support selection of appropriate blood components
- LIMS alerts should be relevant, appropriate, and not easily overridden. Where overrides are required there should be a clear audit trail of the justification

Details about additional cases can be found in the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/report-summary-and-supplement-2021/).

Laboratory IBCT-SRNM events n=94

Table 9.3: Laboratory SRNM errors in 2021

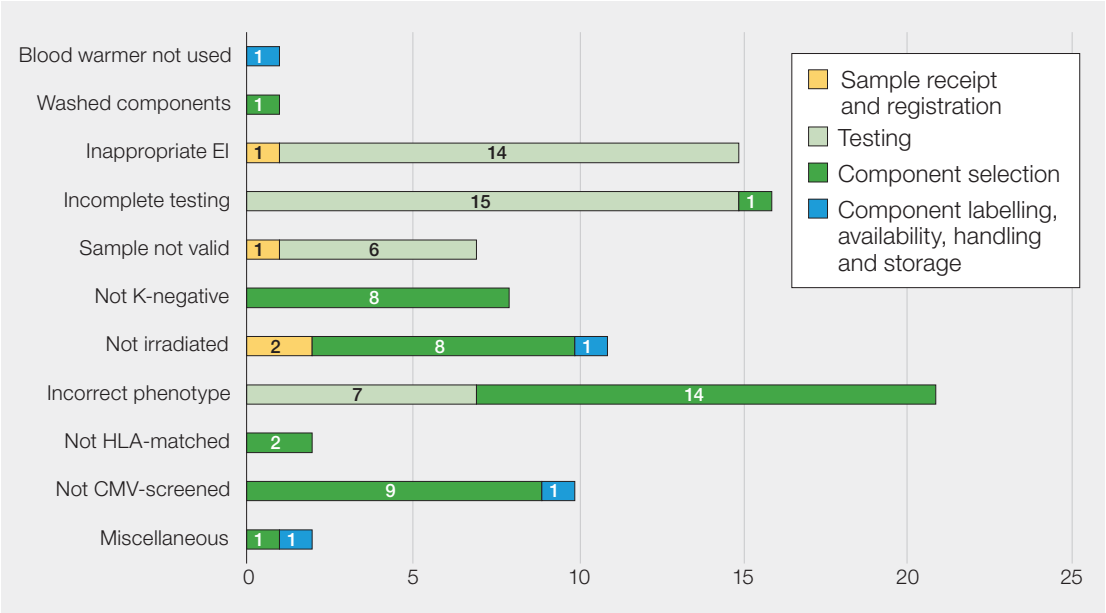
	Sample receipt and registration	Testing	Component selection	Component labelling availability and handling and storage
				
	4	42	44	4

Laboratory IBCT-SRNM are discussed in more detail in Chapter 14, Laboratory Errors.

Most laboratory errors related to SRNM occurred during component selection (44/94, 46.8%) or testing (42/94, 44.7%). Incomplete testing includes cases where blood has been transfused prior to resolution of serological testing (e.g., antibody identification not completed, analyser not within quality control or incorrect testing methodology used). Details of the laboratory SRNM errors can be found in Figure 9.7.

Of the 94 SRNM reports, 52/94 (55.3%) stated that staff had not followed the SOP correctly.

Figure 9.7: Laboratory errors resulting in SRNM (n=94)



Footnote: Where the blood warmer was not used, transfusion laboratory knew patient had cold agglutinins and would normally add a sticker to unit if warmer is needed. Clinical staff should have been informed before collection of unit as they would need to source warmer pre transfusion

EI=electronic issue; HLA=human leucocyte antigen; CMV=cytomegalovirus

Incidents have been grouped based on the specific requirement that has not been met

Case 9.7: Beta thalassaemia on request not investigated

A woman in her 60s attended the ED requiring a blood transfusion. The patient told ED staff they had beta thalassaemia and presented their antibody card from the Blood Service. The request received in the laboratory stated 'Beta thalassemia major, regular RBC transfusion and intra op femoral nailing', but the BMS did not investigate this further and two standard red cells were issued by two different members of staff over the following hours which did not meet extended phenotype and red

cell antibody requirements. A further blood request was received by a third BMS who determined that further investigation was needed. Sp-ICE was checked, which detailed presence of known antibodies and an extended phenotype.

All available clinical information must be used to inform specific transfusion requirements for patients. In this case further information had been provided by the clinical area and this should have prompted the BMS to investigate further and provide appropriate red cell units.

Case 9.8: Antigen-negative requirements missed due to cognitive bias

A woman in her 40s with known anti-e and anti-C requiring a blood transfusion due to multi organ failure received red cells not antigen-matched for known red cell antibodies. The BMS received a request for two red cell units for this patient, and upon seeing the patient's DOB and assumed that, as the patient was of childbearing potential, they should receive R1R1 (c-E-) red cells in accordance with local policy, rather than identifying that patient required R2R2 (C-e-) red cells due to presence of anti-C and anti-e red cell antibodies. LIMS warning flags were in place but were not heeded. C and e-positive red cell units were serologically crossmatched and issued. There was no clinical reaction in the patient following blood transfusion.

LIMS should be updated with antigen-negative requirements and algorithms and alerts should be built to alert staff where there is inappropriate blood component selection. In this case, while the LIMS flag was in place, it was not very clear and not robust enough to prompt appropriate action.

The BMS made assumptions based on the patient's date of birth rather than their specific requirements for antigen-negative units, which led to the selection and issue of inappropriate red cells. LIMS functionality should support safe decision making for component selection and specific requirements.

Learning points

- All essential testing should be resolved prior to issue of red cells. Further advice from senior colleagues should be sought if in doubt
- If the antibody identification is yet to be completed, then concessionary release should be considered to avoid transfusion delays
- LIMS functionality should support safe decision making for component selection and specific requirements

Near miss cases n=145 (87 clinical, 58 laboratory)

Definition:

A near miss event refers to any error which if undetected, could result in the determination of a wrong blood group or transfusion.

There was a total of 5 NM ABOi transfusions in 2021 which is a reduction from the 20 cases in the 2020 Annual SHOT Report. Of these 4/5 originated in the clinical area and 1/5 in the laboratory. All the clinical cases involved red blood cells. The errors were picked up by vigilant nurses carrying out their proper checks, two errors were detected at the final bedside check and one when the unit was checked on arrival to the ward with the porter. In the final case the transfusion practitioner was in the blood issue room at the time as she wanted to check the HCA's collection technique. She noticed that the paperwork the HCA was holding did not match the name on the unit and an error was avoided.

Clinical NM IBCT-WCT n=66

As in previous years the most common near miss in this category was at the collection stage of the process with 39/66 (59.1%) of reports. Of these errors 26/39 (66.7%) were identified by effective pre-administration checks and by check at arrival of the component in the clinical area in 7/39 (17.9%) of cases.

At the administration step of the transfusion process there were 21/66 (31.8%) errors. These were detected by an electronic tracking system in all but 1 case.

Clinical NM IBCT-SRNM n=21

There were 19/21 (90.5%) events where the patient could have potentially received non-irradiated components. The majority 15/21 (71.4%) of errors had been made at the request stage and 10/15 (66.7%) of these were detected by nurses during the final pre-administration checks.

As an example of excellent care, in 1 report an attentive nurse asked the patient as part of the pre-administration checks, if they had any specific requirements. This prompted the patient to produce a card which showed they needed to have irradiated components. The patient had forgotten, and this had not been discussed with them during the consent process.

Laboratory NM IBCT-WCT n=22

The most common laboratory IBCT-WCT NM errors occurred during component selection 14/22 (63.6%). Component selection NM errors included issue of D-mismatch components (7/14), incorrect ABO but compatible (2/14), and ABO requirements not met for post HSCT patients (5/14). Of these, 11/14 stated the error was IT-related, and 6 stated that LIMS alerts were either not heeded or were overridden.

Case 9.9: Post-HSCT issued incorrect ABO/D platelets

A male post-HSCT patient in his 60s who now grouped as O D-negative was issued B D-positive platelets by the BMS. The post-HSCT comments for this patient were on the 4th page of the LIMS record, and the BMS did not check all the available comments. The error was detected at the bedside.

Comments and notes for selection of appropriate ABO group for component transfusions for HSCT patients should be clear and succinct and supported by algorithms in the LIMS.

Case 9.10: D group incorrectly transcribed from LIMS onto request form

An ABO/D group was transcribed from the LIMS incorrectly onto the transfusion request form of a woman in her 50s by a BMS as B D-positive, but the patient was in fact B D-negative. The newly qualified BMS, who should have been under supervision, was rostered to work on a late shift due to extremely low staff levels. The BMS issued three red cells units, with the LIMS alerting to the incorrect D group, but alarms were overridden by the BMS. The error was detected during the pre-administration checks.

Laboratory NM IBCT-SRNM n=36

The most common laboratory IBCT-SRNM NM errors occurred during component selection (27/36, 75.0%), with 18/27 not meeting irradiation requirements, and 7/27 not meeting CMV requirements. There were 23/27 NM IBCT-SRNM errors detected during pre-administration checks, emphasising the importance of the pre-administration checklist (See Recommended resources).

Of these IBCT-SRNM events, 27/36 reports stated that the error was IT related with failure to update the LIMS (9/27) and failure to heed LIMS warnings (14/27) being most frequently stated.

Case 9.11: Red cells issued not meeting CMV or irradiation requirements (CMV local requirement)

A request form received in the laboratory for a child <10 years old stated a requirement of CMV-negative and irradiated components. The BMS did not update the LIMS with this information. At the point of issuing the red cell units the BMS thought they remembered this patient's specific requirements from earlier in the day and issued standard components. The report stated that the BMS was rushing to get work completed as they were lone working out-of-hours without a break in 6 hours with a high workload reported. The error was detected at the bedside.

Assumptions and rushing to complete tasks can result in errors.

COVID-19 pandemic

This year the pandemic was implicated in 9 clinical cases where errors were made. In each report issues such as staff shortages, working in unfamiliar areas, with new documentation, PPE and the use of radios for communication were identified. There were 4 COVID-19 positive patients who received incorrect or unsuitable components (2 non-irradiated, 1 non-CMV negative and 1 patient given FFP instead of platelets). In every case some of the above issues were implicated.

From the laboratory perspective COVID-19 was mentioned as a contributory factor in 9 cases and included: reduced staffing levels, additional pressures on remaining staff and staff recovering from COVID-19, pressures on ability to effectively train staff, redeployment of staff into unfamiliar areas and reorganisation of workspaces which all contributed to errors.

Conclusion

It is encouraging to see a reduction in the number of ABOi transfusions especially red cells reported this year. Important lessons can be learnt from errors made at all steps in the transfusion process, clinical and laboratory. If these are identified immediately prior to administration, they will prevent the most serious transfusion incident, unintentional transfusion of an ABO-incompatible blood component. This can lead to patient harm or even death. There continues to be strong evidence supporting a pre-administration patient-side checklist and/or electronic identification systems to improve identification of errors at the final step of the transfusion process. Checks should be embedded in each stage of the transfusion process to ensure that appropriate components are transfused.

Clear communication of specific requirements to the laboratory is essential in order to meet patient's requirements, and when received should be updated on LIMS with appropriate flags to alert laboratory staff to errors in selection.

Where information is available and not entered into the LIMS, or where information is available on the LIMS but not heeded, both have the potential to lead to patient harm. Laboratories should ensure they are using their LIMS functions to their full potential, in particular where algorithms for specific patient groups could significantly improve patient safety. Gender, age, specific clinical conditions and location should all be considered for LIMS algorithms and functionality.

Pre-administration checks detected 39/58 (67.2%) of NM laboratory IBCT errors, with 27/58 (46.6%) stating a formal bedside checklist was used to identify the error. In the clinical area pre-administration checks detected 55/88 (62.5%) of NM errors and a formal bedside checklist had been used in 42/88 (47.7%) of reports. This supports the importance of a robust pre-administration checking system to help detect errors. Such checklists can be an effective safety tool in clinical and laboratory settings. They strengthen compliance with guidelines, improve human factors and reduce the incidence of adverse events.

Factors contributing to transfusion errors have been repeatedly shown to be assumption, inattention, distraction, poor supervision, inexperience, high workload, inadequate staffing and staff fatigue – all commonly seen in high pressure clinical and laboratory environments. It is time to look at a full systems approach which utilises the resources available in a way that makes it more difficult to make errors and supports staff in the busy environments in which they work. Technology (better LIMS, electronic patient identification systems) must help to engineer solutions which compensate for human limitations, and the use of IT must be capable of reducing reliance on human interventions in making systems safer rather than adding to the burden. Finally, despite all the above measures, it is important to remember that patient care is ultimately delivered by humans who are having to work in increasingly complex and hurried environments. Care involves multiple team members, often across teams, working at a faster pace, with higher caseloads, and resource constraints. In most of the near-miss and safety events reported, several cognitive factors are contributory. Factors included attention channelled on a single issue, overconfidence or confirmation bias, inadequate vigilance, errors made based on inaccurate information, and distractions. For all safety critical steps, it is vital to make critical information more conspicuous, decreasing diversions of attention, and reducing the number of secondary tasks when staff are carrying out complex tasks. Hence, in addition to the measures described, the only satisfactory

improvement tool in some cases may be to allow our colleagues to slow down and do less, have more time to think and therefore be able to deliver high quality patient care. Patients and family members should be considered as partners in care supporting a pro-active approach to safety.

Recommended resources

A just culture guide:
https://www.england.nhs.uk/wp-content/uploads/2021/02/NHS_0932_JC_Poster_A3.pdf

Use of checklists: Can Checklists Prevent Human Error?
https://www.exida.com/Blog/can-checklists-prevent-human-error

SHOT Video: ABO-incompatible transfusion events: Insights learned from SHOT Reports 2010-2019
SHOT Video: Transfusion errors in haemopoietic stem cell transplant recipients
https://www.shotuk.org/resources/current-resources/videos/

Safe Transfusion Checklist
https://www.shotuk.org/resources/current-resources/

SHOT Bites No. 1a and 1b: Incident investigation
SHOT Bite No. 9: Component Compatibility
SHOT Bite No. 10: Why 2 Samples?
SHOT Bite No 12: Cognitive Bias
SHOT Bite No. 17: Near Miss
SHOT Bite No. 19: Human Factors
SHOT Bite No. 20: IBCT-SRNM
https://www.shotuk.org/resources/current-resources/shot-bites/

SHOT Webinar: Near Miss and Incident Investigation
SHOT Webinar: Laboratory and IT
SHOT Webinar: Human Factors
https://www.shotuk.org/resources/current-resources/webinars/

SHOT Safety Notice 02: Ensuring patient specific transfusion requirements are met
https://www.shotuk.org/resources/current-resources/safety-notices/

Patient Blood Management - Blood assist app
Apple (https://apps.apple.com/gb/app/blood-assist/id1550911130)
Google play (https://play.google.com/store/apps/details?id=uk.nhsbt.bloodassist)
Web based (https://www.bloodassist.co.uk/)

Good practice guidelines
https://www.edqm.eu/en/good-practice-guidelines-for-blood-establishments

CQC Learning from Never Events
https://www.cqc.org.uk/news/stories/learning-never-events

CAS alert – Safe transfusion practice: use a bedside checklist
https://www.cas.mhra.gov.uk/ViewandAcknowledgment/ViewAlert.aspx?AlertID=102663

HSIB National Learning Report: Never Events
https://www.hsib.org.uk/investigations-and-reports/never-events-analysis-of-hsibs-national-investigations/

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