9 Incorrect Blood Component Transfused (IBCT) n=329

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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

- SHOT reports should be as detailed as possible and prompt, effective responses to SHOT requests for further information are crucial to enable proper analysis of reports
- Collection of blood components remains a critical step in the transfusion process and robust procedures should be in place to ensure that necessary checks are made
- Information regarding specific requirements should be highlighted as an alert in electronic systems such as prescriptions, case notes, transfusion observation systems and laboratory information management system (LIMS). These systems should be updated regularly and be easily accessible to both clinical and laboratory staff
- A check of serology and blood components issued by lone workers at the next available opportunity may identify errors before the patient is put at risk
- When selecting O D-positive red cells for transfusion to O D-negative individuals it is important to check the patient for contraindications in addition to age and childbearing potential e.g. a history of anti-D or if the patient is transfusion-dependent
- It is essential that staff members are adequately trained and competency-assessed before they are expected to perform any task
- Further key SHOT messages related to laboratory practice are stated in Chapter 14, Laboratory Errors

Abbreviations used in this chapter

AAA	Abdominal aortic aneurysm
ABOi	ABO-incompatible
BMS	Biomedical scientist
BSH	British Society for Haematology
CAS	Central alerting system
CMV	Cytomegalovirus
COPD	Chronic obstructive pulmonary disease
CS	Component selection
DH	Department of Health
FFP	Fresh frozen plasma
GMP	Good manufacturing practice
Hb	Haemoglobin
HDU	High dependency unit
HSCT	Haemopoietic stem cell transplant
HLA	Human leucocyte antigen
IBCT	Incorrect Blood Component Transfused
ID	Identification
LIMS	Laboratory information management systems
MAU	Medical admissions unit
MHP	Major haemorrhage protocol
NHS	National Health Service
NM	Near miss
SRNM	Specific requirements not met
SRR	Sample receipt and registration
WCT	Wrong component transfused

Recommendations

- Staff should not undertake any procedures that they have not been fully trained and competency-assessed to perform

Action: Transfusion laboratory managers, ward managers

- Laboratory information management systems (LIMS) should prevent ABO-incompatible blood components being issued, especially in an emergency when the patient's blood group is unknown

Action: Transfusion laboratory managers, pathology quality managers, LIMS providers

- Laboratory staff should discuss requests with clinicians if they have any concerns over the appropriateness of the request

Action: Transfusion laboratory managers, hospital transfusion teams, medical educators

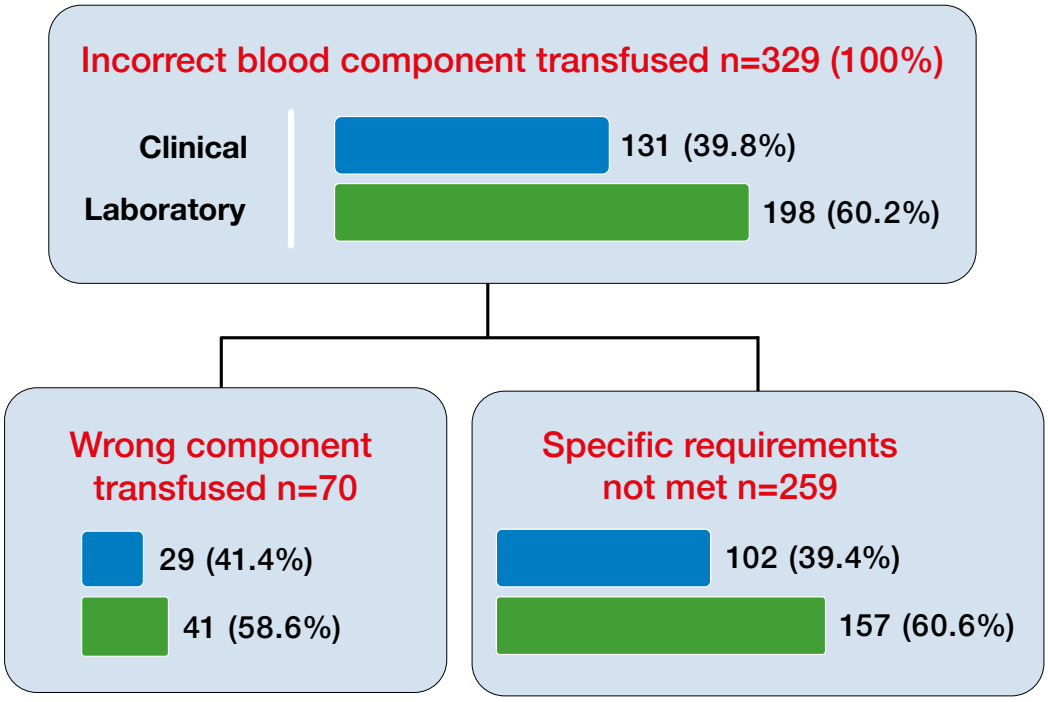


Figure 9.1: Overview of reports where an incorrect blood component was transfused in 2019 n=329

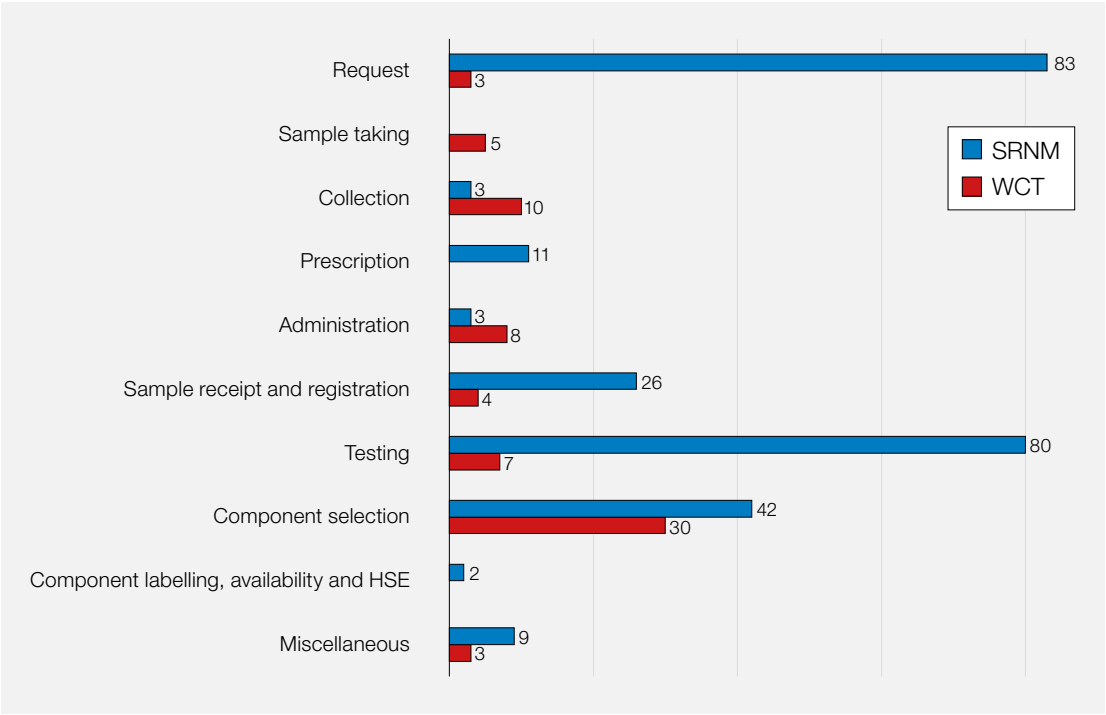
Introduction

IBCT events have the potential to cause major morbidity in patients and are often due to multiple errors in the transfusion process. These errors account for 329/3397 (9.7%) of all reports to SHOT in 2019 and this is an increase in the both number and proportion of reports from 2018 (272/3326 (8.2%)). The total number of WCT reports has slightly reduced in 2019 (78 in 2018 to 70 in 2019), however there has been a substantial increase in the number of specific requirements not met (SRNM) reports of over 33.5%, from 194 in 2018 to 259 in 2019.

The majority of SRNM errors occurred at the request step, 83/329 (25.2%) followed by the testing step, 80/329 (24.3%) as shown in Figure 9.2. The largest increase has been seen in the request, testing and component selection stages of transfusion, increasing by 11, 35 and 15 errors respectively. These are the key points in the transfusion process where specific requirements can be identified. Patient identification and other electronic systems to identify specific requirements should be updated regularly and should be easily accessible to both clinical and laboratory staff (BSH Jones et al. 2014). The recommendation for improved clinical and laboratory awareness, documentation and communication of specific requirements for transfusion was first highlighted in the Annual SHOT Report 2009 and was endorsed by the British Society for Haematology (BSH) (formerly the British Committee for Standards in Haematology) in 2010, however errors have persisted (Taylor et al. 2010, BSH Treleaven et al. 2010).

Collection and administration errors continue to be a major cause of clinical WCT, accounting for 18/29 (62.1%) of reports.

Figure 9.2: Total incorrect blood component transfused errors categorised by the step where the error occurred n=329



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

Remarkably, the proportion of WCT events decreased with the urgency of the request. The vast majority of WCT occurred with routine requests, 42/70 (60.0%), followed by urgent 12/70 (17.1%) and emergency 10/70 (14.3%), see Figure 9.3. This illustrates that procedures should reflect work as done where at all possible so they are fit for use and take into account the factors which are likely to result in unsafe working.

Death n=0

There were no reported deaths in 2019 that were attributable to the transfusion.

Major morbidity n=1

There was a single case of major morbidity which occurred in the laboratory and resulted in sensitisation to the K antigen in a patient of childbearing potential (imputability not stated) Please see the online laboratory case studies in the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/report-summary-and-supplement-2019/).

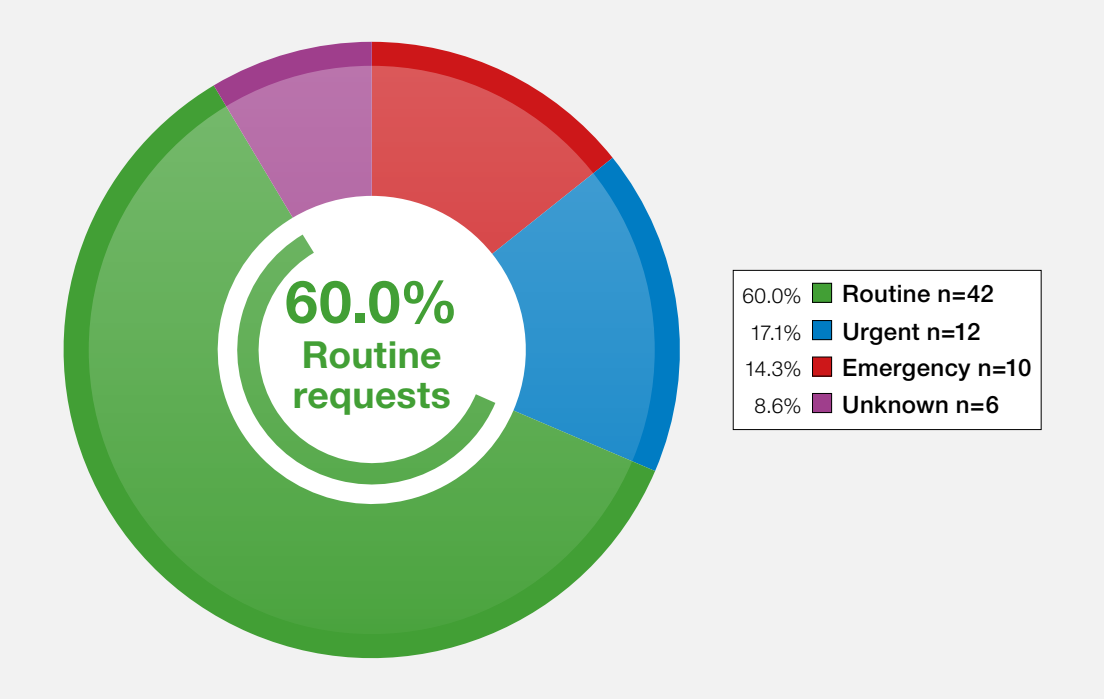


Figure 9.3: WCT errors categorised by urgency of request n=70

ABO-incompatible (ABOi) transfusions n=6

This is a National Health Service (NHS) Never Event for England (NHS England 2018), Wales (NHS Wales 2018) and Northern Ireland. In Scotland these cases would be reported as Red Incidents through the Scottish National Blood Transfusion Service. ABOi red cell transfusions have the potential to cause severe clinical consequences or death through intravascular haemolysis of donor and patient red cells.

In total there were 4 ABOi red cell transfusions (3 clinical errors and 1 laboratory error, Case 14.1, Chapter 14, Laboratory Errors), and 2 ABOi transfusions of fresh frozen plasma (FFP) (both laboratory errors). Table 9.1 provides an overview of each case as provided by the reporters.

Case 9.1: Group A red cells selected for major haemorrhage pack

During a major haemorrhage protocol (MHP) activation for a ruptured aneurysm a component selection error in the transfusion laboratory resulted in a unit of group A red cells being transfused to a group O patient. The patient had no known group at the time of selection, and the error was not detected at collection or bedside administration.

This case is discussed in detail as Case 14.1 in Chapter 14, Laboratory Errors.

Case 9.2: Collection error and failure to carry out positive patient identification (ID)

A patient in their 70s was admitted with abdominal pain following a road traffic collision. The patient had a past medical history of abdominal aortic aneurysm (AAA). The following morning the patient deteriorated and lost a massive amount of blood per rectum. This was subsequently identified as secondary to aorta-enteric fistula. Urgent blood transfusion was prescribed. Less than a minute after starting the transfusion it was noticed that the name on the blood bag didn't match the patient and the transfusion was immediately stopped. The blood collected from the satellite refrigerator had a different patient name on it. The nurse who collected the blood from the satellite refrigerator did not follow the correct procedure. Pre-administration checks were not fully completed as the blood pack

was not checked against the patient ID band. Of the four staff that were involved in the incident only one had their blood transfusion collection competency and theory learning up to date.

Table 9.1: ABO-incompatible transfusions key information n=6

Case number	9.1	9.2	9.3	9.4	9.5	9.6
Component transfused	Red cells Group A	Red cells Group A	Red cells Group A	Red cells Group AB	FFP Group O	FFP Group O
Patient group	Group O	Group O	Group B	Group O	Group A	Group A
Volume transfused	50mL - full unit	<50mL	50mL - full unit	<50mL	4 full units	1 full unit
Primary error	Component selection	Collection	Collection	Administration	Component selection	Component selection
When was the error detected	After the transfusion	Soon after the start of transfusion	During the transfusion	2 minutes into the transfusion	After transfusion of all units - upon investigation of delay	After the transfusion
Patient impact	No clinical reaction	No clinical reaction	Slight temperature rise	No clinical reaction	No clinical reaction	No clinical reaction
Urgency	Emergency	Emergency	Routine	Routine	Emergency	Unknown
In hours (08:00-20:00) Out-of-hours (20:00-00:00 or 00:00-08:00)	Out-of-hours	Out-of-hours	Out-of-hours	In hours	Out-of-hours	In hours
MHP	Yes	Yes	No	No	Yes	No
Department	Laboratory	HDU	Ward	MAU	Laboratory	Laboratory
Adult/paediatric	Adult	Adult	Adult	Adult	Adult	Paediatric
Type of administration check	2-person (dependency not stated)	2-person independent check	2-person independent check	2-person dependent check	2-person dependent check	Not stated
Bedside checklist available	Not stated	Not available in the Trust/ Health Board	Yes, not used	Not stated	Not available in the Trust/ Health Board	Not stated
Patient ID	Manual	Manual	Manual	Manual	Manual	Not stated
Root cause provided by the reporter	LIMS allows non O red cell issue in emergency	Incomplete bedside check	Incomplete bedside check	Bedside check away from patient	No rule in LIMS to prevent O FFP release in emergency	Assumptions and overriding LIMS flags
Contributing factors	Distraction by haematology pager. Over-complication of procedure	Bank nurse not familiar with the environment or caring for level 2 patients	Neither of the two nurses had been competency-assessed for blood transfusion	Multiple interruptions. Cramped busy conditions. No desk to use for documents	BMS rushing and multitasking	Handover involved, excessive workload
What controls are in place that should have prevented this	GMP working. Component labelling check. Bedside check	Competency training. Administration procedure	Competency training. Bedside checklist	Administration procedure	Component labelling check	LIMS flags. GMP working. Component labelling check

MHP=major haemorrhage protocol; HDU=high dependency unit; MAU=medical admissions unit; BMS=biomedical scientist; GMP=good manufacturing practice

Case 9.3: Bed number used as sole patient identifier

A man in his 50s had recently received a liver transplant. Two units of blood were prescribed due to his low haemoglobin (Hb). The blood transfusion was not considered to be urgent. Blood was ordered via the electronic ordering system, at the request of the nurse looking after the patient to the nurse in charge. The only information shared between the two nurses was the patient's bed number. The two nurses did not have any discussion to verify the patient's identity. One nurse then went alone to administer the blood but did not positively identify the patient as she believed that as she knew the patient well this was not necessary.

Case 9.4: Failure to carry out positive patient identification

A female patient in her 50s was admitted due to a declining Hb level of less than 70g/L and chronic obstructive pulmonary disease (COPD). Red cells were prescribed. Two nurses checked the red cells at the nurse's station and one of them took the unit to the wrong patient, did not carry out positive patient identification, and started the transfusion. A healthcare assistant noticed the transfusion was being given to the wrong patient, sought immediate advice and the transfusion was stopped two minutes after it started.

Case 9.5: Group O FFP selected in error for a major haemorrhage pack

During an MHP activation for intra-abdominal haemorrhage group O red cells and group O FFP were selected by the BMS prior to completion of patient blood grouping, the patient group was subsequently found to be A D-positive. The patient received four units of incompatible FFP and unfortunately passed away, however this was thought to be unrelated to the transfusion.

Case 9.6: Group O FFP incorrectly selected for transfusion of a neonate

Group O FFP was mistakenly selected for a group A neonate. The unit was selected by one BMS and issued by another who overrode LIMS flags believing the previous BMS had defrosted the correct unit.

Three ABOi events occurred during the major haemorrhage situation. This illustrates the requirements for such processes to be clearly defined within policies, regularly reviewed and ingrained within working culture so they hold up to situations with increased pressure (see key SHOT messages within Chapter 14, Laboratory Errors).

Three cases could have been prevented if LIMS systems were configured to prevent ABOi components being issued. This factor was not uniformly identified in the root cause analyses submitted; therefore an opportunity may have been missed to prevent further unsafe practice occurring.

A bedside checklist was not available or not used in 3 cases and information on the checklist was not available in the remaining cases. The number of ABOi red cell transfusions has reduced over the past 20 years, however this has not reduced since 2017 (Figure 9.4).

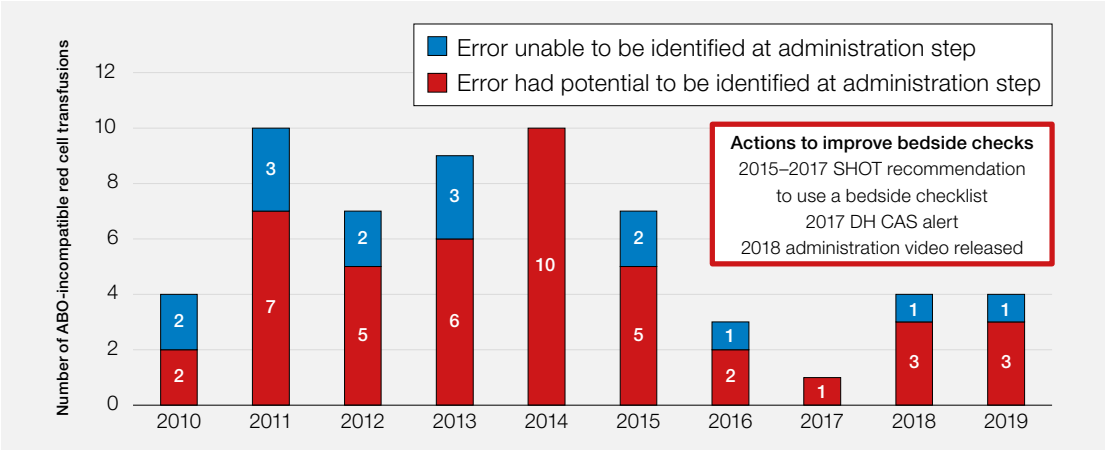
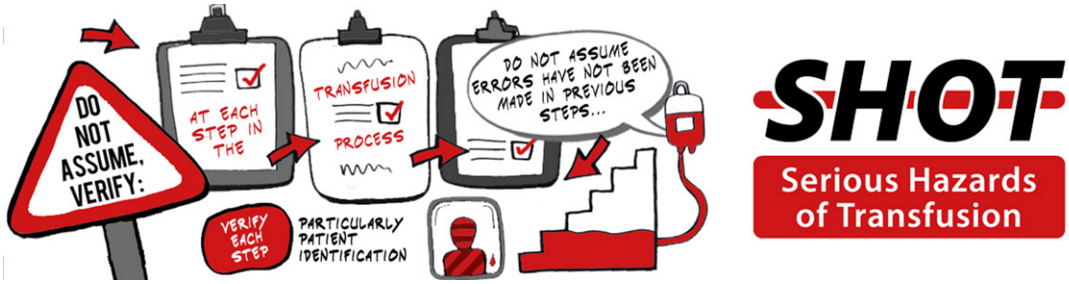


Figure 9.4: ABO-incompatible red cell transfusions from 2010-2019

DH=Department of Health; CAS=central alerting system

Clinical errors n=131

Despite repeated SHOT recommendations and the resulting central alerting system (CAS) alert: 'Safe Transfusion Practice: Use a bedside checklist' (Department of Health 2017), there were 37/131 (28.2%) reports where a checklist was not used to carry out the administration step of the transfusion process. In 19/37 (51.4%) of these cases it was reported that a bedside checklist was not used in that hospital.

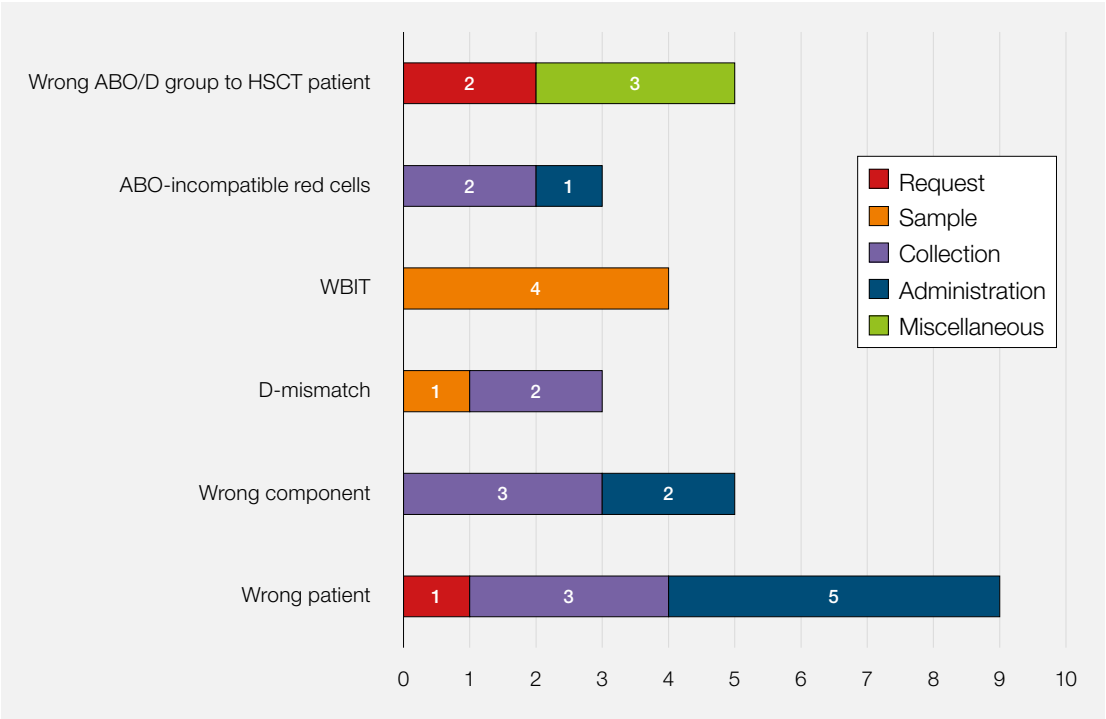


There was a two-person administration check performed in 60/131 (45.8%) cases. Independent checking (two people doing the check independently) accounted for 47/60 (78.3%) reports. Where there was a dependent check (two people checking together) the number was 8/60 (13.3%). There were 5/60 (8.4%) where the type of check was not recorded.

Clinical WCT events n=29

Eleven of the 29 (37.9%) WCT errors occurred at the administration stage of the transfusion process, where positive patient identification was not carried out at the patient's bedside. There were 10/29 (34.5%) reports of the wrong component being collected from the storage site where the member of staff selected the wrong component and delivered it to the clinical area. In 6/29 (20.7%) the transfusions were emergencies, urgent in 5/29 (17.2%), routine/elective in 15/29 (51.7%) and 3/29 (10.4%) not recorded. In relation to time of day 9/29 (31.0%) were during normal working hours (8am-8pm), 3/29 (10.4%) out-of-hours and 17/29 (58.6%) where the time of transfusion was not reported.

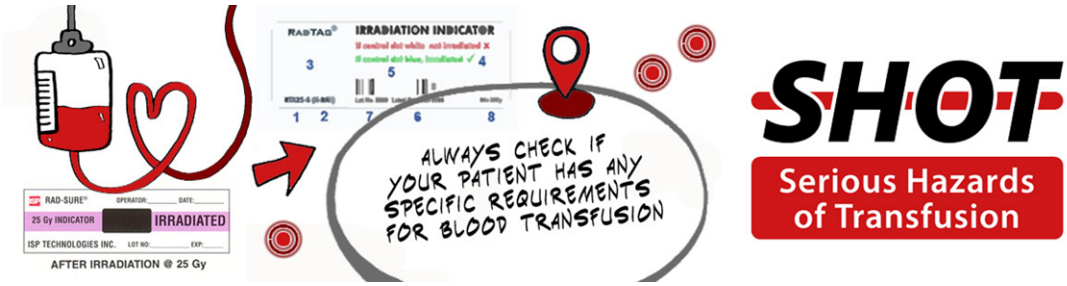
Figure 9.5: Clinical errors resulting in IBCT-WCT categorised by stage the error occurred and patient impact n=29



HSCT=haemopoietic stem cell transplant; WBIT=wrong blood in tube

Clinical SRNM events n=102

There were 83/102 (81.4%) reports where the error occurred at the request step of the transfusion process. There were 85/102 (83.3%) reports where there was a failure to adhere to the requirement for irradiated components (Figure 9.6). In each of these cases the requirement was not recorded on the request due to errors such as lack of effective communication between shared care hospitals and lack of awareness or knowledge when the patient had an historical diagnosis requiring irradiated components. The requirement for cytomegalovirus (CMV)-negative components was missed in 7/102 (6.9%) of reports, followed by incorrect phenotype 5/102 (4.9%) and use of blood warmer 3/102 (2.9%). 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 bedside check may help reduce the numbers of SRNM reports.



Please see the 'Safe Transfusion Checklist' available on the SHOT website, https://www.shotuk.org/resources/current-resources/.

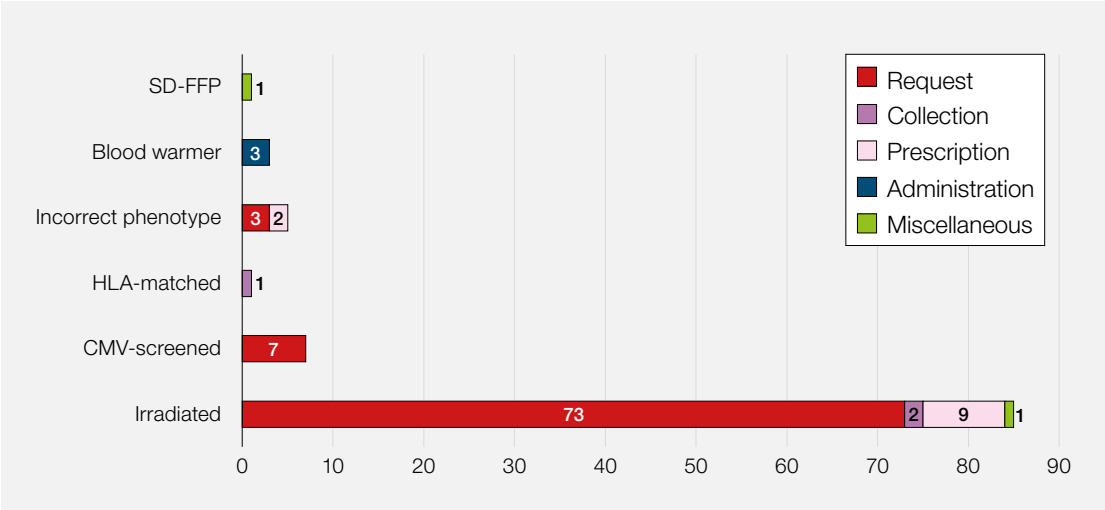


Figure 9.6: Clinical errors resulting in IBCT-SRNM categorised by patient impact and stage the error occurred n=102

SD-FFP=solvent detergent fresh frozen plasma; HLA=human leucocyte antigen; CMV=cytomegalovirus

Laboratory errors n=198

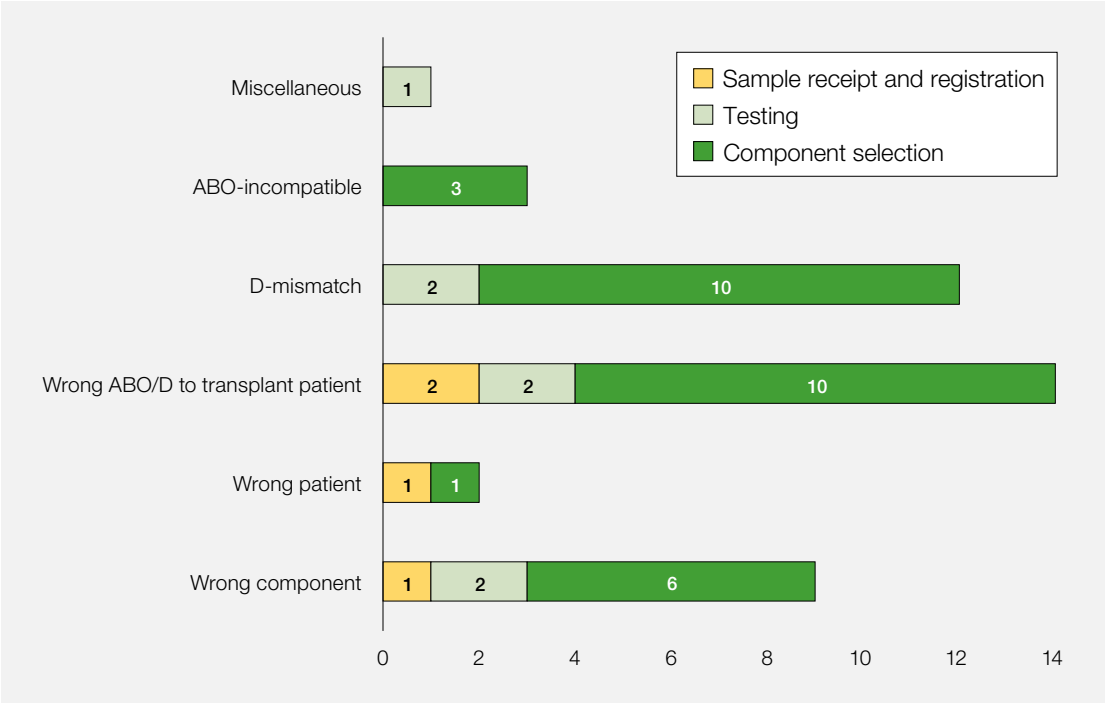
There has been a slight decrease in laboratory WCT events, however a vast increase in SRNM reports was noted in 2019. The majority of laboratory sample processing and component issue occurs during routine working hours. However, of those IBCT events where data regarding time of day the error occurred were provided (76), 3/17(17.6%) of WCT and 16/59 (27.1%) of SRNM occurred outside of routine working hours (20:00-08:00). This disproportionate rate of errors may indicate a higher burden of working and increased pressure on lone workers during non-routine hours. Many transfusion laboratories have a policy to second check component labelling and serology during routine hours, which cannot be maintained during lone working. A second check of lone worker serology and blood issues at the next available opportunity will help identify errors in a timely fashion and may prevent harm.

Laboratory WCT events n=41

Most laboratory IBCT-WCT events occur at the component selection (CS) step, 30/41 (73.2%). The highest number of WCT events in the laboratory remain transfusion of incorrect ABO and D in patients undergoing haemopoietic stem cell transplant (HSCT) or solid organ transplants 14/41 (34.1%) (Figure 9.7). The 12 HSCT incidents are discussed in more detail in Chapter 25, Summary of Reported Transfusion Incidents Related to Haemopoietic Stem Cell Transplants 2012-2019. A total of 10/14 (71.4%) transplant-related errors occurred at CS, however in 2018 most errors occurred at sample receipt and registration (SRR), 10/17 (58.8%). When the error occurs at the CS step, information about the patients' specific requirements is available and recorded in the LIMS, but not acted upon. This shows a gap within the processes implemented at the CS step, in addition to an incomplete component labelling check. These factors and recommendations are discussed further in Chapter 14, Laboratory Errors.

It is good blood stocks management to utilise D-positive components for males and for females over the age of 51 who are not transfusion-dependent and do not have immune anti-D, however policies should be specific on where exceptions exist, and the rationale behind these. There has been an increase in D-mismatch errors where the error occurred at the CS step, 10/12 (83.3%), with the majority of these, 8/12 (66.7%) resulting in transfusion of D-positive red cells to D-negative males, or females over the age of 51, who are transfusion-dependent. BSH guidance (BSH Milkins et al. 2013), states that *'D negative red cells should always be selected for ... transfusion-dependent D negative adults'.* Providing D-mismatched products in inappropriate situations can lead to adverse clinical outcomes, as further illustrated by Case 18.5 in Chapter 18, Haemolytic Transfusion Reactions (HTR), in which an elderly female suffered a delayed transfusion reaction following transfusion with D-positive red cells despite informing the clinical area of previous antibodies.

Figure 9.7: Laboratory errors resulting in WCT n=41



Laboratory SRNM events n=157

IBCT-SRNM are discussed in more detail in Chapter 14, Laboratory Errors. The majority, 63/157 (40.1%), of SRNM errors are categorised as procedural errors, however 35/63 (55.6%) have multiple contributing factors. This highlights the importance of having clear standard operating procedures as recommended in the 2018 Annual SHOT Report (Narayan et al. 2019). Most laboratory SRNM events are the result of incomplete testing (Figure 9.8). 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).

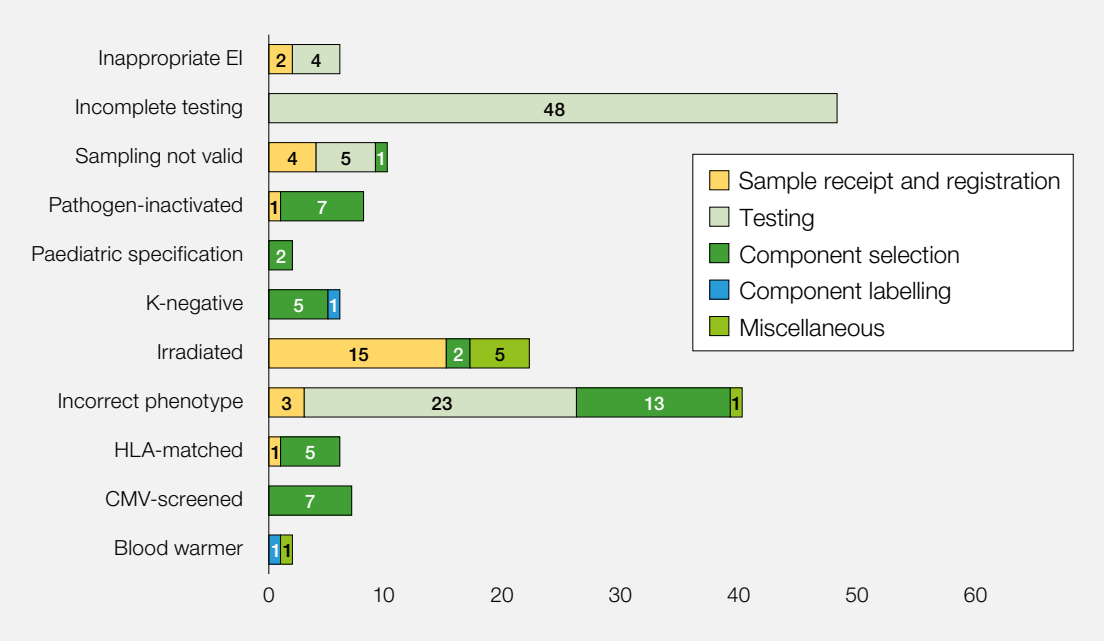


Figure 9.8: Laboratory errors resulting in SRNM n=157

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

Case 9.7: Incomplete interpretation of serology leads to transfusion of antigen-positive blood

During a nightshift, two units of red cells were requested for a patient with myelodysplastic syndrome and known alloantibodies (anti-K and anti-Ku[a]). The antibody panel showed additional reactivity, therefore BMS1 performed a secondary panel. Two units of crossmatch-compatible blood were issued without complete interpretation of the second panel. The following day whilst inputting the results into the LIMS, BMS2 noticed a positive reaction which was previously overlooked. Additional testing was performed which identified an anti-E antibody. One of the units issued and transfused was E-positive, however the patient suffered no adverse effects. The transfusion was a routine request and could have been performed during the next day shift.

The laboratory had four long term vacancies causing routine work to continue into non-routine shifts. The BMS performing initial testing was the sole BMS covering haematology and transfusion. They were inexperienced and had not received optimal training due to senior staff covering night and weekend shifts. The hospital management have now agreed to allow locums to cover vacancies.

All testing should be resolved prior to issue of red cells. Further advice from senior colleagues should be sought if in doubt.

Laboratory management have a responsibility to ensure all staff members are competent before exposing them to lone working.

Learning points

- All testing should be resolved prior to issue of red cells. Further advice from senior colleagues should be sought if in doubt
- Policies should be clear on the appropriate use of D-positive cells, and where D-negative cells should be used to prevent alloimmunisation

Near miss cases n=215 (106 clinical, 109 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 21 near miss (NM) ABOi transfusions, 18/21 (85.7%) originating in the clinical area and 3/21 (14.3%) originating in the laboratory.

An additional 728 cases of near miss wrong blood in tube are not included here, but are discussed in detail in Chapter 12a, Near Miss – Wrong Blood in Tube (WBIT).

Clinical NM WCT n=78

The primary error in this category was made at the collection stage of the transfusion process in 55/78 (70.5%) a slight rise from 49 cases in 2018. Such mistakes were caused primarily by the staff member failing to carry out the correct checks at the storage facility. Most errors were made by registered nurses in 35/55 (63.6%) or by porters in 20/55 (36.4%). Many of such incidents were detected at the patient's bedside prior to administration in 32/55 (58.2%) with 16/32 (50.0%) identified by electronic systems and 13/32 (40.6%) by staff members (3/32 unknown).

There were 13/78 (16.6%) reports where the primary error occurred at the patient's bedside. These errors were mainly an attempt to give the component to the wrong patient in 12/13 (92.3%).

Clinical NM SRNM n=28

At the request step of the transfusion process there were 26/28 (92.9%) NM errors where the specific requirements were not recorded on the request. Most commonly poor communication was involved where the clinical area had not informed the laboratory of specific requirements. There were 2/28 (7.1%) reports where the primary error was at the collection of the blood product.

Laboratory NM WCT n=43, SRNM n=66

The highest proportion of laboratory NM-WCT errors had the potential to result in blood being administered to the wrong patient, 12/43 (27.9%) and the highest proportion of laboratory NM-SRNM events involved patients requiring irradiated blood, 27/66 (40.9%). The majority of laboratory NM events were detected by a successful bedside administration check, 16/43 (37.2%) of NM-WCT events and 27/66 (40.9%) NM-SRNM events. This highlights the importance of a complete and accurate bedside check in transfusion safety.

IT-related IBCT cases n=127

Further details of the IT-related reports can be found in the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/report-summary-and-supplement-2019/).

Conclusion

While transfusion practices have improved, preventable harmful events like ABO-incompatible transfusions continue to occur. Traditional prevention methods like use of checklists, two-person procedures, communication and ongoing training programmes, are effective but by themselves, cannot prevent such incidents completely. It could also be argued that by adding fail-safes we are creating more pressure and increasing the risk for error. Reasons for the errors have been repeatedly shown to be inattention, distraction, poor supervision, inexperience, high workload, and 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 (Provana et al. 2020) and supports staff in the busy environments in which they work.

It must be recognised that humans are fallible and systems that solely rely on operator memory to prevent mistakes both increase cognitive load and are unlikely to be totally effective. For example, training programmes can be flawed in approach, costly, and must be regularly repeated to maintain efficacy. Checklists often fail in stressful and time-pressured situations despite best intentions. Moreover, for checklists to be effective, staff should be engaged and compliant with the process, checklists must be fit for purpose, simple to use and not be used as a tick box exercise. 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 (See the key recommendation from the 2017 Annual SHOT Report: Information technology (IT) systems have the potential to increase transfusion safety by minimising human input and should be considered for all transfusion steps (Bolton-Maggs et al. 2018)).

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, cognitive factors such as channelled attention on a single issue, overconfidence or confirmation bias, inadequate vigilance, errors made based on inaccurate information, and distractions underlay many of them. 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.

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