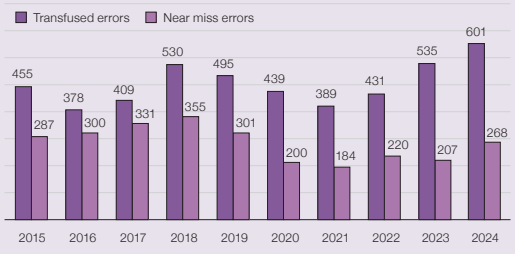
17 Laboratory Errors n=869 (601 transfused errors and 268 near miss)

Authors: Victoria Tuckley, Nicola Swarbrick, Pete Baker and Heather Clarke

Headline data 2024

Number of reports n=869
Deaths n=3
Major morbidity n=4

Laboratory reports by year



Key findings:

- Overall increase in cases (transfused errors and near miss (NM)) with a large increase in laboratory delays adversely impacting patient management
- An increase in the number of deaths, all due to laboratory delays
- ABO-incompatible (ABOi) plasma transfusions continue to be reported
- Most laboratory errors occur at the testing step

Gaps identified:

- Worsening knowledge gaps in laboratory staff were evident in many cases
- Inadequate staffing levels and skills to match workload and distribution between shifts
- Communication between the laboratory and clinical area
- Inadequate functionality or configuration in laboratory information management systems (LIMS) allowing inappropriate electronic issue
- Delays in timely provision of blood components in urgent and emergency situations including failure to use concessionary release when appropriate

Good practice:

- Fewer errors reported at the component selection and handling and storage steps
- Over half of reports stated implementation of a component exit check (54.4% in 2024, up from 47.1% in 2023)
- Please see Chapter 5, Acknowledging Continuing Excellence in Transfusion (ACE), Case 5.2 in Table 5.1 for a description of the laboratory and clinical area collaborating to ensure timely provision of blood components for a patient with complex antibodies

Next steps:

- A 'back to basics' approach should be taken when reviewing training materials to ensure staff have the essential knowledge and skills to carry out routine and non-routine tasks
- Business continuity plans (BCP) should be regularly reviewed, updated and followed. These should cover various scenarios to ensure resilience

For all abbreviations and references used, please see the **Glossary** and **Reference list** at the end of the full Annual SHOT Report. Please see the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/annual-shot-report-2024/).

Introduction

There has been an increase in laboratory errors in 2024 to 601 from 535 in 2023. The largest increase has been seen in the delayed transfusion category which has more than doubled (120 from 56 in 2023). Near miss reports have also increased to 268 from 207 in 2023. There were 3 cases of ABOi transfusion caused by laboratory errors in 2024, all were related to plasma components.

Deaths related to transfusion n=3

In 2024, there were 3 deaths related to errors within the laboratory. This is an increase from previous years, as between the years 2019-2023 there were 3 deaths related to transfusion laboratory errors in total. All deaths in 2024 related to delays in blood transfusion.

One death was probably related to the transfusion (imputability 2). This case involved delayed release of blood components in a neonate with suspected disseminated intravascular coagulation (DIC). Suitable components were available but were not issued.

Case 17.1: Avoidable delays, contributing to death, whilst waiting for the most suitable component (imputability 2 – probable)

Platelets were requested for an extremely unwell neonate with a platelet count of 13x10^9/L. The laboratory had no neonatal platelets in stock and notified the clinical team that there would be a 5-hour delay in obtaining them from the local Blood Service due to geographical reasons. The patient required transfer to a specialist hospital, and this could not occur until the baby was transfused. Whilst waiting, the patient received other blood components, as DIC was suspected. The medical team queried availability of platelets once again and were notified none were available. A suitable adult therapeutic dose of platelets was available but were reserved for another patient. These were administered to the neonate after a 6-hour delay, following discussions with the neonatal consultant. This caused delay in treatment escalation (central line insertion) and transfer to the specialist hospital, resulting in the death of the patient.

The investigation found gaps in communication and misunderstanding of urgency by the laboratory staff. Communication tools were developed by the laboratory for use on the neonatal ward and standard operating procedures were updated to clarify the use of reserved components in an emergency.

Learning points

- In urgent situations where the most appropriate blood components are not available; every effort must be made to ensure a suitable alternative is provided in a timely manner
- Clear communication is a key aspect of safe patient care. Standard protocols and closed loop communication may help prevent misunderstandings

In 2 further cases, the deaths were possibly related to the transfusion (imputability 1); 1 case involved challenges in obtaining blood components for a patient having a cardiac arrest, and 1 case was due to a 2-hour delay in provision of fresh frozen plasma (FFP) during a major haemorrhage protocol (MHP) activation following a plasma thawer malfunction.

Major morbidity n=4

There were 4 cases of major morbidity caused by laboratory errors in 2024, 3 were due to laboratory delays in the availability of blood components and the 4th was due to sensitisation to the K antigen in a patient of childbearing potential. This occurred following a historical component selection error which was discovered in 2024.

Case 17.2: Delay in blood availability during LIMS downtime, with incomplete guidance in business continuity plans

A septic patient required the support of multiple blood components during an urgent invasive

procedure. The LIMS had entered unscheduled downtime 1 hour earlier due to a cyber-attack, therefore all components required manual issue and hand labelling. Labelling and second checking took around 30 minutes instead of the normal timeframe (<20 minutes) for group-specific issue. Due to haemodynamic instability and delay in receiving blood components, the patient was transferred to the intensive care unit for stabilisation. The patient's condition deteriorated, and they returned to theatre 4 hours later.

Laboratory staff were aware of the LIMS unavailability but did not know when it would be restored. There was a high level of stress in issuing blood components for the rest of the surgical list, as well as meeting the demand for top-up requests as there was a delay in cancellation of non-urgent procedures. Staff members focused their efforts on providing blood components for this bleeding patient and had good communication with the theatre team. In total, nine units of red cells, one adult therapeutic dose of platelets, one unit of FFP and two units of cryoprecipitate were administered over a 3-hour period. Emergency issue red cells were available in the satellite refrigerator but not used as both the laboratory and the clinical team were hoping the LIMS would be restored shortly, not being aware of the true cause of the downtime. Upon review, the BCP in place at the time did not consider the complete loss of information technology (IT) systems in the laboratory. The patient recovered from this procedure and survived.

ABO-incompatible (ABOi) transfusions n=3

Three laboratory errors resulted in ABOi plasma transfusions, 2 of group O FFP to group A patients, and 1 case of group O solvent detergent-FFP (SD-FFP) to a group B patient. According to manufacturer's instructions, SD-FFP should not be used across blood groups (emc, 2025). All involved IT errors, with 2 cases having a note within the LIMS to use group A FFP (as the patients had been temporarily assigned group O in an emergency). These alerts were not automatically generated and therefore not viewed or actioned. In the 3rd case there was lack of functionality with the IT system to prevent the incompatible transfusion taking place.

These cases are discussed in more detail within Chapter 9, Incorrect Blood Component Transfused (IBCT).

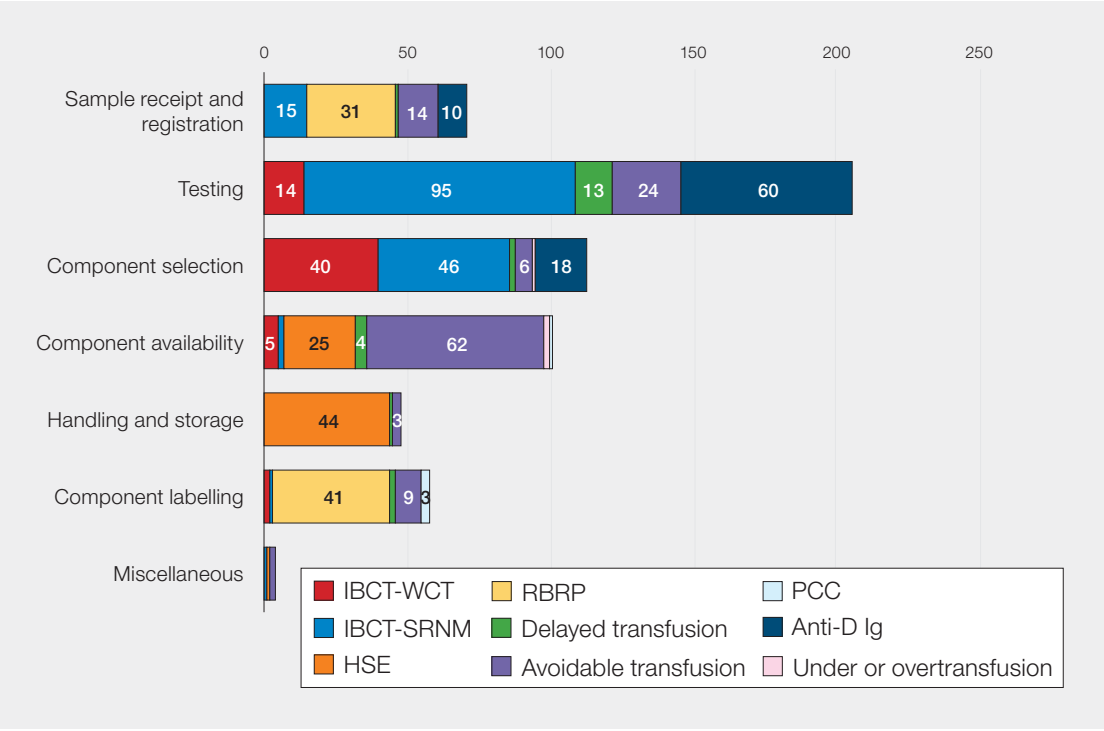
Overview of laboratory errors n=601

The largest number of laboratory error reports related to IBCT-specific requirements not met (SRNM), 160/601 (26.6%), followed by delayed transfusions, 120/601 (20.0%) (Figure 17.1). As in previous years, most errors occurred at the testing step, 206/601 (34.3%), followed by component selection, 113/601 (18.8%). Component availability, 101/601 (16.8%), was the third most common step (Figure 17.2). Further detail on laboratory errors by step is show in Table 17.1.

Figure 17.1: Laboratory errors and near misses in 2024 (n=869)

IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrates; Ig=immunoglobulin

Figure 17.2: Laboratory errors in 2024, classified by the transfusion step where the primary error occurred (n=601)



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Note: numbers <3 are too small to be annotated on the figure

Laboratory themes 2024

Laboratory delays

Laboratory delays have more than doubled from 56 in 2023 to 120 in 2024. This steep increase has been influenced by several factors (Figure 17.3, please note that denominators are dependent on responses received). Case 17.3 highlights how inappropriate staffing and failure to enact BCP can lead to delays in patient treatment.

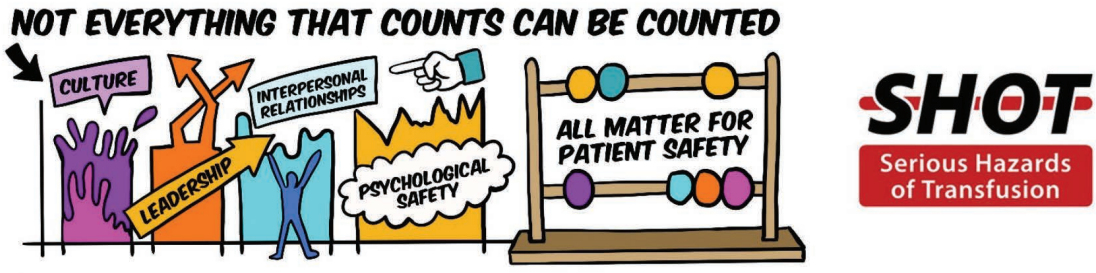
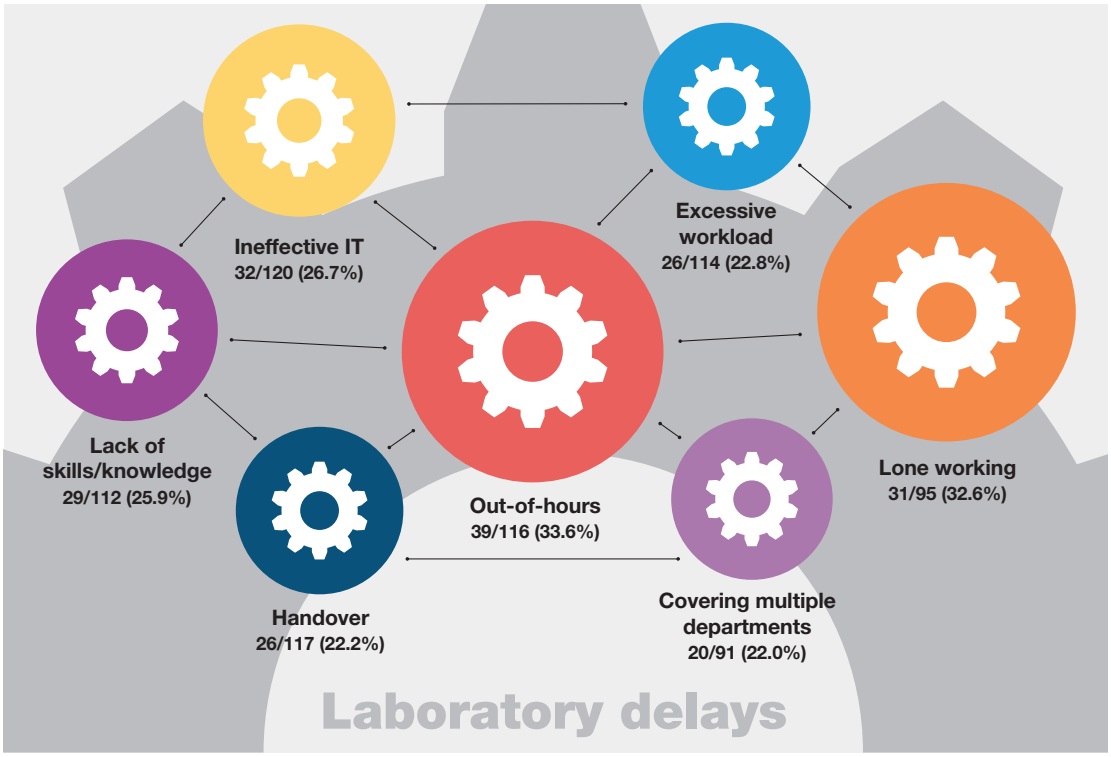


Figure 17.3: Factors interacting to contribute to laboratory delays in 2024



IT=information technology

Case 17.3: Delay in providing group specific blood components during industrial action

Red cell units were requested urgently from the emergency department resuscitation room due to a suspected ruptured ectopic pregnancy. There was a delay in processing the request and red cell units were unavailable in theatre when the haemoglobin was <70g/L. Emergency group O red cells were transfused in the patient's best interest. The patient recovered.

The transfusion delay was caused by significant staffing issues during industrial action for 12 hours overnight on two consecutive days. A single biomedical scientist (BMS) was present to maintain services of specimen reception, haematology, blood transfusion, and biochemistry (to which they had no competency assessment) 'alone, with no type of support'. Management had intended to provide a medical laboratory assistant for support, but this did not occur. Staff availability both substantive and locum/agency had been severely affected. Union representatives and participates in the industrial action had not adhered to the advised minimum safe staffing levels indicated in the BCP. In addition to maintaining critical laboratory functions, the BMS experienced 'undue pressure' to send biochemistry samples to a partner laboratory every hour. This pressure contributed to the delay in processing the request. The night BMS reported that they were not able to take a break or have any time to eat during this 12-hour night shift. When support was secured, this was not properly allocated to transfusion and instead focused on sending away biochemistry samples as this required less extensive competency assessment. Upon review, BCP were not met, and support was not adequately allocated to haematopathology and transfusion activities.

Learning points

- BCP should be regularly reviewed and cover a wide range of scenarios. If BCP cannot be met this should be escalated immediately to hospital directors
- Inability to provide group-specific blood components in a timely manner results in avoidable use of group O emergency red cells

Patient impact from transfusion delays following laboratory errors

In most cases the delay fortuitously had no adverse clinical impact on the patient. In addition to the cases of major morbidity and deaths reported earlier in this chapter, a further 8 cases recorded further bleeding or a delay in obtaining haemostatic control.

Delays in the provision of blood components may also adversely impact future treatment. In 65/120 (54.2%) reports, subsequent procedures or interventions were delayed or the patient was required to return to hospital for transfusion another day. Healthcare services interact and depend upon intricate logistical pathways; therefore, it is important to minimise any initial avoidable days. This is of particular importance in times where National Health Service (NHS) services are already stretched. Case 17.4 describes a scenario where a delay in transfusion had a significant impact on the patient.

Case 17.4: Complex situation with multiple factors resulting in delays for a patient waiting to receive a heart transplant

A patient arrived on a ward for a potential heart transplant at 13:50, and at 13:55 the transfusion laboratory was informed of the patient's transplant plan. A group and screen (G&S) sample was received in the laboratory at 15:30. The sample was tested and showed a positive antibody screen and required further antibody investigation. At 19:21 the clinician looked on the electronic patient record (EPR) system for the blood results, and everything other than the G&S result was available. In this organisation results are released upon completion of all tests; therefore, this was not viewable by the clinical area.

When contacted by the clinical team, the BMS explained they had had an issue with the blood grouping analyser, but the sample was being processed. Antibody identification was required on the sample, however due to analyser 1 downtime (which was being used for antibody investigation), analyser 2 needed to be set up and quality controlled to perform this test. It was at that point the clinician was informed that the patient had known non-specific red cell antibodies which would require additional tests, including a serological crossmatch. Information regarding previous referral to the reference laboratory was contained in the legacy LIMS but this was not accessed by the BMS at this time. The patient had been receiving a monoclonal antibody therapy at the referring hospital (which can impact blood transfusion results). This treatment plan has not been communicated to the receiving hospital or the laboratory, nor had baseline red cell phenotype been performed. The BMS informed the clinician they would contact them once the sample was processed.

The theatre availability had been scheduled for a 01:00-02:00 start time. When nothing was heard, at 20:58 the clinical team again contacted the laboratory, and spoke to a new BMS on duty, who had not received any handover regarding this patient from their colleague. The BMS stated that it would take a further 90 minutes to provide appropriate antigen-negative components. They informed the clinical team that if suitable red cell units were not available on site, the patient's sample would need to be sent to the reference laboratory. At 22:54, the sample had still not been processed and the BMS stated it would be a further 40 minutes. At 00:04, the BMS called the clinical area to inform them that they didn't have any suitable blood. At this point, the heart was declined as blood would not be available for surgery, and it was offered to another transplant centre. It was later identified that the donor heart was declined by the other transplant centre based on cardiac studies. Valves from the heart were retrieved and successfully used for two further patients.

Upon investigation, the clinical area was not aware that the patient had a history of red cell antibodies as this had never been reported to the transplant coordinators during the previous two failed transplant calls the patient had undergone. The second BMS was lone working and had a higher than usual workload due to a cyber-attack, where additional checks using alternative databases impacted the BMS's ability to carry out required tasks. Multiple improvement actions were implemented including training and education for clinical staff regarding monoclonal antibody therapy, improved visibility of results in the EPR for all clinical staff, and regular testing of antibody status for patients on solid organ transplant waiting lists.

This case demonstrates gaps in communication between the laboratory and clinical team, and a lack of handover causing delay. This could have had disastrous consequences for the patient if they had been deemed clinically fit to receive the transplant. Open lines of communication with the consultant haematologist and the reference laboratory may have been able to secure safe blood for the patient by

referring samples to the reference laboratory when the initial analyser malfunction happened.

The incident was investigated thoroughly demonstrating a clear commitment to transparency, learning and improvement. The team's efforts to share insights widely reflects true system leadership and contributes to safer care across the wider healthcare community.

SHOT and UKNEQAS performed an exercise in 2023 regarding uninterpretable groups, which contained questions regarding policies surrounding organ transplant (UKNEQAS, UKTLC and SHOT, 2024). In total, 151/254 (59.4%) of laboratories did not have a policy which covers what to do if they are contacted by an organ donor liaison team for blood grouping results. Two recommendations from this report are shown as learning points below.

Learning points

- There must be robust business continuity procedures in place which should include processes to follow during IT and equipment downtime
- There must be clear communication between all teams involved in patient care, particularly when patients receive shared care between organisations and clinical teams
- There must be processes in place to ensure adequate transfer of information during shift handover to ensure patient safety
- There should be a proactive approach to managing patients due to receive monoclonal antibody treatment in relation to baseline group, antibody screen and phenotyping (BSH, 2017)
- Findings from local investigations should be shared widely where possible to promote learning and embed safer practices throughout all aspects of patient care

Underlying causes of laboratory delays

Reports were further examined to determine the source of the error within the transfusion laboratory. Delays were mostly due to incomplete/inaccurate communication, 43/120 (35.8%), or knowledge 28/120 (23.3%), technical problems (e.g., IT downtime, non-functional equipment), 24/120 (20.0%), and excessive workload 15/120 (12.5%).

The SHOT team have developed a communication toolkit in collaboration with Royal Cornwall hospital. These include:

- A template to help clarify clinical expectations regarding product availability, storage conditions and nomenclature
- An updated handover form first provided in the supplementary material of the 2019 Annual SHOT Report
- A telephone request form which includes key questions for laboratory staff to ask to identify transfusion priorities (e.g., emergency, urgent etc.)
- SHOT Bite No. 34: Switching to group-specific red blood cells in major haemorrhage

These editable resources are available for laboratories to use if they would find them beneficial, and links can be found in the recommended resources at the end of this chapter.

Clinical groups at higher risk of laboratory delays

Reports were evaluated to determine whether the underlying clinical situation could have potentially influenced the delay. A total of 65 reports were identified, with the most common factor being patients with complex antibodies, 19/65 (29.2%), followed by a haemorrhage, 17/65 (26.2%), and pregnancy or neonatal-related conditions, 10/65 (15.4%) (Table 17.2). Knowledge gaps in staff surrounding the clinical condition or the situation or the condition itself was complex and required additional steps within laboratory processes were found in reports included in this evaluation.

Table 17.2: Clinical factors which influenced laboratory errors in 2024

Influencing factor	Number of cases
Complex antibodies	19
Haemorrhage	17
Pregnancy or neonatal	10
Regularly transfused	7
Platelet related	6
Specialist component	2
Condition requiring irradiated components	1
Granulocytes	1
Paediatric	1
Transplant	1
Total	**65**

To optimise safety and ensure timely provision of blood components, especially in an emergency, the following actions are suggested:

- Review local standard operating procedures to ensure that sufficient detail is included regarding the clinical situations listed above and the potential impact
- Guidance should be provided for escalation when staff are unaware of the correct actions to take
- Provide educational sessions on these conditions to address knowledge gaps. These could include scenario drills, specific journal-based learning topics, and these particular conditions could be included in competency assessments

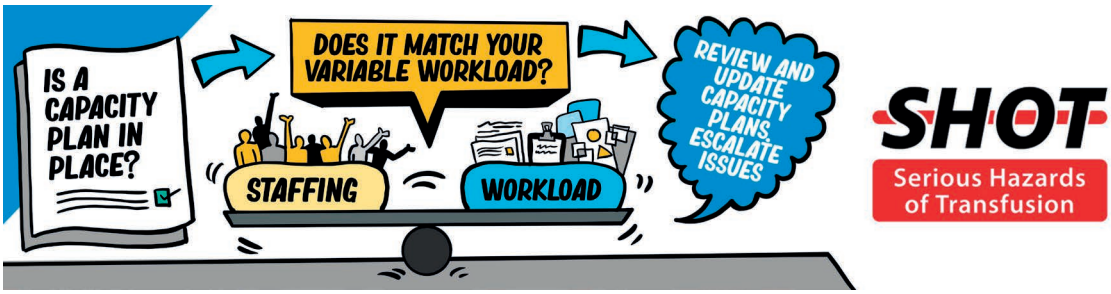
The SHOT team have developed an audit/debrief tool that laboratories can use if a delay occurs in their organisation. This document was created to help identify the source of error including contributory factors, highlight knowledge gaps within the laboratory, and suggest supporting actions that could be implemented. Furthermore, this tool may be used to update team members following an incidence of delay. It can be reviewed as part of the regular audit schedule to monitor and trend delays within laboratories. This is available in the recommended resources at the end of this chapter.

Staffing, workload and work distribution

Workload and its distribution had a notable impact upon laboratory errors in 2024. A total of 112/601 (18.6%) reports stated that there was a mismatch between workload and staff capacity at the time of the incident. This is an increase from the 72/535 (13.5%) identified in 2023. The Infected Blood Inquiry (IBI) recommendation 7C states 'Transfusion laboratories should be staffed (and resourced) adequately to meet the requirements of their functions' (IBI, 2024). Although progress has been made in many working channels, the 2024 data suggest that improvement in this area is still required. Transfusion laboratories are still struggling to obtain adequate funding for staffing provision, and to recruit and retain staff with an appropriate level of knowledge and experience.

There has been an increase in the number of reports which stated the member of staff was lone working when the error occurred, 198/601 (32.9%) in 2024 from 160/535 (29.9%) in 2023. Furthermore, in 117/601 (19.5%) reports, the staff member was covering more than one laboratory department at the time of the event (e.g., haematology). A total of 213/513 (41.5%) reports stated that the error occurred outside of normal working hours (this figure does not include data for anti-D immunoglobulin (Ig) related incidents as this question is not requested in the anti-D Ig data set).

This trend could also signify that there is an increased workload outside of routine hours, as outpatient facilities are being provided into the evenings and at the weekend more often. Considerations should be made to increasing staff outside of normal working hours if workload exceeds the amount which is acceptable for one individual during routine hours. Actions should also be taken to minimise work that needs to be undertaken outside routine hours when an individual is working by themselves. Assessing and redistributing the workload throughout the day may help reduce errors.

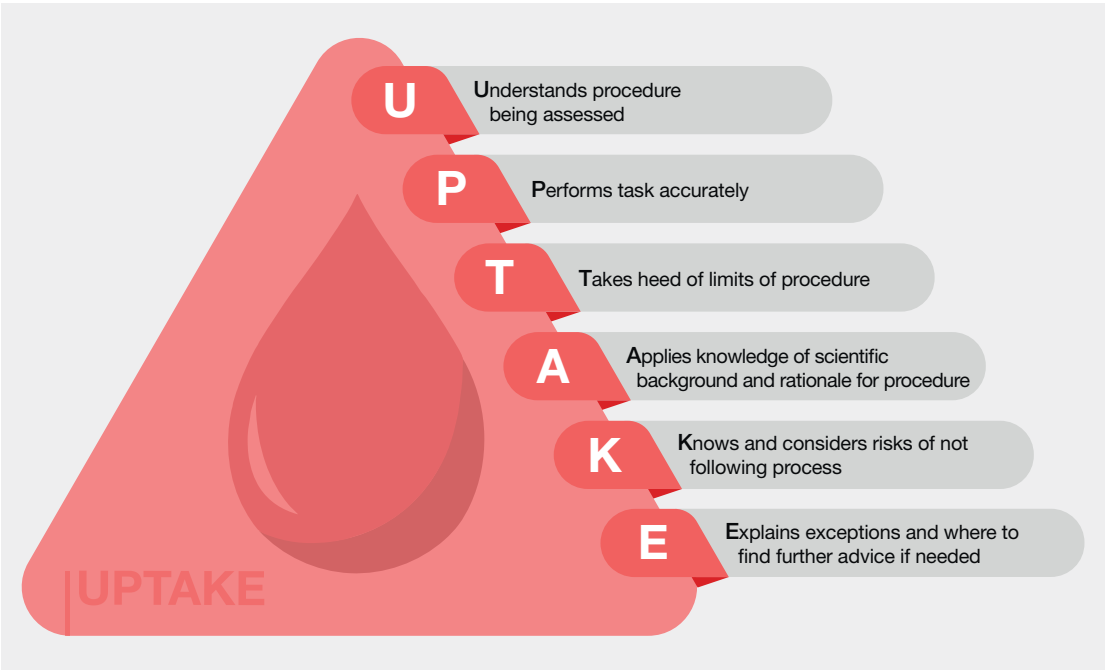


Knowledge

There has been an increase in the number of reports which stated that lack of knowledge was a contributing factor to the error, 159/601 (26.5%) compared to 124/535 (23.2%) in 2023. Gaps within transfusion knowledge were evident in errors occurring at the testing step. Within the IBCT-SRNM category there were 95 testing errors including, 44/95 (46.3%) incomplete testing errors and 33/95 (34.7%) inappropriate use of electronic issue. The second largest group of testing errors were anti-D Ig errors, of these 37/60 (61.7%) were related to incorrect interpretation of results or lack of knowledge. These types of errors can have significant clinical impact and may lead to formation of an antibody or result in transfusion reaction. Where anti-D Ig is omitted, this poses a danger to current and future pregnancies. Following incidents where gaps in knowledge are identified, appropriate action plans should be put into place to address these gaps to prevent patient harm.

Most staff involved in laboratory errors were competency assessed, 467/601 (77.7%) but the event still occurred. Analysis of SHOT laboratory data from 2017-2023 showed that 93.5% of individuals who made the primary error were competency-assessed and 91.8% of the assessments were in date (Tuckley, et al., 2023). Competency assessments should not be a tick box exercise. It is important that competency assessments are sufficiently detailed and cover essential knowledge required to perform the tasks. The content of these should be reviewed regularly. They should include non-routine scenarios in addition to frequently encountered cases. They should also contain questions regarding where to go for advice in complex situations. As competency assessments represent knowledge and skills held at one moment in time, it may be necessary to perform these more regularly when the subject is not frequently encountered in the organisation, staff are inexperienced, have limited time 'on bench' in the laboratory, or work outside of routine hours regularly. The UPTAKE model of competency assessment (first published in the 2019 Annual SHOT Report) shown in Figure 17.4 remains relevant (Narayan, et al., 2020).

Figure 17.4: UPTAKE competency assessment model



https://www.shotuk.org/resources/uptake-competency-assessment/

An example of a competency assessment aligned to the UPTAKE principles is available within the supplementary material for this chapter.

Case 9.4 in Chapter 9, Incorrect Blood Component Transfused (IBCT) describes a case of a BMS working alone, out-of-hours, in the absence of a completed competency assessment.

A decrease in quality of knowledge in newly qualified BMS staff has been noted by other organisations. In 2022, the UK Transfusion Laboratory Collaborative (UKTLC) survey noted an overall dissatisfaction with the candidates for transfusion BMS posts (UKTLC and SHOT, 2022). A repeat survey is scheduled to take place in 2025 and should reflect any changes.

In England, Transfusion 2024 (T2024) have published findings regarding the quality of transfusion education given during Institute of Biomedical Science (IBMS) accredited undergraduate degrees. Gaps and variation in the quality and quantity of transfusion education provided were found. This included one site which did not cover any transfusion in its degree programme and 11% of sites which did not offer any transfusion practical training (Caulfield, 2024). The T2024 project team are working in collaboration with the IBMS, university lecturers and practice educators to produce resources for lecturers, and other knowledge-based resources for newly qualified BMS.

Information technology (IT)

IT was identified as a contributory factor in 329/601 (54.7%) laboratory errors. The most common factor was warning flags not being actioned, 52/329 (15.8%), followed by a lack of functionality to support safe transfusion practice, 47/329 (14.3%), and systems not being used correctly, 32/329 (9.7%) (Table 17.3).

Table 17.3: IT impact on laboratory errors in 2024 (n=329)

Type of IT error	Number of reports
Warning flag in place but not heeded	52
Lack of functionality/algorithms in the system to support safe practice	47
System not used correctly	32
Computer or other IT systems failure	31
IT could have prevented the error	28
Failure to use flags and/or logic rules	26
Failure to link, merge or reconcile computer records	23
Warning flag not updated or disabled	15
Failure to consult or identify historical record	13
Other	13
Incorrect patient details selected from IT system	12
System not configured correctly	11
Lack of interfacing/interoperability	10
Incorrect results entered or accessed manually	9
Printing error	7
Total	**329**

Case 17.5: LIMS allowed electronic issue of red cells in presence of manual blood group serology

A unit of red cells was electronically issued to a child, using a sample that had a manual blood group completed due to the small volume. The LIMS had no functionality to differentiate between an automated or manual ABO blood group and inappropriately allowed red cells to be released via electronic issue when manual testing was required. The member of staff performing the test was lone working and demonstrated incomplete knowledge during the event review. Previous and subsequent blood groups were performed automatically and had no serological abnormalities. The patient had no adverse outcome.

Of note, the investigation was in depth and identified many systemic and human factors including staff fatigue, with appropriate CAPA implemented.

Learning point

- When procuring a new LIMS or reviewing existing systems, it is essential that electronic issue functions are only used if they comply with British Society for Haematology guidance (Staves, et al., 2024)

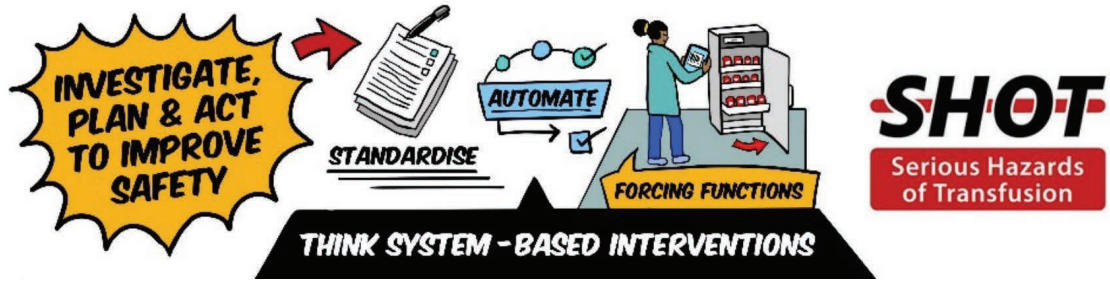
Cyber-attack impact

In June 2024, a cyber-attack impacted the transfusion IT systems of several major hospitals in London (NHSE, 2024d). In total, 43 transfusion incidents reported to SHOT in 2024 were identified as being related to this cyber-attack. Some of these reports are known to have impacted multiple patients and further reports may still be received. Of these reports 36/43 (83.7%) were laboratory errors. These are summarised in Table 17.4.

Table 17.4: Laboratory errors with cyber-attack impact on 2024 (n=36)

SHOT category	Number of reports	Percentage
IBCT-WCT	3	8.3%
IBCT-SRNM	3	8.3%
Delayed transfusion	4	11.1%
RBRP	7	19.5%
Anti-D Ig	1	2.8%
NM-other	18	50.0%
Total	**36**	**100%**

Of note, 1 case of major morbidity was impacted by the cyber-attacks (Case 17.2). This resulted in a delay providing blood components for a patient who started bleeding during surgery, as described under major morbidity section.



Errors by step in the laboratory process

Table 17.1: Laboratory errors by step in the transfusion process for 2024 (n=869)

Transfusion step	Transfused errors	Near miss	Pressure points
Sample receipt and registration n=104	**n=71↑↑**	**n=33↑**	• Data entry during sample registration which is not detected later in the process • Incorrect recording of request communicated verbally, or information not noticed on transfusion request forms causing delays
Testing n=221	**n=206↑**	**n=15↓**	• Incomplete or inappropriate testing which should have been prevented by IT systems • Limitations of technology • Misinterpretation of results or knowledge gaps regarding testing procedure
Component selection n=172	**n=113↓**	**n=59↓**	• Selection of specific antigen-negative components (particularly in multi-transfused patients) • Selection of inappropriate ABO/D group components for transplant patients • Lack of provision of D-negative components when required
Component labelling n=174	**n=58↑**	**n=116↑↑**	• Manual entry of patient details, handwriting or transcription into electronic blood management systems • Transposition of labels between components
Component availability n=117	**n=101↑↑↑**	**n=16↑**	• Components not available in the expected timeframe • Lack of knowledge of when alternative components may be suitable and timely actions needed • Components being available to collect after expiry (components and sample validity)
Component handling and storage n=76	**n=48↓**	**n=28↑**	• Response to equipment deficiencies and temperature monitoring alarms • Suboptimal inventory management resulting in the collection of expired blood components

Arrows denote increase or decrease relative to 2023. There were an additional 4 errors and 1 NM classed as 'miscellaneous' which are discussed in the supplementary material for this chapter

Laboratory near misses (NM) n=268

Laboratory NM reports have increased to 268 in 2024 from 207 in 2023. There has been a large increase in the number of NM RBRP, 106/268 (39.6%) in 2024 from 80/207 (38.6%) in 2023. Of the NM RBRP incidents, 86/106 (81.1%) occurred at the component labelling step. NM IBCT-WCT have increased to 59/268 (22.0%) from 33/207 (15.9%) in 2023, and NM IBCT-SRNM to 44/268 (16.4%) from 32/207 (15.5%).

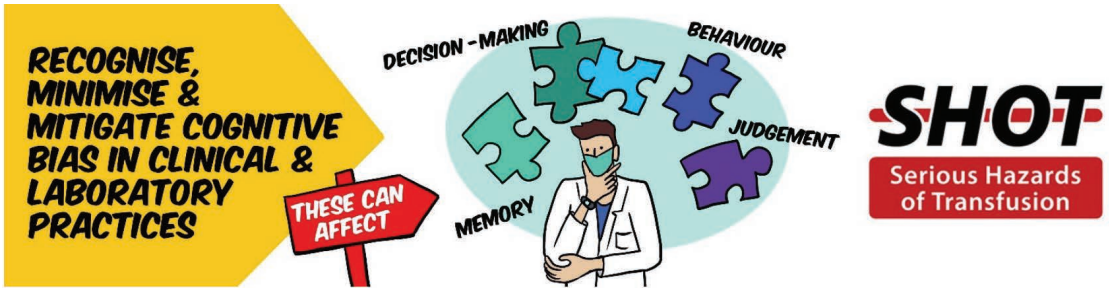
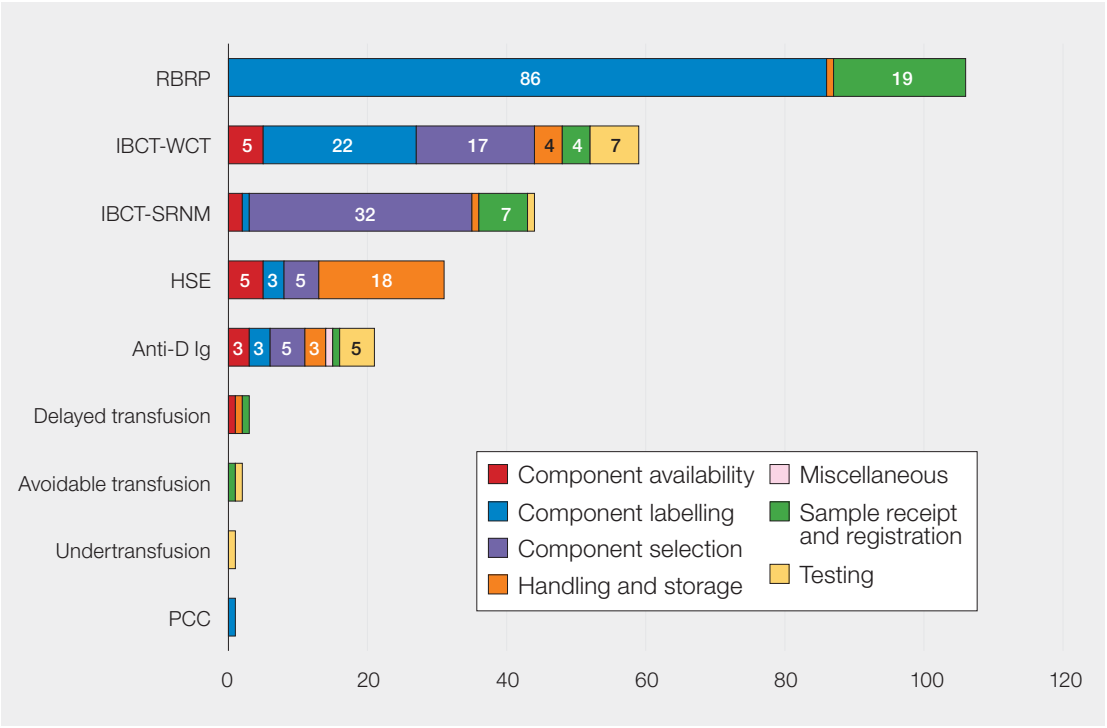


Figure 17.5: Laboratory NM classified by the transfusion step where the primary error occurred in 2024 (n=268)



IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrates; Ig=immunoglobulin

Note: numbers <3 are too small to be annotated on the figure

A more detailed analysis of NM data can be found within the supplementary material for this chapter.

Conclusion

The 2024 data reflects a particularly challenging year for staff working in transfusion laboratories. Factors which have been previously highlighted such as staffing, knowledge and culture, persist and seem to be worsening. These have been compounded by issues such as cyber-attacks, industrial action, and an overall increase in organisational pressures within the NHS. Worsening patient impact is now evident and is reflected in the steep rise in laboratory delays. Patient harm has occured as a result of these delays.

In these challenging times, it is vital that laboratories maintain strong links and relationships with clinical areas. Non-technical skills such as empathy are needed more than ever by all staff. SHOT would once again like to extend its gratitude to transfusion staff for their tireless work and commitment to patient care, which has been clearly demonstrated within investigations, and is shown in Case 17.3. This commitment is also demonstrated within Chapter 5, Acknowledging Continuing Excellence in Transfusion (ACE).

Meaningful intervention is needed from senior hospital management, leadership teams and political leaders to improve working conditions within laboratories and to retain staff within this vital profession. The IBMS (2025), in their response to NHS England's 2025 priorities and operational planning guidance stated a need for:

- Expansion of training pathways and career progression opportunities to address workforce shortages
- Increased investment in pathology networks and community diagnostic centres
- Greater recognition of BMS' expertise in strategic NHS workforce planning
- Clear career progression pathways that enable BMS to take on advanced clinical roles, ensuring their skills are fully utilised in decision-making and service development

Without such intervention it may be possible that this caring workforce may feel more de-valued, lose momentum and the few occurrences of slips and gaps in care may ultimately turn into a landslide. SHOT

has observed and highlighted that breaking point was being approached, it may now have been passed, and the service seems to now be struggling and broken, hopefully not beyond repair.

UKTLC update

Author: Kerry Dowling, UKTLC chair

Laboratory errors continue to rise, and the same themes remain key in the root cause analyses (staffing levels, education, workload, IT).

The Infected Blood Inquiry recommendations and Transfusion Transformation are aiming to address some of these huge challenges that transfusion laboratories are facing. During the past year the UKTLC have represented on a variety of these groups using data and learning from UKTLC surveys to inform change. The UKTLC has also presented on the challenges that transfusion laboratories are facing and the findings of the culture survey at several supplier meetings and BBTS.

The UKTLC page on the SHOT website continues to be updated with useful links and useful examples such as capacity plans. Previous UKTLC surveys and the culture survey recommendations are also available on the UKTLC page (https://www.shotuk.org/transfusion-laboratory-collaborative-uktlc/).

There are also many valuable resources on the SCRIPT page to support with IT challenges https://www.shotuk.org/script/.

During 2025 the UKTLC will be repeating our survey, we would appreciate as much feedback from the transfusion community as possible. This data will continue to inform Transfusion Transformation and IBI working groups.

We are keen to continue listening and sharing learning from laboratories and welcome suggestions for resources, questions and feedback.

UKNEQAS update

Authors: Claire Witham and Richard Haggas, UK National External Quality Assurance Scheme Blood Transfusion Laboratory Practice (NEQAS BTLP)

Participation in external quality assessment (EQA) offers the chance to learn from errors. The errors made in EQA exercises can be viewed as 'free lessons', as appropriate corrective action can be taken before the error occurs with a clinical sample. The aims of all UK NEQAS Schemes are primarily educational. Provision of identical samples to all participating laboratories allows inter-laboratory comparison and identifies the overall level of performance within the UK. Learning from others through reports of exercises, leads to an improvement within the UK as a whole; specific strengths and weaknesses can be identified, driving change. National guidelines are reinforced and the need for new guidelines identified.

The aim of the UK NEQAS pre-transfusion testing (PTT) programme is to assess performance in undertaking standard pre-transfusion serological testing, and decision-making with respect to selection of red cells for crossmatching or issue. Additional educational elements are sometimes included with PTT exercises, e.g., testing in an emergency situation, or selection of components for a range of patient types.

One of the main aims of exercise 24E9 was to assess the limit of detection of anti-D. The exercise included two samples, made from material provided by the European Organisation of External Quality Assurance Providers in Laboratory Medicine (EQALM), Patients 2 and 3, contained anti-D at low concentrations (approximately 0.05 and 0.025 IU/mL respectively). These levels are at a lower concentration than typically required in anti-D control antisera. All participating UK and Republic of Ireland (RoI) laboratories detected the anti-D (0.05IU/mL) in Patient 2, with the majority of participants reporting a 2+ reaction strength. Three laboratories recorded an additional specificity in Patient 2 which was not present (two anti-C^w and one anti-C). The anti-D (0.025IU/mL) in Patient 3 was not detected in the indirect antiglobulin test (IAT) antibody screen by 36% of participating laboratories worldwide (35% in UK and RoI), and this was not linked to any particular technology.

In exercise 24R10, two samples were included to assess the ability to interpret 'unusual' ABO typing results. Patient 1 was group O D-positive with a missing reverse group reaction vs B cells, and Patient

2 was D-negative with a positive direct antiglobulin test (DAT), which can occasionally produce false positive reactions vs. the anti-D and inert control wells in some column agglutination grouping cards. In this exercise there were no errors in interpretation of D group for the positive DAT (Patient 2). For Patient 1, the majority stated either 'uninterpretable' for the ABO group alone or for both the ABO and D group. Seventy-six (20.9%) laboratories made an interpretation of O D-positive and one laboratory, recording a forward group of O and a reverse group of B, made an interpretation of B D-Positive for Patient 1. Reverse groups in ABO grouping are intended to show the presence of anti-A and / or anti-B in a patient's plasma and this provides confirmation of the forward (cell) group obtained. Reverse groups can be weak or absent in babies, elderly patients, or in patients with some clinical conditions, especially post stem cell transplant. Had this been a clinical sample requiring blood for transfusion, the selection of group B red cells may not have produced an incompatible crossmatch reaction and an ABO-mismatched transfusion given. Laboratories should have policies for dealing with absent reverse groups which consider all of these factors and should suggest further steps, including testing a reverse group at lower temperatures or using a greater plasma to red cell ratio.

These exercises represent similar clinical samples being tested for the first time, i.e., there is no previous transfusion history available, and under such circumstances, the BSH guidelines recommend the level of testing that should be performed (Milkins, et al., 2013). In 2024, an additional 'emergency scenario' was sent with exercise 24R5. This comprised of a whole blood sample for grouping and an accompanying questionnaire. The aims were to explore testing undertaken within 10 minutes where blood is required in an emergency situation, and the provision of red cells and components (where the major haemorrhage protocol is not triggered). The BSH criteria for issue of group specific red cells is that following the initial group, a further test to detect ABO-incompatibility should be performed, i.e., a second group on a new aliquot of the primary sample, or an immediate spin crossmatch (ISXM) (Milkins, et al., 2013). In 27% of laboratories performing a group within 10 minutes BSH criteria for issuing group specific blood were met, whilst 73% did not include a second test to detect ABO-incompatibility. 9/111 (8%) laboratories, completing a blood group within 10 minutes, issued group specific red cells based on testing that did not meet the BSH criteria. Conversely, 21/111 (19%) met the criteria for issue of group specific red cells but issued group O at 10 minutes.

Recommended resources

Laboratory communications toolkit (phone log, handover log & guidance for clinical areas)
https://www.shotuk.org/resources/laboratory-communications-toolkit/

Transfusion delays investigation tool
https://www.shotuk.org/resources/transfusion-delays-investigation-tool/

Laboratory competency UPTAKE model
https://www.shotuk.org/resources/uptake-competency-assessment/

SHOT Safety Notice 01: Emergency preparedness in the transfusion laboratory in case of total power outage
https://www.shotuk.org/resources/safety-alerts-and-safety-notices/safety-notices/

RCI Assist - Referral Support Tool
https://nationalbloodtransfusion.co.uk/transfusion-2024/deliverable/b3/documents-and-resources