Cases from the 2024 Annual SHOT Report

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They have been loosely categorised, but some cases may be appropriate to illustrate more than one type of error

Donor Haemovigilance

Transient red urine in a post source plasmapheresis donation

- A regular donor attended for a routine source plasma donation
- The donor, who had been donating source plasma since 2021 had a history of successful donations without complications
- During the 7th cycle of the donation process, the haemoglobin (Hb) detector alarm was triggered on the plasmapheresis machine, indicating the presence of red blood cells in the plasma
- Staff observed red discolouration in the tubing, (referred to as Hb in harness, which indicates a potential red cell spill or haemolysis: the breakdown of red blood cells)
- The donation was terminated without returning the remaining red cells to the donor
- The donor remained well and asymptomatic whilst in the care of the plasma centre but later reported observing blood in their urine
- The donor declined the request to attend their general practitioner (GP) surgery as the symptoms had subsequently resolved, and they were in good health
- Due to the presentation of reported symptoms by the donor, it was believed the likely cause of red urine was haemoglobinuria (the clearance of haemolysis breakdown products through the kidneys)
- The donor was temporarily deferred but remains eligible to donate in the future

Two donors with arm pain lasting more than 12 months since venepuncture

- Two regular whole blood donors reported persisting arm pain for more than 12 months following their donation
- The first case was a returning donor who reported the last donation was more painful than usual with accompanying slow flow
- The donor could not recall whether they reported their symptoms to session staff at the time of donation and only reported it to the Blood Service 4 years later
- At that time, a full donation was obtained, no needle adjustments or pain at session were recorded and it was noted to have been an uneventful donation
- The donor reported developing a large haematoma with significant bruising and associated nerve symptoms (tingling and numbness) to their hand
- The haematoma resolved without any further intervention and the donor was reviewed by their GP who did not recommend any further investigations or treatment
- The second donor was a regular donor who reported that a needle adjustment was performed soon after venepuncture due to slow flow; this caused them pain, but they did not report this to staff
- The donor could not recall whether staff enquired regarding their wellbeing following the adjustment
- A full donation was obtained
- The donor reported that they continued to experience pain in the antecubital fossa with no other neurological symptoms
- The donor received ultrasonic treatment to help alleviate symptoms

Human Factors and Ergonomics (HFE) in SHOT Error Incidents

Workarounds by nursing staff during administration of platelets

- A patient on the intensive care unit (ICU) received an adult therapeutic dose of platelets following a cardiac procedure
- An incorrect identification (ID) band, not attached to the intended patient, and not at the patient's side, was scanned by the nurse administering the platelets
- The electronic-tracking system alerted that an incorrect patient ID band had been scanned
- When the error was realised, the correct patient received the transfusion
- The ICU had a very limited number of handheld scanning devices and so relied on additional scanners attached to workstations on wheels, which did not reach the ID bands attached to patients
- As a workaround staff had begun printing spare ID bands which were not attached to patients, and it was common practice to have multiple ID bands at the computer desk

Adverse Events Related to Anti-D Immunoglobulin (Ig)

Omission of anti-D immunoglobulin (Ig) administration in a D-mismatched renal transplant

- A D-negative patient of childbearing potential received a D-mismatched renal transplant (D-positive donor)
- The renal registrar did not complete the requirement for anti-D Ig in the patient's admission booklet
- Furthermore, this requirement was not identified by the renal or the surgical teams involved in the patient's care
- During the incident investigation, it was stated that the transplant nurse identified the need for anti-D Ig and this was communicated to the ward staff verbally
- There was no evidence of this communication in the patient's notes and no request was made to the blood transfusion laboratory
- The omission of anti-D Ig was identified when anti-D was detected in the patient's plasma one-month post transplant

Delay in administering anti-D immunoglobulin (Ig)

- A woman was discharged from the labour ward following a vaginal bleed at 20^{+1} weeks gestation, without receiving anti-D Ig, or being advised by staff about the need for anti-D Ig
- No follow up was arranged
- Discharge had been recommended by the consultant overseeing the care
- A fetomaternal haemorrhage (FMH) test had been requested but the results were not followed up by staff discharging the patient
- Anti-D Ig was available after the woman was discharged
- The plan of care and information given to the woman was not questioned by the midwife on duty, who was a new member of staff
- The failure to administer anti-D Ig was identified by laboratory staff who checked the blood refrigerator at 72 hours
- The woman was contacted by the community midwife to explain that anti-D Ig was indicated but declined to attend until the routine appointment which would have been 14 days after the potentially sensitising event (PSE)
- Following further discussion with a haematologist, the woman agreed to come in the next day, 6 days after the PSE to receive anti-D Ig

D-negative mother of D-negative baby erroneously given anti-D immunoglobulin (Ig)

- A woman with a predicted D-negative fetus had a potentially sensitising event (PSE)
- Anti-D Ig was issued despite the cell-free fetal deoxyribonucleid acid (cffDNA) result being available
- Following birth an order was placed in the clinical computer system for a Kleihauer, cord bloods and anti-D Ig
- The system flagged a warning stating the fetus was D-negative and asking if anti-D Ig was required
- The midwife on duty instructed a registered nurse caring for the woman to administer anti-D Ig
- The anti-D Ig that had been issued for the antenatal PSE was used
- Neither healthcare professional had noted the earlier error or heeded the warning on the information technology system

Unfamiliarity with managing large fetomaternal haemorrhage (FMH) and misinterpretation of instruction

- A large FMH of 44mL was detected following birth and 1500IU anti-D Ig was given in the first instance
- Upon confirmation of the FMH volume by the reference laboratory, 6500IU was advised, to be given intravenously (IV)
- The staff were not familiar with administering anti-D Ig IV and did not escalate this
- The midwife misinterpreted the instruction to give anti-D Ig within 72 hours, as to give after 72 hours, and placed the anti-D Ig in the ward refrigerator which was not temperature controlled
- The midwife documented their interpretation into the electronic patient record, and this was copied and pasted in the record across multiple shifts by other staff
- The error was detected by the charge nurse after finding the anti-D Ig in the ward refrigerator, more than 72 hours after it was due to have been administered
- Consultation with the reference laboratory led to a reduced dose being administered IV, after the 72-hour window had elapsed

Incorrect Blood Component Transfused (IBCT)

Multiple errors during major haemorrhage led to a wrong blood transfusion

- A major haemorrhage protocol was activated for patient A in the emergency department (ED) with a suspected ruptured abdominal aortic aneurysm
- Two units of emergency O D-negative red cell units were administered appropriately
- A further six red cell units were issued under the name ‘unknown, unknown’ and placed in the ED blood refrigerator
- A group and screen sample was sent to the transfusion laboratory but rejected due to an incorrect hospital number
- The electronic blood management system (EBMS) alerted laboratory staff that the ED blood refrigerator had been accessed using the emergency function
- It was evident that none of the blood components allocated for patient A were removed
- This prompted laboratory staff to contact the ED where they identified that two units for patient B had been removed without being scanned and administered to patient A
- Both patients were group O D-positive
- The patient’s death was not related to transfusion

Delayed transplant due to communication issues regarding specific transfusion requirements

- An autologous haemopoietic stem cell transplant (HSCT) harvest was scheduled for a patient with lymphoma, but the clinical area had not informed the transfusion laboratory of the planned harvest
- A request was received in the laboratory for one unit of irradiated red cells
- The laboratory queried this with the clinical area as this requirement was not previously recorded, but the ward staff stated that the patient did not require irradiated components, and a standard red cell unit was issued
- The HSCT harvest was commenced
- During the procedure, a nurse completing a blood request order for the patient for the following day queried if the patient now needed irradiated components
- The apheresis nurse then realised that a non-irradiated red cell unit had been transfused
- The procedure was stopped, and the collected cells were discarded
- The harvest was deferred for 3-4 weeks, following which the patient was very upset
- The treating team deemed that the delay would be unlikely to change the clinical course in the patient

Skill mix gaps and organisational pressures led to wrong blood being transfused (1)

- Patient 1 (group B) and patient 2 (group O) both required two red cell unit transfusions postoperatively, with both receiving their first units as required
- The day shift had not had sufficient staff numbers to complete required tasks, which resulted in these transfusions being completed during the evening
- Due to challenges across the organisation the patient flow co-ordinator arrived on the ward during the night shift to explore whether any staff could be redeployed to other areas
- The high workload and acuity of the patients meant that a decision was made to keep all remaining staff on the ward
- Although the staffing levels met establishment, there was only one transfusion trained registered nurse, a substantive band 5 nurse and a bank band 5 nurse
- A second unit of red cells arrived on the ward for patient 2
- The patient flow co-ordinator who was a registered nurse, offered to help with the transfusion administration as no other trained staff were available on the ward, but their transfusion administration competency had expired

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Skill mix gaps and organisational pressures led to wrong blood being transfused (2)

- The nurses entered the room of patient 1 in error
- Transfusion of one unit of red cells had already been completed, and staff took this unit down and placed it on a tray next to the full red cell unit ready to be administered
- Erroneously using the label from the completed red cell unit, the two staff members checked patient identification verbally with the patient, and the patient's identification band
- The full red cell unit was transfused but fortuitously, there was no ABO-incompatibility, and no adverse reaction was reported in the patient
- The error was only identified when the nurse came to document the unit as transfused
- In addition, an initial delay in seeking medical review was evident as staff waited for the patient flow co-ordinator to respond before contacting resident medical staff
- This incident was investigated, and improvement actions were undertaken
- Learning from the incident was shared across various teams

Knowledge gaps in inexperienced staff working alone and overriding information technology (IT) alerts led to wrong D-group issue

- A recently qualified biomedical scientist (BMS) was lone working in the transfusion laboratory over a lunch period when they received a request for one unit of red cells from the emergency department (ED)
- The request was for a female patient, less than 50 years old, with chronic haemolytic anaemia and a haemoglobin of 66g/L
- The patient was A D-negative with known red cell antibodies (anti-C, -E and -Jk^a)
- An electronic search of red cell stock inventory indicated that there were no suitable units on site
- Due to the perceived urgency of the request, the BMS selected partially phenotype-matched D+ C+ E- Jk(a-) red cell units without meeting the C and D requirements
- Advice from the haematology consultant was not sought nor was a concessionary release chosen
- Two laboratory information management system (LIMS) alerts about issuing D-positive to D-negative and not meeting the patient's phenotype requirement were not heeded
- The discrepancy was not detected by the clinical area
- There was no reaction reported in the patient

Biomedical scientist (BMS) expedited to working alone inappropriately due to staffing issues

- BMS 1 who was lone working in blood transfusion over a weekend shift issued two M-negative red cell units to a patient with anti-M
- The BMS had not completed testing to exclude anti-S from the antibody identification panels at this point but did not issue S-negative units as per local policy
- Further investigation carried out on the following day indicated that anti-S could have been excluded using additional extended panel cells that were available in the laboratory
- A fully competent and transfusion trained BMS 2 was available in another department when the event occurred to answer any queries
- However, the advice was not sought because it was not deemed necessary
- During the event review, the BMS 1's competencies showed gaps in antibody identification, including the relevance of heterozygous and homozygous panel cells, and selection of red cells when a red cell antibody is present
- This training need had been identified 6 months previously, but no action had been undertaken to rectify
- The responsibility for training junior staff members had recently rotated and may have contributed to this

Handling and Storage Errors (HSE)

Transfusion in progress for 7 hours 10 minutes

- A unit of red cells was collected from the blood refrigerator at 13:02 and the transfusion was commenced at 13:09
- After handover from the day shift to the night shift, it was realised that the red cell unit was being transfused for over 7 hours
- The alarm on the pump was sounding, indicating that the bag was empty
- The bag was taken down at 20:20

Red cell unit transfused after the blood sample had expired

- A unit of red cells remained in the blood issues refrigerator available for collection after the blood sample expiry had passed
- A clinical staff member came to collect the unit from the refrigerator and the electronic blood management system (EBMS) alerted that the unit should not be transfused
- The laboratory staff member did not understand the alert and continued to release the unit manually and it was then transfused to the patient

Delayed Transfusions

Delay in provision of alternative blood component contributes to the death of a paediatric patient (imputability 2 – probable)

- A neonatal consultant requested platelets for an unwell neonate who was waiting to be transferred to a specialist unit
- The urgency of the transfusion was not clearly communicated by the clinical team initially
- In addition, the transfusion biomedical scientist (BMS) was not aware of alternative options available

Failure to recognise bleeding contributed to the death of a new mother (imputability 1 – possible)

- A woman experienced a significant bleed following the birth of her baby
- There was a delay in the clinical team recognising the severity of bleeding and escalating care appropriately
- This was due to multiple factors including issues with equipment and focus on an alternative diagnosis
- The MHP was not activated, delaying appropriate transfusion support
- Coagulopathy was not promptly recognised and addressed; fibrinogen replacement was initiated too late to be effective
- The patient suffered multiple cardiac arrests, and despite surgical intervention and intensive care, she died a few days after giving birth with disseminated intravascular coagulation

Multiple issues contributed to the delay in transfusion during major haemorrhage (imputability 2 – probable)

- A patient with postoperative bleeding failed to receive a timely blood transfusion out-of-hours
- There was a 3-hour delay in recognising the severity of bleeding and therefore the major haemorrhage protocol was not activated
- The initial group and screen (G&S) sample was rejected, and the urgency of the transfusion was not clearly communicated to laboratory staff
- The clinical team on the ward were unfamiliar with the management of patients with major bleeding and were not aware of the procedures for accessing emergency blood components
- The patient suffered a cardiac arrest and died

Assumption resulted in a 10-hour transfusion delay (imputability 2 – probable)

- An elderly patient with a gastrointestinal (GI) bleed and a haemoglobin (Hb) of 45g/L was prescribed a unit of red cells
- There was a misunderstanding regarding who should request the red cell units from the transfusion laboratory
- The prescribing doctor assumed the nurses would request the blood as this was routine practice in the clinical area where they previously worked
- Conversely, the nurses assumed the doctor would be requesting the blood as this was routine practice on the current ward
- The error was noticed when the doctor reviewed the patient 10 hours later, the Hb had dropped to 38g/L
- The patient was transfused one unit of red cells but suffered a cardiac arrest and died

Multiple issues during major haemorrhage resulted in avoidable delays in accessing blood components

- A patient with a suspected ruptured ectopic pregnancy presented to the emergency department (ED)
- O D-negative red cells were requested for immediate transfusion, but staff were unable to access units from the blood refrigerator despite multiple attempts
- Similar issues occurred when trying to obtain red cells from the theatre and maternity refrigerators
- The major haemorrhage protocol (MHP) was activated, but the incorrect obstetric alert was issued, delaying an appropriate response
- The patient was transferred to theatre, where blood components were finally administered
- The patient had lost 3L of blood and required intensive care unit (ICU) admission
- A subsequent investigation revealed that an electronic blood management system upgrade had prevented units from being removed from the blood refrigerator

Multiple issues and delayed decision-making contributed to a delay in blood component provision during a major haemorrhage

- A patient with significant bleeding required an urgent transfusion, but rejection of multiple samples delayed the provision of crossmatched red cell units
- When emergency red cell units were requested, further delays occurred due to problems accessing the remote blood refrigerator
- By the time emergency red cell units were obtained, the patient had lost approximately 1000mL of blood, suffered a cardiac arrest and was admitted to the intensive care unit

Failure to contact the laboratory during major haemorrhage resulted in blood component delays

- A patient was found in the hospital grounds with a massive upper gastrointestinal bleed
- The major haemorrhage protocol was activated, but no blood components were sent from the laboratory
- Upon investigation, the transfusion laboratory had not received the notification of the activation, leading to a significant delay in blood provision
- Emergency O D-negative red cells units were administered from the emergency department, but the patient required further transfusion support and intensive care unit admission
- Multiple follow-up calls with communication gaps, compounded by confusing terminology contributed to the delay
- In-person visits to the laboratory were necessary to clarify the request and obtain the required components

Delay in provision of blood components during a major haemorrhage due to red cell antibodies

- Provision of emergency blood components caused delays for a woman with a massive obstetric haemorrhage
- A new red cell antibody was identified in the group and screen sample
- The clinical team was advised that they needed approval from the haematology specialist registrar before emergency group O or group-specific red cell components could be issued
- This led to a delay in blood provision for a bleeding patient

Patient put at risk due to staffing issues in the laboratory

- A woman with suspected ectopic pregnancy presented to the emergency department out-of-hours
- Group and screen samples were sent to the transfusion laboratory for urgent crossmatch
- The transfusion laboratory was not staffed and a lone-working biomedical scientist in the biochemistry department received undue pressure to also cover the transfusion service
- Clinical site managers at the hospital were not aware of the situation
- The clinical team knew how to access emergency blood components, and the patient was transfused with full recovery

Multiple issues resulted in a delay in blood for a patient with a gastrointestinal (GI) bleed

- A patient with multiple co-morbidities and an upper GI bleed due to varices required blood components
- The major haemorrhage protocol was activated, and multiple clinical specialties were involved in his care
- There was a delay in accessing blood components, the patient did not have a valid group and screen (G&S) and the laboratory requested a G&S sample
- The porter was subsequently unable to access the blood refrigerator
- The patient suffered cardiac arrest as the blood was being transfused and was transferred to intensive care unit where he died, unrelated to the delay

Avoidable Transfusions

Unnecessary prophylactic platelet transfusion related to miscommunication and knowledge gaps

- A patient with myeloma was admitted unwell and one adult therapeutic dose of platelets was transfused as the platelet count was $11x10^9/L$
- The consultant's plan was to transfuse further platelets if the count was less than $20x10^9/L$
- This was misread as $70x10^9/L$ by a locum resident doctor, who lacked the knowledge to question the threshold
- The patient's platelet count was $45x10^9/L$ and platelets were given
- The consultant, who was covering for the doctors' strikes, was in a rush and did not write clearly, and the patient was on a medical admissions unit rather than the haematology ward, where staff were unfamiliar with use of platelets

Wrong blood in tube for full blood count (FBC)

- Two patients on a ward required repeat blood samples to be sent for FBC and biochemistry
- A nurse took the samples from patient 1 but labelled them as patient 2 and then took patients 2's samples and labelled them as patient 1
- Patient 2 was noted to have a haemoglobin (Hb) drop from 90 to 70g/L and was transfused two units of red cells
- The following day, the pharmacist was reviewing the blood results for biochemistry and noted that they seemed erroneous
- The FBC results were then reviewed, and patient 2 had a post-transfusion Hb of 129g/L
- Both patients' results were discarded
- Patient 1's repeat Hb was 77g/L and transfusion was not required

Transcription error involving triplets

- A premature triplet had an incorrect haemoglobin (Hb) level of 105g/L (the result of his sibling) transcribed into his notes and as a result was transfused 20mL/kg packed red blood cells
- A subsequent result (delayed as the initial sample had clotted) demonstrated a pre-transfusion Hb of 136g/L, which was above the threshold for transfusion for his gestation
- The post-transfusion Hb was 148g/L

Platelets transfused based on anticipated need without up-to-date review

- A patient had a target platelet count of >50x10^9/L for treatment dose anticoagulation for a new pulmonary embolism
- Platelets were ordered based on the predicted rate of fall of their count after the last transfusion
- The plan following discussions on the ward round was for these to be given at 06:00 (before the anticoagulation dose was due)
- The night nurses asked the on-call medic to prescribe these as they had not been written up
- The full blood count was checked after one adult therapeutic dose of platelets and found the platelet count to be 126x10^9/L, well above the target threshold

Platelets in major haemorrhage pack given despite cessation of bleeding

- The major haemorrhage protocol was activated for a patient with lower gastrointestinal bleeding with a platelet count >150x10^9/L, and they were on no antiplatelet medication
- Four units of red cells and two fresh frozen plasma were issued, and two adult therapeutic doses of platelets were requested on blue light delivery
- Upon contacting the ward to inform them they were available; the laboratory was informed they were no longer needed
- The patient went on to receive additional platelets more than 12 hours after the major haemorrhage alert with no apparent indication

Red cells transfused in place of intravenous (IV) iron due to erroneous verbal handover

- A woman who had been anaemic throughout pregnancy had a post-delivery haemoglobin of 74g/L, having suffered minimal blood loss
- A prescription was written for IV iron but the nursing plan, which documented ‘IV iron transfusion’, became ‘blood transfusion’ during verbal handover
- An agency nurse ordered and administered a unit of red blood cells, and a doctor was asked to prescribe these retrospectively

Lack of communication with clinical area results in avoidable use of O D-negative red cells

- Emergency O D-negative red cells were collected for a patient as the staff member was unaware that group-specific red cells were available via electronic release
- There was no biomedical scientist in the hospital or on call out-of-hours, so the clinical area had not been contacted to tell them that electronic release was available
- Only limited stocks of O D-negative red cells were held in the remote refrigerator, so this was depleted overnight unnecessarily, with no ability to replenish until the following day

Configuration of remote refrigerator prompted staff to collect group O red cells unnecessarily

- A patient was actively bleeding, and staff went to collect two red cell units from the remote refrigerator via electronic issue (as there was a valid pre-transfusion sample)
- The refrigerator was configured not to allow multiple collections for a single named patient at the same time, to prevent transposition of labels
- Staff successfully removed one unit of group-specific red cells but were unable to remove the second unit at that time
- Staff assumed no other group appropriate blood components was available, so an emergency O D-negative red cell unit was also taken for transfusion
- Further O D-negative red cells were collected later in the shift, as the staff member continued to assume that no group-specific blood was available

Under or Overtransfusion

Death from severe drug-induced haemolysis and ineffective transfusion (imputability 1 – possible)

- An elderly person died from probable severe drug-induced haemolysis with haemoglobinuria and ineffective transfusion
- The patient had an infected joint prosthesis and was receiving Rifampicin
- Over a 4-day period, red cell transfusions were provided using best-matched concessionary release red cells together with steroids and intravenous immunoglobulin
- However, there was insufficient response in the haemoglobin due to the rampant haemolysis

Extravasation of transfusion and inadequate monitoring

- An elderly patient presenting with rectal bleeding received a transfusion of red cells which extravasated extensively with bruising of his arm
- The patient received no benefit from the transfusion which was also not adequately monitored
- They were very unwell with fluid overload and renal dysfunction and died but unrelated to the transfusion

Undertransfusion during exchange transfusion: use of wrong giving set

- A neonate underwent exchange transfusion for haemolytic disease of the fetus and newborn but was significantly undertransfused
- The wrong giving set was used resulting in a lower volume transfusion than planned
- The hospital's supplier produced two paediatric giving sets that looked very alike, one for transfusion and one for fluids
- Exchange transfusion was very infrequently performed in this hospital
- The infant developed hypovolaemic shock with cardiac arrest and required ventilation
- The child recovered when appropriately transfused

Overtransfusion of a child with thalassaemia

- An infant with known beta thalassemia was prescribed 80mL red cells but was transfused 210mL in error
- There were additional concerns: there were significant delays in providing the blood components due to mislabelled samples, conflicting information regarding whether irradiated units were required, how fresh the blood should be, and what component type i.e., large volume unit vs paediatric packs
- The child was not harmed

A patient with sickle cell disease could not complete their exchange transfusion

- A young person was receiving an exchange transfusion via an implanted central venous line which stopped functioning during the procedure
- Two red cell units were returned to the refrigerator but as they had been out of temperature control for 31 minutes, they were not subsequently released to finish the transfusion
- The patient was not harmed

Incidents Related to Prothrombin complex concentrates (PCC)

Slow reversal of Warfarin with PCC associated with increased intracranial haemorrhage (ICH) and death (imputability 1 – possible)

- A patient who was on Warfarin for a previous deep vein thrombosis suffered an assault resulting in head injury
- A computed tomography (CT) scan of the head was done within an hour of admission when the patient was fully alert
- This showed ICH and vitamin K was given 3 hours after the CT report
- The patient sneezed just after this with a rapid deterioration in Glasgow Coma Scale
- PCC was prescribed 30 minutes later and given an hour after the sneeze
- This was 4 hours after the CT report
- Repeat CT confirmed extension of the ICH and 9 hours after admission, the patient became unresponsive
- They were transferred to a neurosurgery unit but died from the ICH
- The delay in treatment with PCC was considered to have possibly led to the patient death

Delayed treatment with PCC after injury resulted in a prolonged stay in the intensive care unit (ICU)

- An elderly patient on warfarin attended a very busy emergency department after a fall in the shower sustaining a head injury
- Blood tests showed a high international normalised ratio of 12.0 and vitamin K was given
- Imaging showed peritoneal haematoma related to a fractured vertebra with a damaged blood vessel
- Interventional radiology (IR) was planned to treat this
- However, due to confusion, lack of understanding among staff and poor communication, there was a delay of at least 15 hours before PCC was requested, delaying the IR procedure
- Had the PCC been given sooner, this delay may not have occurred, and it is possible that admission to ICU would not have been required
- The patient was in ICU then the high dependency unit for a total of 2 weeks

Near Miss - Wrong Blood in Tube (WBIT)

Multiple errors contributed to the misidentification of a sample

- Patient 1 in the emergency department required a red cell transfusion and was identified by an incorrect bed space number instead of their name
- During a single venepuncture, the doctor took both a group and screen sample and a confirmatory sample from patient 2, with no positive patient identification performed
- The doctor labelled the first sample away from the patient's side using patient 1's details
- They then asked a nurse to label the second sample and send it to the laboratory
- The error was finally detected when the blood samples were rejected by the transfusion laboratory
- Patient 1 had a historical group of O D-negative with positive red cell antibodies, while the current samples grouped as AB D-positive

Language barrier contributes to inaccurate patient identification

- A patient was referred with incorrect details, which were used to update their electronic patient record
- An interpreter assisted during the antenatal clinic visit, but it was unclear whether the patient confirmed their name and date of birth or if their details were checked
- There was no evidence of positive patient identification at phlebotomy leading to a wrong blood in tube (WBIT) which was identified during testing based on discrepancies with their previous results

Right Blood Right Patient (RBRP)

Blood component administered on wrong date of birth (DOB) (1)

- A patient had two group and screen (G&S) samples taken for a planned transfusion
- There was no identification (ID) band on the patient during sample taking as they were an outpatient
- They had three entries on the electronic patient record (EPR) system with different hospital numbers, with various DOB
- An incorrect DOB was recorded on the sample, which matched the request and the record in the laboratory
- The chosen entry had the correct National Health Service (NHS) number but incorrect year of birth
- They were subsequently admitted for an elective transfusion
- Two units of red blood cells were issued, which were labelled with an incorrect DOB

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Blood component administered on wrong DOB (2)

- On admission, and while preparing the patient for transfusion, it was noticed that the DOB was incorrect
- The EPR system was updated with the correct details, and a new ID band was printed and attached to the patient
- The red cells were collected and during the pre-administration check, it was noted that the DOB was incorrect on the blood component label
- The staff member checking the component was the same one who had updated the DOB on the system
- They felt confident that this was the right blood for the patient and, after informing the second checker of this, decided to continue with the transfusion
- After starting the transfusion, they sought advice from the haematologist about how to proceed with the second unit
- They were advised to repeat the G&S sample and to request that the transfusion laboratory re-issue the red cells based on the correct details

Over 100 units transfused with incorrect patient identification (ID) due to inoperative information technology (IT) caused by a cyber-attack

- In June 2024, the blood transfusion laboratory was a victim of a ransomware cyber-attack on an unprecedented scale
- The attack encrypted the entire laboratory information management system (LIMS) and associated systems rendering it inoperative
- The laboratory had to revert to manual processes to issue blood components
- The LIMS was restored in September 2024
- During this period, errors on the compatibility label were frequent due to the manual processes
- A total of 540 patient records were created with incorrect details and used to issue blood components
- Of these, 373/540 (69.1%) were detected by the quality management system
- There were 167/540 (30.9%) patients where units were available for collection in the remote issue refrigerator with incorrect details on the compatibility label
- Units for 148 patients were collected from the blood refrigerator with incorrect details
- In 136 cases, the kiosk did not alert the user to the incorrect details
- In 12 cases the kiosk did alert the user, but the units were still collected
- In 133 cases, the unit with incorrect details arrived at the patients' side
- In 16 cases, the error was detected by the pre-administration check and not transfused
- In 40 cases a manual pre administration check failed to prevent the transfusion
- In 50 cases, an electronic pre-administration check alerted the user to the error, but the transfusion continued

Laboratory Errors

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 disseminated intravascular coagulation (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

Delay in blood availability during laboratory information management system (LIMS) downtime, with incomplete guidance in business continuity plans (1)

- 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

Continued…

Delay in blood availability during LIMS downtime, with incomplete guidance in business continuity plans (2)

- 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 fresh frozen plasma 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 business continuity plan 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

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 business continuity plan (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

Complex situation with multiple factors resulting in delays for a patient waiting to receive a heart transplant (1)

- 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

Continued…

Complex situation with multiple factors resulting in delays for a patient waiting to receive a heart transplant (2)

- 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

Continued…

Complex situation with multiple factors resulting in delays for a patient waiting to receive a heart transplant (3)

- 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

Laboratory information management system (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

Errors Related to Information Technology (IT)

Antigen-positive red cells transfused to a patient with red cell antibodies

- A patient with historic red cell antibodies required a transfusion
- Recent antibody screens were negative
- The current laboratory information management system (LIMS) contained a ‘critical note’ that the legacy LIMS should be interrogated for details of the antibody
- This note was missed by the biomedical scientist (BMS) and the sample for crossmatch was the first to be tested in the new LIMS
- Antigen-positive red cell units were selected, crossmatched and transfused to the patient

Ineffective alarm escalation leads to transfusion of red cell units subjected to temperature excursion

- Laboratory support staff doing daily blood refrigerator checks found that there was water on the floor and the refrigerator door was slightly open
- There was a unit of red cells in the refrigerator that was due to be returned to stock
- The staff member removed the red cell unit and took it back to the laboratory without checking the cold chain
- The support staff informed the biomedical scientist (BMS) about the situation, but lack of clear communication meant that the BMS determined the red cell unit was acceptable and returned it to stock
- This blood component was subsequently reissued to another patient and transfused
- The temperature-monitoring alarm system had previously alerted the hospital switchboard, and two attempts were made to notify the laboratory staff with no response
- The temperature-monitoring system then sent an email informing laboratory staff of the situation, but this had not been actioned
- Hence the BMS returning the unit to stock was unaware of a temperature excursion

Incorrect use of electronic blood ‘prescribing’ system leading to procedure delay

- There was a delay to the availability of blood components for a procedure in a patient with known red cell antibodies
- A midwife who was not trained in blood authorisation accessed the electronic patient record (EPR) prescribing system with an intention to request blood components
- Completing the EPR prescription did not order the blood components from the laboratory and therefore they were not available
- This resulted in a delay to planned surgery whilst suitable red cells were sourced
- The procedure went ahead when all blood components were available
- The training on the new EPR had not made it clear how to order blood components and who was eligible to prescribe/authorise blood components

Ineffective checks during information technology (IT) downtime

- Two units of fresh frozen plasma (FFP) were issued for a patient
- One unit was collected and delivered to the clinical area where it was noted that the unit number on the compatibility label did not match the unit number on the component
- The FFP unit was returned to the laboratory where transposition of labels between these two units was noted
- A label verification step was available within the electronic blood management system (EBMS), but this had been disabled, because of a cyber-attack on the laboratory information management system (LIMS), to allow other functions to work
- During this period, label verification became manual but high workload and interruptions increased the risk of human factors leading to error

Implementation of a new electronic patient record (EPR) system introduced unsafe workarounds

- A group and screen sample grouped as B D-positive, but the patient was known to be O D-positive
- The sample was labelled away from the patient
- The organisation implemented an EPR system using workstations on wheels that were too large to be moved to near the patient
- There was no other mobile equipment that could be used for sample labelling
- Prior to the introduction of the new EPR system, transfusion sample labels were generated using a different system (mobile handset and mobile printer) which allowed easy use at the patient's side
- The introduction of the new EPR resulted in an increase in 'workarounds' by staff such as using identification bands not attached to the patient

Febrile, Allergic, and Hypotensive Reactions (FAHR)

Mismanagement of a febrile reaction to a platelet transfusion given outside of guidelines

- A patient with pancytopenia, receiving an adult therapeutic dose of platelets to cover a bone marrow biopsy on the haematology ward, developed rigors and a temperature rise to 38°C after completion of transfusion
- They were treated with an antihistamine and hydrocortisone and repeat group and screen was sent
- No blood cultures were performed
- The patient recovered completely within 4 hours

Mixed febrile/allergic reaction to granulocytes in a patient with an allergic predisposition

- A patient post allogeneic bone marrow transplant for aplastic anaemia received granulocytes in the evening for neutropenic sepsis
- The patient developed facial oedema, urticaria and dyspnoea
- Temperature increased from 37 to 38.5°C
- There was a mild blood pressure drop from 136/81 to 114/57mmHg
- The patient had known allergy to banana and peanuts and carried an EpiPen
- They were treated with their own EpiPen 300µg intramuscular (IM) whilst waiting for the emergency drug bag and then received a further 500µg IM dose of adrenaline after 5 minutes
- They were transferred to intensive care for overnight observations but made a full recovery

Transfusion-Associated Circulatory Overload (TACO)

Excessive transfusion for chronic anaemia contributed to a patient's death (imputability 1 – possible) (1)

- A patient on palliative care for colorectal carcinoma with heart failure, renal impairment and other comorbidities was admitted with a 2-week history of shortness of breath
- They were transfused two units of red cells for chronic anaemia (haemoglobin (Hb)68g/L, mean corpuscular volume (MCV) 81fl)
- They had a relatively low body weight (59kg)
- The clinician decided to aim for a target Hb of >90g/L due to 'cardiac disease'
- Acute coronary syndrome was not cited in the report, and it is likely this was chronic cardiac disease
- The patient was on a regular diuretic, and they also had a low serum albumin level
- There was no current fluid balance recorded, and the patient had peripheral oedema

Continued…

Excessive transfusion for chronic anaemia contributed to a patient's death (imputability 1 – possible) (2)

- The pre-transfusion chest x-ray showed a small pleural effusion and atelectasis in the base of the right lung
- A transfusion-associated circulatory overload (TACO) pre-transfusion risk assessment was not performed and therefore the multiple risks for TACO were not identified, and mitigations were not implemented
- The patient developed a worsening respiratory status with tachypnoea (26 breaths per minute), oxygen desaturation to 87%, and an increased oxygen requirement (3L oxygen to maintain an oxygen saturation of 96%)
- The heart rate increased to 101 beats per minute, and the blood pressure had also increased from the baseline to 144/78mmHg
- The post-transfusion Hb was 95g/L
- The post-transfusion chest X-ray showed progression of the pleural effusion and new interstitial oedema
- The patient was treated with a steroid, bronchodilator, and multiple doses of diuretic, however the patient deteriorated and died

Pulmonary Complications of Transfusion: Non-TACO

Transfusion-related acute lung injury (TRALI) type II associated with granulocyte antibody of undetermined specificity in a donor

- A patient with history of ischaemic heart disease and pulmonary embolus underwent laparotomy 2 days after caesarean section because of bleeding
- Low albumin and raised C-reactive protein were present prior to surgery
- The patient became haemodynamically unstable with a haemoglobin of 55g/L and was transfused four units of red cells, four units of plasma and 4L of crystalloid
- The patient developed respiratory deterioration 2 hours after transfusion, and despite a 4L diuresis, continued to deteriorate
- Non-invasive ventilation was required, and the patient improved after 48 hours
- Chest x-ray showed progressive bilateral pulmonary oedema
- Donor antibody testing showed one donor with IgG reactivity against 4/5 granulocyte panels but negative human leucocyte antigen (HLA) antibodies and reactivity against lymphocytes
- A human neutrophil antigen (HNA) specificity could not be determined, and monoclonal antibody immobilisation of granulocyte antigens assay (MAIGA) testing was also negative

Transfusion-related acute lung injury (TRALI) type II - therapeutic effect of granulocytes

- A patient with neutropenic sepsis already on antifungals and broad-spectrum antibiotic developed fever, rigors and respiratory deterioration following a first granulocyte transfusion
- The chest x-ray showed patchy bilateral consolidation which was not present before transfusion
- The patient required mechanical ventilation for 1 day but then improved

Haemolytic Transfusion Reactions (HTR)

Patient death following an acute haemolytic transfusion reaction (AHTR) (imputability 1 – possible)

- A patient with a history of multiple red cell antibodies (anti-Co^b, -E, -S, -Le^a plus an auto and non-specific antibody), reacted to the first unit transfused as part of a routine red cell exchange transfusion to manage the symptoms associated with sickle cell anaemia
- During the transfusion, the patient reported feeling unwell with lumbar pain
- The transfusion was stopped, and the patient was treated for a suspected transfusion reaction
- Serological investigation of the implicated unit demonstrated a positive crossmatch with both the pre- and post-transfusion samples and anti-Co^b was identified in the eluate prepared from the patient's red cells
- Despite supportive measures, and management in the intensive care unit (ICU), the patient deteriorated and died 5 days later

Patient death following hyperhaemolysis (imputability 2 – probable)

- A patient presented in hospital with a suspected sickle crisis
- They were transfused two units of red cells and discharged home the following day
- The patient re-presented 6 days later reporting general weakness and continued pain
- The patient's haemoglobin (Hb) had fallen to below the pre-transfusion level, and they exhibited multiple markers of haemolysis
- The patient was admitted to the intensive care unit (ICU) and died 2 days later

Delayed haemolytic transfusion reaction (DHTR) due to anti-Jk^{a}

- A positive antibody screen was detected prior to transfusion
- Antibody identification was performed by the reference laboratory, but the antibody was mistakenly identified as anti-K
- K-negative units were crossmatched and transfused, however the patient later showed symptoms of a delayed transfusion reaction
- On investigation of the cause of the reaction, it was identified that the antibody detected pre transfusion was actually an anti-Jk^{a}

Uncommon Complications of Transfusion (UCT)

Patient not monitored during platelet transfusion (imputability 1 – possible)

- An elderly patient with acute myeloid leukaemia was admitted to the emergency department with a history of a fall, hypothermia, confusion, and suspected septicaemia
- The patient was not actively bleeding but did have thrombocytopenia (platelet count <$10x10^9$/L)
- They were prescribed an adult therapeutic dose of platelets which was commenced at 16:50
- At 18:19 the patient was found in cardiac arrest and subsequently died
- On investigation it was noted that baseline observations were performed at 15:20 after which no vital signs had been taken
- At the time of the arrest call, the platelets were not considered as a contributory factor, and the transfusion laboratory were not informed until 2 days after
- This delayed a precautionary recall
- The cause of death was determined to be hypothermia and sepsis, with an underlying diagnosis of acute myeloid leukaemia

Patient diagnosed with subdural haematoma following red cell transfusion

- A patient with acute coronary syndrome, chest pain and suspected pernicious anaemia was admitted with a haemoglobin (Hb) of 44g/L and chest pain
- They were transfused with three units of red cells over approximately 18 hours
- Following completion of the third unit, the patient experienced headaches, blurring of vision and other symptoms
- A computed tomography head scan revealed a large subdural haematoma
- The patient was admitted to intensive care and made a full recovery
- The investigation noted that the patient received one dose of Aspirin and Ticagrelor the day before the bleed
- It was later revealed that the patient had fallen and hit their head three days prior to admission resulting in loss of consciousness for 20-30 seconds

Transfusion-Transmitted Infections (TTI)

Near miss (Staphylococcus aureus)

- A platelet pack was returned to the Blood Service following the hospital transfusion laboratory noticing a large clump in the pack
- The affected pack was a day six apheresis pack; the associated pack was recalled but had already been transfused
- Routine bacterial screening remained negative at day seven
- Gram staining of the returned pack indicated Gram-positive cocci, organisms were cultured and were identified using matrix-assisted laser desorption/ionisation time-of-flight (MALDI ToF) as S. aureus
- The donor was followed up and no reason was identified that should have prevented them from donating, they volunteered to have nasal swabs taken
- S. aureus was isolated from the nasal swabs which were indistinguishable from the pack isolate
- Multi-locus sequence typing (MLST) and single nucleotide polymorphism (SNP) analysis using whole genome sequencing showed a single staphylococcus lineage (MLST 5) that is genetically closely related and belonged to the 10 SNP cluster
- The associated platelet pack had been transfused to a patient undergoing regular transfusion
- The clinical team followed up the patient who had not experienced any transfusion reaction and remained well seven days post transfusion
- The donor has been removed from the donor panel

Near miss (Staphylococcus aureus)

- During quality checking prior to issue, the Blood Service hospital services department noticed a visible clump of approximately 1cm in a pooled platelet pack
- This had not been detected by bacterial screening
- A sample from the pack was inoculated and Staphylococcus aureus flagged as positive on the BacT/ALERT Virtuo within 5 hours of loading
- The original day two sample remained negative on the BacT/ALERT at seven days and was terminally cultured with no growth observed
- The four associated red cell units were cultured but there was no growth so the bacteria could not be linked to a single donor

Cell Salvage (CS)

Incorrectly labelled blood

- A different patient's details from a previous day were on the transfusion label attached to the transfusion record
- This was identified in theatre recovery, where the details were amended by the anaesthetist and the transfusion subsequently continued

A distracted operator

- A patient underwent elective orthopaedic surgery with cell salvage
- The cell salvage operator experienced some difficulty in using the machine, ascribed to unfamiliarity with the software
- This resulted in blood not being washed
- Upon reflection, the reporter identified several factors that may have also contributed to the error
- ‘The operation was coming to an end, and they were trying to keep an eye on the patient too
- The cell salvage machine had been positioned at the back of the anaesthetic machine, so (that) they could not see the patient, and it was difficult to get round…the lines were entangled with other cables
- Hence, they were very distracted’

Hypotensive reaction in a patient receiving cell salvaged blood

- A patient was undergoing a major vascular procedure
- Shortly before finishing, the transfusion of cell salvaged blood was commenced
- The patient became profoundly hypotensive, which was compounded by a further bolus of cell salvaged blood
- The patient was managed with fluid boluses and an infusion of vasopressors
- The patient recovered shortly after and did not require further blood pressure support

Paediatric Cases

Lack of platelet concessionary release policy for a neonate with thrombocytopenia (imputability 2 – probable)

- A very sick preterm neonate required a platelet transfusion prior to tertiary centre transfer
- The baby had disseminated intravascular coagulation and required a central line
- Platelets were requested but no neonatal/infant specification units were available on site
- Due to a lack of concessionary release policy for emergency and failure of the clinical team to communicate the urgency of transfusion, 6 hours elapsed before an adult specification component was authorised
- This delayed transfer and contributed to the death

Transfusion-associated circulatory overload (TACO) following red cell transfusion in an infant with severe iron deficiency anaemia (imputability 2 - probable)

- A 10kg infant was admitted to the emergency department with severe iron deficiency anaemia (haemoglobin (Hb)18g/L)
- The child received a total of 140mL (14mL/kg) of red cells in 3 aliquots over a 2.5-hour period
- The post-transfusion Hb was 51g/L
- The child had not received any other fluids and had no previous cardiac disease
- Following transfusion, the child deteriorated with evidence of fluid overload and heart failure and was admitted to the paediatric intensive care unit (PICU)
- There was some response to furosemide, however, the child died

Transfusion-associated circulatory overload (TACO) causing major morbidity in an infant following overtransfusion of red cells

- A 2.5kg infant received 121mL of red cells (48mL/kg) due to a prescribing and administration error
- The infant became bradycardic and suffered a cardiac arrest
- The pre-transfusion Hb was 77g/L, post-transfusion Hb 190g/L
- Chest x-ray showed pulmonary oedema
- The infant also developed hyperkalaemia with a potassium of 8.5mmol/L
- Venesection and treatment for hyperkalaemia was required
- The following pre-transfusion risk factors for TACO were also present: additional crystalloid, cardiac disease, and renal impairment

Incomplete testing for a child with autoimmune haemolytic anaemia (AIHA)

- A young child presented to the emergency department with a haemoglobin of 24g/L and a presumptive diagnosis of AIHA
- The major haemorrhage protocol was activated, and the patient was appropriately transfused with group O D-negative red cells
- A subsequent group and screen sample showed a dual population of group O and group A red cells
- Antibody screen was weakly positive and the direct antiglobulin test (DAT) was strongly positive for IgG and C3d
- Antibody testing was reported as negative in-house on an alternative method, and two units of red cells were manually crossmatched by the hospital transfusion laboratory and transfused to the patient
- Samples should have been sent to the reference laboratory for further testing and antibody identification but instead the component was issued in the hospital

Confusion around the requirement for a maternal sample in a neonate

- A neonate had symptomatic anaemia (pallor, tachypnoea, and desaturation, haemoglobin 79g/L) and a paedipack was requested
- The baby had been transfused 2 days previously
- The maternal transfusion history had been checked (negative for antibodies) on an antenatal sample, but a current maternal sample had not been obtained or tested
- The laboratory picked up the earlier error when a new request for transfusion was made
- At this point a maternal sample was requested
- The mother was bought back into the hospital, a sample taken, and the red cells eventually transfused after a 7-hour delay

Avoidable red cell transfusion due to issues with a blood sample and not looking at trend

- A teenager with sarcoma was undergoing proton beam therapy and was reviewed in the shared care centre
- The haemoglobin (Hb) was noted to be 79g/L, and a two-unit red cell transfusion was requested (a Hb of 100g/L was the transfusion threshold for proton beam)
- A full blood count taken prior to the second unit was 131g/L but the result was not seen until after the unit was given
- In retrospect, the initial Hb of 79g/L was considered unexpected based on the trend for the patient
- In addition, there was miscommunication between the oncology centre and shared care as it was not realised that chemotherapy had been discontinued 4 months previously

Undertransfusion during exchange transfusion for a neonate

- Insufficient red cells were administered to a neonate (pre-exchange haemoglobin (Hb) 136g/L) undergoing an exchange transfusion, resulting in a post-transfusion Hb of 108g/L
- This was due to the use of a fluid giving set (with a smaller diameter) rather than a blood giving set which resulted in fewer red cells being transfused than anticipated
- The neonate became hypovolaemic and had a cardiac arrest but survived

Overtransfusion in a child with sickle cell anaemia due to a prescribing error

- An overtransfusion error was discovered in retrospect following an audit of practice
- A teenager with sickle cell anaemia was admitted with diarrhoea and vomiting
- Pre-transfusion haemoglobin (Hb) was 83g/L
- The transfusion calculation was performed incorrectly and 1080mL (26mL/kg) of red cells were given
- Post-transfusion Hb was not recorded
- There was insufficient documentation to be able to judge whether the transfusion was indicated at all

Recurrent acute haemolytic transfusion reactions in a complex post haemopoietic stem cell transplant (HSCT) child

- A young child post HSCT for immunodeficiency had a gradually dropping haemoglobin
- The pre-transfusion direct antiglobulin test (DAT) was positive (C3d) with investigations and crossmatch being performed by the Blood Service
- Following transfusion of only 60mL of red cells the child developed fever, abdominal pain and dark urine
- The post transfusion eluate was difficult to resolve with both an autoantibody and possible anti-E and anti-Jk^b
- The child received two further red cell transfusions with sequential changes to management including: lowered transfusion threshold, phenotype-matched red cells, folate supplementation, treatment for mycoplasma, blood warmer, immunosuppression for presumed autoimmune haemolytic anaemia (steroids and intravenous immunoglobulin (IVIg))
- Post-transfusion investigations showed a pan-reactive red cell antibody with the only negative reaction being in the cord blood cell
- Further serology from the International Blood Group Reference Laboratory (IBGRL) showed ongoing incompatibility with all cell types (including cord, In(Lu), adult ii and A1)
- Fortunately, the patient responded to immunosuppression and has not required further transfusion
- A follow-up sample was planned to be sent to IBGRL 3 months from the last transfusion for further investigation

High potassium in a bypass circuit for a neonate undergoing cardiac surgery

- High potassium levels (19 mmol/L) were found in an irradiated large volume transfusion unit when performing equipment prime prior to bypass
- The unit was day 3 post donation, and it was 15 hours post irradiation
- The unit was filtered and washed and due to clinical urgency, was transfused once potassium levels were within normal/usual range
- Subsequent testing of the donor by the Blood Service confirmed that the donor was heterozygous for a genetic variant, associated with familial pseudohyperkalaemia

Haemoglobin Disorders

Acute presentation following recent transfusion resulted in patient death (imputability 2 – probable)

- A patient with sickle cell disease and a history of red cell alloimmunisation received one unit of red cells for concerns over evolving chest syndrome with severe chest pain and hypoxia
- The patient was discharged 5 days later but re-presented within 24 hours with severe pain and rapidly progressive multi-organ failure
- They were admitted to critical care but died within 48 hours
- The working diagnosis was delayed haemolytic transfusion reaction/hyperhaemolysis

Death secondary to hyperhaemolysis (imputability 2 – probable)

- A patient with sickle cell disease and a history of red cell alloimmunisation presented with a sickle cell crisis and was given two units of red cells
- The patient was discharged the following day but then re-presented 6 days later with recurrent pain, weakness, dark urine, and a falling haemoglobin
- They were admitted to critical care and died within 48 hours of admission
- The working diagnosis was hyperhaemolysis

Febrile reaction in a young child with thalassaemia leading to major morbidity

- A young child with thalassaemia was attending an outpatient department for routine red cell transfusion
- The first red cell unit was given uneventfully, but during observations to administer a second unit, they became unresponsive
- They had chills, rigors, developed a fever of 40.6^{o}C and tachycardia (heart rate 142 beats per minute)
- The child was treated with paracetamol, antihistamine, and admitted to the paediatric ward for observation overnight
- A repeat group and screen sample was tested but did not indicate incompatibility
- The red cell unit was sent to the Blood Service for bacterial and fungal culture testing, the results of which were negative
- They were discharged the following morning with no further concerns
- Local investigation showed that staff dealt with the reaction promptly and appropriately

Sickle cell disease (SCD) patient transfused without haematologist advice

- A patient with SCD and a history of a previous haemolytic transfusion reaction with multiple red cell antibodies was admitted under the renal team with a haemoglobin (Hb) of 41g/L
- There were clear instructions from the haematology consultant not to transfuse the patient without discussion
- A decision to transfuse was made without discussion with haematology which resulted in a further drop in Hb to 37g/L
- A new alloantibody (anti-Fy^a) was identified on antibody screen
- The patient was treated with intravenous immunoglobulin (IVIg), corticosteroid and further red cell transfusion
- The patient died subsequently but the cause of death was not recorded as being related to transfusion

Hyperhaemolysis despite intravenous immunoglobulin (IVIg) and corticosteroid prophylaxis in thalassaemia

- A patient with non-transfusion dependent thalassaemia was admitted with significant anaemia
- The patient was transfused one unit of red cells and due to a history of hyperhaemolysis, they also received IVIg and corticosteroid
- The patient presented 8 days later with recurrent haemolysis which was managed appropriately, and they recovered fully

Difficulties ascertaining specific requirements of a new patient during a cyber-attack on the hospital electronic patient record system

- A patient with sickle cell disease presented to a hospital that was not their usual base hospital with a sub arachnoid haemorrhage and transfusion was requested
- Although the laboratory information management system (LIMS) was shared between the new hospital and base hospital, there were different procedures for each system recording specific requirements
- The request was made during downtime on the LIMS following a hospital cyber-attack
- The patient had a Specialist Services Integrated Clinical Environment (Sp-ICE) record; however, this was not accessed due to a discrepancy in the demographic data
- The patient was known to be D-variant and should receive D-negative units
- The crossmatch sample reacted strongly with anti-D reagent and therefore, the laboratory issued two units of D-positive red cells

Poor communication with laboratory

- Blood components were requested for a sickle cell disease (SCD) patient, but the only clinical detail provided on the request was ‘HbSC’
- The laboratory staff did not recognise from the limited information provided that this was a SCD patient and therefore the red cell units issued were not extended phenotype matched or HbS-negative
- This was incidentally discovered when laboratory staff looked up the haemoglobinopathy screening results at a later date

No extended phenotype-matched red cells provided for a thalassaemia patient

- A patient with thalassaemia was admitted to the stroke unit
- Group and antibody screen on admission was sent without indicating the patient had a haemoglobinopathy
- Two units of red cells were requested that were not extended phenotype-matched and the patient inappropriately received one E-positive unit

Missed specific requirements for a haemoglobinopathy patient undergoing exchange transfusion

- A patient with sickle cell disease and multiple red cell antibodies, required a six-unit red cell exchange transfusion
- Biomedical scientist (BMS) 1 pre-ordered the red cell units from the Blood Service
- Three of the six red cell units ordered did not have the correct antigen-negative requirements
- BMS 2 began crossmatching the red cell units during the night shift but realised they did not meet the patient's antigen requirements
- BMS 2 found replacement red cells from routine stock which met antigen requirements, but one red cell unit was not HbS-negative
- The laboratory information management system (LIMS) did not alert BMS 2 to the missing requirement at issuing
- The nurse conducting the pre-administration check identified that the red cell unit was not HbS negative and contacted the laboratory
- The exchange transfusion was completed with appropriate units

Transfusion Errors in Transplant Cases

Missed requirement for irradiated blood components following laboratory information management system (LIMS) replacement

- Prior to the implementation of the new LIMS, data migration from the old LIMS took place but the most recent data had not been yet migrated
- To address this gap in data migration, an interim process was implemented to check patient's notes on the legacy LIMS
- A check label on the request form to confirm this process was implemented
- Prior to the implementation of the new LIMS, all staff were trained, and instructions provided
- In this case, the transplant information was in the legacy LIMS, but the biomedical scientist (BMS) did not check when processing the request in the new LIMS
- Another BMS performed the crossmatch but also did not check the legacy LIMS
- There was reliance on the first check and the instructions for use of the check label were not clear

Patient transfused non-irradiated red cells pre transplant with shared care barriers

- A patient with relapsed high-grade lymphoma received a unit of non-irradiated red cells at their local hospital, 6 days prior to stem cell harvest
- The request form did not indicate the patient's diagnosis, or the need for irradiated red cells
- The requirement for irradiated blood components was also not recorded on the prescription
- Furthermore, there was incomplete communication from the transplant centre to the local hospital regarding the specific transfusion requirement
- The error was discovered when a second request for irradiated red cells was received
- Laboratory staff acted promptly to contact the ward and asked for the transfusion to be stopped and added flags to the laboratory information management system (LIMS)
- Contributory factors included the haematology ward at the local hospital not using the organisations' electronic patient record and relying on handwritten documentation
- Following this event, a system had been set up for the transplant centre to notify the local transfusion laboratory, the transfusion practitioner and clinical staff about specific requirements using secure email
- The patient was given an irradiated components card, relevant information leaflet and had the rationale for specific requirement explained to them

Immune Anti-D in Pregnancy

Anti-D Ig administered in error for a case with known immune anti-D

- Immune anti-D was identified while testing the first group and screen sample at 37 weeks due to a concealed pregnancy
- The sample was insufficient to complete investigations
- Further samples were received 4 days later and sent to the referral laboratory for quantification
- A verbal report was provided by the reference laboratory which confirmed the presence of immune anti-D (result level: 1.5IU/mL)
- The birth was at 38 weeks gestation, but the presence of immune anti-D was not checked resulting in anti-D Ig being issued and administered unnecessarily
- The baby's group was O D-positive, and no treatment was required for haemolytic disease of the fetus and newborn (HDFN)

Confirmation of D immunisation potentially masked by large fetomaternal haemorrhage (FMH)

- A woman gave birth to a D-positive baby at 40 weeks gestation
- No evidence of the presence of immune anti-D in the antenatal testing
- The FMH volume post birth was calculated to be 101.5mL and 17,000IU anti-D immunoglobulin (Ig) was administered
- In the follow-up sample, a bleed of 17mL was identified and a further 3,000IU anti-D Ig was administered
- The second follow-up sample showed a volume of <1mL bleed and a further 500IU anti-D Ig was administered
- The baby needed a top-up transfusion to treat haemolytic disease of the fetus and newborn (HDFN) post birth
- Two weeks after birth, a maternal sample was taken where anti-D, anti-C and an autoantibody were identified
- The sample was not referred for quantification or further investigation
- One year later, the antibodies remained detectable

D-variant identified by the presence of immune anti-D

- Immune anti-D was identified with a level of 0.8IU/mL at booking (11 weeks gestation) in the index pregnancy
- This was the woman's third pregnancy, and all prior samples were grouped as D-positive
- In the previous pregnancy, a sample had been referred to the reference laboratory for serological D-status investigation
- This was reported as weak D and recommended the woman to be treated as D-positive
- In the previous pregnancy, during birth, the woman received a unit of D-positive red cells in accordance with the reported D-status
- In the index pregnancy, when anti-D was identified, samples were referred to the International Blood Group Reference Laboratory (IBGRL) for genotyping who confirmed that the woman was D-variant and had been immunised
- The birth in the index pregnancy took place at 37 weeks gestation and the baby received phototherapy for treatment of haemolytic disease of the fetus and newborn (HDFN)

Discrepancy between guidelines in early pregnancy results in D immunisation

- A woman attended the early pregnancy unit at 10^{+4} weeks gestation reporting a per vaginal bleed (PVB) (no pain but bleed equivalent to a period and still ongoing)
- A group and screen sample was not taken, and anti-D immunoglobulin (Ig) was not given
- This was the recommended practice as per the National Institute for Health and Care Excellence (NICE) guidelines
- The woman returned at 14^{+5} weeks gestation with another PVB episode where immune anti-D was identified during laboratory testing
- The result of anti-D quantification was 0.3IU/mL, and although there were no records of the woman receiving anti-D Ig in this pregnancy, it was advised to continue prophylaxis
- Immune anti-D was confirmed later during pregnancy
- This case was reported to highlight discrepancies between the British Society for Haematology (BSH) and NICE guidelines as according to BSH, anti-D Ig should have been given when the woman reported the first potentially sensitising event at 10^{+4} weeks gestation
- The antibody status of the booking sample tested before 10^{+4} weeks was negative