Cases from the 2023 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

Acknowledging Continuing Excellence in Transfusion (ACE)

Excellent care of a patient during a major haemorrhage

- The major haemorrhage protocol (MHP) was activated in a timely manner for a patient with a gastrointestinal bleed, taking warfarin and in peri arrest
- The transfusion practitioner (TP) attended the emergency department (ED) to advise on management
- Blood samples had already been sent to the hospital transfusion laboratory, and an emergency transfusion of O D-negative red cells was in progress
- Prothrombin complex concentrates were rapidly requested from the HTL to reverse warfarin
- Vitamin K and tranexamic acid was already prescribed and administered
- The guidance the TP planned to give was already in progress or completed
- The MHP was also stepped down appropriately
- This hospital has very few MHP activations and rarely for patients being treated with anticoagulants
- During MHP activations clinical staff often wait for guidance on appropriate blood components
- Staff managed this patient appropriately and ensured timely lifesaving transfusions without any delays
- The doctor who led the management of this patient was given a ‘Top-Notch’ transfusion award due to the excellent management of the MHP
- The practice was shared on the hospital social media page, with the hospital transfusion team and hospital transfusion committee
- The ED lead consultant also shared with the ED team

Two consecutive major haemorrhage activations dealt with safely and effectively

- During two very difficult and upsetting major trauma cases, the anaesthetists, surgeons, laboratory staff, nurses and porters showed grit, determination, teamwork, excellent communication and great collaboration
- The staff across all disciplines did everything they could to give both patients the best chance of survival
- The hospital transfusion laboratory (HTL) received excellent communication from the clinical team, which enabled them to pre-empt which components would be required prior to requests coming in
- The HTL was able to support the clinical team with a huge number of blood components
- The porters were required to run back and forth from main theatres in one building, descend four floors, cross a busy road, into another building several metres away, scale two more floors to the HTL and then rush all the way back again to main theatres
- This allowed the clinical teams to transfuse blood components in a timely manner
- This task was undertaken by the portering team multiple times
- The HTL requested a ‘blue light’ delivery for more components from the Blood Service
- They also had to reclaim multiple blood components from satellite refrigerators to support the ongoing code red
- Once the team had been stood down from the first code red, another code red was activated, and the team were once again in management mode and providing support in blood provision for another very difficult case

Specific requirements on transfusion request form made mandatory [1]

- An incident of incorrect blood component transfused-specific requirements not met (IBCT-SRNM) occurred in the hospital and this instigated an update to the transfusion request form to make an answer in the specific requirement (SR) section mandatory
- Prior to this SR were not being effectively assessed and the transfusion laboratory staff would accept transfusion requests with the SR section left blank
- This enhanced system puts the patient at the heart of what they do in relation to assessing and communicating their specific requirements for transfusion
- An electronic special requirements assessment form was developed which must be completed for all patients who may need a transfusion as part of their care
- This form has been exceptionally well embedded into clinical practice and patient care
- When completed on the electronic patient record a clear message appears stating any special requirements required
- If there are none this is also stated

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Specific requirements on transfusion request form made mandatory [2]

- This form is completed at the time of completing the transfusion request form and prescription/authorisation record for transfusion
- It is also printed off and brought to the blood collection point and crosschecked as part of the collection checks
- The form is also used as part of the pre-administration bedside checks
- A monthly check of the laboratory information management system is carried out, containing the patient identifiers of all new irradiated flag patients
- The consultant haematologist, advanced transfusion practitioner and senior BMS then review the patient's clinical records and general practitioner (GP) records to determine the history and indication for irradiated blood
- The patient's GP is then written to, along with the patient being sent the National Health Service Blood and Transplant (NHSBT) information leaflet and alert card for the irradiated blood requirement

Improvements in timely administration of prothrombin complex concentrates (PCC) [1]

- An emergency department (ED) team wanted to improve the rates of patients where intracranial haemorrhage has been confirmed on computed tomography or life-threatening gastrointestinal bleed has been identified receiving PCC
- Guidelines state that PCC should be administered within an hour of the decision being made to reverse Warfarin
- Previous practice required discussion with a consultant haematologist to authorise PCC, the request form would be completed and sent to the hospital transfusion laboratory
- The biomedical scientist would issue the PCC and make it available for collection
- The clinical area would request a porter to collect the PCC which was often where a delay occurred due to time constraints and other factors in the clinical area

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Improvements in timely administration of PCC [2]

- A specific protocol was developed where authorisation of PCC is by a registrar (ST3 or above) and 1000IU of PCC can be administered immediately on diagnosis, allowing time to discuss further PCC requirement with a consultant haematologist
- Audit results identified that 67% of patients now receive PCC within 1 hour of the decision being made compared with 36% pre implementation of the project
- Patient survival rate has increased to 86% from 53% pre implementation
- In 43% of cases, the initial dose of 1000IU of PCC was sufficient to reverse the international normalised ratio without need for further PCC
- The ED educational development nurse shared the training resources with all ED nurses via WhatsApp to supplement the face-to-face training
- The ED consultants undertook training with doctors and registrars, the transfusion laboratory managers undertook training with the BMS, and the transfusion practitioner trained the porters in the new process along with supplementary training for nurses and other staff who required it

Donor Haemovigilance

Venepuncture-related pain and paraesthesia but no abnormalities on electromyography or nerve conduction studies

- A regular male whole blood donor, who had donated fifteen times previously, reported persistent problems with his donation arm when he returned to donate five months later
- The donor remembered experiencing a sharp pain at the time of needle insertion but this improved during the donation process and this was not reported to staff
- A full donation was taken
- Post donation, minor bruising in the right antecubital fossa and the medial aspect of right forearm was experienced
- Since donation, the donor described having a painful cramp and tingling sensation when holding a phone to his ear for long periods or when lifting weights
- The donation arm was painful with elbow flexion but not at rest
- He occasionally woke in the mornings with discomfort in his arm if his hand or elbow came under his weight
- There was no loss of power or coordination, no swelling, or lump
- The donor was subsequently assessed by his GP for numbness in his right thumb/thenar eminence and pain on elbow flexion against resistance
- He was seen by a consultant neurologist and a clinical neurophysiologist, 10 months after donation
- Neurological examination, electromyography and nerve conduction studies were all normal
- He also had a normal magnetic resonance imaging scan of his right forearm
- The donor has been withdrawn from future blood donations

Vasovagal reactions in two whole blood donors, and suboptimal pre-donation preparation

- Two regular whole blood donors, who both experienced vasovagal adverse events with complications are described here
- One donor experienced a vasovagal reaction on session following their second donation, with a brief loss of consciousness and sustained an injury in the form of chipped teeth
- The other donor experienced pre-syncopal symptoms at session following their fifth donation; once home, they felt unwell and were admitted to hospital due to excessive vomiting, where they were diagnosed as hyponatraemic
- In both instances, preparation for donation was not optimal: the first donor had not taken adequate fluids while the other donor declared on follow-up that they had drunk more fluids than usual as it was a very hot day

Suspected air embolism in a platelet donor

- A regular male platelet donor in his 60s, had given 250 donations previously
- No concerns were reported during the pre-donation health screen
- During the platelet donation a 3cm air embolism had been seen by staff in the line entering the donor circulation
- The donation was stopped immediately, and appropriate actions taken including donor assessment
- The donor was taken to the emergency department by ambulance and was monitored for 4 hours
- The donor remained well and was discharged home
- The incident was investigated thoroughly but has failed to uncover the exact cause of the incident
- The donor remains withdrawn from future donations

Human Factors and Ergonomics in SHOT Error Incidents

Individual staff member was asked to reflect despite report showing wider staffing and organisational issues

- A sample from a patient in the emergency department (ED) grouped as O D-positive, historic group A D-positive
- A wrong blood in tube (WBIT) incident was identified because the staff member who performed phlebotomy realised that they had bled the wrong patient and escalated to a senior clinician who informed laboratory staff
- Due to workload pressures, the samples were labelled remotely from the patient with inadequate patient identification and patient notes from the neighbouring bed space were used
- The ED had an operational escalation process in place due to extreme pressures
- Patients were being seen on the ambulance corridor and there was only one nurse and one nursing assistant
- The member of staff involved had to undergo retraining, competency-assessment, and completed a reflection tool

Human factors analysis in a transfusion-associated circulatory overload (TACO) case reported to SHOT

- An elderly patient was admitted to the emergency department (ED) unwell, with shortness of breath and sepsis
- A full blood count sample was sent to the laboratory and a haemoglobin (Hb) result of 65g/L and pancytopaenia was reported to the clinical area
- The Hb result was discrepant to results obtained by point-of-care testing using venous blood gas samples
- A TACO risk assessment was carried out pre transfusion and risks of TACO were identified including heart failure
- One unit of red blood cells was requested, and the transfusion was commenced over three hours
- Observations recorded during the transfusion found that the patients National Early Warning Score (NEWS) score had increased, indicating that the patient was having a reaction, and the transfusion was stopped while medical review was undertaken
- Following review furesomide was administered to the patient, the transfusion was recommenced, and observations were recorded more frequently
- A chest X-ray showed bilateral effusions consistent with fluid overload
- A post-transfusion full blood count sample was sent to the laboratory which showed a Hb result of 145g/L and improved platelet count
- On investigation it was discovered that the wrong patient's results had been released to the clinical area initially, and that the decision to transfuse had been made on erroneous laboratory results with no review of point-of-care test results
- The patient recovered and survived, and a structured TACO investigation was performed using the dedicated SHOT template
- Please see the Human Factors supplementary information for a full analysis of the human factors principles

Adverse Events Related to Anti-D Immunoglobulin (Ig)

Incorrect decision to omit anti-D immunoglobulin (Ig)

- During a major haemorrhage protocol activation, an adult therapeutic dose of D-positive platelets was transfused to a D-negative mother
- The baby's sample tested D-negative at delivery
- The clinical team returned the anti-D Ig because the baby was D-negative, failing to recognise the need for anti-D Ig following the transfusion of D-positive platelets

Incorrect dose of anti-D immunoglobulin (Ig) following cell salvage

- A dose of 500IU anti-D Ig was given to a mother post delivery
- The laboratory was not informed that cell salvage products had been re-infused and that a 1500IU dose should have been provided

Incorrect Blood Component Transfused (IBCT)

Red cells administered in error instead of platelets

- A patient was due to undergo spinal surgery
- As they had been taking clopidogrel, two adult therapeutic units of platelets were prescribed to be given pre surgery
- The patient's Hb was 152g/L
- A nurse asked the porter to collect 'one unit of blood' from a remote issue refrigerator
- The red cells were issued to the patient for use during surgery if required but had not been prescribed
- The nurse administering the transfusion reported that pre-transfusion safety checks were completed, but this failed to pick up that the wrong blood component was about to be administered
- The unit of red cells was transfused uneventfully
- When another nurse requested platelets to be collected, a second unit of red cells was brought to the ward
- When the nurse realised the wrong component had been delivered, the previous transfusion was checked, and the earlier error was identified
- The patient suffered no ill effects from the red cell transfusion and surgery went ahead as planned with the prescribed platelets being administered during the surgery

Shared care communication failure leads to transfusion of a non-irradiated blood component

- A patient with a history of Hodgkin lymphoma did not receive an irradiated red cell unit for an elective transfusion
- The laboratory had not been informed of the patient's diagnosis by the clinician when the request was made therefore no alert was in place on the laboratory information management system (LIMS)
- Neither the request form nor the prescription/authorisation record stated the specific requirements, and no relevant clinical history was provided

Incorrect ABO red cells transfused to a post-haematopoietic stem cell transplant (HSCT) patient due to not heeding information technology (IT) alerts

- A group A D-positive patient received a group O D-positive HSCT
- The patient grouped as O D-positive and seemed to be fully converted but further investigations were required to see if the patient had been transfused elsewhere to confirm this
- A request for two units of red cells was received, and two A D-positive red cell units were issued, of which the patient received one unit
- The patient's clinical notes clearly stated that O D-positive red cells should be given, and a 'specific group needed' flag previously added to the laboratory information management system (LIMS)
- The flag appeared when issuing the components but was misread and cleared using a comment designed for use on a 'phenotype required' flag
- Secondary LIMS checks were also bypassed as the group and screen results were not validated before the blood was issued
- Outstanding results were discovered and validated 12 hours later when checking the outstanding work
- Unfortunately, the error was not noticed at this point and the second unit remained available for collection but was not required
- The error was only detected during a subsequent request for red cell transfusion when biomedical scientist (BMS) staff looked through recent transfusion history
- The BMS involved stated that they had been called in to cover the shift at short notice and were rushing to clear the workload
- The laboratory has plans to install a new LIMS system which has rules for HSCT patient grouping requirements

Red cells transfused to patient not meeting antigen requirements and without serological crossmatch

- Red cell units were electronically issued to a patient with autoimmune haemolytic anaemia (AIHA) and detected autoantibodies for an urgent transfusion
- This was based on a report from the reference laboratory using samples that had exceeded the 72-hour sample expiry rule
- The current sample had not been tested in-house and no further samples had been sent to the reference laboratory for antibody investigations
- Furthermore, the unit selection recommended by previous reference laboratory reports suggested issuing C-, K- ABO D-compatible units, but C+, K- units were selected instead
- The reporter stated this error occurred out-of-hours and that the biomedical scientist (BMS) involved was not fully competent in this task
- They were asked to cover the shift at short notice due to illness, as no other sufficiently trained staff were available. The BMS did not seek transfusion advice for this complex patient

Communication failure at handover leads to ABO-incompatible transfusion

- Patient A, with group O D-positive blood, being treated for a malignancy, required a routine transfusion but was given group B D-negative red cells in error
- The ward was very busy with multiple patients requiring transfusions concurrently, general admissions and further patients arriving from the haematology clinic for treatment
- A nurse was providing cover for another nurse on their break
- During the handover, the second nurse misunderstood which patient the blood that had been requested for
- The red cells had been requested for patient B but when they arrived on the ward, they were taken to patient A's bedside
- A two-person independent check was carried out but not completed correctly and the patient's identity was not verified
- The patient's observations were checked, and the transfusion commenced
- When the nurse checked the patient's observations at 15 minutes the error was detected, and the transfusion stopped immediately
- The patient had received less than 50mL of the incorrect red cells and they developed rigors but recovered fully

Incorrect unit collected leading to ABO-incompatible transfusion [1]

- A patient with blood group O, had COVID-19 and sepsis, required an emergency transfusion, but was given group A red cells in error
- Nurse 1, the patient's allocated nurse handed over care to nurse 2 and went for a break
- Nurse 2 requested the first unit of red cells to be collected from the laboratory and delivered to the unit urgently
- The incorrect unit of red cells was collected from the transfusion laboratory and delivered to the department by the porter
- They were rushing, saw the correct surname but did not check the full patient details
- The patient was in an isolation room and personal protective equipment was needed prior to entry
- The red cells were handed to the nurse outside of the patient's room

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Incorrect unit collected leading to ABO-incompatible transfusion [2]

- It was a highly stressful situation, where the clinicians believed that the patient was peri-arrest and required an immediate transfusion
- When inside the patient's room they checked the prescription for the red cells against the patient's wristband and checked the expiry date of the unit
- They did not check the patient's identification band
- The yellow label warning of another patient with a similar name had not been noticed by the porter or the nurses
- Nurses had called the consultant to review the patient and he noticed that the first name on the red cell unit was not that of the patient
- At that point, 56mL of incorrect red cells had been given over a 3-minute period
- The transfusion was stopped immediately
- The patient died 3 days later due to sepsis and COVID-19. His death was unrelated to the transfusion

Difficult pre-administration checks lead to ABO-incompatible transfusion

- A known haematology patient, with chronic transfusion dependent anaemia, blood group O, was admitted to the medical day-case unit for a transfusion of two units of red cells
- The first unit was administered uneventfully
- When the second unit was to be transfused the correct collection process was not followed by the clinical staff, only the surname of the patient was checked
- They did not cross check the details with prescription/collection form and compatibility slip
- There happened to be two patients with the same surname receiving red cell transfusions at that time, but they were on different wards
- The bedside pre-administration checks were not undertaken correctly by the two nurses
- The only checks undertaken were between the patient's identification band and prescription
- Transfusion of a unit of group A red cells was then commenced. The patient had received approximately half of the unit when they became acutely unwell with rigors and vomiting
- The transfusion was stopped immediately by nursing staff and the patient was reviewed by a consultant physician, and the haematology consultant was contacted and involved immediately
- The patient subsequently developed an acute haemolytic transfusion reaction
- They were admitted as an inpatient for close observation under the care of the haematology and renal teams due to the development of acute kidney injury

Use of wrong pick-up slip leads to an ABO-incompatible transfusion

- Patient A, with group O blood, being treated for liver disease, required an emergency transfusion during a cardiac arrest, but was administered group A red cells in error
- A nurse gave the healthcare assistant (HCA) a pick-up slip and they collected the unit of red cells from the main blood refrigerator and brought it to the ward
- The red cells were run through the giving set by one nurse and handed to another nurse to connect to the patient's intravenous line
- The electronic blood-tracking system was not used to scan either the patient's identification band or the unit of red cells prior to setting up the transfusion
- The nurses involved did not do a visual check of the labels or the unit
- No manual pre-administration checks were carried out and the patient's identity was not confirmed before the transfusion was commenced
- Another member of staff noticed that the compatibility label on the unit was for a different patient, and the transfusion was stopped immediately
- Most of the unit had already been transfused
- The patient was then given a unit of emergency O D-negative red cells
- The patient later died but this was not attributed to the transfusion error

Collection of the wrong unit leads to an ABO-incompatible transfusion

- Patient A, with blood group O, required a routine red cell transfusion for treatment of anaemia
- A porter incorrectly collected red cells from the blood issue refrigerator for patient B, despite the patient identification details on the blood collection form being for patient A
- The porter took the red cells to the clinical area that had requested the red cells for patient A, and the nurse administered the unit to patient A
- The blood collection form was handwritten, and the two patients had similar names, but different dates of birth and unique identification numbers
- Patient A had not had a crossmatch carried out, so there was only a unit of red cells available for patient B
- The transfusion was completed without incident and there was no harm to the patient
- Patient A had a repeat group and screen 6 days later and at this time the transfusion laboratory staff contacted the haemovigilance practitioner (HVP) to inform them that patient A had received a unit of red cells, but there were no blood products issued for them historically
- When the HVP reviewed the patient A's medical records it was realised that the unit of red cells patient A received was intended for patient B

Incorrect ABO red cells transfused to post solid organ transplant patient due to not heeding IT alerts

- The patient (blood group A D-positive) was transplanted a liver (blood group O D-negative)
- Two weeks post transplant the patient had a positive DAT with IgG 2+ and crossmatching was found to be incompatible with all group A D-positive red cells
- The sample was referred to the reference centre for elution studies as part of querying possible passenger lymphocyte syndrome (PLS) investigation
- Reference centre reported anti -A1 antibody was detected in an eluate prepared from the patient's red cells
- The patient's specific requirements were updated on the pathology IT system to issue group O D-positive blood until the PLS resolved
- A week later the biomedical scientist on call issued two group A D-positive red cells without checking the special requirements on the pathology IT system
- Units were crossmatched as serologically compatible but should have been group O D-positive
- The staff member failed to follow the correct requirements and laboratory procedure
- The patient was transfused both units of red cells and is currently stable without evidence of haemolysis

Red cell units transfused to a sickle patient which did not meet specific requirements

- Two red cell units were issued and transfused to a sickle patient, which did not match the Rh and K phenotype specific requirements
- Rh and K phenotype was not performed by the biomedical scientist (BMS) prior to the issue of red cell units to a known sickle cell patient new to the organisation
- The patient typed as group O D-positive
- The patient was male, so the BMS decided to select K-positive, O D-negative units (rr) HbS-negative
- RhK type was performed the next day, and the patient typed as C-e-K- (probable R2R2)
- On reservation and issue of the red cell units, the laboratory information management system (LIMS) did flag to state that the patient had sickle cell disease
- This flag was acknowledged by the BMS, as the unit was selected as HbS-negative
- But as the RhK phenotype had not been performed prior to issue, the RhK phenotype specific requirements were not available in the LIMS to flag a discrepancy between the selected units and the patient's requirements
- Investigation felt this highlighted a gap in knowledge of the laboratory staff member and/or inadequate training having been provided. This incident occurred towards the end of a late shift
- During this time, there were minimum staff managing the transfusion and haematology departments, prior to hand over to the out-of-hours night shift BMS

Platelets transfused to the wrong patient

- Patient A with acute myeloid leukaemia in an emergency assessment unit was prescribed platelets
- They were prescribed, issued and collected for the correct patient but were administered to patient B
- The complete unit had been transfused before the error was realised
- The two patients were in separate cubicles next door to each other and had similar illnesses
- The nurses involved did not follow the correct positive patient identification checks prior to administration
- Some checks were completed outside of the cubicle and only one of the nurses entered the cubicle to administer the platelets and they did not check the patient's identification
- A bedside checklist was signed by both nurses to confirm the checks had been completed, but these checks were not performed
- Patient B did not suffer any ill effects from the transfusion and patient A received their correct transfusion later that day

Handling and Storage Errors (HSE)

Excessive time to transfuse using the wrong giving set

- When receiving a non-urgent transfusion, the patient reported that the transfusion they were receiving had run for an extended period (approximately 6 hours)
- It was found to have been administered through the incorrect giving set
- Upon investigation, the documentation was found to be sub optimal
- No stop time and no end observations were recorded
- There were no medical or nursing notes pertaining to the transfusion
- The patient was in the day surgery unit which after hours was covered by agency staff supervised by a single substantive nurse not familiar with this area

Temperature-monitoring system alarm limits set incorrectly [1]

- During a training session the transfusion practitioner noted that the issue refrigerator door was slightly ajar, and closed the door, but did not inform the laboratory staff at the time of the event
- Later, when laboratory staff reviewed the temperature logs on the temperature-monitoring system and the paper chart on the refrigerator, it was noted that the temperature had been above 6°C for approximately 2 hours
- The lead biomedical scientist immediately initiated a recall of all red cell components that had been stored in the refrigerator during the time that it had been outside the acceptable temperature
- It emerged that one patient had been transfused with a unit of red cells implicated in the temperature excursion
- The consultant haematologist was made aware and there was no obvious adverse reaction in the patient

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Temperature-monitoring system alarm limits set incorrectly [2]

- Five other red cell units were disposed of
- The blood refrigerator temperature-monitoring system usually triggers an audible and visual alarm in the laboratory, but this did not occur
- The alarm settings were reviewed, and it was noted that the air temperature alarm was set to trigger at 7.7°C with a 5-minute delay
- No justification could be provided for the air alarm setting and so it was immediately adjusted to meet requirements
- The blood refrigerator temperature probes were connected to a third-party alarm escalation service, but did not trigger an alarm to switchboard as expected
- The blood refrigerator was also fitted with a door open alarm
- The settings for this were checked and found to be on 3-minute delay, this has since been adjusted to a 1-minute delay
- It is not clear whether the door alarm did sound on the day of the event but, during testing, it was observed that the alarm was not very loud

Avoidable, Delayed or Under/Overtransfusion (ADU), and Incidents Related to Prothrombin Complex Concentrates (PCC)

Communication confusion, poor organisation of major haemorrhage protocol (MHP) roles combined with delayed recognition of bleeding result in major morbidity

- A patient with acute bleeding (delayed computed tomography scan to assist diagnosis) suffered cardiac arrest
- The MHP was activated incorrectly – the doctor rang the transfusion laboratory directly (lack of knowledge of the organisation) rather than activating through switchboard so the porter was not alerted leading to delay in blood collection
- The sister in charge was multi-tasking in the busy ward as the neighbouring patient was being discharged and so she was not fully present at the incident
- The nurse looking after the patient was newly qualified and was busy doing chest compressions
- The patient was transferred to the intensive care unit and ultimately survived
- The MHP activated again despite being ongoing
- Timings: cardiopulmonary resuscitation from 14:38, MHP initially activated at 14:47. Pulse present at 16:48. haemoglobin 79g/L on blood gas at 15:02, first two units collected from the transfusion laboratory at 15:15 (total six units of red cells and four fresh frozen plasma were transfused)
- The report noted that there is a general shortage of staff on the ward who were heavily reliant on agency staff
- There was no clear designation of roles within the MHP, and people were very busy with the patient due to cardiac arrest

Staffing issues and poor communication together contribute to patient death

- An elderly patient with known myelodysplasia was admitted with trauma out-of-hours following an unwitnessed fall
- The laboratory staff telephoned the haemoglobin 35g/L to the emergency department (ED) at 21:23 and advised that a single sample was needed for confirmation and crossmatch (multiple historical records)
- Two samples were received at 22:45, but both were rejected due to the wrong date of birth
- The ED was informed immediately
- At 00:40 the ED notified the laboratory staff that they were taking the emergency O D-negative units and there was a repeat sample in the pod (which should not be used for emergencies)
- Due to the delay (>3 hours) the patient was now very unwell and unable to wait for crossmatched blood

Delayed Transfusions

Delay in red cell transfusion in patient with a gastrointestinal (GI) bleed awaiting a hospital bed contributes to death

- An elderly patient with haematemesis, dark stool and shortness of breath was attended at home by a paramedic crew
- The patient had tachycardia and was pale with low blood pressure. The patient was taken as an emergency to the emergency department
- On arrival there were delays offloading from the ambulance due to lack of available space
- Whilst still in the ambulance, the patient began to deteriorate and despite escalating care from the paramedics and a haemoglobin of 38g/L, treatment was delayed by more than 2 hours and the patient passed away from a cardiac arrest

Lack of understanding on how to activate the major haemorrhage protocol (MHP) contributes to patient death

- A patient with a perforated duodenal ulcer was being managed as an outlier in a COVID-19 bay
- The clinical team caring for the patient identified that the patient was bleeding and there was a requirement for urgent blood components
- Due to unfamiliarity with the management of MH, staff failed to correctly activate the MHP
- Instead, a doctor instructed a nurse, not directly involved in this patient's care, to 'get blood' without conveying the urgency
- Lack of vital information caused confusion between the laboratory staff and the nurse as to what was expected
- The communication difficulties were compounded by lack of understanding among staff about how to activate the MHP
- The patient was in a COVID-19 bay and the rarity of major bleeding in a ward environment caused delay in blood transfusion which contributed to the death of this patient

A sample that did not meet acceptance criteria was sent to the Blood Service resulting in unnecessary delay in transfusion

- An elderly person requiring transfusion for the treatment of chronic anaemia had a blood sample taken for group and screen
- The sample was accepted by the hospital transfusion laboratory and referred to the laboratory in the Blood Service for further testing
- The Blood Service staff telephoned the hospital laboratory to inform them that the surname on the sample did not match the surname on the request form and therefore the sample had been rejected
- This required a repeat sample and caused a delay in the provision of red cells for the patient

Biomedical scientist (BMS) decided not to thaw cryoprecipitate due to previous high levels of wastage

- The major haemorrhage protocol was activated for a patient with major bleeding post-surgery
- Cryoprecipitate was ordered as part of the initial ‘Pack 1’
- The BMS working in the transfusion laboratory decided not to thaw the cryoprecipitate because they had encountered wastage of frozen components in a previous shift
- This decision resulted in a 75-minute delay in the issue of cryoprecipitate
- The patient recovered and survived

Printer failure caused delay in transfusion

- The major haemorrhage protocol was activated for a patient suffering from a gastrointestinal bleed
- There was a delay in the blood components being issued as the printer failed to print labels
- The biomedical scientist (BMS) did not realise that the printer had run out of labels and tried to reprint
- The BMS contacted senior staff at home for advice
- The printer was reloaded with labels, but they were misaligned
- The patient was given two units of red cells after a 15-minute delay

Incorrect red cell units sent to the hospital results in delayed transfusion

- Samples were sent from a hospital transfusion laboratory to a Blood Service reference laboratory for further testing and crossmatching of red cell units
- The reference laboratory completed the testing but sent the blood components to the wrong hospital
- This error resulted in a 2-hour delay in treatment

Avoidable Transfusions

Unnecessary empirical transfusion given for upper gastrointestinal bleeding

- A patient with alcoholic liver disease presented after vomiting blood at home
- They were haemodynamically stable, but two units of red cells were transfused without any haemoglobin (Hb) check
- The post-transfusion Hb was 125g/L

Lack of understanding of appropriate use of O D-negative red cells

- The doctor caring for a trauma patient was not aware that crossmatched red cells were available and requested O D-negative emergency units
- The porter delivered named patient units from the laboratory, but the nurse rejected these twice as she was expecting emergency O D-negative units rather than named patient units (D-positive)
- The nurse did not check the compatibility label which confirmed the units supplied were for that patient

Platelet clumping in an oncology patient results in two unnecessary platelet transfusions

- A full blood count from a patient with leukaemia showed a significant drop in platelets compared to the previous day
- The analyser flagged possible platelet aggregates, but the result was released
- A blood film was made but only examined routinely the next day
- This showed platelet clumping, and the count was visually normal
- By this time the patient had been transfused with platelets
- Another sample sent the next day again reported low platelets
- No blood film was made, and a further platelet transfusion was given
- The post-transfusion platelet count was 232×10^9/L

Failure to correctly identify the patient at the time of authorising the transfusion leads to transfusion of the wrong patient

- A doctor had reviewed the full blood count for patient A and a red cell transfusion was indicated
- The doctor mixed up two patients' names and results and authorised transfusion for patient B in error
- Patient B's haemoglobin was 100g/L and they received a red cell unit they did not require

Under or Overtransfusions

A patient died following surgery where overtransfusion was justified [1]

- Shortly after an uneventful elective surgery (exchange of ureteric stents), the patient developed hypotension and tachycardia and was only minimally responsive to intervention (including intravenous fluids and vasopressors)
- The abdomen appeared distended, and the patient began complaining of back pain
- The patient was thought to have major haemorrhage and was transfused three units of red blood cells and two units of fresh frozen plasma (emergency major haemorrhage protocol)
- Computed tomography scan showed no evidence of bleeding, but there was evidence of pulmonary oedema
- The patient was transferred to critical care and remained extremely unstable

A patient died following surgery where overtransfusion was justified [2]

- Transfusion-associated circulatory overload was considered but not supported by bedside echocardiography
- Sadly, the patient died
- Subsequently blood cultures from the patient grew E coli
- This death was referred to the coroner who concluded multi-organ failure, E Coli urosepsis with chronic ureteric obstruction caused the patient's death
- The blood transfusion could have contributed to the patient's deterioration, but the relationship to the patient's outcome was not certain

Wrong blood in tube (WBIT) in full blood count (FBC) sample impacts two patients [1]

- A patient was transfused based on a wrong FBC result involving incorrectly labelled blood samples
- Labels for Patient 1 were printed, but the phlebotomist was unable to get a sample from the patient
- At the same time, there was a request for bloods to be taken from Patient 2 but the information technology (IT) system defaulted to the Patient 1's record following an incorrect hospital number data entry
- This resulted in labels belonging to Patient 1 being printed
- Positive patient identification was not undertaken correctly at the time of phlebotomy, and the incorrect labels were attached to the FBC sample which contained Patient 2's blood
- The FBC results were issued against Patient 1

WBIT in FBC sample impacts two patients [2]

- The laboratory staff noticed the discrepant haemoglobin (Hb) result in relation to the previous results from this patient but attributed this to surgery because the request had originated from a surgical ward
- The junior medical and nursing staff had also discussed the discrepancy of both Hb and mean cell volume but the possibility of WBIT was not considered
- Patient 1 was unnecessarily transfused a unit of red cells resulting in a post-transfusion Hb of 151g/L with no adverse symptoms
- Patient 2, whose Hb had been 91g/L fell to 71 then 69g/L resulting in a delay before they were transfused
- A mismatch between workload, staff provision, an ineffective IT system and communication factors were noted to be contributory factors in this incident

Hypotension attributed to gastrointestinal (GI) bleeding results in overtransfusion

- An elderly woman with pre-existing cardiac failure and poor renal function suffered a major GI bleed requiring a red cell transfusion and endoscopy which confirmed arterial bleeding from a duodenal ulcer
- She was stabilised but the following morning had hypotension
- No formal laboratory sample was taken between the first transfusion and the second the day after
- An urgent haemoglobin (Hb) was recorded mistakenly as 49g/L but on the venous gas was 119g/L
- Based on the erroneous result, she received six units of red cells; her Hb rose to 198g/L and she required venesection
- Computed tomography angiogram showed no evidence of bleeding
- She was admitted to the intensive care unit following interventional radiology treatment with gastroduodenal artery coil
- Four days later she returned to the ward, Hb 152g/L
- Although she subsequently died this was not related to the overtransfusion

Splenic rupture with major haemorrhage requiring interhospital transfer

- An elderly man on oral anticoagulants developed abdominal pain found to be caused by splenic rupture
- He required emergency transfer to another hospital site for interventional radiology (IR)
- Transfusion of red cells was started and planned to continue throughout the transfer
- He also received prothrombin complex concentrates and tranexamic acid
- There was no nurse available to accompany the patient, and the paramedics did not know how to manage the infusion pump when it stopped working and the transfusion was not completed
- The transfusion laboratory at the transferring hospital had not been informed of the transfer, so the available crossmatched red cell units and patient sample were not sent with him
- During the IR procedure he was peri-arrest and received emergency group O D-negative units and fresh frozen plasma
- The splenic embolisation was successful and he was transferred to a ward

Incidents Related to Prothrombin Complex Concentrates (PCC)

Failure to reverse warfarin and inadequate red cell transfusion

- An elderly person was admitted with a suspected cerebrovascular accident which was not confirmed on computed tomography
- However, they were found to have a haemoglobin of 44g/L and very high international normalised ratio (INR) (confirmed on repeat testing)
- The patient received a single unit of red cells but no reversal of the high INR
- They had epistaxis earlier in the day but no other bleeding
- No bleeding source was sought
- The patient collapsed and died 15 hours after admission
- The patient was on an acute ward which was very short staffed and usually relied on bank and agency staff

Near Miss (NM)

Near miss helps to identify safety issues with requesting electronic system

- A unit of red cells was collected by a porter using the porter electronic system
- The unit collected was for a different patient
- Both patients had the same surname, however no other patient details matched the blood request
- When the blood component arrived at the ward and the details were checked, the error was identified and reported to the laboratory
- The red cell unit was returned to the laboratory

Near Miss – Wrong Blood in Tube (NM-WBIT)

Patient care documented on the wrong patient record

- A patient queried why they were being called by another name
- The patient's pregnancy records had been uploaded incorrectly to another non-pregnant patient's notes
- Previous clinical notes and booking in bloods were undertaken under incorrect patient details/records
- The patient had not been positively identified at the previous appointment

Patient not adequately identified prior to phlebotomy

- The hospital transfusion laboratory received two samples for a patient with no previous blood transfusion history
- The samples and the request forms were correctly labelled and processed
- However, ward staff later called the laboratory to say the samples had been taken from the wrong patient
- The doctor realised the mistake when the nurse was placing the wristband on the patient
- The patient had a similar name and date of birth as the intended patient and was without a wristband at the time of sample collection

Failure to accurately identify patients leads to a near miss wrong blood in tube (WBIT)

- A doctor planned to take two group and screen samples from a patient that did not have a blood group history recorded in the laboratory
- The samples were taken 10 minutes apart, but one was taken from the correct patient and the other was inadvertently taken from a different patient
- The request forms were completed prior to taking the samples and the doctor did not check the patients' identities or their identification bands
- Samples were then labelled away from the patient’s side
- Testing revealed that the first sample grouped as O D-positive, and the second taken 10 minutes later grouped as A D-positive
- Two repeat samples had to be obtained from the right patient to ascertain their correct blood group
- There was a lack of medical staff on duty and the doctor involved was the only doctor on duty at the time, with multiple competing tasks to complete
- There were no delays to transfusion, or any other adverse outcome reported as a result of this WBIT

A baby's blood group not as predicted from cell-free fetal deoxyribonucleic acid (cffDNA) result

- A mother noted that her baby's blood group result (D-positive) did not correspond with the cffDNA result (predicted D-negative)
- The placenta had been discarded into the general placenta bucket with others, placed in individual plastic bags but unlabelled
- No cord bloods were taken
- A second midwife retrieved what she thought was the correct placenta from the bin, took a cord sample and sent it to the hospital transfusion laboratory
- Repeat bloods from the baby confirmed the sample from the retrieved placenta was a wrong blood in tube

Cord sampling mix-up

- Cord bloods were taken in the labour ward from newborn twins
- Twin 1 grouped as A D-negative and Twin 2 as O D-negative
- Subsequent samples were taken for Twin 1, which grouped as O D-negative
- Repeat bloods confirmed a wrong blood in tube from cord sampling at delivery
- The staff member taking samples at delivery had not undertaken transfusion training and was unaware that they were not to use pre-labelled tubes

Right Blood Right Patient (RBRP)

Blood component transfused despite patient identification/compatibility label mismatch

- A group and screen sample was incorrectly labelled for the intended patient and a unit of red cells was issued and transfused with incomplete details
- The clinical staff contacted the transfusion laboratory and queried the name discrepancy.
- The biomedical scientist said the blood component was safe to transfuse and incorrectly told the clinical team it was a middle name instead of the second part of the forename
- The sample should have been rejected and the blood component recalled
- The root cause analysis concluded that the patient details on the sample were taken from the electronic patient record not the patient's identification band
- The two-part forename was assumed to be a middle name and not included on the sample
- A contributing factor was that the discrepancy between the request form and sample was not detected

No patient identifiers on the prescription

- Due to an incomplete record of traceability, a copy of the patient transfusion record (PTR) was requested as evidence of transfusion
- Only the actual prescription section of the PTR had been completed without patient details on either the front or the back of the PTR to indicate which patient the prescription was for
- The prescriber had not completed the patient details on the consent section, transfusion-associated circulatory overload pre-transfusion risk assessment, indication for transfusion and pre-transfusion results
- Despite the prescription being incomplete, both units of red cells were administered to the patient by an external agency nurse who was not trained to administer transfusions in the hospital

Patient identification (PID) amended in error by laboratory and assumptions by clinical area led to unit of red cells being transfused [1]

- A biomedical scientist erroneously amended a patient's forename in the laboratory information management system (LIMS) in error to the name of the patient's ward
- The forename field was adjacent to location field in LIMS on the patient registration page
- This led to the unit being issued with the compatibility tag stating the incorrect forename and resulted in a compatibility tag and identification (ID) band mismatch at the bedside
- A new ID band with the patient's name as the name of the ward was then printed (electronic patient record (EPR) had automatically been updated by LIMS) and used to transfuse the patient
- Using the new ID band would not have alerted the staff to a mismatch on the electronic blood management system which was then used to confirm patient identification

Continued…

PID amended in error by laboratory and assumptions by clinical area led to unit of red cells being transfused [2]

- The ward nurse noticed the patient's forename read as the ward name on EPR and the compatibility tag
- This patient had restrictions on family members being aware they were in hospital and information being passed on to them
- The nurse mistakenly attributed the change in name was to protect their identity
- The staff nurse therefore printed a new ID band which was then used to transfuse the patient
- As all other identifiers matched, they reported being confident that this was the correct patient

Laboratory Errors

Death probably related to delay in platelet transfusion, due to laboratory results being suppressed pending film review [1]

- A patient with undiagnosed acute promyelocytic leukaemia presented in the emergency department (ED) at 9pm on day 1
- A full blood count (FBC) sample showed a Hb of 39g/L, white cell count of $86x10^9$/L and platelet count of $15x10^9$/L
- Results were reviewed by biomedical scientist (BMS) 1 who had not been signed off on FBC validation whilst BMS 2 was taking a break
- A routine blood film was requested, and an urgent review was not flagged
- The platelet count was not visible to clinical staff, as reporting parameters required it to be confirmed by blood film
- The FBC result was not phoned through to the clinical area
- Red cell transfusion commenced around 03:00 on day 2

Continued…

Death probably related to delay in platelet transfusion, due to laboratory results being suppressed pending film review [2]

- The high white cell count was referred by the ED to the clinical haematology department using the routine referral system, and was not flagged as urgent, therefore it was not viewed by the haematology team until 11:00 on day 2
- After seeing this result the blood film was reviewed urgently, and the diagnosis of an acute leukaemia was made
- The critically low platelet count and diagnosis was available to the clinical teams at around 11:20 on day 2
- There was over a 12-hour delay in the diagnosis of an acute leukaemia and commencement of urgent chemotherapy
- This also caused a delay in coagulation testing, which was requested around 12:30 on day 2 and the fibrinogen result was 1.8g/L
- However, when the fibrinogen level dropped to 1.2g/L on day 3 this was not escalated as an urgent referral as it was above the local threshold for telephoning results

Continued…

Death probably related to delay in platelet transfusion, due to laboratory results being suppressed pending film review [3]

- Cryoprecipitate was not administered for another 7.5 hours after the result was available on day 4
- Treatment was initiated urgently with blood component support, but the patient developed a subdural haemorrhage and died
- Upon investigation, there was a communication failure between the BMS staff
- BMS 2 originally requested that BMS 1 looked at the FBC results and make any blood films that were needed
- This was interpreted as being asked to validate the results. Local action was to remind BMS 1 to act within their scope of responsibility
- Within the laboratory, inadequate staffing levels and skill mix had already been raised within the organisational risk register and has subsequently been escalated to the divisional director

Communication failure causes delay and major morbidity

- A patient with sickle cell disease and a haemoglobin of 45g/L was admitted in crisis
- The patient had a progressive anaemia with multiple antibodies therefore frozen red cells were ordered from the Blood Service
- The following morning, the patient deteriorated with peri-arrest, hypoxia and acidosis
- One red cell unit was transfused at 08:00
- The transfusion consultant advised to administer further red cell units although fully compatible units would not be available for some hours
- The laboratory was advised by the consultant haematologist to select ABO, Rh, K matched red cells at 09:00
- The laboratory was contacted at 11:30 to ask about availability of the blood
- The patient was finally transfused after midday and recovered from this episode
- The transfusion delay was caused by communication failure, poor venous access for sampling and staff inexperience with issuing the best available red cells due to the presence of multiple red cell antibodies
- The staff are now aware that if blood is required urgently the clinical team can request red cells to be issued using concessionary release before testing is complete

Lack of staff knowledge leads to inappropriate editing of results and incomplete testing when lone working

- A sample was received from a patient requiring red cell transfusion postoperatively when the biomedical scientist (BMS) was lone working in the laboratory
- The analyser flagged the sample as haemolysed, and the results were validated and accepted by the BMS rather than being rejected, as the BMS did not know how to reject a haemolysed sample
- There was no result in the patient reverse group (B cells) and the BMS inappropriately amended the result to a 3+
- The laboratory information management system excluded the patient from electronic issue (EI) and highlighted the requirement for a serological crossmatch due to the group amendment
- The BMS was unaware that a modification would de-select EI and entered a negative reaction (compatible) into the crossmatch result, even though no test had been performed, due to the patient not having any antibodies or alert flags
- Although the BMS was deemed competent, they were bank staff who did not routinely work core hours and were previously employed as a transfusion BMS within the organisation
- This incident happened over a weekend where there was no second checker available
- The reporter identified that samples prior and after this incident were suitable for EI suggesting there was a primary issue with the sample being tested at the time

Laboratory safety culture and leadership issues influence a component selection error

- A patient with thalassaemia received red cells which did not match their Rh and K phenotype
- The requirement for phenotype-matched components was recorded in the laboratory information management system (LIMS) (despite an initial mistaken diagnosis of sickle cell disease being communicated)
- An additional step to highlight this requirement in the patient notes field on the LIMS was not completed which resulted in the biomedical scientist (BMS) not selecting phenotype-matched red cells
- During investigation the BMS stated they were multi-tasking and rushing, and the event happened at a weekend when there were less staff available than normal
- The report stated that staff do not have the correct amount of protected time to develop their knowledge and are less prepared to deal with complex cases
- Additionally, the BMS stated they felt they were ‘being watched’ and there was a blame culture within the laboratory
- Leadership and staffing issues within the laboratory had been identified during a recent inspection
- Corrective actions included updating standard operating procedures for issuing phenotype-specific blood and potential changes to LIMS but did not mention culture issues identified

Incomplete knowledge of quarantine procedures leads to inappropriate transfusion

- A patient on anticoagulants was due to have major orthopaedic surgery
- Two units of red cells were requested for theatre the following day but were taken in error to the clinical area the day before
- When this was noted, they were returned to the laboratory some 40 minutes later
- The blood-tracking system highlighted to the user they were beyond 30 minutes, so the nurse spoke directly to the biomedical scientist (BMS)
- It is alleged that to avoid wastage the BMS informed the nurse to transfuse it to the patient within the 4-hour window
- The nurse discussed this with the vascular registrar to transfuse to avoid wastage
- Although not clinically indicated at the time, the registrar decided to transfuse on the basis the patient would undergo major surgery the following day and would most likely need the blood perioperatively
- The initial communication error was the nurse being asked to collect the unit but, no consideration was given to use extended quarantine of the unit, or the appropriateness of advice in this specific situation

Cold chain error involving staff member lone working without competency assessment

- A blood component refrigerator was not within the required temperature limits for over 30 minutes, but below 60 minutes, meaning a quarantine period of at least 6 hours was required for the stored blood components prior to issue
- However, the temperature excursion was only noticed the day after this excursion and components were issued to patients without quarantine
- Upon investigation, the staff member responsible for temperature monitoring had not been trained or competency assessed for this procedure and had been working alone on a weekend shift
- The investigation stated ‘The de-reservation of units section to be managed by blood bank when the senior one of the blood transfusion seniors is trained’ indicating multiple training and knowledge gaps within the laboratory
- Further equipment factors were noted, such as the refrigerator did not have a system to prevent access in case of a temperature excursion
- Despite these findings, the reporter stated the cause of the incident was the member of staff not following procedure

Lack of laboratory information management system (LIMS) functionality, insufficient staffing, and incomplete training leads to inappropriate issue of antigen-negative red cells when lone working

- A sample and request arrived in the laboratory outside of normal working hours from a haematology patient with autoimmune haemolytic anaemia, presenting with anaemia
- The sample was partly tested and then sent to the Blood Service reference laboratory for further investigation
- A previous Blood Service report indicated to give C-negative, K-negative, ABO- and D-compatible red cells
- The clinical area required blood urgently and the laboratory selected C-positive, K-negative red cells
- Although the sample was beyond its' 72-hour expiry time, the LIMS allowed issue with electronic issue
- Upon investigation, it was noted that the LIMS did not automatically alert for specific requirements
- Although this was known, there was no capacity within information technology to implement the change
- The biomedical scientist (BMS) was filling a shift at short notice as no other qualified BMS staff were available
- It was later noted the BMS lacked competency, was relatively inexperienced and did not seek help with issues they did not understand

Plasma components thawed too close to issue caused temperature deviation for all components issued

- Red cells and fresh frozen plasma (FFP) were packed and issued to the air ambulance
- The team attended a major trauma and decided to transfuse at the scene and transfused one unit of red cells and one unit of FFP
- The remaining components were returned to the laboratory upon return
- When the data logger was interrogated, it indicated that the temperature was greater than 10°C for greater than 30 minutes
- The returned units were disposed of
- The haematology consultant was informed, and the patient assessed as no harm from the transfusion
- Upon investigation it was noted suitable FFP units were not available and that the FFP issued was thawed too close to packing and had not reached a core temperature of less than 6°C

High-titre anti-K detected in a pregnant patient, sensitised by previous transfusion

- During a postpartum haemorrhage in which six red cell units were required, a woman was transfused one unit of red cells which were not typed for the K antigen
- The laboratory information management system flagged that the requirement was not met but this was overridden by the biomedical scientist who was lone working
- When booking samples were analysed for the subsequent pregnancy 7 years later, an anti-K antibody with a titre of 1 in 256 was detected
- The woman required monitoring for haemolytic disease of the fetus and newborn throughout the pregnancy

K sensitisation in a patient of childbearing potential detected through dual population

- When performing a group and screen for a patient of childbearing potential, a dual population of cells in the anti-K well was detected at hospital 1
- They confirmed with the Blood Service that a red cell unit was transfused to the patient which was K-positive at hospital 2 (another site within the same organisation)
- A laboratory information management system (LIMS) flag was overridden at the point of issue
- The biomedical scientist, who did not have an in-date competency assessment for this procedure, stated there was a high workload on this particular day
- The laboratory at hospital 2 was looking to implement a new LIMS system which would prevent the issue of K-positive units to patients of childbearing potential

K-positive blood issued to a patient of childbearing potential with irradiated requirement, leading to sensitisation

- During a major bleed, a patient who required irradiated blood was issued O D-negative units which were not K typed, as these were the only irradiated components available on site
- This unit was issued to prevent delay in ordering units with all requirements from the Blood Service
- The patient subsequently developed an anti-K antibody
- The biomedical scientist (BMS) was lone working and reflected they may have provided more information to the clinical area about the risks of providing K-unmatched red cells if they had extra support in the laboratory and were less rushed
- The laboratory has submitted a business case to have 2 BMS staff working during night shifts to reduce future risks out-of-hours

K sensitisation in a patient of childbearing potential

- One unit of red cells was requested for a patient of childbearing potential due to low haemoglobin of 68g/L
- The patient had a negative antibody screen, the red cells were electronically issued and transfused
- The next time the patient presented, they had developed anti-E and anti-K antibodies, indicating the patient had been sensitised to the K antigen
- The transfused red cell unit was confirmed to be K-positive by the Blood Service
- Upon investigation, the biomedical scientist issuing the unit was lone working, outside of routine hours

Errors Related to Information Technology (IT)

Alert on electronic blood management system (EBMS) overridden twice

- The wrong platelet pack from a two-unit donation was issued electronically and the discrepancy between codes was highlighted by the EBMS at the point of collection
- The laboratory re-issued the same unit, but the discrepancy remained, so the alert was overridden without identifying or resolving the source of the error
- The same discrepancy was highlighted at the pre-administration check and again was overridden, and the unit transfused
- This error came to light when the second pack from this donation could not be issued because it had already been fated as ‘transfused’
- This highlights the importance of understanding the exact nature of the error message and effective troubleshooting before proceeding with transfusion

Staff inexperienced in use of a newly implemented electronic blood management system (EBMS)

- Nurses undertaking an electronic pre-administration check received a warning message that a unit of red cells was ‘not recognised’
- There was a back-up protocol in place to revert to the two-person independent check using paper documentation, but this was not followed
- The laboratory was consulted and advised that the unit was returned, and a replacement was issued
- This was successfully scanned, and safely administered without any further warning messages
- Investigation demonstrated that clinical staff were unfamiliar with which barcode on the unit to scan and the initial error message had not clearly indicated this

Crossmatched blood could not be collected while the remote electronic issue (REI) system was updating

- A member of clinical staff, who was fully trained and competent at using the electronic blood-management system, clicked ‘blood products out’ on the blood kiosk and entered the patient’s details
- An error message appeared indicating a problem retrieving the units assigned to this patient stating, ‘Please try again, or contact support for assistance’
- The alert was acknowledged, but to avoid delay, emergency blood was collected instead of the assigned units
- Investigation identified that, at the time of the attempted collection, the laboratory had just issued two further units of red cells which were being transferred into the REI system, so the patient’s record was updating
- Therefore, the kiosk would not allow the already issued blood to be collected
- The error message advice was specific and, had an attempt been made to collect the blood again the system would have allowed the blood that was issued and labelled for the patient to be removed

Error message misunderstood, and expired blood transfused

- The ward staff administering blood to an unwell patient who needed an urgent transfusion got the error message ‘dereservation’ from the electronic blood-management system (EBMS) and reverted to a manual independent two-person check, which is was the contingency for system downtime
- Neither noticed the ‘use by’ time on the blood bag tag and it was transfused beyond its expiry
- There had already been a delay in collecting the blood and there was no written or verbal communication from the laboratory indicating the unit was close to expiry
- There had been repeated error messages from the EBMS, so the clinical staff concluded that the system was not working as expected and went straight to the downtime procedure
- There was already a degree of ‘alert fatigue’ and the error message was not understood at the bedside to mean that the unit had expired

Two different medical record numbers in use across hospital sites

- A sample and request for red cells was sent to the transfusion laboratory from another hospital site
- Two units were crossmatched using the hospital number from the main hospital site and transported to the theatre refrigerator
- When the member of staff came to collect the first unit the electronic blood-management system said there was no blood available for the patient but, using the ‘emergency access’ facility, blood was located and found to have correct identifiers except for the hospital number
- There was a shared laboratory information management system (LIMS) across these two hospital sites which used a site-specific hospital number as the unique identifier
- The NHS number was included in the patient’s record for information only
- The LIMS is due for replacement which may present an opportunity to resolve this lack of interoperability

Information technology (IT) server failure causes multiple operational issues

- There was a failure of the power supply to multiple servers because the uninterruptable power supply had been set up in a way which was not in accordance with the design and undermined the resilience built into the system
- This caused multiple systems to fail including the electronic blood-management system and remote electronic issue refrigerator resulting in potential delay to transfusion of a bleeding patient and avoidable use of emergency blood
- There were additional IT-related communication issues because the bleep system was down, and it was difficult to get specific help and advice on transfusion issues without access to a telephone directory
- Had they been in contact with the laboratory, theatre staff would have known that fully crossmatched units were available for the patient

Communication of the back-up procedures during planned downtime

- During a planned IT downtime which affected the electronic blood-management system, a patient in theatres was given emergency blood taken from a CREDO™ box instead of the crossmatched blood that was available in the laboratory
- Despite organisation-wide communications supplemented by individual emails to anaesthetists working on the day there was still lack of clarity about the arrangements
- There was a review of the downtime arrangements including consideration of a standard blood refrigerator with keycode access and a manual register as back up in future

Loss of data from a temperature probe

- A temperature-monitoring system required upgrading
- There was a failure to force a data back-up before the system was taken offline for maintenance, so data appeared to have been lost since the last back-up which was scheduled every 24 hours
- The external provider of this monitoring system did not consider the implications of the timing of the maintenance/upgrade although the need for an uninterrupted cold-chain record had been highlighted by the hospital laboratory and quality managers
- The missing data was eventually fully retrieved and there had been no temperature excursions therefore no risk to the blood supply
- Both parties undertook to take this into consideration when planning for future works

Febrile, Allergic and Hypotensive Reactions (FAHR)

Inappropriate use of fresh frozen plasma (FFP) prior to liver biopsy results in an anaphylactic reaction

- A patient was given FFP prophylactically prior to liver biopsy due to prolonged international normalised ratio
- They developed itching, wheeze, angioedema, and a drop in oxygen saturations requiring the anaphylaxis pathway

Inappropriate investigation and management of a febrile platelet reaction

- A patient with lymphoma developed fever and rigors on their way home after an outpatient platelet transfusion
- They returned to hospital and were treated with hydrocortisone and chlorphenamine
- Repeat group and screen was sent but no blood cultures were performed

Inappropriate investigation and follow-up plans for a patient after an allergic reaction to fresh frozen plasma (FFP)

- A patient developed itching and eye swelling during transfusion of FFP in the context of major haemorrhage
- They were appropriately treated with an antihistamine and their symptoms settled
- They were investigated with a repeat group and screen and because of this reaction, a flag was placed on their record to require a serological crossmatch (rather than electronic issue) for future transfusions

Transfusion-Associated Circulatory Overload (TACO)

Transfusion-associated circulatory overload (TACO) risks failed to be identified leading to missed opportunities and death [1]

- A female patient weighing 52kg with a haemoglobin level of 68g/L was prescribed two units of red cells
- She had liver disease and sepsis with peripheral oedema
- The cause of the anaemia was not clear, but she was not actively bleeding, and the National Blood Transfusion Committee (NBTC) indication code assigned to the transfusion was R2 (acute anaemia)
- A TACO pre-transfusion risk assessment was completed, and the clinician did not identify any risks, therefore no actions were assigned to mitigate TACO
- The first unit of red cells was given without issue and the second unit was commenced 4 hours later without a clinical review
- She became acutely unwell after the first hour, and an emergency call was made
- She developed dyspnoea and tachypnoea with oxygen desaturation to 90% from a previously normal level and had tachycardia and systolic hypertension

Continued…

TACO risks failed to be identified leading to missed opportunities and death [2]

- The post-transfusion chest X-ray showed significant pulmonary oedema
- The NT-pro BNP was significantly raised however there was no pre-transfusion value
- An echocardiogram showed moderate left ventricular systolic dysfunction which had not been previously reported
- A fluid balance was not reported but there had been a 5kg increase in weight post transfusion
- Multiple doses of furosemide were given resulting in some diuresis, but respiratory symptoms remained unchanged. Intensive care unit admission was required, and continuous infusion of diuretic was administered, with morphine and antibiotics
- The patient unfortunately died
- Sepsis was clearly a major factor however the transfusion was assessed as contributory to the death
- A local structured review was performed in the form of an audit of the TACO pre-transfusion risk assessment completion, transfusions out-of-hours, and the single unit red cell policy

Pulmonary Complications of Transfusion: (Non-TACO)

Transfusion-associated dyspnoea (TAD)-C - High suspicion of fluid overload not satisfying transfusion-associated circulatory overload (TACO) criteria

- A patient with decompensated liver disease, impaired left ventricular function, aortic stenosis, and low albumin, was receiving diuretics for fluid overload
- They developed respiratory distress and crepitations during a two-unit fresh frozen plasma transfusion given to correct clotting abnormalities during an endoscopy for bleeding varices
- The chest X-ray showed increased consolidation in the left lower lobe. The risk of fluid overload was noted prior to transfusion
- There was no immediate response to diuretic at the time of the reaction, but the patient was given further diuretics in the intensive care unit
- The patient was ventilated overnight and improved by morning

Transfusion-related acute lung injury (TRALI) type II - Recurrent pulmonary reactions with solvent-detergent fresh frozen plasma

- A patient was undergoing plasma exchange for suspected thrombotic thrombocytopenic purpura (eventually confirmed as haemolytic uraemic syndrome)
- Respiratory deterioration occurred on three successive occasions during exchange
- The chest X-ray showed worsening bilateral changes and there was a rising C-reactive protein, but the patient was not thought to have pneumonia
- Renal function was normal and there was a negative fluid balance and no features of fluid overload

TRALI/TACO with human leucocyte antigen (HLA) class I antibody

- A patient with pre-eclampsia but normotensive, low albumin, and peripheral oedema was transfused one unit of red cells for postpartum haemorrhage following caesarean section
- Dyspnoea developed 2-6 hours after transfusion, and oxygen saturation was 95% on oxygen (FiO2 not recorded)
- The chest X-ray showed upper lobe diversion and a computed tomography scan the following day confirmed pulmonary oedema
- There was no response to diuretic or haemodynamic change
- Donor antibody testing showed HLA B45 antibodies cognate with the recipient
- The patient made a complete recovery

Haemolytic Transfusion Reactions (HTR)

Fatal haemolytic transfusion reaction (HTR) following unnecessary elective exchange transfusion

- A patient with sickle cell disease was scheduled for an exchange transfusion in advance of elective surgery
- The patient was informed that the surgery had been cancelled and despite this being communicated to the patient in advance of the transfusion, this information was not communicated to the haematology team and the exchange transfusion went ahead
- Five days later the patient presented at the emergency department with severe pain and symptoms consistent with a delayed HTR
- The patient later collapsed and suffered a cardiac arrest

Death attributed to hyperhaemolysis with delays in treatment

- A patient with sickle cell disease and an existing heart condition presented to haematology outpatients with severe pain 5 days post transfusion
- The patient did not have an appointment and was told to go to the emergency department where they were admitted for suspected hyperhaemolysis and transferred to the intensive care unit
- The patient was treated with intravenous immunoglobulin, methylprednisolone and eculizumab and was showing signs of recovery when they suffered cardiac arrest and died

Acute haemolytic transfusion reaction in a patient with known anti-Js^{b}

- A patient with a history of anti-Js^{b} was scheduled for major surgery with a high expected blood loss
- Js^{b} antigen-negative blood is rare, with 100% of caucasians being Js^{b}-positive (Reid, et al., 2012) however two Js^{b}-negative units were provided from the Blood Service frozen blood bank and issued to the patient
- Some additional ‘best matched’ Js^{b} untyped units were also crossmatched on standby in case of major blood loss which were placed in the theatre blood refrigerator in error
- During the surgery a one-unit top-up transfusion was prescribed
- One unit of the ‘best matched’ red cells was taken and transfused despite the compatible Js^{b}-negative units being available for transfusion
- The patient immediately started to exhibit symptoms of an acute transfusion reaction but recovered fully following appropriate management

Uncommon Complications of Transfusion (UCT)

Acute transfusion reaction resulting in patient death

- An elderly patient with myelodysplastic syndrome and chronic transfusion-dependent anaemia developed sudden onset acute abdominal pain, along with associated nausea while receiving a second unit of red cells in an outpatient setting
- The red cells were compatible, and all pre administration checks had been performed as required
- The transfusion was stopped immediately, all observations were within normal range with no pyrexia, hyper or hypotension, tachycardia, or bradycardia
- The intravenous (IV) line was changed for IV saline
- The patient was reviewed by the medical team and given chlorphenamine IV and hydrocortisone IV
- The unused blood was returned to the transfusion laboratory along with the relevant blood samples
- The unit was tested locally and was sent to the Blood Service for further testing
- The patient was admitted to the ward and was treated for a transfusion reaction, further deterioration, and for suspected sepsis
- The patient subsequently died, and the case was referred to the coroner

Acute deterioration and death following a red cell transfusion in a neonate with pre-existing comorbidities

- A premature baby required intubation in the delivery room and was transferred to the neonatal unit for respiratory support
- The baby was noted to have acute respiratory distress syndrome, hyperkalaemia, suspected sepsis, mild left pulmonary artery stenosis, anaemia of prematurity, hyperglycaemia, acute bowel, possible necrotising enterocolitis
- On day 28 post delivery, anaemia was treated with red cell transfusion based on a Hb of 84g/L
- The transfusion event was uneventful but a concerning change in the infants' condition was noted later the same day with the presentation of a distended tense abdomen
- The infant continued to deteriorate, requiring additional interventions and support, including re-intubation
- The baby was diagnosed with a bowel perforation and worsening metabolic acidosis
- Despite all efforts, the baby died

Venous air embolism following inappropriate preparation of line prior to transfusion [1]

- A postoperative patient in recovery required a recheck of haemoglobin (Hb) with a decision to transfuse red cells if the Hb was < 80g/L
- The first Hb result was 83g/L but following repeating testing Hb was 78g/L which deemed the transfusion necessary, and a unit of red cells was requested from the transfusion laboratory
- The first nurse was instructed to go on a break and a handover was given to the operating department practitioner (ODP) who would take over the patient's care and initiate the transfusion
- The ODP checked the blood component with the authorisation/prescription and patient's identification band and spiked the blood bag with a giving set
- The giving set included a warming device and extension line distal to the warmer and attached to the patient's intravenous cannula
- The patient quickly presented with central chest pains and a decreasing saturation – Sp02 to 50%

Continued…

Venous air embolism following inappropriate preparation of line prior to transfusion [2]

- The transfusion was stopped, and a possible transfusion-related reaction was suspected
- It was noted that approximately 10cm of wide bore extension tubing was clear and a rapid call was sent to the floor anaesthetist for medical assistance
- A transfused air embolus was confirmed
- A rebreathing mask was applied at 15L of oxygen which was changed to water circuit with positive end-expiratory pressure
- The Sp02 increased to 96%
- Crystalloids were commenced and the patient was transferred to the high-dependency unit for level 2 care for further observation
- The patient was visited by the attending consultant anaesthetist and duty of candour was applied
- The patient recovered and survived

Respiratory distress and desaturation following transfusion in a patient with underlying pancreatitis, sepsis, and diverticulitis

- A patient with underlying pancreatitis, sepsis and diverticulitis developed increasing anxiety with impending doom while receiving red blood cell transfusion
- Tachycardia and respiratory distress and an impending sense of doom were reported 5 minutes into second transfusion for a haemoglobin of 70g/L
- The patient was very anxious prior to transfusion
- A review of observations preceding blood transfusion indicated a respiratory rate range between 18-28mmHG, systolic blood pressure range 90-104
- There were no other signs and symptoms
- The initial impression was a fluid overload as the patient presented with pitting oedema, and scrotal swelling present in the days prior to transfusion
- Also, the patient was receiving total parental nutrition, blood and fluids and had their diuretics omitted on previous days
- The chest X-ray showed no evidence of pulmonary oedema
- The patient was very anxious regarding their care and expressed concerns

Transient chest tightness, chest pain and mild shortness of breath in a patient with a postpartum haemorrhage

- While receiving the third unit of red cell transfusion, the patient complained of chest tightness, chest pain and mild shortness of breath
- Symptoms started 10 minutes after starting the transfusion
- This was a maternity patient with a haemoglobin of 58g/L who had received two units of red cells before this with no ill effect
- No further intervention was required, and no medication was administered, and the symptoms subsided after transfusion was stopped
- The patient recovered

Onset of supraventricular tachycardia (SVT) while receiving a red cell transfusion

- A patient commencing on chemotherapy was admitted for a single unit red cell transfusion for a symptomatic anaemia with a haemoglobin of 94g/L
- The red cell unit was commenced with stable baseline observations
- Fifteen minutes after commencing the transfusion, the patient complained of feeling ‘unusual’ and developed sudden SVT
- While all other vital signs remained unchanged, a heart rate of 180 bpm was recorded
- There was no known history of any cardiac conditions prior to this episode
- The SVT required multiple interventions with intravenous adenosine and overnight admission to the cardiology ward before a sustained sinus rhythm was achieved
- The patient was discharged the following day
- All follow-up serological testing showed no transfusion reaction

Left-sided weakness and confirmed stroke 14 hours post transfusion

- A patient with acute coronary syndrome and an underlying malignant neoplasm of uterus receiving chemotherapy was transfused one unit of red cells as an outpatient
- They were admitted later that night with left-sided weakness and was treated for a suspected stroke in the emergency department
- This was later confirmed as a stroke and the patient was admitted for further management
- The patient was reviewed by the oncology team and dealt with appropriately
- The oncology team had meetings with the family who wanted to know if the transfusion caused the stroke however, it was difficult to say if it was transfusion, chemotherapy, cancer, or cardiac issues

Rigors, hypertension, and mild pyrexia during transfusion

- A patient with metastatic bladder cancer was under palliative care having frank haematuria and a low-grade fever being treated with intravenous antibiotics
- Their haemoglobin was 77g/L
- A decision was made to transfuse the patient
- The patient experienced rigor, hypertension, and a spike in temperature
- At the time of the suspected reaction: temperature 38.3ºC, blood pressure 202/66, heart rate and Sp02 were stable
- No further interventions were required, and no medication was administered
- There were no results of a septic screen or a haemolysis screen, so infection or a suspected mild transfusion reaction were unable to be ruled out

Suspected transfusion reaction in a patient with symptomatic iron deficiency anaemia

- A female patient presented at the emergency department with symptomatic iron deficiency anaemia of unknown cause. The haemoglobin (Hb) was recorded as 56g/L
- The patient had a history of menstrual bleeding every 7 days and presented as pale and unwell
- She was admitted to a ward for gynaecological investigations and was crossmatched for two units of red cells
- While receiving the transfusion she became tachycardic with nausea and vomiting. The transfusion was stopped, and the symptoms subsided
- The haematology consultant was contacted for advice and suggested it was a mild reaction and to continue with oral paracetamol and antihistamine cover, plan a second transfusion and thereafter an iron infusion
- The transfusion was restarted with no worsening symptoms and a further unit was administered
- The patient was commenced on iron infusions the next day. The Hb improved from 56g/L to 81g/L on discharge
- The patient received IV iron infusions as a day case patient
- This case was reviewed by the haematology team who advised that the patient receive iron infusions rather than red cell transfusion while investigations for the chronic anaemia continue

Uncommon transfusion reaction to platelets

- A patient complained of back pain after commencing a unit of platelets
- Chlorphenamine 10mg and hydrocortisone 100mg were administered immediately
- The platelets were then re-commenced and completed without any further symptoms
- After review, consideration was being given to administering prophylactic treatment to this patient prior to any future platelets' transfusions

Suspected transfusion reaction to platelets

- While receiving a platelet transfusion, the patient buzzed to say they didn't feel right
- Observations were taken during which time the patient became unresponsive
- The patient presented with hypotension, dyspnoea without wheeze and tachycardia
- The transfusion was stopped, and an antihistamine and hydrocortisone were administered
- A crash call was put out and the patient was reviewed by a registrar who treated it as a reaction to the platelets
- No further information was recorded

Transfusion-Transmitted Infections (TTI)

Confirmed hepatitis A virus (HAV) transmission

- Post-donation information prompted this lookback investigation
- A regular donor developed symptoms of acute hepatitis within two weeks of their most recent blood donation and was subsequently diagnosed with a HAV infection
- Both HAV IgM antibodies and ribonucleic acid (RNA) were detected in their blood sample
- The recipient was identified and followed up for HAV testing
- The patient was asymptomatic at the time of diagnosis of their HAV infection, they subsequently developed significant transaminitis with a peak alanine aminotransferase test (ALT) of 730 IU/L
- Donor and recipient virus sequences were identical, a rare 1B subgenotype, confirming that this HAV infection was acquired via a red blood cell blood transfusion
- The implicated donor was deferred from donation for 6 months, but will be eligible to donate, as HAV (like HEV) does not cause a chronic infection in healthy individuals
- HAV infection is generally very rare in the UK and hence blood donations are not routinely screened for this virus
- Testing for HAV (together with human parvovirus B19) will be undertaken by Blood Services in England and Scotland from Spring 2024 to facilitate collection of plasma for fractionation

Probable hepatitis E virus (HEV) transmission

- A renal transplant recipient was diagnosed with HEV infection following abnormal liver function tests
- HEV infection of the transplanted organ had been excluded, hence it was considered whether they might have acquired it via the plasma exchange or blood transfusions received during 2022
- A total of 86 donor exposures (2 red cell units and 84 fresh frozen plasma units) were identified for investigations
- Archive samples from two of these donors tested positive for HEV ribonucleic acid (RNA), but due to very low viral loads, sequencing of donor viruses was not successful
- HEV genotype 3c was identified in the stored sample from the recipient
- Due to a lack of sequence confirmation, this case is reported as a probable transmission
- Both donors have now resolved their infection and are eligible to return to donation

Probable hepatitis B virus (HBV) transmission

- An older person was diagnosed with acute HBV infection during their hospital admission in December 2022
- Blood transfusion was considered as the most likely source of their HBV infection
- They had received multiple transfusions six months prior to diagnosis of HBV; 33 donor exposures were investigated
- The archive samples obtained from two donors subsequently tested positive for anti HBc antibodies (note these donations were collected before the full implementation of anti-HBc screening in England), one donor (donor 1) had evidence of past HBV infection with high levels of anti-HBs antibodies (999 IU/ml) whereas another donor had HBV infection with low levels of anti-HBs antibodies (donor 2)
- HBV deoxyribonucleic acid (DNA) was not detected in either donor
- It is probable that the recipient acquired the hepatitis B infection via the blood transfusion from donor 2
- Transmission could not be confirmed but circumstantial evidence of this donor originating from the region where recombinant genotype D/E is prevalent, the same genotype as that identified in the patient, further supports transmission
- The two anti-HBc positive donors have been removed from the donor panel

Possible hepatitis C virus (HCV) transmission – result pending in the 2022 Annual SHOT Report [1]

- A recipient with transfusion dependent beta thalassaemia regularly transfused in the UK was noted to have abnormal liver function tests in September 2021
- Although it was initially considered to be due to transfusion related iron overload, subsequent diagnosis of past HCV infection was made
- The patient had never been reported as HCV ribonucleic acid (RNA) positive, but antibody testing was suggestive of past HCV infection
- However, it is difficult to estimate when they actually acquired HCV infection as the infection is known to remain asymptomatic for years, if not decades
- As this recipient had not been tested for HCV antibodies prior to 2021 and was not known to have ever been HCV RNA positive, it is difficult to estimate when they acquired their HCV infection

Continued…

Possible HCV transmission – result pending in the 2022 Annual SHOT Report [2]

- Based on their transfusion history over many decades, it is worth noting that the risk of acquiring HCV via blood transfusion in the UK was highest before the screening for HCV antibodies was introduced in 1991 and for HCV RNA in 1999
- The residual risk of testing not detecting HCV has significantly reduced since the screening was implemented, and the latest (2020-2022) estimates of residual risk of HCV in the UK is approximately 1 in 64 million blood donations tested (JPAC, 2023)
- Testing all previous donations was not possible as the archive samples no longer existed for the donations taken prior to the implementation of screening
- It is therefore possible that this individual acquired the HCV infection via blood transfusion

Confirmed malaria

- A malaria diagnosis in a recipient of multiple red cell transfusions with no overseas travel or other likely risk initiated an investigation into the likely source of this infection
- Testing of archive samples from donations identified between February and September 2023 were shown to be negative on routine screening for malaria antibodies
- Despite negative initial screening results, samples from six donors were subjected to further testing based on their clinical history, one of whom was identified with Plasmodium malariae deoxyribonucleic acid (DNA) in their blood sample and identified as the likely source of transmission
- Further work is ongoing to type the malaria found in the donor and recipient, but the donor has been removed from the donor panel and appropriate medical review arranged
- A lookback has been initiated into previous donations given by this donor
- To date the approach of discretionary malaria antibody testing of donors based on travel history has been effective in preventing transfusion transmission of malaria, the last reported transmission in the UK was in 2003
- However, following this transmission, current policies and procedures are being reviewed to see if any further mitigations are required
- The patient has received treatment and is clearing their infection

Post-Transfusion Purpura (PTP)

Post-transfusion purpura with human platelet antigen (HPA)-1a antibody

- A patient received one unit of red cells post-delivery
- She presented to the emergency department 18 days later with widespread petechiae and a platelet count of $3x10^9/L$
- HPA-5b antibodies were found in her plasma
- Intravenous immunoglobulin was administered and she made a complete recovery

Cell Salvage (CS)

Hypotensive reaction in a patient receiving allogeneic and salvaged red cells

- A patient was undergoing invasive internal surgery and experienced significant blood loss
- Cell salvage was being used and a major shock pack was requested
- During transfusion of a unit of red cells from the shock pack and the cell salvaged blood, a dramatic fall in blood pressure from 90mmHg to 45mmHg was observed
- This was managed with bolus infusions of adrenaline
- It is not clear whether the reaction was due to the allogeneic blood, or the salvaged red cells given through a leucocyte depletion filter

Hypotension in a patient receiving autologous red cells

- A patient was undergoing vascular surgery where cell salvage was being used
- On infusion of the cell salvaged blood there was marked hypotension with the lowest systolic blood pressure (BP) recorded at 48mmHg
- The infusion was stopped, and the BP improved
- Metaraminol and ephedrine were used to stabilise the patient and the remaining 109mL of cell salvaged blood discarded
- A leucocyte depletion filter was not used for salvaged blood reinfusion on this occasion

Hypotension in a patient with post-partum haemorrhage receiving autologous red cells intraoperatively

- A patient underwent an emergency caesarean section with a starting haemoglobin of 9.9g/L
- Significant post-partum haemorrhage in the order of 2.1L resulted in a two-unit allogeneic blood transfusion without incident
- Reinfusion of salvage red cells was then commenced through a leucocyte depletion filter
- After approximately 50mL had been infused the patient's blood pressure (BP) dropped from 160/65mmHg to 60/30mmHg, with concomitant increase in heart rate and respiratory rate, and a drop in oxygen saturation
- The infusion was stopped, and the giving set changed
- Correction of BP with vasopressors resulted in resolution of symptoms, with the patient remaining alert and stable

Paediatric Cases

Death due to bowel perforation within 24 hours of red cell transfusion

- An extreme preterm neonate (a month old) received a red cell transfusion for anaemia
- Eight hours later the neonate developed significant deterioration including a distended abdomen and required reintubation
- Abdominal X-ray was suggestive of necrotising enterocolitis
- The neonate subsequently developed bowel perforation and metabolic acidosis and died

Adult O D-negative red cells given to a neonate in error when neonatal red cells were available

- A bleeding neonate required an emergency red cell transfusion
- The laboratory instructed the clinical team use the ‘emergency paedipack’ from the satellite refrigerator
- An adult pack was accidentally selected and transfused to the neonate

Preterm neonate erroneously assigned as blood group O

- The laboratory assigned a preterm neonate as group O and issued group O fresh frozen plasma (FFP)
- It was subsequently determined that the neonate had been grouped as A at birth in a different hospital where they were transfused with emergency blood group O red cells
- Of note, the laboratory should have issued group AB FFP as only one group result was on record

Platelet transfusion given to a non-bleeding teenager with acute immune thrombocytopenic purpura (ITP)

- A teenager presented with acute ITP
- The platelet count was $14x10^9$/L, on repeat $10x10^9$/L
- A platelet transfusion was requested by the ear nose and throat (ENT) team and administered
- The patient had no bleeding

Delay in concessionary release of adult specification platelets for a neonate with significant bleeding

- Emergency platelet transfusion was requested for a severely thrombocytopenic neonate with liver failure and both rectal and intracranial bleeding
- Neonatal/infant specification platelets were not available on site
- The clinical team asked for standard adult specification platelets but there was a 2-hour delay in authorising their release due to difficulty in contacting the haematology medical team and the laboratory's inability to authorise emergency release

Delay in red cell transfusion for critically unwell teenager with sickle cell disease (SCD) due to failure to issue red cells urgently under concessionary release

- A teenager with SCD and multiple red cell antibodies was on the point of cardiac arrest due to rapidly progressive anaemia (from 97g/L to 45g/L), hypoxia, and acidosis
- Whilst awaiting frozen thawed red cells, the Blood Service consultant on call advised transfusing ABO, Rh matched, K-negative red cells given the urgency
- There was a 3-hour delay in issuing red cells
- The pre-transfusion haemoglobin was 26g/L immediately prior to transfusion
- The delay contributed to major morbidity in this patient

Delay in provision of appropriate red cells for a teenager with sickle cell disease and red cell antibodies

- A teenager with sickle chest syndrome required emergency red cell exchange transfusion
- There was a 24-hour delay due to poor communication between laboratory and clinical staff regarding degree of urgency, and to failure to send crossmatch samples of sufficient volume to allow required antibody testing
- The patient recovered fully with no adverse impact from the delay

Overtransfusion in a preterm neonate due to illegible prescription

- An extremely pre-term infant (birth weight 0.5kg) with necrotising enterocolitis was prescribed platelets
- The prescription should have been 7.5mL but was misread as 75mL
- The neonate received 43mL (83mL/kg) before this was noticed and subsequently was hypertensive
- The reporter commented that electronic prescribing had not been implemented in paediatrics due to complexities

Allergic reaction to red cell component in multiply transfused patient

- A child receiving regular red cell transfusions for a haemoglobinopathy, developed coughing followed by drowsiness after only 4mL of red cells
- There was increased work of breathing and prolonged expiratory phase, with a drop in blood pressure
- The child received intravenous antihistamine and adrenaline, then further adrenaline with hydrocortisone was administered when the reaction was prolonged
- The child recovered and was subsequently given washed red cells

Haemoglobin Disorders

Delayed haemolytic transfusion reaction despite best practice

- A patient with sickle cell disease sustained an ankle fracture and required surgery
- They were known to have anti-S and anti-M antibodies
- They received two compatible red cell units preoperatively and were discharged with appropriate safety-netting
- The patient presented the following week to the emergency department with sickle pain and anaemia
- Their blood results showed evidence of significant haemolysis and they were treated with intravenous immunoglobulin, steroids, rituximab and eculizumab
- The patient received one unit of red cells during this treatment when her Hb dropped to 35g/L and spent 2 days on the intensive care unit before making a full recovery

Hyperhaemolysis recurrence after miscommunication

- A patient with sickle cell disease presented to the emergency department with pain
- It was noted that they had a haemoglobin of 49g/L (baseline 50-55g/L)
- One unit of red cells was transfused overnight, after discussion with the on-call consultant haematologist
- The next day, the haematologist noted that the patient had a history of hyperhaemolysis which had not been relayed on the phone overnight
- The patient was subsequently started on steroids and was monitored as an inpatient for 2 days
- They returned 3 days after discharge with pain and evidence of haemolysis
- The patient remained in the hospital for 6 weeks, including 5 days on the intensive care unit

The importance of informed consent

- A patient with sickle cell disease was admitted with a painful crisis
- Two units of red cells were transfused, despite the haemoglobin being at baseline for this patient
- The indication for this transfusion was not clear
- Six days later, they had an acute deterioration with hyperhaemolysis
- The patient was admitted to the intensive care unit for 7 days, treated with intravenous immunoglobulin, steroids and tocilizumab and subsequently made a full recovery
- On discharge, the patient expressed concern that the rationale for the initial transfusion was not explained to them
- There was no documentation of consent for the transfusion

Avoidable alloimmunisation in a patient with thalassaemia

- A patient with non-transfusion dependant thalassaemia required a red cell transfusion during pregnancy
- The laboratory was not informed that the patient had thalassaemia on the first ‘booking’ group and screen (G&S), so Rh and K typing were not performed
- The second G&S sample did include the relevant clinical information, but the required testing was not performed
- Three red cell units were issued to the patient without being Rh/K matched
- The patient made an anti-c and anti-E antibody as a result

Specific requirements not met for sickle cell disease (SCD)

- A patient with SCD presented to hospital with a haemoglobin of 49g/L
- The laboratory information management system had a flag to say that the patient had SCD, but this was not noted
- Rh and K typing were not performed
- The patient was O D-positive, but O D-negative red cells were provided for stock management reasons, though the transfusion was not an emergency
- No pre-administration checklist was in use in the hospital, so specific requirements were not checked at the bedside
- The case was picked up on a subsequent audit of O D-negative red cell use

Confusion about red cell matching post haematopoietic stem cell transplant (HSCT)

- A patient with sickle cell disease required a red cell transfusion after an allograft
- Laboratory staff were unclear whether the Rh phenotype would be maintained post transplant, and this was not made clear on the local protocol
- This has since been clarified and the post-HSCT protocol updated

Delayed exchange transfusion

- A teenage patient with sickle cell disease required an emergency exchange transfusion due to acute chest syndrome
- The patient had a new positive antibody screen
- The blood had been sent in a paediatric tube, so there was insufficient serum for red cell immunology testing
- Two further samples were sent, but one sample tube had expired and the other was both insufficient and incorrectly labelled. Further samples then had to be collected
- In the end, provision of appropriate red cell units took 22 hours

Transfusion Errors in Transplant Cases

ABO-incompatible red cell transfusion

- A haematopoietic stem cell transplant patient (patient group A and donor group O) was transfused group A red cells
- The information related to appropriate selection of ABO group for blood components was available in the notes in the laboratory information management system but was not read by the biomedical scientist

Specific transfusion requirements not met: information not added to the laboratory information management system (LIMS) in a timely manner

- A notification of irradiated blood components requirement for a patient pre haematopoietic stem cell transplant was sent to the laboratory manager by email
- The patient was admitted to the ward and required a transfusion before the laboratory manager had acknowledged the email and updated the LIMS
- The patient was transfused with red cells that were not irradiated

Incorrect red cells selected for patient with suspected passenger lymphocyte syndrome

- A group A patient received a liver transplant from a group O donor
- Post transplant, the patient was noted to have a positive direct antiglobulin test, and group A red cells were noted to be incompatible in serological crossmatch
- A sample was referred for further testing and anti-A1 eluted from the patient red cells
- A requirement for group O red cells was added to the laboratory information management system for future transfusion
- However, two units of group A red cells were transfused to the patient at a later date
- The units were serologically crossmatch-compatible and there was no evidence of haemolysis in the patient

Immune Anti-D in Pregnancy

Incorrect management of pregnancy results in development of clinically significant antibodies

- A woman delivered at 38^{+6} weeks gestation and suffered post-partum major haemorrhage
- Anti-D and anti-C were detected in this sample for the first time
- This could have led to a delay in issuing crossmatched units while further testing was performed, but fortunately there was no delay in providing appropriate blood
- During pregnancy, the woman had not received routine antenatal anti-D Ig prophylaxis (RAADP) and was not offered cell-free fetal deoxyribonucleic acid (cffDNA) testing to enable correct management of pregnancy and prevent development of clinically significant antibodies

High anti-D level contributed to premature induction of labour

- A woman attended the early pregnancy assessment unit with pain and bleeding at 9^{+5} weeks gestation
- Pregnancy booking had been completed and the blood group was available
- Anti-D Ig was not administered as per organisational guidelines
- Immune anti-D was detected at 28 weeks
- At 34^{+5} weeks the anti-D quantification was 170.6IU/mL
- Labour was induced at 34^{+5} weeks
- After delivery the baby required double volume exchange transfusion and phototherapy due to haemolytic disease of the fetus and newborn and recovered

Two-dose routine antenatal anti-D Ig prophylaxis (RAADP) regime and no group and screen sample at delivery

- Immune anti-D was detected for the first time at booking (11^{+2} weeks) during the 4th pregnancy
- No red cell antibodies were detected in the previous pregnancy up to 1 month prior to delivery (no group and screen sample taken at delivery)
- The Kleihauer test performed after delivery at 36 weeks gestation estimated <2mL fetal bleed and 500IU anti-D lg was given within 72 hours
- The RAADP regime followed in the preceding pregnancy was two 500IU doses

Immune anti-D detected for the first time in a patient with multiple risk factors for D sensitisation and previous intrauterine death (IUD)

- Immune anti-D was detected for the first time in the index pregnancy at 12^{+1} weeks gestation
- The patient had a high body mass index >30 in both the previous and index pregnancies
- This was the fifth pregnancy, with two previous live births, one miscarriage and one IUD
- The preceding pregnancy resulted in an IUD at 40^{+4} weeks gestation
- The fetomaternal haemorrhage (FMH) volume was 56mL and 5600IU anti-D Ig was administered intravenously
- In the follow-up sample, taken 48 hours after anti-D Ig administration and after delivery of the stillbirth at 40^{+5} weeks, a repeat FMH sample detected a fetal bleed volume of 4mL and further 500IU of anti-D Ig was administered
- No follow-up sample was taken after the repeat 500IU dose
- It is unclear if the decision to not take further follow-up samples for FMH testing was discussed with the haematology consultant

Immune anti-D assumed to be prophylactic in its origin

- At delivery immune anti-D was identified with a quantification level of 14.6IU/mL
- The baby was delivered at 39^{+3} weeks gestation and required phototherapy as treatment
- When the case was reviewed it was noted that the immune anti-D had been detected at 27^{+4} weeks gestation but it had been misinterpreted as passive (prophylactic) anti-D
- A dose of anti-D Ig had been issued 5 months prior to the first antibody detection however that dose was not given
- Miscommunication and assumptions resulted in the patient not being monitored throughout the pregnancy including the immune anti-D levels, placing the baby at risk of haemolytic disease of the fetus and newborn