

Cases from the 2019 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

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Donor Haemovigilance

Development of a venous aneurysm/varix in the right cubital fossa - the site of repeated venepuncture for blood donation (1)

- *A regular female donor in her 50s, contacted the Blood Service as she had developed an unexpected complication in her right arm*
- *Her treating surgeon thought it was donation related*
- *She last donated in January 2014, which she described as an uneventful donation*
- *She however developed a lump at the venepuncture site several weeks post donation that slowly enlarged and pulsated on occasion*
- *She saw her general practitioner, who initially prescribed symptomatic treatment but was referred to a vascular surgeon in January 2019 as the swelling was slowly enlarging*

(Continued)

Development of a venous aneurysm/varix in the right cubital fossa - the site of repeated venepuncture for blood donation (2)

- *Of note is that this donor had no relevant past medical history, notably no history of a collagen vascular disorder*
- *Ultrasound showed that the swelling communicated with adjacent veins*
- *She had the swelling surgically excised*
- *At surgery it arose from the median cubital vein and contained thrombus*
- *It was dissected clear of surrounding tissues, the feeding median cubital vein was ligated and divided proximally and distally and the swelling was removed*
- *The surgeon's diagnosis was that of a venous aneurysm/varix at the site of repeated venepuncture for blood donation*
- *At surgery, there was no association with the artery and thus the surgeon did not feel that she had developed an arteriovenous fistula at the time of venepuncture for blood donation*

Delayed faint in a regular whole blood donor resulting in ankle fracture

- *A regular female whole blood donor in her 60s who had donated over 25 times gave blood uneventfully*
- *The donor's record had an instruction to give her extra rest after donation, following a delayed faint in 2017, so the donor remained at the donation session for 30 minutes*
- *The donor felt light-headed whilst she was in a shop, so she left and went to a café for something to eat and drink*
- *Whilst the donor was queueing to be served approximately 2 hours after her donation, she lost consciousness and fell to the floor*
- *When the donor recovered, she attended a local ambulatory care centre where she was found to have a fracture to her left ankle*
- *The donor has been withdrawn from blood donation*

Arterial puncture resulting in severe arm bruising in a regular whole blood donor

- *A regular female whole blood donor in her 40s who had donated several times previously, experienced pain on needle insertion*
- *The donor did not inform staff of the discomfort that she experienced*
- *The donation took around 4 minutes and no pain was experienced by the donor during the donation*
- *The donor experienced pain on needle removal and was seen by a nurse who suspected an arterial puncture and was given care and advice*
- *Later that day the donor's arm became painful and swollen, an ambulance was called, and she was taken to an emergency department*
- *The donor was admitted overnight for observation due to severe bruising as a result of an arterial puncture*
- *The donor was discharged the following morning*
- *The donor has decided not to donate again*

Human Factors

Overemphasis on staff culpability when there were obvious system failures

- *Four separate samples were collected from one patient, by four different staff members and all were labelled with an incorrect hospital number rather than the patient's actual number from their wristband*
- *This was classified as poor practice and the incident was given a score of 10/10 for unsafe practice by individual staff member(s) with no scores assigned to the system and organisational factors*
- *However, the incident report identified the root cause was mismatched data between two different information technology (IT) systems*
- *A suggestion for the primary change to make this incident less likely to happen again was for IT systems that link up in real time to reduce multiple patient identities*
- *The report concluded that since the introduction of new organisation-wide patient administration system there were no further incidents of this type*
- *This indicates the scoring should have reflected the system and organisational problems more than the staff-related failings*

Anti-D Immunoglobulin (Ig) Errors

Patient refused blood products on religious grounds

- *A woman informed her midwife at booking that she was a Jehovah's Witness and did not wish to receive blood products*
- *This was documented*
- *She was administered anti-D immunoglobulin (Ig) despite this*
- *There is no record of a discussion or documented consent in relation to the anti-D Ig*

Flags or logic rules not updated to reflect new processes (IT case)

- *A woman had a potentially sensitising event after 20 weeks gestation and a Kleihauer was sent to the laboratory*
- *On reporting the Kleihauer an automatic laboratory information management system (LIMS) comment prompted the issue of anti-D immunoglobulin (Ig)*
- *Anti-D Ig was duly issued and administered, although the midwife did query whether this was necessary and was reassured by the laboratory that it was*
- *However, a sample for cell-free fetal deoxyribonucleic acid (cffDNA) had been analysed and predicted the fetus was D-negative*
- *It was the laboratory policy to check the cffDNA result before issuing anti-D Ig but this was not done*
- *The LIMS had not been configured to link to this result when issuing anti-D Ig so the LIMS did not prevent issue of anti-D Ig in this situation*

Ineffective recording of cell-free fetal deoxyribonucleic acid (cffDNA) result (IT case)

- *Anti-D Ig was given to a D-negative woman carrying a D-negative fetus*
- *A woman presented late in pregnancy with reduced fetal movements and it was noted that she had not been given routine antenatal anti-D Ig prophylaxis (RAADP) so after checking with the laboratory it was given late*
- *She had a cffDNA sample sent but the result was not on the laboratory information management system (LIMS), however it was on Sp-ICE which was accessed the following day and the fetus was predicted to be D-negative*
- *In fact, this had also been accessed by the community midwife which is why RAADP had not been given, but this was not recorded*
- *There was no procedure in place for putting the cffDNA result onto the LIMS and therefore no way of ensuring that anti-D Ig prophylaxis is only given to those who need it*

Incorrect Blood Component Transfused (IBCT)

Group A red cells selected for major haemorrhage pack

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

A more detailed case is provided under laboratory errors

Collection error and failure to carry out positive patient identification (ID) (1)

- *A patient in their 70s was admitted with abdominal pain following a road traffic collision*
- *The patient had a past medical history of abdominal aortic aneurysm (AAA)*
- *The following morning the patient deteriorated and lost a massive amount of blood per rectum*
- *This was subsequently identified as secondary to aorta-enteric fistula. Urgent blood transfusion was prescribed*
- *Less than a minute after starting the transfusion it was noticed that the name on the blood bag didn't match the patient and the transfusion was immediately stopped*

(continued)

Collection error and failure to carry out positive patient identification (ID) (2)

- *The blood collected from the satellite refrigerator had a different patient name on it*
- *The nurse who collected the blood from the satellite refrigerator did not follow the correct procedure*
- *Pre-administration checks were not fully completed as the blood pack was not checked against the patient ID band*
- *Of the four staff that were involved in the incident only one had their blood transfusion collection competency and theory learning up to date*

Bed number used as sole patient identifier

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

Failure to carry out positive patient identification

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

Group O fresh frozen plasma (FFP) selected in error for a major haemorrhage pack

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

Group O fresh frozen plasma (FFP) incorrectly selected for transfusion of a neonate

- *Group O FFP was mistakenly selected for a group A neonate*
- *The unit was selected by one biomedical scientist (BMS) and issued by another who overrode laboratory information management system flags believing the previous BMS had defrosted the correct unit*

Incomplete interpretation of serology leads to transfusion of antigen-positive blood (1)

- *During a nightshift, two units of red cells were requested for a patient with myelodysplastic syndrome and known alloantibodies (anti-K and anti-Lu^a)*
- *The antibody panel showed additional reactivity, therefore biomedical scientist (BMS)1 performed a secondary panel*
- *Two units of crossmatch-compatible blood were issued without complete interpretation of the second panel*
- *The following day whilst inputting the results into the laboratory information management system, BMS2 noticed a positive reaction which was previously overlooked*
- *Additional testing was performed which identified an anti-E antibody*

(continued)

Incomplete interpretation of serology leads to transfusion of antigen-positive blood (2)

- *One of the units issued and transfused was E-positive, however the patient suffered no adverse effects*
- *The transfusion was a routine request and could have been performed during the next day shift*
- *The laboratory had four long term vacancies causing routine work to continue into non-routine shifts*
- *The BMS performing initial testing was the sole BMS covering haematology and transfusion*
- *They were inexperienced and had not received optimal training due to senior staff covering night and weekend shifts*
- *The hospital management have now agreed to allow locums to cover vacancies*

Wrong blood issued for non-urgent transfusion during IT downtime

- *An elderly female with no red cell antibodies was given two units of O D-positive blood during IT downtime*
- *She was actually O D-negative and this was identified when the manually issued units were retrospectively entered into the laboratory information management system (LIMS)*
- *The error was an incorrect manual interpretation of the blood group, but also failing to have a second checker of the results and the issue of correct components when manual procedures were in place*
- *The scheduled IT downtime lasted for 6 hours, 2 hours longer than expected, and the hospital transfusion laboratory was issuing blood for non-urgent patients during this time which made the laboratory staff very busy*

Incorrect use of electronic blood tracking system

- *A postoperative female patient aged less than 50 years with a haemoglobin (Hb) of 70g/L required an 'urgent' transfusion*
- *A registered nurse did not follow the correct procedure when collecting blood from a remote issue refrigerator*
- *Two units of group O D-positive red cells were removed without entering the patient's details or printing a compatibility label*
- *The blood was then transfused to the patient without any bedside checks*
- *Fortunately, the patient was O D-positive and suffered no adverse effect*

Laboratory information management system (LIMS) defaults to 18-week sample validity

- *A problem with the LIMS configuration was identified during a sample audit*
- *It was recognised that two units of red cells had been collected from a remote issue refrigerator and transfused during an emergency in theatres based on a sample that was invalid (16-week-old)*
- *The local policy stated a maximum of 12 weeks for sample validity for remote electronic issue*
- *Investigations during the audit showed that the LIMS defaults to a fixed sample validity of 18 weeks*
- *This highlights the importance of configuring the LIMS to reflect local policies*
- *Initial validation or periodic revalidation should have detected this discrepancy*

An update to report printing has an unexpected effect on electronic issue (EI)

- *An upgrade to the laboratory information management system (LIMS) was requested with the purpose of changing how transfusion reports for the general practitioner (GP) were printed*
- *An algorithm intended to be run overnight identifies a GP report, prints the report and removes the flag from the sample*
- *This had an unexpected effect on a completely different and unrelated task – that of identifying sample unsuitable for EI*
- *The new algorithm turned off the flag that states a sample has been manually edited and the case is ineligible for EI*
- *This could potentially result in inappropriate permission for electronic blood issue*
- *The hospital reported to the LIMS provider who have investigated and corrected as well as communicating to all users of their system*

Use of remote electronic issue (EI) fails to provide irradiated blood components

- *Two units of irradiated red cells were requested for a male in his 70s with Hodgkin's Lymphoma*
- *This specific requirement was not flagged on the laboratory information management system (LIMS), but irradiated blood was crossmatched and placed in the issue refrigerator*
- *The clinical staff by-passed the crossmatched blood and opted for remote-issue blood instead*
- *Because the LIMS flag had not been set, Bloodhound360[®] then released short-dated non-irradiated blood and one unit plus 100mL of the second unit was transfused before this error was detected*

Handling and Storage Errors (HSE)

Poor communication and assumptions lead to a non-compliant component being transfused

- *Red cells were collected from the laboratory by the correct transportation method at 01:32, and subsequently returned to the laboratory unused at 03:03 which equates to 1 hour and 31 minutes after collection*
- *In accordance with the hospital policy this would deem that the units would not be appropriate for transfusion and consequently they should have been discarded and fated as not suitable for use*
- *The units were entered into quarantine to be checked by a senior member of the team as the biomedical scientist (BMS) on duty was unsure of the appropriate time limits for out of controlled temperature storage for the unit*
- *However, there was no adequate communication between the staff and the assumption was made by another BMS that the units in quarantine had been assessed and approved as cold chain compliant*
- *They returned the units to stock and in turn issued them to another patient whom they were transfused to*
- *Fortuitously the patient did not come to any harm*

Ambiguous standard operating procedures (SOP) for temperature excursion puts 23 patients at risk (1)

- *Red cells which had been stored in a refrigerator with a core temperature between 6°C and 7°C for 4 hours were transfused to 23 patients*
- *The temperature rise began after the refrigerator was shut incorrectly at 22:00 but was able to lock without an airtight seal*
- *A further rise in temperature occurred at 01:35 and prompted a call from the helpdesk to the biomedical scientist (BMS) working within the transfusion laboratory, however this alert was not acted upon*
- *It is also assumed that the refrigerator alerted locally but was muted*
- *The BMS was covering both haematology and transfusion departments and acting on 'autopilot', they were further required to review an urgent malaria screen and were feeling unwell*
- *The temperature excursion was also not acted upon by the associate practitioner (AP) performing daily checks of the paper temperature chart for the next two mornings*
- *The AP expressed confusion over the different temperature ranges for blood and reagent refrigerators, and the difference between air and load temperature displays*

(Continued)

Ambiguous standard operating procedures (SOP) for temperature excursion puts 23 patients at risk (2)

- *Upon investigation, it was found that the information in the SOP regarding recording of refrigerator temperatures was incorrect*
- *A second AP checked the refrigerator on day 3 but did not escalate concerns as the SOP stated to record any deviations which occurred within the past 24 hours*
- *Many units which had exceeded temperature control were returned to stock and re-issued to patients*
- *The temperature increase was discovered 4 days after the excursion, but fortunately no patients came to any harm*
- *The root cause analysis (RCA) from this case listed three causes which were all related to the errors and omissions made by individuals, and none related to the systemic failures highlighted*
- *The hospital has updated their SOP and competency assessments relating to refrigerator temperature monitoring*
- *The hospital is now in the process of implementing an updated temperature monitoring system*

Incorrect use of electronic prescribing system fails to verify traceability

- *A new electronic prescribing system for blood was introduced which allowed staff to fate the transfusion at the point of administration and also to record the transfusion observations*
- *The fate of a red cell unit could not be established because there was no electronic record*
- *The ward confirmed the unit had been transfused, but further investigation revealed that staff had been recording the transfusion and observations on a piece of paper and transcribing at a later date*
- *On this occasion, they had forgotten*
- *This was not the correct procedure for which they had been trained but was 'normal' practice on the ward*

Avoidable, Delayed or Under/Overtransfusion (ADU)

Delayed Transfusion

Inappropriate interhospital transfer in a patient with a falling haemoglobin (Hb) (1)

- *An elderly woman was admitted after a fall (no fracture) 2 weeks from discharge following hip surgery (Hb 90g/L)*
- *She was found to have a popliteal vein thrombosis and was anticoagulated*
- *Eight days later she was considered fit for transfer*
- *However, her Hb had been falling and on the day of transfer was 58g/L*
- *She was transferred at 12:00 before the blood results were reviewed*
- *The hospital was experiencing winter pressure and the need to free up beds*
- *Her condition deteriorated during transfer (National Early Warning Score (NEWS), 10), despite five hours at the second hospital, where electronic issue blood was available for the patient, she was returned to the emergency department at the first hospital for transfusion*
- *After a delay of 45 minutes in the ambulance she was admitted at 18:00 (Hb now 46g/L)*

(Continued)

Inappropriate interhospital transfer in a patient with a falling haemoglobin (Hb) (2)

- *At this point the patient was showing signs of hypovolaemic shock*
- *The first request form for crossmatched blood was sent to the laboratory without the required sample which further delayed the transfusion*
- *When a second request for crossmatched blood was sent the laboratory staff were not informed of the urgency of the situation*
- *The patient was transferred to a ward at 19:00; a blood transfusion had not been administered up to this point*
- *The patient had a cardiac arrest at 22:00 and it was not until this point that she received a unit of emergency group O D-negative blood*
- *Three additional crossmatched units were later made available and transfused*
- *The patient survived and was eventually discharged home*

Delayed treatment of gastrointestinal haemorrhage

- *A man in his 60s was admitted with chest symptoms and possible gastrointestinal bleeding*
- *His haemoglobin (Hb) fell over 2 days from 115g/L to 96g/L on day 2, and 50g/L early the following morning when he had a cardiac arrest*
- *Although the laboratory staff provided all components promptly there were misunderstandings with the medical staff who had not received adequate training, and communication was confused*
- *The review considered that transfusion could have occurred earlier as the Hb was clearly falling*

Delayed treatment of severe anaemia

- *An elderly woman was admitted with anaemia, possibly due to bleeding*
- *Her haemoglobin (Hb) was 45g/L and she was not adequately transfused over the next 6 hours and had a cardiac arrest*
- *The patient was located in a busy and overflowing department and was moved several times during her stay which contributed to the delay*
- *As a result of this incident changes to clinical practice have been implemented regarding the group-check sample rule (i.e. that in an emergency, O D-negative units can be obtained)*

Missed diagnosis and delay in treatment of a child with haemophilia and intracranial bleeding (1)

- *A male infant <6 months of age presented to hospital A with a history of falling down the stairs while in his mother's arms*
- *The child was seen by a consultant and was noted to be unharmed, and there were no safeguarding concerns*
- *Six days later the infant re-presented at hospital A with an acute collapse*
- *The computerised tomography (CT) scan showed an extensive intracranial bleed with mid-line shift*
- *Two coagulation screens showed an un-clottable activated partial thromboplastin time (APTT) with normal prothrombin time (PT)*
- *No further investigations such as coagulation factor assays were performed*
- *The infant had vitamin K administered before transfer to a tertiary centre, hospital B*
- *He was transferred as a time critical transfer, details of the discharge summary and communication between hospitals was not available*

(Continued)

Missed diagnosis and delay in treatment of a child with haemophilia and intracranial bleeding (2)

- *At hospital B the infant was electively intubated*
- *Coagulation samples were sent to the laboratory ~8 hours following admission*
- *His APTT was 101 seconds with normal PT and thrombin time*
- *The biomedical scientist (BMS) noted in the report that these were abnormal and requested a repeat, but the abnormal results were not discussed with a haematologist by either the laboratory or clinical teams*
- *Solvent-detergent fresh frozen plasma (SD-FFP) was requested, and 3 units of SD-FFP were issued and transfused*
- *This resulted in partial improvement in APTT to 47s but not full correction*
- *After the third plasma transfusion, the results were discussed with a haematologist over 24 hours after admission to hospital B*

(Continued)

Missed diagnosis and delay in treatment of a child with haemophilia and intracranial bleeding (3)

- *A diagnosis of haemophilia A was made following specific blood tests for clotting factors (factor VIII found to be 7IU/dL)*
- *Factor VIII concentrate was administered 48 hours after admission, and 36 hours post APTT of 101s*
- *The child also had a pulmonary haemorrhage and subsequently died from the intracerebral bleed*
- *The case review noted that an intracranial arteriovenous malformation was the cause of bleeding*
- *Root cause analysis (RCA) identified lone BMS working overnight covering haematology/blood transfusion with unclear standard operating procedure (SOP), combined with lack of recognition of importance of isolated prolongation of APTT by clinical and laboratory staff as key factors*
- *Corrective and preventive action to address these were instituted*

Delay due to laboratory information management system (LIMS) interface with remote electronic issue (REI) refrigerators

- *Clinical staff were unable to remove blood REI from the theatre blood refrigerator for a patient who was actively bleeding during liver transplant*
- *This resulted in a 30-minute delay which was resolved by collecting the red cells for the patient from the transfusion laboratory*
- *On this occasion the interface had to be restarted to enable REI*
- *The problem identified was the capacity of the server which needed replacing because excessive demand on existing capacity slows down messaging between LIMS and REI refrigerators*

Avoidable Transfusion

Panic at low haemoglobin (Hb) level results in avoidable use of group O D-negative blood

- *A patient in her 60s was readmitted with bleeding from arthroscopy sites*
- *Her Hb had fallen to 67g/L from 87 four days previously*
- *Her international normalised ratio (INR) was 7.7 (on warfarin for mitral and aortic valve replacements)*
- *She was not hypotensive or decompensated*
- *The junior staff gave emergency O D-negative units against the advice of haematology staff*
- *A sample was available in the laboratory and she could have received group-specific units*
- *The INR was corrected using intravenous (IV) vitamin K*

Use of the wrong haemorrhage protocol leads to inappropriate transfusion of cryoprecipitate

- *A woman in her 70s bled following an insertion of an intramedullary nail*
- *Thromboelastography results were interpreted using the postpartum haemorrhage protocol and she received cryoprecipitate*
- *The laboratory fibrinogen level was 2.2g/L*
- *A level 2.0 to 3.0g/L would trigger replacement in postpartum bleeding but not in other non-obstetric bleeding*
- *The transfusion was also not properly recorded*

Incorrect use of bedside identification and labelling systems

- *A patient was transfused in error based on a haemoglobin (Hb) from a different patient*
- *Using order comms, a sample was taken from the wrong patient (wrong blood in tube) because the correct procedure was not followed*
- *The procedure for phlebotomists, using a 'computer on wheels' and wireless printer, is to bleed and label one patient's sample at a time, at the bedside*
- *But in practice, medical staff make a request, print off the labels and give to the phlebotomist to do, so this sample probably had a label attached that got left on the trolley and was not checked prior to attaching the label to the sample*

Under or Overtransfusion

Haemorrhage during surgery with fatal outcome (1)

- *A woman in her 40s with advanced rectal cancer bled during surgery*
- *The patient started bleeding at varying rates in surgery at 14:00, until this increased at 16:00*
- *There are conflicting reports of when the major haemorrhage protocol (MHP) was activated by the theatre team and the correct procedure was not followed*
- *The biomedical scientist (BMS) reported that the team requested red cells and to withhold the fresh frozen plasma (FFP)*
- *The patient was being monitored with thromboelastography (TEG) so samples were not sent to the laboratory for clotting*

(Continued)

Haemorrhage during surgery with fatal outcome (2)

- *FFP was not required because the thromboelastogram was normal*
- *Misinterpretation of Hb levels contributed and there was no documentation of blood loss during surgery*
- *The patient became haemodynamically unstable and the first suggestion of coagulopathy was made at 3 hours from the start of surgery*
- *A request for FFP was then made and haematology contacted for advice*
- *In total she received 26 units of red cells, but only six of plasma, two of platelets, two pools of cryoprecipitate and fibrinogen concentrate once the coagulopathy was evident, but she unfortunately died 3 hours later during the surgery*

Prescription of five times the correct dose of cryoprecipitate

- *A young woman was admitted as an emergency with a diagnosis of myeloma with spinal cord compression*
- *During admission she developed marked haemoptysis with evidence of deranged coagulation*
- *Following transfusion of fresh frozen plasma (FFP), she was prescribed '10 units' of cryoprecipitate and received seven of these*
- *The correct dose was two units (two pools of five)*
- *There was confusion between the locum doctor, who had no experience of prescribing cryoprecipitate, and the haematology registrar, and this prescription was not challenged either by the laboratory or the nursing staff*
- *It was clear that all staff groups required education about the correct dose of cryoprecipitate*

Overdose of platelets

- *A man in his 80s with a platelet count of $15 \times 10^9/L$ received four adult therapeutic doses of platelets prescribed by a consultant, where one dose would have been appropriate*
- *The request of 1 'mega' unit was interpreted as being 4 normal therapeutic units and all were transfused*
- *The use of 'nonconventional' terminology by the requesting clinician was compounded by failure to clarify what was required for the patient by several people involved in this incident*
- *The patient made a complete recovery*

Prothrombin Complex Concentrate (PCC)

An asymptomatic patient with very high international normalised ratio (INR) received prothrombin complex concentrate (PCC)

- *An elderly lady with no bleeding but a history of falls was on warfarin for atrial fibrillation*
- *Her INR was very high, 16.2, and she received vitamin K and 3000IU of PCC as an outpatient as prophylaxis on the advice of the Patient at Home team*

Delay to administration of prothrombin complex concentrate (PCC) contributes to a patient's death

- *An elderly lady on warfarin fell and broke her arm*
- *She was admitted and later developed a spontaneous intracerebral haemorrhage, possibly as a result of hypertension*
- *The anticoagulation was immediately reversed with vitamin K and PCC was advised*
- *The doctor 'prescribed' PCC using the electronic patient record system but in fact this was an order to the blood bank, not a prescription*
- *The PCC was issued immediately but not collected or administered for another 5 hours*
- *The patient died 5 days after admission*
- *Changes have been made to the IT system to make sure it is clear to clinical staff that an order and a prescription need to be completed separately*

Near Miss (NM) – Wrong Blood In Tube (WBIT)

Incorrect information given by care home

- *Patient A was admitted to hospital from a care home, however the care home gave hospital staff incorrect details of Patient B who had dementia*
- *Patient A told the staff his correct name and date of birth (DOB) but was ignored due to incorrectly informed staff assuming the patient had dementia*
- *A member of the radiology department staff queried the patient's identification details but were told that the patient was 'just confused'*
- *Due to departmental pressures, Patient A was not clerked by a doctor for more than 5 hours after admission*
- *It was at this point the doctor noticed that the patient was not confused, and the medications were for a completely different patient*
- *The details were checked with the lucid patient, who was confirmed as Patient A*
- *The blood samples taken from Patient A were identified as 'wrong blood in tube' as the blood group did not match that on record for Patient B and all results were removed from Patient B's record*

Incorrect selection and editing of patient address leads to wrong blood in tube (WBIT) (1)

- *A biomedical scientist (BMS) in the transfusion laboratory was contacted by the ward to alert them that a group and save sample had been labelled incorrectly*
- *The patient was admitted as an emergency with suspected myocardial infarction and under pressure to rapidly admit the patient, a healthcare assistant (HCA) selected an incorrect patient from the electronic patient record (EPR)*
- *This incorrect record had the same forename, surname and date of birth (DOB) as the admitted patient, however, the address did not match so this was edited by the HCA*

(Continued)

Incorrect selection and editing of patient address leads to wrong blood in tube (WBIT) (2)

- *When addressograph labels and identification (ID) bands were printed, the correct forename, surname, DOB, and address were present but the hospital numbers were incorrect*
- *The group and screen sample was taken during an emergency procedure by a doctor - it was witnessed by a nurse who then labelled the sample, using an addressograph label, as the doctor was scrubbed and unable to label it themselves*
- *The patient was asked to confirm their ID, which matched the ID band, however the error in hospital number remained undetected*
- *When relatives arrived the details were checked and the HCA realised their error*

Incorrect wristband and subsequent failure to positively identify the patient leads to wrong blood in tube (WBIT)

- *A surgical patient was booked into the electronic patient record (EPR) under an incorrect record, which differed only by hospital number and year of birth*
- *An incorrect wristband was generated and applied to the patient*
- *Two group and save samples were taken from the patient by two different members of staff who both used request forms containing the incorrect details, and did not note a discrepancy when asking the patient for their date of birth (DOB)*
- *The error was not initially detected by the laboratory as the details on the samples matched the request forms*
- *The error was discovered when a third sample was taken later in the day which was labelled with the patient's correct details and generated the same blood group and positive antibody screen result*

Failure to check wristband at registration and subsequent failure to positively identify the patient leads to wrong blood in tube (WBIT)

- *A patient was admitted to the ambulatory care unit with a haemoglobin (Hb) of 61g/L and was clerked as another patient with the same name but different date of birth (DOB), address and hospital number*
- *Two crossmatch samples were taken by the same assistant practitioner 23 minutes apart as the patient was previously unknown to the blood transfusion laboratory (one sample using electronic patient identification (EPI) and the second being handwritten)*
- *The patient grouped as B D-positive on both samples and blood was prepared*
- *Upon completing bedside verbal administration checks on an inpatient ward, the nurse found that the patient's DOB did not match either the wrist band or the blood compatibility label*
- *The blood was immediately returned to the laboratory, the patient was readmitted under the correct details and received two units of red cells the following morning*

Wrong blood in tube (WBIT) due to multiple patient records and incorrect merging

- *A WBIT incident was queried when a sample for group and screen was received for a patient who had a previous group recorded as B D-positive but tested as A D-negative*
- *A prior WBIT incident had been investigated 3 years previously when the sample received also grouped as A D-negative*
- *This patient's record had been amended multiple times and had six different hospital numbers and two different National Health Service (NHS) numbers present*
- *Investigation found that the patient record had been merged incorrectly 3 years previously and none of the suspected samples were WBIT incidents*

Right Blood Right Patient (RBRP)

Patient with dementia has multiple names

- *A request for two units was received by the laboratory, at the sample receipt and registration stage the form and sample details matched correctly*
- *The laboratory issued two units of crossmatched blood into the issue refrigerator*
- *The first unit was transfused to the patient, however when collecting the second unit the nurse realised that the surname was the incorrect spelling for the patient*
- *The nurse informed the laboratory and a further new sample and request form was sent to the laboratory*
- *On further investigation it was identified that the patient's name had been changed multiple times on the electronic patient record system and it was only when the patient's relatives were contacted that the correct spelling was identified*
- *The patient had dementia and was unable to confirm the correct details*

Extra care required when using manual systems during downtime

- *The usual printer was not working during laboratory information management system (LIMS) server 'downtime'*
- *The LIMS was working and blood was issued to a patient using the LIMS*
- *Compatibility labels were printed using the back-up printer system*
- *Two ABO-compatible red blood cell units were issued and transfused but the units issued had different donation numbers to the ones allocated by the LIMS*
- *There was no procedure in place to check the units and patient details against the LIMS system when the back-up printer was being used*
- *A new two-person check sheet has been programmed into the back-up printing program, to ensure two independent people check before the blood leaves the laboratory*

Medical staff respond inappropriately to electronic blood management system (EBMS) printer failure

- *A patient bled during surgery and blood was available for immediate remote electronic issue (REI)*
- *At the point of collection from the REI refrigerator, the label printer failed, and a blank label was issued*
- *The hub laboratory was consulted and the biomedical scientist correctly advised the theatre team that emergency blood was immediately available or compatible blood could be provided if there was enough time to label and transport it from the hub laboratory*
- *Neither option was acceptable to the surgeon or anaesthetist who went for a third incorrect option of transfusing the unlabelled units that had been released from the REI refrigerator*

Incorrect use of the emergency button on BloodTrack®

- *During a Code Red trauma call 20 components were transfused over 30 minutes to a patient with a different spelling of the trauma name on the units and the identification (ID) wristband*
- *Although a BloodTrack® system was in place and was used for all the components, the operator selected the emergency mode which does not check the ID on the blood against the ID band*

Laboratory Errors

Patient blood group O D-positive transfused a unit of group A D-positive red cells in error

- *Following activation of the major haemorrhage protocol (MHP) for a ruptured abdominal aortic aneurysm (AAA) patient when their blood group was unknown, a biomedical scientist (BMS) selected four units of group A red cells instead of O for pack one*
- *This was collected and taken to theatres where one unit was transfused*
- *The patient's sample then arrived and was processed and grouped as O D-positive and the error was then realised. All remaining units were immediately recalled*
- *Initial assessment of the patient showed no adverse reaction, but laboratory investigations showed evidence of haemolysis postoperatively, renal function declined minimally and then improved*
- *There was evidence of intravascular coagulopathy with low platelets*
- *All indicators improved with conservative treatment and there were no clinical sequelae directly related to the ABO-incompatible transfusion*
- *The patient recovered and was discharged home a week later*

Delay in transfusion of solvent-detergent fresh frozen plasma (SD-FFP) in a bleeding acute myeloid leukaemia (AML) patient

- *A phone call was received from a ward requesting three units of SD-FFP for an actively bleeding AML patient*
- *The biomedical scientist (BMS) on a night shift was unable to issue the units because they had not been shown how to issue this product*
- *The BMS attempted to issue the product on the laboratory information management system (LIMS), but failed as they were entering the incorrect code for the product and group – creating an alert for ABO-incompatible transfusion*
- *They called the ward to inform them that they were unable to issue the SD-FFP*
- *The plasma was not issued until the day staff arrived which was then 3.5 hours since the requesting phone call was received*

Non-irradiated cells issued for a patient with a history of Hodgkin lymphoma due to convoluted laboratory information management system (LIMS) procedure (1)

- *A patient in his 80s, with a history of Hodgkin lymphoma, in the intensive care unit (ICU) required a red cell transfusion*
- *The request sent to the laboratory clearly indicated the requirement for irradiated blood and this information was inputted on the patient's record on LIMS, however a secondary step of adding this requirement to the product issue page was not completed*
- *Non-irradiated blood was issued remotely through Hemobank 80®*
- *The requirement for irradiated blood was overlooked at collection, however it was identified by the healthcare support worker and nurse at the patient's bedside*
- *The laboratory was contacted and a new unit of blood issued via Hemobank 80®*

(Continued)

Non-irradiated cells issued for a patient with a history of Hodgkin lymphoma due to convoluted LIMS procedure (2)

- *Only one of the two members of laboratory staff involved in the issue of the blood had completed their competency assessment, and the other was a new starter (a large volume of staff turnover was also listed as a contributory factor)*
- *The investigation also noted that the application of flags in LIMS is not uniform and has caused confusion*
- *Some flags are for information only, whilst others require direct action; for some flags a single step is required to apply this to the patient record and others require the two steps*
- *Furthermore, the information regarding specific requirements on the clinical patient record does not link to the LIMS*
- *The laboratory management team are investigating the possibility of altering the irradiated flag on LIMS to prevent remote issue of blood but cannot currently change the system of recording specific requirements*

Untrained staff supporting lone worker causes sample labelling error to go unidentified

- *A unit of red cells was transfused overnight to a patient in his 60s*
- *The following morning it was discovered that the sample used for crossmatching had an incorrect date of birth written on it*
- *This had not been picked up by the biomedical scientist (BMS) during processing*
- *A second check was not performed before analysis of the sample due to staffing issues, which should have picked up the discrepant date of birth*
- *The laboratory information management system (LIMS) had the correct date of birth, which meant that the blood unit compatibility paperwork was correct and the error would not be picked up at collection or administration*
- *An additional unit of red cells which had been issued was recalled, and replacement units were issued on a correctly labelled sample once received and processed*
- *The incident occurred following increased pressure on a lone working BMS, who was not adequately supported by the medical laboratory assistant (MLA) on duty*
- *The MLA later stated that they were not confident to work in the transfusion laboratory and required further training*

Patient post autologous haemopoietic stem cell transplant (HSCT) transfused with non-irradiated blood

- *The laboratory information management system (LIMS) contained two records for a patient in her 50s who had undergone a HSCT, however only one record had an alert flag for irradiated blood components recorded against it*
- *A sample for group and screen was received and booked in against the patient record with no alert flag*
- *A verbal request was later received for red cells, and non-irradiated red cells were selected and transfused*
- *The duplication of records was not identified by the laboratory*
- *Irradiated blood requirements were not identified from clinical details provided with previous samples*
- *There was no indication that irradiated blood was required on the group and screen request form or the transfusion prescription chart*
- *Staff performing the bedside checks not aware that the patient required irradiated components*

Specific requirements not met due to incorrect antibody identification

- *The red cell immunohaematology (RCI) laboratory contacted the hospital transfusion laboratory regarding a sample that had been sent to them in October for confirmation of anti-Fy^a identification*
- *RCI said that they could not find anti-Fy^a, but they had identified anti-M, anti-K and anti-Kp^a and that the patient themselves was Fy^a positive*
- *On investigation the previous testing in the hospital laboratory in April had identified anti-Fy^a because the antibody identification worksheet used had an expiry date of 28th March, so this red cell panel was no longer in use*
- *The antibodies which should have been detected using the correct worksheet was anti-M and anti-Kp^a*
- *The transfusion dependant chronic kidney disease patient in her 80s had been transfused with a unit of red cells that was negative for Fy^a and K but unknown to M in October*
- *It is assumed that the unit was M negative as the crossmatch was compatible. There were no reported adverse events for the patient during or after the transfusion*

Neonate transfused a unit of red cells that was not antigen-negative for a maternal alloantibody (1)

- *A neonate was transfused a unit of red cells that was not compatible with the maternal specific requirements*
- *The mother of the neonate was known to have Anti-M of IgG sub-class*
- *One unit of red cells was requested for transfusion and an O D-negative paediatric pack unit was selected from stock*
- *This was then crossmatched by indirect antiglobulin test (IAT) against both the maternal plasma and also the neonate's plasma*
- *The neonate's plasma by IAT was compatible and the unit was issued and transfused*
- *It was later noticed by a second biomedical scientist (BMS) during the second check performed on all manual compatibility tests, that the IAT maternal plasma crossmatch was incompatible*

(Continued)

Neonate transfused a unit of red cells that was not antigen-negative for a maternal alloantibody (2)

- *The transfused unit was confirmed as being M positive*
- *On investigation the maternal IAT crossmatch had not been documented on the manual crossmatch worksheet*
- *The 'family link' had not been made on the laboratory information management system between mother and baby, therefore, maternal flags were not seen and the alert flag to indicate maternal antibodies was not added onto the babies record*
- *It was also found that the standard operating procedure (SOP) required clarification, as there was some confusion over the crossmatch method and what sample should be used for the IAT crossmatch*
- *This led to the unnecessary set-up of both the baby and maternal IAT crossmatches*

Transcription error results in specific requirement not being met (1)

- *A patient in her 70s with a history of anti-Jk^b required a one-unit red cell transfusion*
- *The biomedical scientist (BMS) checked the patient records and noted the history of the patient and specific requirements but wrote anti-Jk^a on the request form instead of anti-Jk^b*
- *The BMS then selected a Jk^a-negative unit and crossmatched it alongside a manual group and antibody screen on the patient*
- *The antibody screen was negative and the crossmatch was compatible*
- *The unit was then issued to the patient on the laboratory information management system (LIMS) and subsequently transfused*

(Continued)

Transcription error results in specific requirement not being met (2)

- *When issuing the unit to the patient on the LIMS, a warning flag was displayed notifying the BMS that the special requirements were not met*
- *The BMS did not take heed of the warning, accepted it and carried on*
- *The error was identified when a further request for one unit was sent 2 days later*
- *The antibody screen was negative and direct antiglobulin test negative*
- *The patient was monitored and no symptoms of delayed transfusion reaction were observed*

Incorrect blood group manually entered on to the laboratory information management system (LIMS)

- *A patient in her 80s requiring a two-unit transfusion was grouped manually due to persistent analyser maintenance failures*
- *The blood group result was as O D-negative; however, it was transcribed onto the LIMS as O D-positive*
- *Two O D-positive units were issued*
- *The sample should then have been put on to the analyser for processing, but there was a delay to the maintenance of the analyser and the sample was not processed until later that day*
- *The analyser grouped the sample as O D-negative and flagged the discrepancy, but the error was not picked up in time and both units were transfused*

Patient transfused platelets unnecessarily

- *A patient in her 80s was bleeding and was prescribed two units of platelets following a reported low platelet count*
- *During transfusion of the second unit the patient experienced a suspected transfusion reaction. They developed a fever of 39.2°C, rigors, increased respiratory rate of 24, normal O₂ saturations of 98% on air, with no change to blood pressure but heart rate did increase to 100 beats per minute*
- *The patient had a history of platelet aggregates*
- *The platelet count of 29x10⁹/L was reported while a blood film was being made and looked at*
- *The film confirmed the presence of platelet aggregates and this was written on the report, however the count was not removed from the laboratory information management system (LIMS)*
- *The incorrect platelet count was seen and acted upon by medical staff who prescribed two units of platelets for the patient. The patient went on to have a transfusion reaction during transfusion of the second unit of platelets*
- *It was during the investigation of the transfusion reaction that this error was identified*

Delayed transfusion for a patient on monoclonal antibody therapy (1)

- *A transfusion dependant myeloma patient in his 60s on monoclonal antibody therapy, had a crossmatch sample taken and sent to the laboratory on a Friday morning for booked transfusion on the following Monday in the day case ward*
- *This patient's sample needed to be sent to the red cell immunohaematology (RCI) laboratory for testing due to pan-reactivity caused by the anti-CD38 drug they were on*
- *The hospital laboratory did not send the sample until 11:00 on the Sunday and also did not let RCI know that it was being sent to them*
- *The hospital laboratory contacted RCI at 08:45 on the Monday chasing up the crossmatched blood as the patient was attending that day for transfusion*

(Continued)

Delayed transfusion for a patient on monoclonal antibody therapy (2)

- *RCI informed the laboratory that they were not aware of the sample until that morning and the results would not be available until that afternoon*
- *The crossmatched blood was received from RCI and issued by the hospital laboratory on Tuesday afternoon at 15:17*
- *This resulted in a 2-day delay in the blood transfusion to this patient*
- *There were no adverse effects reported*
- *On investigation the SOP needed more clarification on sending samples to RCI for investigation, especially at weekends and that RCI require at least 24 hours to work on samples from patients on monoclonal antibody therapies*

Specific requirement not met for a patient of childbearing potential

- *A patient in her 30s, with per vaginal bleeding following miscarriage, was transfused three units of red cells in April 2018*
- *Antenatal booking bloods were received and analysed in February 2019*
- *The patient now had a positive antibody screen and the antibody was identified as being anti-K*
- *On investigation one of the three units transfused in 2018 was K-positive*
- *The biomedical scientist (BMS) who issued the units failed to select a K-negative unit, as per requirements for a patient was of child bearing potential*
- *The laboratory information management system (LIMS) had a flag alerting of the need for K-negative units for this group of patients but this was not adhered to*

Group O fresh frozen plasma (FFP) selected for a group A patient (1)

- *A patient in her 70s attended the emergency department with a catastrophic intra-abdominal bleed after suffering a fall onto her left side while in the nursing home*
- *The group and screen sample was being analysed when the massive haemorrhage protocol was activated*
- *The blood group results showed a forward group of A but the reverse group had no reactions with A or B cells*
- *The blood group was later confirmed as group A D-positive*
- *While the biomedical scientist (BMS) was waiting to confirm the blood group, O D-negative red cells and four group O FFP were issued*

(Continued)

Group O FFP selected for a group A patient (2)

- *The patient was taken to theatre and during the procedure was transfused all four units of FFP*
- *This ABO-incompatible transfusion was only detected when an incident relating to a delay in blood component provision was being investigated*
- *It was then noted that group O FFP had been transfused. The patient was on the intensive care unit (ICU) postoperative for 7 days and was monitored more closely for any signs of a transfusion reaction*
- *On investigation it was found that the BMS had issued group O red cells to the patient then proceeded to incorrectly select group O FFP instead of group AB or A as emergency issue*
- *The BMS failed to take heed of the alerts to ABO-mismatch on the LIMS before accepting and issuing the incompatible units*

Test tube labelled with incorrect barcode

- *Retrospective crossmatching of two units of red cells, which were issued and transfused in an emergency situation, showed an error in the labelling of the test tubes containing cells from the units*
- *Both test tubes had been labelled with the barcoded donation number for unit A*
- *It was later discovered that the blood units had both been labelled with the barcoded donation number for unit B on the traceability tags.*
- *The error on test tubes was discovered when they were put on the analyser for crossmatching against the patient's sample*
- *The analyser would not perform the crossmatch because the tubes were labelled exactly the same*
- *The standard operating procedure (SOP) had not been adhered to; printing the barcodes for the donor units twice, labelling the test tubes with one barcode and the second left to place on the traceability tags before labelling the units*
- *This resulted in the both test tubes being labelled as donor unit A and the blood units both being labelled as donor unit B*

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- *This resulted in the both test tubes being labelled as donor unit A and the blood units both being labelled as donor unit B*

Unit of red cells transfused to a patient after the sample used for testing had expired

- *A member of clinical staff rang the laboratory enquiring about blood for a patient, as a unit had been collected earlier that morning but on return to the refrigerator the other units had been removed*
- *The units had been returned to the laboratory at 10:20 that morning, but should have been returned at 09:00 when the reservation expiry was reached*
- *The laboratory staff were too busy to get down to the theatre refrigerator at 09:00*
- *This meant that at 10:00 a unit was collected by clinical staff and transfused*
- *The blood track collection competency did not cover the checking of the reservation expiry on the blood bag and label but it is clearly stated in the policy*

Transfusion of a blood component that was out of temperature control (1)

- *A request was made to the laboratory at 02:00 for four units of fresh frozen plasma (FFP) and two units of cryoprecipitate (cryo) for a patient in his 30s with disseminated intravascular coagulation (DIC)*
- *The request had been discussed with consultant haematologist who advised to correct the coagulopathy*
- *All units of FFP and cryo were thawed and then issued to the patient at around 03:00*
- *The units were sent to the ward at 05:45*
- *The first unit was connected at 06:00 and an attempt was made to run the component through the giving set; however, the component was not fluid enough to get through the filter and continue through the giving set to port end*

(Continued)

Transfusion of a blood component that was out of temperature control (2)

- *The laboratory was contacted immediately by nursing staff; they were advised to discard the component that had been spiked by the giving set and to warm the second component to room temperature prior to transfusion*
- *As a blood warmer was not available this was achieved by placing in the pocket of one of the nursing staff, delaying transfusion of cryo by 20 minutes*
- *On investigation it was discovered that once thawed, the FFP and cryo were all placed in the refrigerator until needed*
- *This storage error was realised by the biomedical scientist (BMS) when the above call was received from the ward, which is why nursing staff were instructed to warm up the second unit of cryo before transfusing*
- *The following day the patient had further blood components and the coagulopathy was corrected but unfortunately they did not survive*

Incorrect sample used for crossmatching detected prior to transfusion – systemic factors addressed

- *Four units of blood were requested for a patient, these were manually crossmatched and issued to the patient during the night shift, and subsequently collected by clinical staff*
- *At 09:30 the next day more units were requested, however on looking for the sample to test and allocate the additional units, the sample in the position for this laboratory number belonged to another patient*
- *The laboratory number label had been placed on another patient's sample and this sample used to crossmatch the four units of red cells*
- *However, the label on the request form was for the correct patient*
- *The ward was contacted to inform them of the error and the units retrieved*
- *This error could have been identified at five points in the laboratory processes and was missed by two members of staff*
- *Staff members recorded excessive tiredness and stress due to increased workload on the shift*
- *The department has introduced several corrective measures to ensure resilience in the shift system, such as a training rota to ensure cross cover between departments, shortening of night shifts and additional staff being allocated*

Errors Related to Information Technology (IT)

Incorrect replacement identification (ID) band used to scan components prior to administration

- *Administration checks for solvent-detergent fresh frozen plasma (SD-FFP) were performed by two nurses at the bedside*
- *The ID band on the patient had eye-readable patient details however the barcode was worn and could not be scanned by the BloodTrack[®] system*
- *A new ID band was printed, however the nurse had not realised there were previous ID bands in a queue*
- *They selected the incorrect patient's ID band to scan away from the bedside using the personal digital assistant (PDA) linked to BloodTrack[®], however the system alerted to prevent transfusion of an incorrect unit to the wrong patient*
- *The correct patient subsequently received an SD-FFP transfusion as indicated*

Patient details mismatched on two unlinked information technology (IT) systems

- *A request for red blood cell transfusion was received in the laboratory, however the date of birth on the request form and blood sample received from the general practitioner (GP) did not match the laboratory information management system (LIMS)*
- *It did match the information on the GP patient identification (ID) system (summary care record (SCR)) and the LIMS was updated by laboratory staff*
- *When attempting to issue the unit, it was scanned into Blood360® which held information from the patient's previous transfusion, and the unit was automatically quarantined due to a mismatched date of birth (DOB)*
- *The details on Blood360® are updated manually, and this step had not been completed*
- *The ward was contacted to ascertain the correct DOB, and the patient confirmed the DOB on Blood360® was correct, but incorrect on the patient ID system and pathology LIMS system*
- *A new sample was requested from the ward to provide blood for the patient and the GP practice contacted to inform them of the error*

Irradiated red cells not issued for a baby with previous intrauterine transfusion (IUT)

- *A woman with history of IUT at a different hospital in the Trust presented for a planned caesarean section*
- *A unit of neonatal emergency red cells, which had not been irradiated, was removed from a satellite refrigerator in advance of the procedure to be given to the infant immediately following birth*
- *Even though the woman had been admitted 12 hours prior to the procedure, the transfusion laboratory had not been informed of admission, or delivery plan*
- *The laboratory team were alerted to the removal of neonatal emergency cells by an alarm on BloodTrack® and contacted the clinical area to assist in the emergency haemorrhage*
- *They were subsequently able to access the woman's transfusion records, prevent this incorrect unit being transfused and provide a component with the correct specification for the infant*

Failure to complete all steps required to attach a flag to the laboratory information management system (LIMS)

- *The specific requirements section on the request form stated that the patient required irradiated blood*
- *An irradiated warning flag was put onto the patient's laboratory record on WinPath® by the transfusion laboratory staff*
- *However, within this LIMS a second step is necessary - the specific requirement section on the 'product issue page' must also be populated for each sample during the booking-in process*
- *On this occasion this step was omitted in error and therefore there was no message to the HaemoBank80® remote issue refrigerator to prevent the issue of non-irradiated blood*

Incorrect storage of red cells identified by electronic tracking system

- *A unit of blood was correctly collected from the transfusion laboratory issue refrigerator and put into the ward satellite refrigerator using an electronic tracking system*
- *During collection from the satellite refrigerator it was noted that the unit was not present*
- *The blood was then found in a chemotherapy storage refrigerator next to the satellite blood refrigerator*
- *The unit was initially quarantined pending investigation and then discarded*

Febrile, Allergic and Hypotensive Reactions (FAHR)

Febrile reaction occurring with platelets given for an erroneous result

- *A patient in her 80s was admitted for symptoms relating to a pulmonary embolism*
- *She was prescribed two units of platelets for a low platelet count (reported as $29 \times 10^9/L$)*
- *During the second unit she developed rigors, a fever of 39.2°C and an elevated heart and respiratory rate*
- *The laboratory had noted platelet clumping and had revised the report on the system however the medical team had already acted on this initial result*

Severe allergic reaction when given platelets to reverse aspirin

- *A patient in his 70s was transfused two doses of platelets in theatre*
- *He was undergoing surgery for an acute subdural haematoma and platelets were given as he was on aspirin*
- *Fifteen minutes after his second dose, the patient developed a rapid rash covering his body and hypotension unresponsive to vasopressors*
- *The patient was treated for anaphylaxis and rapid stability was achieved*

Avoid unnecessary transfusion

- *A female in her 60s was found to have a haemoglobin of 48g/L when routine blood tests were carried out at her general practice surgery*
- *She experienced severe rigors, back pain, breathlessness and felt very cold 15 minutes after being transfused a unit of red cells for symptomatic anaemia*
- *Paracetamol alone was used to treat this reaction*
- *Future management will be with intravenous (IV) iron*

Pulmonary Complications

Transfusion-Related Acute Lung Injury (TRALI)

Acute lung injury following cardiac surgery with cognate antibodies in red cells from a female donor without history of pregnancy

- *A female patient in her 20s, undergoing cardiac surgery was transfused four units of red cells and two pools of platelets for intraoperative bleeding*
- *30 minutes after coming off bypass, she became hypoxic with increased difficulty ventilating*
- *Pink frothy fluid was aspirated on bronchoscopy and chest X-ray showed severe pulmonary oedema*
- *There was no respiratory improvement with diuretics*
- *She required extracorporeal membrane oxygenation (ECMO) and 15 days ventilation*
- *This was assessed as a 'probable' transfusion-related acute lung injury (TRALI)*

Acute deterioration in a patient with sepsis with cognate antibodies in both red cell units

- *A female patient in her 60s with myelodysplasia was admitted with fever and weight loss and had bronchopneumonia on a computerised tomography (CT) scan on admission, treated with intravenous antibiotics*
- *She received a two-unit red cell transfusion for anaemia and was found unconscious 15 minutes after the second unit started with hypoxia and hypotension*
- *Chest X-ray showed florid pulmonary oedema; post-transfusion N-terminal-pro B-type natriuretic peptide (NT-BNP) was borderline at 200pg/mL*
- *She required 48 hours of ventilation and inotropic support but subsequently made a full recovery*
- *Echocardiogram showed good left ventricular function but a vegetation on her mitral valve; she was subsequently confirmed as having infective endocarditis, for which she received an extended course of antibiotics*
- *This was assessed as a 'probable' transfusion-related acute lung injury (TRALI)*

Cognate antibodies from female platelet donors in a patient with multiple possible reasons for lung injury

- *A male patient in his 50s, 40 days post allogeneic transplant for myelofibrosis had had a complicated admission with influenza, suspected pneumocystis pneumonia and bacteraemia, but was clinically improving on the day of reaction though still on oxygen*
- *He was transfused two pooled units of platelets prior to Hickman line insertion and then became acutely hypoxic and breathless immediately after the procedure*
- *CT scan was reported as 'There is widespread mixed interstitial and intraalveolar air space shadowing suggesting an evolving bilateral pneumonic process*
- *The appearances are more confluent, than on the previous chest X-ray*
- *The appearances are not typical of acute pulmonary oedema.'*
- *He required ventilation for 48 hours and was treated with multiple antibiotics but made a full recovery*
- *This was assessed as 'equivocal' transfusion-related acute lung injury (TRALI)*

Transfusion-Associated Circulatory Overload (TACO)

Omitted transfusion-associated circulatory overload (TACO) checklist leading to overtransfusion and TACO

- *A female patient in her 70s weighing 54kg developed anaemia following orthopaedic revision surgery (Hb 67g/L)*
- *She had a number of risks for TACO: positive fluid balance (1215mL), and the pre-transfusion chest X-ray report was suggestive of possible infection and heart failure, however a TACO checklist was not performed before the transfusion*
- *She was transfused two units of red cells*
- *Following the second unit she developed shortness of breath, crackles on chest auscultation, hypoxia, tachycardia and an increase in blood pressure*
- *The post-transfusion chest X-ray report confirmed findings were consistent with heart failure, fluid overload and possible infection*
- *She was transferred to the critical care unit for continuous positive airway pressure (CPAP) ventilation*
- *Her respiratory status improved following treatment with diuretics, nitrates and fluid restriction*
- *Her post-transfusion Hb was 108g/L*

Transfusion-Associated Dyspnoea (TAD)

Transfusion-associated dyspnoea (TAD) with inadequate clinical details (IC)

- *A man with known chronic obstructive pulmonary disease (COPD) in his 80s was admitted with suspected sepsis with leucocytosis (white cell count (WCC) $>30 \times 10^9/L$)*
- *He developed acute dyspnoea with no wheeze/rash and deteriorated suddenly during red cell transfusion with tachypnoea and tachycardia, hypoxia (O_2 saturations 78%), temperature $37.7^\circ C$ with bilateral transmitted sounds*
- *He was not reported to have any concomitant cardiac or renal disease*
- *Due to sudden deterioration, investigations could not be completed to ascertain cause*

Transfusion-associated dyspnoea (TAD) with complete clinical information (C)

- *A patient in her 80s was admitted with symptomatic anaemia and a 3-week history of worsening breathlessness and leg oedema*
- *Other co-morbidities included acute on chronic renal failure (stage 3), non-insulin dependent diabetes mellitus (NIDDM), hypertension, cardiac failure with oedema*
- *She was reported to have become more breathless 3 hours after the start of a unit of packed red cells with tachypnoea and desaturation: her oxygen saturation (on 10L O₂) dropped from 91% to 87%*
- *Chest X-ray showed an area of developing consolidation*

Transfusion-related acute lung injury (TRALI) type II – Case 1

- *A young patient in his 30s diagnosed with acute myeloid leukaemia (AML) on induction chemotherapy developed rigors within 2 hours of platelet transfusion, with a rise in temperature of 2.4°C, tachycardia, desaturation, and wheeze*
- *The chest X-ray showed acute respiratory distress syndrome (ARDS) with progression from the previous one*
- *This was assessed as ‘probably’ related to the transfusion*

Transfusion-related acute lung injury (TRALI) type II – Case 2

- *A woman in her 70s with pre-existing chronic obstructive pulmonary disease (COPD) and asthma became hypoxic, tachypnoeic and tachycardic within 1.5 hours of platelet transfusion*
- *Cultures were negative, serology was negative and chest X-ray showed bilateral ground glass appearance*
- *The patient recovered following treatment with steroids, antihistamines and supportive measures*
- *This was assessed as ‘possibly’ related to the transfusion*

Transfusion-related acute lung injury (TRALI) type II – Case 3

- *A patient in her 40s following surgery for breast carcinoma required massive transfusion, needing several blood components desaturated to 68% with hypotension, no evidence of fluid overload and bilateral patchy infiltrates on chest X-ray*
- *There was no evidence of cardiac, renal or respiratory disease and the donor antibody screen was negative*
- *The patient needed continuous positive airway pressure (CPAP) support and recovered*
- *This was assessed as ‘possibly’ related to the transfusion*

Haemolytic Transfusion Reactions (HTR)

Hyperhaemolysis in a patient with myelodysplastic syndrome and cold agglutinin disease

- *A haematology patient with a provisional diagnosis of myelodysplastic syndrome was transfused one unit of red cells due to a haemoglobin (Hb) 64g/L*
- *The patient immediately experienced symptoms of a transfusion reaction including fever, hypotension, nausea and dyspnoea*
- *The transfusion was stopped and the post-transfusion Hb dropped to 54g/L*
- *The patient was transfused another four times over the following 7 days, each time with hydrocortisone cover*
- *However, each transfusion resulted in similar reactions, although the symptoms were less severe*
- *At this point a decision was made to stop transfusion and to treat the patient with intravenous immunoglobulin (IVIg) and erythropoietin*
- *The patient improved and the Hb began to rise over the following 3 weeks with the Hb stabilising at 86g/L 7 weeks after the initial reaction*

Anti-Jk^b detected in eluate post transfusion

- *The patient reported feeling unwell 30 minutes into the transfusion of the second unit*
- *The transfusion was stopped, and a transfusion reaction investigation performed*
- *Both pre- and post-transfusion samples demonstrated a non-specific pan reactive antibody detectable in Biovue[®] and low ionic strength saline (LISS) tube indirect antiglobulin test (IAT)*
- *No underlying antibodies were detected in either sample however an eluate on the post-transfusion sample demonstrated the presence of anti-Jk^b*

Patient visiting from abroad with multiple antibodies

- *A Ghanaian national visiting the UK was admitted to hospital in sickle crisis*
- *The initial antibody screen was positive, and samples were sent to the Blood Service for investigation*
- *The Red Cell Immunohaematology (RCI) laboratory was unable to identify the antibody and samples were sent to the International Blood Group Reference Laboratory (IBGRL) for further investigation*
- *Two units of crossmatch-compatible blood were issued by the Blood Service and transfused prior to the IBGRL investigation being completed*
- *Following transfusion, the patient required urgent treatment for bleeding in the brain and had evidence of haematuria however this was initially attributed to the sickle crisis*
- *IBGRL subsequently reported anti-D, anti-E and anti-Js^b*
- *The units which had been transfused were negative for the D and E antigens but were both Js^b positive*
- *The patient had stated that she had an antibody, but she did not know which one*

Patient with anti-E, -C^w, -S, -Jk^a and -k

- *A patient required urgent transfusion for chronic anaemia after presenting at hospital with haemoglobin (Hb) 31g/L*
- *The patient had a known history of anti-E, -C^w, -S, -Jk^a and -k, however no red cells units of this specification were available at the Blood Service or the frozen blood bank*
- *The anti-Jk^a was not detectable in the sample therefore following discussion between the consultant haematologists at the hospital and Blood Service it was decided to transfuse units which were Jk^a-positive but negative for all detectable red cell antibodies*
- *The patient's Hb initially rose post transfusion however 6 days later the Hb had dropped by 18g/L, the direct antiglobulin test (DAT) had become positive and anti-Jk^a was detectable in the post-transfusion sample*

Delayed haemolytic transfusion reaction (DHTR) in an O D-negative female transfused with D- positive blood

- *A female patient in her 70s presented in the emergency department (ED) with an abdominal aortic aneurysm*
- *The major haemorrhage protocol was activated*
- *The patient's antibody screen was negative, and the patient was transfused with emergency D-positive blood*
- *Six days later the patient experienced symptoms of a transfusion reaction including raised bilirubin, raised lactate dehydrogenase (LDH), falling haemoglobin (Hb), positive direct antiglobulin test (DAT) and impaired renal function*
- *Anti-D was detected in the post-transfusion sample and was also eluted from the patient's red cells*
- *Following investigation, the patient informed the clinical area that she had developed an antibody in a previous pregnancy*

Acute haemolytic transfusion reaction (AHTR) reported with a direct antiglobulin test (DAT)-positive unit

- *A cancer patient transfused two units for anaemia became unwell during the transfusion of the second unit, exhibiting symptoms of a HTR*
- *The transfusion was stopped, and the unit was sent to the transfusion laboratory for investigation*
- *The pre- and post-transfusion samples both gave a negative antibody screen and negative DAT*
- *A DAT performed on the unit found that it was positive for C3d*
- *There have been no previous reports of adverse events in patients due to the transfusion of a DAT-positive component, however no alternative cause of the reaction could be found*

Delayed haemolytic transfusion reaction (DHTR) in a patient with anti-HI

- *A patient with sickle cell anaemia and a negative antibody screen was treated by exchange transfusion*
- *Eleven days later they were readmitted with a suspected delayed transfusion reaction*
- *The patient had a rising bilirubin and falling haemoglobin (Hb) and the post-transfusion sample was found to be direct antiglobulin test (DAT) positive, with a non-specific pan-reactive autoantibody detected*
- *Further samples sent to the Blood Service were found to contain anti-HI*

Uncommon Complications of Transfusion (UCT)

Transfusion-associated necrotising enterocolitis (TANEC)

- *This was a case of an extreme preterm neonate (24 weeks) in the neonatal intensive care unit with a previous bowel perforation, post haemorrhagic hydrocephalus and had received multiple transfusions*
- *Around 2-2.5 hours into the second transfusion, the neonate developed clinical features suggestive of necrotising enterocolitis with vomiting, increasing nasogastric aspirates, worsening abdominal distention and respiratory deterioration requiring ventilation*
- *This led to multiorgan failure and death*

Multiple ongoing issues

- *A woman in her 60s was admitted with chronic obstructive pulmonary disease (COPD), cor pulmonale, alcoholic liver disease with gastrointestinal bleeding*
- *She received one unit of red cells uneventfully and developed acute dyspnoea with no rise in temperature an hour into the second transfusion 2 days later*
- *This was followed by sudden deterioration with a pulseless electrical activity (PEA) arrest*
- *Pre- and post-transfusion compatibility testing showed negative direct antiglobulin test (DAT), negative antibody screen and crossmatch-compatible unit*
- *The patient had begun to bleed spontaneously, and gastric re-bleeding was suspected*
- *Resuscitation attempts failed*

Transfusion-associated necrotising enterocolitis (TANEC)

- *This was a suspected case of TANEC in a preterm neonate who developed symptoms after approximately 25mL of a red cell transfusion*
- *The neonate had bleeding per rectum approximately 90 minutes post transfusion with worsening tachycardia*
- *The neonate underwent surgical removal of part of the ileum after being transferred to a tertiary care centre*

Severe back pain in a paediatric patient

- *A paediatric patient <10 years old, known to have hereditary spherocytosis was admitted with a viral illness and anaemia, and developed severe back pain 1 hour after commencing a red cell transfusion*
- *They were given paracetamol and antihistamine, and the transfusion was temporarily stopped with full recovery*
- *There was no evidence of haemolysis*

Unexplained symptoms in an elderly patient

- *A patient in her 70s, was diagnosed with bowel cancer with anaemia pre procedure*
- *Halfway through the third unit she complained of headache, slight rise in temperature (0.5°C) and raised veins all over her hands and feet with stable vitals*
- *She recovered soon after cessation of the transfusion*

Loin pain during platelet transfusion

- *A patient in her 80s with myelodysplastic syndrome on a chronic transfusion programme received a routine human leucocyte antigen (HLA)-matched platelet transfusion, and experienced loin pain with no other symptoms 20 minutes into the transfusion*
- *The patient remained stable*
- *The transfusion was stopped, hydrocortisone and paracetamol were given, and the pain quickly subsided*

Mild reaction with anti-C3b/anti-C3d

- *A mild febrile-type (temperature rise of 1.7°C) non haemolytic reaction in a male patient in his 70s following an out-of-hours urgent transfusion for pancytopenia with epistaxis*
- *This case has been included here as a learning point - red cells had been electronically issued but post-transfusion investigations showed the patient's direct antiglobulin test (DAT) to be positive with Anti-C3b/C3d*
- *At the time of the transfusion the laboratory was not aware of the reaction with anti-C3b/anti-C3d as this is not routinely part of electronic issue*

Multiple symptoms and pain

- *A patient in her 30s, admitted with neutropenic sepsis while on treatment for metastatic breast cancer, developed chills, shivering, tachycardia and pain in the peripherally inserted central catheter (PICC) line where the transfusion was started*
- *A full antibody screen was done with a negative result, and there was no serological evidence of a transfusion reaction*

Severe pain during red cell exchange transfusion

- *A patient with sickle cell anaemia in his 20s, developed a severe headache and pain in his right elbow during unit five of an eight-unit red cell exchange*
- *The procedure was stopped, and investigations including cultures were all negative*

Tachycardia, hypertension and feeling cold

- *A patient in his 70s with underlying cardiac disease underwent percutaneous cardiac intervention*
- *One hour after starting a red cell transfusion for a haemoglobin of 56g/L, the patient complained of feeling very cold with documented tachycardia and hypertension*
- *The transfusion was stopped and discarded; and the patient was managed with supportive measures and recovered*

Pyrexia, tachycardia and hypertension

- *A patient in his 50s undergoing aortic valvular replacement, had bleeding into the chest drains post-surgery*
- *During a transfusion of red blood cells, the patient experienced a pyrexia, tachycardia and hypertension*

Recurring chest pain during transfusion

- *A patient in her 40s admitted for breast reconstruction (flap) developed chest pains after the blood transfusion was started, and recurred when transfusion was restarted after pausing*
- *Gram positive cocci was grown from the bag*

Tachycardia, chest pain and anxiety during platelet transfusion

- *A patient in her 70s being treated for acute myeloid leukaemia (AML) with neutropenic sepsis developed tachycardia, chest pain and anxiety following transfusion of HLA/human platelet antigen (HPA)-matched platelets*
- *No rash or wheeze was noted, and the patient recovered within 30 minutes of additional chlorpheniramine and hydrocortisone post reaction*

Vomiting, blood pressure rise, and tachycardia during transfusion

- *A patient in her 90s was admitted following a fall with fractured humerus, with co-existing chronic kidney disease and heart failure*
- *The patient developed vomiting, a rise in blood pressure (BP) from 180/79 to 203/93 and tachycardia 2 hours into the blood transfusion (150mL red cells transfused)*
- *She recovered with paracetamol, ondansetron and omeprazole*

Multiple symptoms and pain during transfusion

- *A patient in his 80s was admitted with a fractured neck of femur*
- *He had no pre-existing cardiac/lung disease but had renal impairment. He developed shortness of breath, anxiety, restlessness and pain in the chest, loin and abdomen during transfusion associated with tachycardia and hypertension*
- *He improved with oxygen therapy and nebulisers, had a normal chest X-ray, negative cultures and no evidence of haemolysis*

Transfusion-Transmitted Infections (TTI)

Confirmed hepatitis E virus (HEV) (1)

- *In late September 2019, an apheresis platelet donation from a repeat donor was picked up on screening as HEV ribonucleic acid (RNA) positive with a viral load of 4,900IU/mL*
- *An investigation was launched immediately and archive samples from previous donations were retrieved and tested for HEV RNA in individual sample testing*
- *In the donor's previous donation from the beginning of September, HEV RNA was detectable but below the level of quantification at <36.13IU/mL*
- *This low-level infection was not picked up by the original screening process done in pools of 24 with a detection limit of around 500IU/mL*
- *The recipient of the positive donation was traced and found to be a patient in their 40s with aplastic anaemia, excessive alcohol use and portal hypertension (without cirrhosis) who had received the platelets shortly after the donation was made*
- *Their portal hypertension was due to underlying liver problems and their anaemia was caused by a rare genetic mutation causing bone marrow failure which was being treated with danazol*
- *The platelets were given as a prophylactic treatment before a dental procedure as they had a low platelet count*

(Continued)

Confirmed HEV (2)

- *Two months after the identified transfusion the patient was diagnosed with HEV infection but was clinically well*
- *They were monitored closely and remained stable with unchanged liver function tests (LFT) until mid-November*
- *Around this time, the patient's viral load peaked at 29,200,000IU/mL and they were developing a good antibody response*
- *However, this coincided with a sudden increase in bilirubin and alanine aminotransferase (ALT) levels and hence the patient was started on Ribavirin*
- *Their liver function continued to decline from this point eventually leading to acute hepatitis with kidney failure*
- *Sadly, the patient died at the end of November 2019*
- *The viral load in the sample of the index unit was too low to perform sequence analysis but this was possible on the donor's subsequent donation in late September*
- *Sequence obtained from the virus infecting the recipient was identical to that obtained from the donor*
- *Based on this it was confirmed that blood transfusion was the source of the patient's HEV infection*

Probable hepatitis B virus (HBV) (1)

- *In January 2019, a patient in their 70s with chronic HBV infection self-reported to NHSBT as they had been advised by a hospital that they might have acquired HBV from a blood transfusion in 2015*
- *An investigation was initiated and it was confirmed that the patient received three units of red cells during surgery on their mitral valve in December 2015*
- *No archived samples were available, but as all three donors had donated since, samples from their subsequent donations were retrieved*
- *These samples were tested and results showed no evidence of infection in donor 1 and 3 however the sample from donor 2 contained antibodies for HBV core but was negative for deoxyribonucleic acid (DNA)*
- *These results indicate a past infection in donor 2*
- *This donor originates from an area with high HBV prevalence, particularly for the HBV genotype identified in the recipient*
- *The donor was resampled*
- *A large volume was taken to increase the likelihood that any small levels of DNA would be detected, however no DNA could be detected here either*

(Continued)

Probable HBV (2)

- *It is worth noting that it is possible for HBV transmission to occur without detectable DNA and that it was not possible to test a sample of the index unit for DNA*
- *Extensive investigations into other sources of infection had been conducted at the time of the incident by external bodies such as hospital and local public health teams, including screening of family members and staff*
- *No other potential sources were identified in those investigations; NHSBT was not contacted at that time*
- *Based on all the available evidence it was concluded that blood transfusion was the probable source of the infection but this could not be confirmed as it was not possible to genetically sequence the DNA detected in the donor sample*
- *A later sample from the donor (when donated in October 2016), was traced back to a patient in their 80s*
- *The patient was tested and found to be positive for anti-HBc antibodies indicating a past HBV infection*
- *It is possible that they acquired the HBV infection via blood transfusion*
- *The donor has since been removed from panel and the hospital and patient have been notified of the results of NHSBT's investigations*

Cell Salvage (CS)

Hypotension on reinfusion with a filter and ACE inhibitors

- *A man in his 70s, with known coronary artery disease on angiotensin converting enzyme (ACE) inhibitors, underwent a cystectomy for bladder cancer*
- *Cell salvage was used with citrate as an anticoagulant and a leucocyte depletion filter (LDF) for reinfusion*
- *During heavy bleeding and cell salvage reinfusion the patient became very hypotensive*
- *Following treatment with fluid, inotropes and calcium, this resolved*
- *A second similar hypotensive episode occurred at the end of the procedure when the last bowl from the cell salvage machine was reinfused*
- *The transfusion was stopped and the patient quickly stabilised*
- *The patient went to intensive care intubated and ventilated*
- *He was extubated the following day and went on to make a good recovery*

Paediatric Cases

A case of transfusion-associated necrotising enterocolitis (TANEC)

- *A very preterm baby who was a few months of age, received two red cell transfusions for anaemia within 12 hours*
- *The baby had had a previous bowel perforation*
- *Around 2 hours after starting the second transfusion they developed increasing nasogastric aspirates and worsening abdominal distension*
- *The baby died 24 hours later from multiorgan failure*

Failure to recognise importance of an isolated severely prolonged APTT in a male child leading to delay in appropriate treatment of an infant with haemophilia (1)

- *A male infant <6 months of age was admitted to his local hospital 6 days after a fall down the stairs*
- *Two coagulation screens showed an un-clottable activated partial thromboplastin time (APTT) with a normal prothrombin time (PT) and the patient was given vitamin K prior to transfer*
- *This result was not communicated at the time to a haematologist*
- *Further investigations, in particular coagulation factor assays, were not performed*
- *The infant was transferred to a tertiary centre and the APTT was noted to be 101 seconds with a normal PT*

(Continued)

Failure to recognise importance of an isolated severely prolonged APTT in a male child leading to delay in appropriate treatment of an infant with haemophilia (2)

- *The biomedical scientist noted in the report that these were abnormal and requested a repeat, but the abnormal results were not discussed with a haematologist*
- *The infant was given fresh frozen plasma (FFP) with a partial improvement in APTT but not full correction*
- *The results were not discussed with the haematology department until over 24 hours after admission, and the infant received three transfusions of solvent detergent (SD)-FFP*
- *The infant was subsequently diagnosed with severe haemophilia A*
- *He died of an intracranial bleed caused by an arteriovenous malformation*

Failure to communicate history of haemopoietic stem cell transplant (HSCT)

- *A young child who was post HSCT for juvenile myelomonocytic leukaemia received group O platelets instead of group B*
- *The transplant protocol and therefore the change in the child's transfusion requirements had not been shared with the hospital transfusion laboratory*
- *There were no clinical sequelae*

Transcription error resulting in transfusion based on erroneous results

- *A young infant who was unwell had a full blood count sent to the laboratory*
- *The platelet count was telephoned through to the ward by a member of the laboratory team and was written down as $23.8 \times 10^9/L$*
- *The child was unwell and it was presumed that the count was valid and so a platelet transfusion was given*
- *Subsequently when the result was available on the computer it was seen that the true result was $238 \times 10^9/L$*

Prescription error of 10 times the required red cell volume

- *Red cell transfusion was prescribed for a 3kg infant (pre-transfusion haemoglobin (Hb) 79g/L): the volume was discussed in a ward round and 300mL was prescribed*
- *An electronic system was used to prescribe the blood but there was no in-built error message to prevent prescription of such a large volume*
- *138mL (46mL/kg) was administered before the error was realised*
- *Post-transfusion Hb was 141g/L*

Acute haemolysis secondary to an anti-E in a child with acute leukaemia

- *A child with acute lymphoblastic leukaemia who had a negative pre-transfusion antibody screen was transfused with two units of red cells*
- *Near the end of the second unit they developed rigors and dark urine*
- *A positive direct antiglobulin test (DAT) and a strongly positive antibody screen was found in the post-transfusion sample*
- *Anti-E was eluted from the patient's red cells*
- *The pre-transfusion sample was then retested and a weak (1+) antibody was detected but only on the homozygous E-positive cells*
- *The Rh type of the transfused units was subsequently confirmed and one unit was negative but the other unit was heterozygous (Ee)*
- *The child made a complete recovery with supportive care*

Tachypnoea following a platelet transfusion

- *A young child with neuroblastoma received a 15mL/kg apheresis platelet transfusion prior to a procedure*
- *They developed tachypnoea 6 hours following transfusion with drop in oxygen saturations to 92% on air*
- *Chest X-ray showed pulmonary oedema*
- *The child responded to frusemide*
- *They had also received intravenous (IV) chemotherapy and hydration fluids the same day and therefore there was uncertainty as to the relative contribution of the platelet transfusion as the cause of the fluid overload*

Haemoglobin Disorders

Overtransfusion in a child, identified by a parent during transfusion

- *A young patient with thalassemia attended for an elective transfusion*
- *An incorrect volume was prescribed and administered*
- *The large volume was noticed by the child's father who alerted the nurse*
- *The transfusion was stopped after 45mL over the recommended volume had been transfused*

Avoidable transfusion due to information technology (IT) failure and lack of awareness of indications for transfusion in sickle cell disease (SCD)

- *There was an avoidable transfusion in a patient in their 60s with SCD who presented with heart failure*
- *Due to an IT failure the clinical team did not realise that the current haemoglobin (Hb) value of 60g/L was his baseline level*
- *A decision was made in the emergency department to transfuse the patient without seeking advice from haematology*
- *It was later determined to be an unnecessary transfusion*

Delayed transfusion following perioperative bleed due to decision to proceed with elective surgery

- *A man in his 50s with sickle cell disease (SCD) was admitted for elective hip surgery*
- *The surgical team requested blood on the day of surgery, but a sample had not been sent to the laboratory*
- *The patient had a history of alloantibodies and the laboratory informed surgeons not to proceed with surgery as there would be a delay in blood availability*
- *Surgery proceeded and was complicated by excess bleeding causing a drop in haemoglobin (Hb) from 90 to 52g/L*
- *The patient was admitted to the high dependency unit (HDU) and monitored until blood was available later during the night*
- *The patient made a complete recovery*

Clinical pressure on the laboratory to release components before completing antibody investigations

- *A patient with sickle cell disease (SCD) attended for an elective exchange transfusion*
- *The laboratory suspected an antibody but required a further sample to complete the investigation*
- *The laboratory stated they were under pressure to issue blood and so issued crossmatch-compatible units before completing antibody investigations*
- *A second sample was collected post transfusion which identified an anti-Jk^b alloantibody*

Incorrect patient transfused due to failure to follow patient identification procedures

- *A young female with sickle cell disease (SCD) attended for a red cell exchange transfusion on the haematology day unit*
- *Due to a failure to correctly identify the patient, blood transfusion was commenced with the blood intended for another patient in the department*
- *The error was noticed after 10mL of blood was transfused*
- *By chance the incorrect transfusion was ABO-compatible and met all specific requirements for the patient*
- *There were several issues which contributed to this error; the healthcare assistant collected multiple transfusions for different patients at the same time, the patient did not have a wrist band on, and patient identification policy was not followed*

Recurrent hyperhaemolysis following a series of transfusions in a patient with alloantibodies whose specific requirements were also not met

- *A patient in their late 20s with sickle cell disease (SCD) and a history of anti-S and previous hyperhaemolysis had 2 transfusion episodes over a 2-month period for recurrent anaemia*
- *The patient received intravenous immunoglobulin (IVIg) and corticosteroid prior to transfusion due to a history of hyperhaemolysis*
- *The patient had a further transfusion episode for anaemia 1 month later without IVIg and corticosteroid cover and developed a further episode of hyperhaemolysis*
- *It also transpired that specific requirements were not met with all transfusion episodes due to a flag being removed from the transfusion record*
- *The patient subsequently developed anti-C alloantibody*

A case of hyperhaemolysis with no new alloantibody identified

- *A female patient in her 40s with sickle cell disease (SCD) received two units of blood for acute chest syndrome*
- *There was a history of previous alloimmunisation with anti-C and anti-S*
- *One week later she presented with severe all over pain described as 'sickle pain' and dark urine*
- *This was associated with an acute drop in haemoglobin (Hb) from 95g/L to 50g/L with a relative reticulocytopenia and markedly raised lactate dehydrogenase (LDH)*
- *The patient was treated for hyperhaemolysis. No new alloantibody was identified*

Severe headache during transfusion

- *A male patient in his 20s with sickle cell disease (SCD) developed a severe headache during an elective exchange transfusion*
- *The exchange procedure was aborted after the fifth out of eight units planned*
- *The patient was admitted for observation but made a complete recovery*

Specific requirements not met detected at the bedside by a nurse

- *A teenage male with sickle cell disease (SCD) attended for a red cell exchange transfusion*
- *Units of the incorrect phenotype were ordered from the Blood Service, and the error was not initially identified at authorisation as the special requirement information had not been added to the correct module of the laboratory information management system*
- *The error also went unnoticed during manual label checking, and C-positive units were issued when the patient should have received C-negative units*
- *These errors occurred during a period of particularly high pressure in the laboratory; activation of the major haemorrhage protocol for a paediatric patient, printer failures and reduced staffing*
- *The incorrect phenotype was noticed by the nurse at the bedside and the units were sent back to the laboratory before transfusion*

Immune Anti-D in Pregnancy

Detection of alloimmune anti-D in the third trimester

- *A primiparous woman in her 20s, was booked at 19 weeks gestation (booking weight 70kg) and no alloantibodies were detected*
- *A group and antibody screen was taken at 27 weeks and routine antenatal anti-D Ig prophylaxis (RAADP) given prior to the result being received*
- *Alloimmune anti-D was detected, quantification 0.1IU/mL*
- *The laboratory biomedical scientist and midwife checked the records with the woman to confirm this was prior to RAADP and no prophylaxis had been administered earlier in pregnancy*
- *The peak quantification was 6.5IU/mL at 34 weeks*
- *The baby was delivered at 37 weeks gestation and required phototherapy*

Ideal treatment

- *A primiparous woman in her late 20s, with a booking weight of 63kg was booked at 9 weeks gestation*
- *She was D-negative, and no alloantibodies were detected*
- *Routine antenatal anti-D Ig prophylaxis (RAADP) was given at 28 weeks, then, following a fall at 31 weeks gestation, received an additional 1500IU dose of prophylactic anti-D Ig within 24 hours*
- *The fetomaternal haemorrhage (FMH) was <2mL*
- *Serology was performed at 32 weeks gestation and detected anti-D, with a quantification of 0.1IU/mL*
- *A further sample was taken at 40 weeks gestation; anti-D quantification 0.4IU/mL*
- *A D-positive baby was delivered at 40 weeks and the baby required no interventions for haemolytic disease of the fetus and newborn (HDFN)*

Detection of low-level alloimmune anti-D with no reported cause

- *A teenager presented at 8 weeks gestation, with no prior transfusion or pregnancy history*
- *Anti-D was detected with a quantification 0.1IU/mL, which did not increase during pregnancy*
- *A D-positive baby was delivered at 39 weeks gestation, there were no potentially sensitising events (PSE), and the baby required no interventions for haemolytic disease of the fetus and newborn (HDFN)*

Large fetomaternal haemorrhage (FMH) where clearance of fetal cells was not checked

- *A woman in her 30s, gravida 2 para 1 (booking weight 48kg) had anti-D detected at 7 weeks gestation with a quantification of 7.2IU/mL, which peaked at a quantification of 23.3IU/mL*
- *A cell-free fetal deoxyribonucleic acid (cffDNA) test at 16 weeks gestation predicted a D-positive fetus*
- *A fetal intrauterine transfusion was given, and she delivered at 34⁺⁶*
- *Neonatal treatment for haemolytic disease of the fetus and newborn (HDFN) included phototherapy, immunoglobulin and exchange transfusion*
- *In the preceding pregnancy vaginal bleeding occurred at 16 weeks gestation and she received 1500IU anti-D Ig*
- *Routine antenatal anti-D Ig prophylaxis (RAADP) was given at 28 weeks gestation*
- *She delivered at 35⁺⁶ by emergency caesarean section. A FMH of 79mL was confirmed by flow cytometry*
- *She received 12000IU intravenous anti-D Ig, and the follow up FMH test at 48 hours showed 1mL fetal cells*
- *She received a further 1500IU anti-D Ig, but it was not subsequently checked if the fetal cells had cleared completely*

Ideal management of large fetomaternal haemorrhage (FMH)

- *A woman in her 20s, gravida 2 para 1, booked at 8 weeks gestation, with a booking weight of 75kg*
- *Anti-D was detected with a quantification of 0.3IU/mL*
- *The peak quantification at 23 weeks gestation was 68.5IU/mL and an intrauterine transfusion was performed*
- *The pregnancy was further complicated by maternal medical complications and resulted in a stillbirth*
- *The previous pregnancy was booked at 9/40, routine antenatal anti-D Ig prophylaxis (RAADP) was received at 29 weeks gestation, and she delivered at 40⁺¹*
- *There was 16mL FMH, she received 3000IU anti-D Ig, and a follow up FMH test demonstrated complete clearance of fetal cells*

Delivery at 42⁺³ weeks in preceding pregnancy which was otherwise ideally managed

- *A woman in her 30s, gravida 2 para 1, booked at 9⁺⁵ weeks gestation, with a booking weight of 61.8kg*
- *Anti-D was detected at booking with a quantification of 0.7IU/mL*
- *Peak quantification in the pregnancy was 0.9IU/mL, and a D-negative infant was delivered*
- *In the preceding pregnancy the woman received routine antenatal anti-D Ig prophylaxis (RAADP) and experienced no potentially sensitising events (PSE)*
- *However, she delivered vaginally at 42⁺³ weeks and the baby was D-positive*
- *No test for quantitation of fetomaternal haemorrhage (FMH) was performed, and a standard dose of anti-D Ig was given into the deltoid within 24 hours of delivery*

Home birth

- *A woman in her 20s, gravida 2 para 1, had no details available for her preceding pregnancy of booking weight or serology, routine antenatal anti-D Ig prophylaxis (RAADP) administration, potentially sensitising events (PSE) or delivery except that it was a home delivery with no fetomaternal haemorrhage (FMH) test postpartum*
- *Postpartum prophylaxis (PPP) was administered 3 days after delivery*
- *In the index pregnancy, alloimmune anti-D was found at 10 weeks when the woman attended for termination of pregnancy*

Obese, previous miscarriage, antepartum haemorrhage (APH) in index pregnancy

- *A woman in her 30s, gravida 2 para 1, experienced an early miscarriage at 5-6 weeks in her previous pregnancy*
- *No anti-D Ig was given and was not indicated*
- *She booked for the index pregnancy at 8⁺⁵ weeks gestation, with a booking weight of 97kg and body mass index (BMI) of 32*
- *An APH occurred at 22 weeks, the flow cytometry was negative, and 1500IU anti-D Ig was given intramuscularly within 24 hours*
- *Follow up testing at 25 weeks showed low level anti-D (0.1IU/mL) which was thought to be due to prophylactic anti-D Ig given to cover the APH*
- *Blood Service advice was to continue with prophylactic anti-D Ig, so routine antenatal anti-D Ig prophylaxis (RAADP) was given at 28 weeks and the anti-D level was monitored every 2 weeks*
- *The level peaked at 2.9IU/mL at 38 weeks*
- *A healthy D-positive baby was delivered and required no treatment for haemolytic disease of the fetus and newborn (HDFN)*

Failure to inform the laboratory of a potentially sensitising event (PSE)

- *Woman in her 30s, gravida 2 para1, received routine antenatal anti-D Ig prophylaxis (RAADP) in the preceding pregnancy at 29 weeks*
- *She experienced spotting at 35⁺² weeks, but the midwife did not inform the laboratory so no prophylaxis was issued or given.*
- *She was delivered by elective caesarian section at 38⁺¹ weeks and received appropriate postpartum prophylaxis (PPP)*
- *In the index pregnancy alloimmune anti-D was detected at 28 weeks (not present at booking) and the infant was born at 38⁺² weeks and required phototherapy*

Twin pregnancy

- *A woman in her 30s had a preceding pregnancy that was ideally managed*
- *In the index pregnancy she booked at 13 weeks with a twin pregnancy*
- *Due to a hospital error she did not receive an appointment for routine antenatal anti-D Ig prophylaxis (RAADP)*
- *The twins were delivered at 36 weeks when the woman was found to have alloimmune anti-D of 0.75IU/mL*
- *Despite the low titre, the infants required treatment for haemolytic disease of the fetus and newborn (HDFN)*

Obese woman with previously ideally managed caesarian delivery who developed immune anti-D at term in index pregnancy

- *A woman in her 30s, gravida 2 para 1, had a booking weight in the preceding pregnancy of 118kg (body mass index (BMI) 42.8)*
- *She received routine antenatal anti-D Ig prophylaxis (RAADP) of 1500IU anti-D Ig into the deltoid muscle at 27 weeks gestation and delivered at 42 weeks by emergency caesarian section*
- *No fetomaternal haemorrhage (FMH) test was performed, and she was given 1500IU anti-D Ig postpartum prophylaxis (PPP) into the deltoid*
- *In the index pregnancy, alloimmune anti-D was detected at delivery at 40 weeks*
- *The woman had experienced an antepartum haemorrhage (APH) at 17 weeks for which she received 1500IU anti-D Ig into the deltoid*
- *She also received RAADP into the deltoid at 28⁺⁶ weeks*
- *The infant required no treatment for haemolytic disease of the fetus and newborn (HDFN)*

Haemopoietic Stem Cell Transplant (HSCT) Errors

Incorrect ABO group transfused: failure to heed laboratory information management system (LIMS) flag (1)

- *A transplant protocol was received by the transfusion laboratory lead on Day -9 stating that the patient was scheduled for allogenic stem cell transplant on Day 0*
- *A flag was set on the LIMS on Day -9 to indicate the transfusion requirements*
- *The patient's blood group was A D-negative and the donor was O D-negative*
- *In this case, the patient should have been transfused with group O D-negative red cells to match the donor group*
- *The specific requirements flag was changed according to the protocol, so that the patient would immediately start receiving the appropriate group blood components if required*

(Continued)

Incorrect ABO group transfused: failure to heed laboratory information management system (LIMS) flag (2)

- *On Day +6, a request for red cells was received*
- *The biomedical scientist (BMS) did not check the specific requirements correctly and ordered group A D-negative blood, instead of O D-negative*
- *A second BMS performing the crossmatch failed to check the specific requirements, which clearly stated the red cell blood group for transfusion*
- *The patient grouped as A D-negative and, as the crossmatch was compatible, a unit of red cells (group A) was issued to the patient*
- *This was transfused to the patient without any noticeable reaction*

Specific requirements not met (SRNM): failure by clinical team to update the specific requirements form

- *On Day +9 following an autologous haemopoietic stem cell transplant (HSCT) for primary central nervous system (CNS) lymphoma, a patient's blood transfusion status form was found to incorrectly state that the patient did not require irradiated cellular components*
- *This form should have been updated with the 'irradiated' status flag 1 week prior to the patient's peripheral stem cell harvest (SCH) 3 months earlier*
- *Consequently, in the 7-day period prior to SCH the patient was transfused with two units of non-irradiated red cells*
- *When stem cells were reinfused on Day 0 the patient was put at risk of transfusion-associated graft-versus-host disease (TAGvHD)*
- *The patient received further units of non-irradiated red cells post transplant before the error was detected*

Specific requirements not met (SRNM) due to poor communication as a result of shared care between hospitals

- *A patient had received a haemopoietic stem cell transplant (HSCT) in August*
- *In September, the patient attended a different hospital and a request was made for red cell and platelet transfusion from the emergency department (ED) due to low haemoglobin (Hb) and platelets*
- *Details of the previous transplant were not provided to the laboratory and irradiated blood components were not issued for this patient; one unit of non-irradiated blood was transfused to the patient before the requirements were known by the laboratory*
- *The patient also had human leucocyte antigen (HLA) antibodies and required HLA-matched platelets; standard platelets were issued (but not transfused) due to lack of information available at the time of the request*