Cases from the 2021 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

SHOT Serious Hazards of Transfusion

Donor Haemovigilance

Delayed faint not declared until the next attendance to donate

- *A regular female donor in her 60s, who had given 46 donations previously, attended to donate again 8 months after her previous donation*
- *At this attendance she declared that after her previous donation she was walking home and felt unwell, she became lightheaded which resulted in her falling and fracturing her elbow*
- *She had not informed the Blood Service of this adverse event prior to her re-attendance as she was not sure if there was a causal link between her donation and the faint*
- *She also did not wish to bother the Blood Service!*
- *This donor has since been withdrawn from further donation*

Tendon injury following venepuncture for blood donation

- *A female donor in her 50s, with one previous donation donated from the right (dominant) arm in September 2020*
- *The donor described a sharp, severe pain at the insertion of the needle*
- *Although initially the pain seemed to be improving, it subsequently worsened, and the donor noted reduced function*
- *The donor was referred and seen at a hospital outpatient clinic*
- *A magnetic resonance imaging (MRI) scan demonstrated tendon injury*
- *The specialist advised that the injury was secondary to venepuncture, to continue mobilising the arm and that recovery could take up to 2 years*
- *The donor continues to have pain on flexion and reduced function/power in their right arm*

Suspected nerve irritation with persistent symptoms 12 months post donation

- *A first-time female whole blood donor in her 30s reported persistent ache and tingling in her donation arm and wrist 12 months post donation, following painful needle insertion*
- *During needle insertion into her left arm, she experienced sharp pain sensation from her forearm to her wrist*
- *The donor did not mention the sharp pain during venepuncture to session staff as 'arm pain resolved during and immediately after donation' . She therefore made a full donation*
- *A few hours after leaving the session, she started to experience numbness in her left wrist and an 'electric shock sensation' from her forearm to her wrist on moving her arm*

Continued…

Suspected nerve irritation with persistent symptoms 12 months post donation (2)

- *The donor reported this to Blood Service 2 days post donation and was appropriately advised on measures to take to alleviate symptoms by the clinical team and was also advised to call back in 3 weeks if no improvement*
- *No further communications were received from the donor, and it was only an outbound call from the Blood Service a year later to discuss booking her next appointment to donate blood that the donor disclosed that she was still symptomatic and experiencing a dull ache in her left wrist which was also 'tender and tingly if touched'*
- *Due to persistent symptoms for at least 12 months, donor was advised by the clinical support team to seek medical review for further assessment and was withdrawn from future donations*

Human Factors in SHOT Error Incidents

Limited scores assigned, but investigation shows a wider range of contributory factors could have been considered

- *A request was made for fresh frozen plasma (FFP) and cryoprecipitate, but when the components were issued the compatibility labels were transposed*
- *This was discovered during pre-transfusion checks on the ward*
- *Only two scores were assigned for factors contributing to the incident: 2/5 for the extent to which the environment hindered work and 1/5 for organisational pressures playing a role in the incident*
- *The most important contributory factors were listed as lack of concentration and distraction from external members of staff, but no scores were assigned to reflect these factors*
- *The investigation report noted other factors that were also not fully reflected in the scoring, such as the staff member was busy and the procedure to issue only one component type at a time was not fully documented*

Pressures caused by COVID-19 pandemic contribute to error with COVID-19 convalescent plasma (CCP)

- *A patient was due to receive a second dose of CCP, but fresh frozen plasma (FFP) was issued in error and placed in a yellow CCP trial bag*
- *The porter received an electronic request to collect 'plasma'; CCP was not specified*
- *The unit was administered without any of the staff involved noticing that FFP had been issued in error*
- *The hospital was experiencing an overwhelming number of COVID-19 cases and many staff were unfamiliar with the component*
- *Staff in all ward areas were under pressure and overwhelmed physically and emotionally*
- *It was a difficult time to oversee and implement any changes and face-to-face training could not be undertaken, so a training video had been created to help staff, but uptake was likely to have been variable*

Adverse Events Related to Anti-D Immunoglobulin (Ig)

Patient discharged before being given anti-D immunoglobulin (Ig)

- *The patient had a per vaginal (PV) bleed at 38^{+6} weeks gestation*
- *She attended maternity triage the same evening and a sample was taken for a Kleihauer test*
- *A standard dose of anti-D Ig was issued by the laboratory*
- *Kleihauer tests are not routinely completed overnight at this hospital, a standard dose should be given with a follow up once Kleihauer result is available, if more anti-D Ig is required*
- *However, the patient was sent home without the standard dose being given because the doctor was waiting for the Kleihauer result before giving any anti-D Ig*

Continued…

Patient discharged before being given anti-D immunoglobulin (Ig) (2)

- *The midwife was asked to write the patients details in the follow up diary to be contacted the next day, which she did*
- *Unfortunately, the midwife on duty the following day overlooked this in the diary. The patient was therefore not contacted*
- *The anti-D Ig was found in the blood refrigerator during subsequent checks*
- *The patient had not been given a date or time to attend for anti-D Ig administration by the discharging doctor, neither had she been contacted by the midwives*
- *The anti-D Ig was administered but beyond the required 72-hour period*

Failure to inform the transfusion laboratory of cell salvage reinfusion

- *A D-negative mother delivered by emergency caesarean section, and cell salvage was used during the procedure*
- *The transfusion laboratory was not informed that cell salvage had been used for this patient*
- *The patient received 515mL of salvaged blood and baby was D-positive so she should have been given 1500IU anti-D immunoglobulin (Ig)*
- *However, because the transfusion laboratory staff were unaware that cell salvage had been used only 500IU anti-D Ig was issued to the patient*
- *This was discovered retrospectively by the transfusion practitioner after receiving the cell salvage data collection form*

Failure to review cell free fetal deoxyribonucleic acid (cffDNA) results leads to unnecessary administration of anti-D immunoglobulin (Ig)

- *The patient was admitted to the labour ward assessment unit following a potentially sensitising event (PSE)*
- *The patient was D-negative and the fetus was predicted to be D-negative*
- *A fetomaternal haemorrhage (FMH) test was carried out by the transfusion laboratory and no further anti-D Ig was recommended for the PSE*
- *The cffDNA results were available to view on the electronic patient record but were not viewed the day of the event and 500IU anti-D Ig was given to the patient unnecessarily*

Incorrect Blood Component Transfused (IBCT)

ABO-incompatible (ABOi) error related to convalescent plasma

- *A male in his 60s with a blood group of A D-positive was issued a unit of O D-positive COVID-19 convalescent plasma (CCP) in error by the transfusion laboratory*
- *The laboratory information management system (LIMS) alerted the biomedical scientist (BMS) to the ABO discrepancy, but this was overridden, and the unit issued*
- *The nurse administering the CCP noted the ABO discrepancy but believed O plasma could be transfused to group A recipients*

Continued…

ABO-incompatible (ABOi) error related to convalescent plasma (2)

- *Within 17 minutes of the transfusion commencing the patient began complaining of loin pain and the transfusion was stopped and patient was medically reviewed*
- *It was felt the loin pain was consistent with previous medical history and given pain relief*
- *The pain settled and the transfusion was restarted*
- *Following administration of the CCP unit the patient complained again of loin pain, and the ABO discrepancy was detected*
- *The patient was monitored closely and fully recovered*

ABO-incompatible (ABOi) error due to misunderstanding of instructions on the laboratory information management system (LIMS)

- *A major haemorrhage protocol (MHP) was initiated for a male in his 40s following transfer from an outlying hospital where he had received group O D-negative emergency red cell units*
- *Blood grouping results indicated a mixed field population of both O and A, and D-negative and D-positive red cells*
- *The ABO/D group was entered into the LIMS as A D-positive, with a note in the patient record stating to crossmatch and issue group O D-positive components until the group could be confirmed by further samples*
- *A request was made to the transfusion laboratory for fresh frozen plasma (FFP) and group O FFP was selected and issued as per instructions*
- *The patient received 3 units of ABOi FFP*
- *There was no mention of clinical harm to this patient*

ABO-incompatible (ABOi) error due to miscommunication during handover

- *A telephone call was received in the transfusion laboratory requesting two units of cryoprecipitate for a male in his 40s*
- *During the same telephone call two units of cryoprecipitate were also requested for another patient*
- *Both patients were group A*
- *The telephone order was taken during handover between the day and night shifts*
- *In an informal conversation between the two biomedical scientist (BMS) staff the day shift BMS mentioned that there were only two units of group A cryoprecipitate remaining in stock and the night shift would need to order more group A or find out if another group (group O) would be a suitable substitute*

Continued…

ABO-incompatible (ABOi) error due to miscommunication during handover (2)

- *The night shift BMS misunderstood the day shift BMS and thought they had been instructed to issue group O to the second patient and proceeded to issue group O cryoprecipitate units to the patient*
- *The laboratory information technology (IT) system warned the BMS that the units they were issuing were 'incompatible'*
- *At this point the BMS acknowledged and overrode the warning to proceed with the product issue*
- *No harm was detected in the patient*

Patient given red cells instead of platelets

- *A male patient in his 60s with acute myeloid leukaemia, neutropenic sepsis and a low platelet count of 15x10^{9}/L was admitted to a medical ward*
- *A platelet transfusion was prescribed*
- *Nurse 1 went to the platelet agitator, but it was not operational at the time (nurse had not been informed of this), the patient had red blood cells in the issue refrigerator, so these were collected instead of the platelets*
- *The nurse checked the unit with a colleague but not at the patient's bedside*

Continued…

Patient given red cells instead of platelets (2)

- *Nurse 2 read the prescription and questioned if this was the correct component as she was concerned that it had been prescribed to be administered over 30 minutes*
- *Nurse 1 sought the advice of the prescribing doctor (but did not show the doctor the unit of red cells) and was reassured platelets can be transfused over 30 minutes*
- *The patient raised his concerns about what he was being given due to the colour of the component, but despite this, Nurse 1 started the transfusion without Nurse 2 present to complete the checks*
- *Nurse 1 realised she had made an error after 10 minutes and the transfusion was stopped*
- *There was no harm to the patient*

Non-irradiated component administered despite the patient highlighting the specific requirement to the administering nurse

- *A female patient in her 60s with acute myeloid leukaemia was admitted to a haematology ward for chemotherapy (purine analogue)*
- *As she had symptomatic anaemia, neutropenic sepsis and a haemoglobin (Hb) of 76g/L she was transfused two units of red cells and 1 unit of platelets*
- *The units issued and transfused did not meet the specific requirements as they were not irradiated*
- *Fludarabine had been prescribed and issued from pharmacy without an irradiated components registration number, which should have been the correct process for ensuring a patient receives irradiated components if a transfusion is required*

Continued…

Non-irradiated component administered despite the patient highlighting the specific requirement to the administering nurse (2)

- *The transfusion laboratory was not informed that the patient required irradiated components and as there was no flag on the laboratory information management system (LIMS) to alert the biomedical scientist (BMS) to the irradiation requirements, standard units were issued*
- *The patient asked staff to check that the components had been irradiated but this was not acted upon*
- *Nursing staff did not accurately complete the pre-transfusion checks when administering the transfusion and it was commenced*
- *A pre-administration bedside checklist had been used ineffectively and it was recorded that specific requirements had been met when they hadn't*
- *They had also failed to respond to alerts on the ward handover and the electronic prescription which highlighted the need for irradiated components*
- *Staff had assumed that the components were irradiated but did not check*

Requirement for irradiated red blood cells missed

- *A male patient in his 50s with non-Hodgkin's lymphoma in shared care was prescribed Bendamustine*
- *The transfusion laboratory in hospital 1 had been informed about the need for irradiated blood components*
- *Patient attended hospital 2 where the transfusion laboratory was not aware of the specific transfusion requirement*
- *Irradiated blood components were not requested appropriately on the transfusion request form and as the laboratory information management system (LIMS) had not been updated with the irradiated blood requirement this was not flagged in the transfusion laboratory*

Continued…

Requirement for irradiated red blood cells missed (2)

- *Two units of non-irradiated red cells were issued*
- *The nurses checking the first unit at the patient's side were unaware that irradiated red cells were required as it was not on the prescription, and the whole unit was transfused*
- *It was only on checking the second unit by a junior member of the clinical team who had recently attended transfusion training, which had detailed specific requirements for patients treated with Bendamustine, that the error was discovered*
- *The second unit was not transfused and returned to the laboratory*

Beta thalassaemia on request not investigated

- *A woman in her 60s attended the emergency department (ED) requiring a blood transfusion*
- *The patient told ED staff they had beta thalassaemia and presented their antibody card from the Blood Service*
- *The request received in the laboratory stated 'Beta thalassemia major, regular red blood cell (RBC) transfusion and intra op femoral nailing', but the biomedical scientist (BMS) did not investigate this further and two standard red cells were issued by two different members of staff over the following hours which did not meet extended phenotype and red cell antibody requirements*
- *A further blood request was received by a third BMS who determined that further investigation was needed*
- *Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment (Sp-ICE) was checked, which detailed presence of known antibodies and an extended phenotype*

Antigen-negative requirements missed due to cognitive bias

- *A woman in her 40s with known anti-e and anti-C requiring a blood transfusion due to multi organ failure received red cells not antigen-matched for known red cell antibodies*
- *The biomedical scientist (BMS) received a request for two red cell units for this patient, and upon seeing the patient's date of birth (DOB) and assumed that, as the patient was of childbearing potential, they should receive R1R1 (c-E-) red cells in accordance with local policy, rather than identifying that patient required R2R2 (C-e-) red cells due to presence of anti-C and anti-e red cell antibodies*
- *Laboratory information management system (LIMS) warning flags were in place but were not heeded*
- *C and e-positive red cell units were serologically crossmatched and issued*
- *There was no clinical reaction in the patient following blood transfusion*

Post-haemopoietic stem cell transplant (HSCT) issued incorrect ABO/D platelets

- *A male post-HSCT patient in his 60s who now grouped as O D-negative was issued B D-positive platelets by the biomedical scientist (BMS)*
- *The post-HSCT comments for this patient were on the 4th page of the laboratory information management system (LIMS) record, and the BMS did not check all the available comments*
- *The error was detected at the bedside*

D group incorrectly transcribed from the laboratory information management system (LIMS) onto request form

- *An ABO/D group was transcribed from the LIMS incorrectly onto the transfusion request form of a woman in her 50s by a biomedical scientist (BMS) as B D-positive, but the patient was in fact B D-negative*
- *The newly qualified BMS, who should have been under supervision, was rostered to work on a late shift due to extremely low staff levels*
- *The BMS issued three red cells units, with the LIMS alerting to the incorrect D group, but alarms were overridden by the BMS*
- *The error was detected during the pre-administration checks*

Red cells issued not meeting cytomegalovirus (CMV) or irradiation requirements (CMV local requirement)

- *A request form received in the laboratory for a child <10 years old stated a requirement of CMV-negative and irradiated components*
- *The biomedical scientist (BMS) did not update the laboratory information management system (LIMS) with this information*
- *At the point of issuing the red cell units the BMS thought they remembered this patient's specific requirements from earlier in the day and issued standard components*
- *The report stated that the BMS was rushing to get work completed as they were lone working out-of-hours without a break in 6 hours with a high workload reported*
- *The error was detected at the bedside*

Handling and Storage Errors (HSE)

Cryoprecipitate transfused after the permitted 4 hours post-thaw expiry time

- *A request for two adult pools of cryoprecipitate was received in the laboratory at 10:35*
- *The units were thawed and issued at 11:10 and were ready for collection with a post-thaw expiry time of 15:10*
- *The first unit was collected at 15:01 and transfused at 15:25*
- *The second unit was then attempted to be collected but was no longer available as it had expired and was subsequently wasted by the laboratory*
- *On investigation the electronic blood-tracking system was active and permitted the removal of the unit as it had not expired at the time of collection, but staff involved failed to check the expiry time on the unit prior to commencing the transfusion*

Expired unit of emergency group O issued and transfused

- *A unit of red cells was requested by maternity theatres due to a massive obstetric haemorrhage (MOH) at 01:24*
- *The porter came to the laboratory to collect a unit of red cells and the laboratory staff member on-call selected the first O D-negative unit from the stock refrigerator not noticing that the unit had expired at 23:59 the previous day*
- *On investigation, the laboratory had a relatively new laboratory information management system (LIMS) and the on-call laboratory staff member was unfamiliar with issuing un-crossmatched units in an emergency*
- *The incorrect procedure was performed and the expired red cell unit was issued*
- *The incident investigation identified that the LIMS did not block the user from changing an expired unit's location to 'Flying Squad'*

Delayed Transfusions

Urgent need for blood during surgery - pager failure

- *Theatre staff needed blood during repair of an abdominal aortic aneurysm (AAA) for a man in his 80s but could not contact the biomedical scientist (BMS) due to pager failure*
- *The delay was 30 minutes and was thought to have contributed to the patient's death*

Delayed transfusion contributes to death due to myocardial ischaemia

A man in his 80s with myocardial ischaemia and anaemia, haemoglobin (Hb) 63g/L, received a first unit of red cells but the second was delayed for 12 hours contributing to his death. There were several issues:

- *The request form had incorrect details so was rejected*
- *The revised request form could not be found when the porter came to collect the unit. The porter did not inform the clinical area of this*
- *A further collection form had to be sent*
- *All these factors and poor communication contributed to the delay. It is important that transfusion requests are completed accurately to avoid delays – 'Get it right first time every time'*

An unexpected death from sickle cell disease

- *A young man with sickle cell disease had a routine endoscopic retrograde cholangiopancreatography (ERCP) with removal of a biliary stent and went home*
- *The next day he was admitted with fever and treated for biliary sepsis (Klebsiella was grown from the blood culture)*
- *His bilirubin remained high over the next 3 days and on day 5 he developed a sickle cell crisis with an acute chest syndrome*
- *He rapidly deteriorated and was admitted to the intensive care unit*
- *He developed multiple organ dysfunction and died*
- *The review noted failure to act on the deteriorating condition in a timely manner (failure to escalate the deteriorating early warning scores) and failure to initiate prompt transfusion after recognition of deterioration*
- *The patient was admitted to a general medical ward where staff were not familiar with sickle cell disease, and was not managed by the haematology team directly*
- *The coroners report suggested earlier transfusion should have been considered*

Confusion between two patients needing transfusion in the emergency department (ED)

- *Emergency red cell units were given to the wrong patient resulting in delay of blood to the intended patient and inappropriate use of emergency blood to the transfused patient*
- *ED staff had not been able to talk to the biomedical scientist (BMS) who was on the telephone about another transfusion issue*
- *The intended recipient, Patient 1, a male in his 90s, had a Hb of 47g/L and died 15 hours after the initial request with the delayed transfusion cited as contributory*
- *Two units of emergency blood were issued 10 minutes after the doctor requested them but were transfused to Patient 2, a woman in her 70s needing urgent surgery who had the major haemorrhage protocol activated in theatre later*
- *Patient 1 received two units about 4.5 hours later, and two more 4 hours later*
- *There were additional issues with unlabelled samples, wrong paperwork and training of porters*

Delayed transfusion resulted from looking at the wrong result

- *A man in his 50s was admitted with difficulty breathing and had a haemoglobin (Hb) of 58g/L falling to 48g/L 2 days later*
- *The major haemorrhage protocol (MHP) was activated, and he was transfused and required admission to the intensive care unit (ICU) which might have been avoided if he had been transfused in a timely way*
- *The doctor had looked at the wrong Hb result on the computer (101g/L from a different date)*

Slow provision of components due to lack of clear communication

- *A man in his 50s was admitted with upper gastrointestinal (GI) bleeding*
- *The major haemorrhage protocol (MHP) was initiated but red cells did not arrive in the expected time frame from the laboratory (within 15 minutes)*
- *Emergency red cell units from a satellite refrigerator were transfused and a second MHP call was initiated in view of ongoing bleed and patient deterioration*
- *It was identified that a lack of clarity about the urgency of the MHP call resulted in a delay in provision of the blood components*

Patient struggled with breathing overnight due to delayed transfusion

- *A man in his 60s with cirrhosis suffered a peritoneal bleed with a haemoglobin (Hb) of 49g/L*
- *Delay was caused by three factors: the first sample was unlabelled; a new antibody was present in the second sample (2 hours later) so was sent to the Blood Service out-of-hours for crossmatch*
- *Although the blood was ready for transfusion by 02:00 it could not be transfused until 06:45 due to lack of ward staff*
- *The patient struggled to breathe overnight*

Delayed transfusion due to staff shortage (1)

- *A postnatal woman was seen by a doctor on a Sunday and was noted to have a haemoglobin (Hb) of 64g/L*
- *She was symptomatic so a transfusion was requested*
- *Blood was issued in the afternoon and confirmed by the transfusion laboratory*
- *On review the following day the team were told that the blood was not given because the ward staff were too busy, and this was not escalated*
- *Her Hb was now 55g/L and so further blood was requested and transfused*

Delayed transfusion due to staff shortage (2)

- *A woman being given palliative care had a haemoglobin (Hb) of 68g/L and a unit of red cells was requested*
- *There was a delay of 5 days due to having staff shortages and avoiding transfusion overnight*
- *The transfusion was eventually given with help from a neighbouring ward*

Delay in urgent transfusion caused by lack of labels in the remote refrigerator printer

- *A man with gastrointestinal bleeding came to theatre, shocked with hypotension and tachycardia and a haemoglobin (Hb) of 70g/L*
- *He was eligible for electronic issue, but staff were unable to release blood from the electronically controlled refrigerator as there was no paper in the printer for the compatibility tags*
- *Staff had to wait for the transfusion laboratory staff to come to theatre to put the labels in*
- *During the first telephone call requesting help the staff were told the transfusion laboratory staff were in the middle of handover*
- *The second telephone call was made by the anaesthetic consultant who said they needed someone to 'come now'*
- *The label printer did not generate a local nor remote alert when empty and was designed to count a specified number of printed labels*
- *It was supposed to send a remote alert when it reached a low threshold*
- *Access to the printer was open to anyone, and is easily knocked, resulting in misalignment of the feed*

Incomplete testing results in delayed intrauterine transfusion

- *A severely anaemic fetus required intrauterine transfusion*
- *A unit was requested on the basis of previous maternal antibodies (anti-c and anti-E) but the current sample displayed an additional antibody (anti-Jk^a) meaning the selected unit was incompatible*
- *The hospital biomedical scientist (BMS) had not completed the maternal antibody identification panels*
- *A further unit had to be sourced from elsewhere in the country and there was a delay of 24 hours*

Red cells sent to the wrong hospital

- *An elderly man required transfusion to treat anaemia due to chemotherapy*
- *The Blood Service used a taxi to send crossmatched and stock red cells but to the wrong hospital*
- *A new crossmatch was arranged as the units would have been out of temperature control with another taxi transfer*
- *The transfusion was delayed until the next day*

Miscommunication results in cancelled crossmatch and overnight admission of the patient

- *An elderly woman was found to have irregular antibodies*
- *The sample was sent to the Blood Service laboratory for investigation on a morning transport run*
- *Later the Blood Service laboratory was contacted both by telephone and email from the hospital to note that the patient required transfusion the following morning*
- *Overnight the request was cancelled following discussion between the hospital biomedical scientist (BMS) (who had not received a handover about this) and the Blood Service staff*
- *This was a miscommunication*
- *The patient had to be rebled and was admitted overnight*
- *The email was found in the 'deleted' folder*

Hospital staff unable to contact the on call biomedical scientist (BMS) at the Blood Service

- *The Blood Service laboratory could not be contacted on multiple occasions in the middle of the night when platelets were required urgently for an elderly patient with thrombocytopenia and haemoptysis*
- *There was a 4-hour delay*

Major haemorrhage protocol (MHP) activated for the wrong patient

- *Activation of the MHP for Patient 1 from the delivery suite was the incorrect patient*
- *This should have been for Patient 2, so there was potential for delay in issuing the correct blood group for the patient in an emergency situation*
- *However, this was recognised very quickly by clinical staff so did not result in significant delay*

Avoidable Transfusion

Avoidable transfusion for B12 deficiency

- *Two units of red cells were given to a patient with B12 and folate deficiency*
- *His haemoglobin (Hb) was 39g/L with macrocytosis*
- *He was referred by his general practitioner (GP) with pancytopenia*
- *He had symptomatic anaemia and a single unit transfusion would have been reasonable, but the administration of the second unit could have been avoided*

Avoidable transfusion for iron deficiency

- *A woman with symptomatic iron deficiency had a haemoglobin (Hb) of 27g/L*
- *She was transfused three red cell units, and her post-transfusion Hb was 56g/L*
- *She was stable with no overt bleeding or cardiovascular compromise, but she went on to receive two more red cell units*
- *Iron replacement was not considered*
- *The locum haematology consultant did not review the patient's latest Hb or iron results before authorising the extra two units*

Avoidable transfusion of group O D-negative emergency blood in an iron deficient patient

- *A man admitted to the emergency department (ED) with gastrointestinal bleeding was found to have a Hb of 49g/L, with a ferritin of 2micrograms/L*
- *Four units of red cells were requested with no clinical details and urgency was also not indicated*
- *The laboratory staff liaised with the haematology registrar who approved issue of one unit of red cells following discussions with the gastroenterologist*
- *It was agreed that transfusion was appropriate to stabilise prior to endoscopy*
- *In the meantime, the treating team had transfused emergency O D-negative red cells, but the laboratory staff were not updated*
- *After two units the Hb was 68g/L*
- *The first unit of group O blood was justifiable, but as a male, he could have received O D-positive red cells*

Confusion caused by duplicate hospital numbers

- *A woman in her 30s was admitted for elective surgery*
- *The surgical team requested that blood be available but when they needed it, it was not ready because the biomedical scientist (BMS) expected a second group sample (which was not necessary as she had a group record with another hospital number)*
- *The woman was bleeding heavily so the major haemorrhage protocol (MHP) was called and emergency group O D-negative was used*
- *She was transfused three units of blood, four units of fresh frozen plasma (FFP) and two pools of cryoprecipitate*
- *The reporting organisation had three sites; two sites use the same hospital number*
- *This caused confusion for this patient who had more than one hospital number which was not noticed by the BMS*

Errors in procedure

- *An elderly man with neutropenic sepsis (myelodysplasia) was transferred from a ward to the coronary care unit*
- *He developed hypotension and an initial haemoglobin (Hb) check done was 58g/L*
- *The major haemorrhage protocol (MHP) was activated and although a repeat Hb was 73g/L he received two units of group O D-negative red cells based on the erroneous Hb result*
- *O D-negative red cells were used despite the fact that crossmatched red cells were available*
- *There were several errors noted in this case such as prescription errors, incomplete information on the traceability records with no patient identification (ID) information and acting on erroneous Hb results*
- *The first Hb result may have been from a diluted sample*

Did the platelet transfusion contribute to thrombosis?

A patient with COVID-19 vaccine induced thrombotic thrombocytopenia (VITT) and post thrombolysis intracranial haemorrhage with mass effect required an external ventricular drain (EVD). Platelet count originally was 16x10^9/L and increased to 46 after 2 adult therapeutic doses (ATD) of platelets. Haematology advice to the intensive care unit (ICU) consultant and neurosurgeon was to proceed with EVD because

- *Platelet count of >80x10^9/L was not achievable*
- *The patient was unlikely to bleed given that he had VITT and was prothrombotic (i.e., thrombocytopenia would not translate into a higher risk of bleeding)*
- *There was a reasonable possibility that a platelet transfusion might cause thrombosis*

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Did the platelet transfusion contribute to thrombosis? (2)

The neurosurgical registrar insisted on an additional ATD of platelets before surgery but was unwilling to wait for a check of the platelet count prior to theatre. The full blood count (FBC) was checked at 18:15 immediately after return to ICU from theatre. The platelet count was 33x10^{9}/L, with no increment following the third unit. The patient did not bleed. Subsequent postoperative head computed tomography (CT)/CT venogram at 22:40 showed no worsening of bleed but there was a new cerebral venous sinus thrombosis (CVST) (not present on 01:34 scan), that subsequently progressed despite adequate anticoagulation. The patient recovered slowly and was discharged to another hospital

Inappropriate transfusion for immune thrombocytopenia (ITP)

- *An elderly man with ITP on a background of chronic lymphocytic leukaemia received 50mL of platelets before transfusion was stopped as his platelet count was 1258x10^9/L*
- *His previous count 2 weeks before was 13x10^9/L but he had been treated with Eltrombopag*
- *The plan was to review the count before proceeding with platelet transfusion but that was overruled by a doctor*

Under or Overtransfusion

Overtransfusion for gastrointestinal (GI) bleeding

- *A woman in her 60s, weight 46kg, died following a GI bleed from a duodenal ulcer*
- *Four units of red cells were requested because of a falling haemoglobin (Hb) (113 to 88g/L over 5 hours)*
- *After three units had been transfused over a 3-hour period her Hb was 203g/L*
- *The overtransfusion did not contribute to the patient death*

Unexpected bleeding during elective surgery

- *The patient suffered a major haemorrhage due to bleeding from an unidentified source during an elective laparoscopic inguinal hernia repair*
- *The major haemorrhage protocol (MHP) was called 7 hours after the start of surgery*
- *After about 11 hours in theatre the wound was packed, and the patient was transferred to the intensive care unit (ICU)*
- *The bleeding could not be stopped and the patient died*
- *This was a complex case where slow, insidious bleeding gradually worsened into a state of cardiovascular collapse due to major haemorrhage and disseminated intravascular coagulation (DIC)*

Concealed blood loss after caesarean section

- *A woman underwent caesarean section and lost 1.3L of blood during the surgery which appeared to have been successfully managed with surgical techniques and two units of red cells*
- *However, 8-9 hours after the delivery, she became very unwell and was taken back to theatre with suspected internal bleeding*
- *A large amount of blood was found in her abdomen, and it was difficult to stop the bleeding and repair its source*
- *She required a hysterectomy*
- *The major haemorrhage protocol (MHP) was activated, and several components transfused*
- *The patient lost 7.3L of blood in total and was transferred to the intensive care unit (ICU) for ongoing monitoring*

Misreading the blood count results

- *A prescriber erroneously interpreted a patient's platelet count as his haemoglobin (Hb) (the last three results were 89, 68 and 66) so booked him into for a two-unit red cell transfusion the same day*
- *Blood was taken for a repeat blood count, film and a crossmatch sample was also taken*
- *An intravenous (IV) cannula was inserted, and he waited for his transfusion*
- *The blood was placed in the blood refrigerator on the ward*
- *A nurse asked why the patient was having a blood transfusion when his Hb was 141g/L which was when the prescriber realised their error*
- *The patient did not receive any blood*

Incidents Related to Prothrombin Complex Concentrate (PCC)

Prothrombin complex concentrate (PCC) delay because of need to weigh the patient

- *A woman in her 80s on Apixaban for atrial fibrillation (AF), with upper gastrointestinal (GI) bleeding was in the emergency department (ED) and received red cells*
- *Confusion was caused by the requirement for her weight, and she was not well enough to get off the trolley*
- *This hospital had a fixed dose policy but shared on call haematology staff with another NHS organisation who use a weight-based dose*
- *It was not clear if she received the dose but was put on an end-of-life pathway and died unrelated to the PCC issues*

Difficulties in accessing prothrombin complex concentrate (PCC) resulting in delayed administration and extension of intracranial haemorrhage (ICH)

- *An elderly patient on Apixaban presented to the emergency department (ED) following trauma with a head injury at 17:31*
- *The report of a head computed tomography (CT) at 22:25 showed ICH*
- *PCC was requested*
- *On this site the transfusion laboratory was shut after midnight, so PCC was kept in the emergency drugs cupboard with access restricted to the site manager and pharmacists*
- *The PCC could not be found in the emergency drugs cupboard*
- *The on-call pharmacist was contacted who recommended discussion with the transfusion laboratory at the main site*
- *The main site biomedical scientist (BMS) offered to transport the PCC but to prevent further delay the clinician chose to transfer the patient to the main site where PCC was issued (06:42)*
- *A repeat CT scan the next day showed extension of ICH*

Off licence use of prothrombin complex concentrate (PCC)

- *A teenager was very unwell and admitted to the intensive care unit with an initial diagnosis of acute promyelocytic leukaemia (APML)*
- *The patient had coagulation disturbances and was prescribed PCC 3000IU but received 1000IU*
- *Fresh frozen plasma (FFP), platelets and cryoprecipitate were also given which were appropriate for acute myeloid leukaemia (AML) with coagulopathy, however there is no literature to suggest PCC is indicated or appropriate in this setting*

Long delay in treatment for intracranial haemorrhage (ICH) with staffing and communication issues

- *A patient on Warfarin presented with frontal ICH*
- *Computed tomography (CT) confirmed this diagnosis 21 hours after admission*
- *After rapid discussion with the haematologist at 17:00, prothrombin complex concentrate (PCC) was requested and issued at 17:40*
- *This plan was not communicated to the ward staff until 21:00*
- *The ward was very busy and short-staffed with many sick patients*
- *The need for additional staff was escalated without success*
- *The patient was difficult to cannulate, and the PCC was given at 01:50 the next morning (about 8 hours from the decision) and with a slow rate as 1500IU took over 1 hour and 50 minutes to administer*

Near Miss – Wrong Blood in Tube (WBIT)

The cord blood sample was shown to be unrelated to the mother

- *Fetal genotyping in pregnancy predicted the baby to be D-negative*
- *However, the cord and Kleihauer samples at delivery typed as D-positive*
- *Samples from both mother and baby were referred to the Blood Service for investigation because of this apparent discrepancy*
- *The two maternal samples pre and postnatal were from the same person, but the cord sample did not share at least one allele with the mother indicating that the cord was not related to the mother*
- *The cord was female, and the baby was predicted to be male*
- *The cord sample was from the placenta which was not sampled at the patient's bedside*
- *The mother received anti-D immunoglobulin inappropriately*
- *This maternity department is reviewing their procedures for sample taking and labelling for cord samples*

A wrong blood in tube (WBIT) in the setting of major haemorrhage identifies several errors

A major haemorrhage procedure was activated for a woman with a postpartum haemorrhage. Samples were sent to the transfusion laboratory with a request for two units of red cells. Two samples arrived in the same bag. The patient received two units of emergency group O D-negative red cells.

- *The switchboard operator did not wait to receive all the information, in particular the extension number to be used during the emergency. A bleep message using the extension number from labour ward from a call received earlier was sent erroneously. There was then a delay in the BMS establishing the correct contact number*
- *Maternal samples were taken by Midwife 1 and then handed to Doctor 1 who completed the details on the hospital transfusion request form and pre-transfusion sample. The mother was bleeding profusely, and Doctor 2 had to attend to her*

Continued…

A WBIT in the setting of major haemorrhage identifies several errors (2)

- *WBIT: one pre-transfusion sample was group O D-positive, but the other sample and the patient's transfusion history indicated that the patient was O D-negative (retrospectively known that one sample was the cord sample). The cord sample was taken by Midwife 2 but was not labelled immediately after the sample was taken. Doctor 2 then completed the details on the cord sample bottle with the mother's details (but no indication that this was the cord sample) and sent this to the transfusion laboratory with the other pre-transfusion sample (in the same bag)*
- *No patient identification details were completed on the traceability record that was returned to the transfusion laboratory. However, the donor number for the unit was documented in the transfusion record (which had patient identification details attached)*

Wrong practice was the norm, lack of safety culture in the organisation

- *An elderly man was admitted for surgery*
- *A first sample was sent for grouping (O D-positive) and later two more were sent*
- *Both these later samples were taken at the same time but labelled 15 minutes apart and were found to be a different group (A D-positive) compared to the first one*
- *The newly qualified nurse (transfusion training had been suspended due to lack of resources) who took the sample had filled out the request forms later at the computer away from the patient*
- *She selected the wrong patient details*
- *She noted that 'the practice I have witnessed throughout my training and in our hospital is that blood sampling labels are not completed at the bedside, an action by many professionals, doctors and nurses. The ward was busy, and I was rushing to help the demand.'*
- *She was working in a different healthcare organisation from the one where she trained suggesting this poor practice was embedded in other hospitals*

Right Blood Right Patient (RBRP)

Error in sample labelling not noticed by laboratory or clinical staff

- *A specimen was received in the transfusion laboratory for an elderly man with surname ending M on the sample and request form*
- *Following processing of the sample 20 blood components were issued and transfused*
- *A further sample and request form were received a few days later with surname ending N but the discrepancy was not noticed by laboratory staff and one adult therapeutic dose (ATD) platelets were issued and transfused*
- *Further samples were received ending N and the discrepancy was then noticed by the laboratory*

Clerical error leads to wrong date of birth (DOB) on all documentation

- *The DOB for a male in his 60s was incorrect on the patient wristband, compatibility label and prescription*
- *At the patient identification (ID) stage of administration, the nurse asked the patient for their DOB but misheard*
- *Electronic PID allowed the transfusion as the wristband and component label matched*
- *The patient had been incorrectly clerked*

Laboratory Errors

Transfusion of K-positive red cells resulted in antibody formation

- *A female patient in her 20s was transfused two red cell units post miscarriage, one of which was K-positive*
- *The laboratory information management system (LIMS) alerted the biomedical scientist (BMS) to the requirement for K-negative units, but alerts were not heeded and were overridden, with the LIMS allowing users to skip past alerts*
- *This incident occurred towards the end of a night shift*
- *This patient became pregnant again, with anti-K titre of 128, where the partner was Kk*
- *Cell-free fetal deoxyribonucleic acid (cffDNA) results indicated the fetus was K-negative*

Lack of provision of emergency stock red cell units

- *An elderly patient in his 80s was admitted with haemoglobin (Hb) 110g/L, which had fallen to 92g/L the following day*
- *The patient became hypotensive with rapid deterioration, and an arterial blood gas result indicated the Hb had fallen further to 70g/L*
- *One unit of emergency O D-negative red cells was requested urgently, but the biomedical scientist (BMS) refused the request as they felt this was not appropriate given that there were no obvious signs of blood loss*
- *The BMS suggested to contact the consultant haematologist, which did not happen*
- *By the time the BMS had a confirmed Hb result of 50g/L and contacted the ward to state group specific red cells could be released, the patient had already died*
- *Post-mortem results identified the patient died due to a bleeding duodenal ulcer*

Incorrect inputting of surname for patient who later required major haemorrhage protocol (MHP) activation

- *A group and screen sample was received in the transfusion laboratory for female in her 50s*
- *The name was inputted incorrectly into the laboratory information management system (LIMS), but the error was not detected during processing checking points*
- *The MHP was activated for the patient and red cells, platelets and fresh frozen plasma (FFP) were all issued with incorrect details on the labelling*
- *The error was not detected at administration checking, and units were transfused*

Error inputting group into the laboratory information management system (LIMS)

- *A group and screen sample was received for a female in her 70s*
- *The patient could not be positively identified (unconscious and unable to communicate) and so was given an unknown patient identification (ID)*
- *The sample was processed, and the patient had a forward group A, but no reverse group to confirm, therefore the LIMS required a manual overall ABO D interpretation*
- *The biomedical scientist (BMS) entered the group as A D-positive, when in fact the patient was A D-negative*
- *There was no information available as to whether a manual confirmation of group was carried out*
- *The patient was transfused D-positive red cells*
- *The patient was subsequently discovered to require irradiated cellular components, but this was not identified prior to administration*

Neonatal crossmatch without antibody screen

- *Neonatal red cells were requested for a new born infant*
- *The biomedical scientist (BMS) checked the laboratory information management system (LIMS) and confirmed that the mother had a negative antibody screen and units were issued and transfused*
- *It was subsequently detected that the maternal antibody screen was 5 days old, and therefore did not meet British Society for Haematology (BSH) 2016 guidelines (BSH New et al. 2016) requiring a sample to be ±72 hours from delivery*

Postnatal patient incorrectly given anti-D immunoglobulin (Ig) after biomedical scientist (BMS) used cell-free fetal deoxyribonucleic acid (cffDNA) result from previous pregnancy to determine newborn's blood group

- *A D-negative postnatal patient was transfused anti-D Ig following delivery of a D-negative infant after the BMS used the cffDNA result from a previous pregnancy to confirm the infant's D group, rather than the current cord group result*
- *The estimated date of delivery (EDD) date of this pregnancy was exactly 1 year from the EDD of the most recent previous pregnancy*

Miscalculation of fetomaternal haemorrhage (FMH) post delivery resulted in excessive anti-D immunoglobulin (Ig) administration

- *A biomedical scientist (BMS) tested a postnatal maternal sample for FMH, but during the calculation entered an incorrect FMH value and the bleed estimate was tenfold larger than the actual value*
- *The actual bleed was 6.4mL, but the estimated bleed was 64mL*
- *The BMS issued 9000IU anti-D Ig to cover this bleed*

Incorrect D group issued to patient – multiple influencing factors

- *A confirmed B D-negative patient was issued two B D-positive red cells via electronic issue*
- *The biomedical scientist (BMS) selected the incorrect D group red cells and proceeded to assign them to the patient record on the laboratory information management system (LIMS)*
- *The LIMS alerted the user to the D-incompatibility, but this was overridden*
- *The BMS signed a laboratory issue checklist to say the units had been checked as compatible*
- *Theatre staff waiting in the transfusion department were pressurising the BMS to prepare the units urgently*
- *The units were collected and transfused in theatre without checking the D-status of the units and the patient*

Red cell units out of temperature-controlled environment not quarantined correctly and mistakenly returned to stock and issued

- *Two red cell units were placed into a temperature monitored cool box for a major haemorrhage protocol (MHP) and were returned unused to the laboratory after 5 hours 21 minutes*
- *These units should have been discarded but were instead quarantined in the laboratory refrigerator, without clear handover to next staff member*
- *These units were returned into routine stock, issued, and transfused to other patients with no patient harm occurring*

Transfusion delays due to lack of handover by laboratory staff

- *An elderly male had a delay of over 24 hours for his transfusion due to lack of handover within the transfusion laboratory regarding this patient's red cell units requiring transport to the satellite refrigerator*
- *The biomedical scientist (BMS) forgot to add the need to organise transport for these units on the laboratory handover log*

Febrile, Allergic and Hypotensive Reactions (FAHR)

Allergic reaction to an unnecessary platelet transfusion

- *A man in his 50s was transfused one adult therapeutic dose (ATD) of apheresis platelets to cover a peripherally inserted central catheter (PICC) insertion in interventional radiology*
- *He developed peri-orbital and lip swelling and a rash*
- *He was treated with intravenous (IV) hydrocortisone and chlorphenamine with resolution of his symptoms*

Future transfusion plan fails to account for reaction type

- *A woman in her 80s with transfusion-dependent anaemia required one unit of red cells following two large nose bleeds*
- *Her haemoglobin (Hb) was 68g/L with a stated target Hb of >90g/L*
- *Midway through transfusion she developed pyrexia (temperature 38°C from baseline 36.5°C), rigors and vomiting*
- *The transfusion was stopped*
- *Investigations revealed no evidence of a serological reaction*
- *On review, frequent transfusion reaction investigations had been performed previously due to similar symptoms*
- *The patient was given a plan for premedication with paracetamol, chlorphenamine, hydrocortisone and furosemide for future transfusions*

Transfusion-Associated Circulatory Overload (TACO)

Omitted transfusion-associated circulatory overload (TACO) risk assessment led to overtransfusion and TACO, with no structured investigation performed

- *A male patient in his 70's weighing **64kg** was admitted to a medical ward with **severe symptomatic microcytic hypochromic anaemia (haemoglobin (Hb) 47g/L)***
- *His pre-transfusion computed tomography (CT) scan showed some pulmonary fibrosis and a small pleural effusion*
- *He had **severe left ventricular systolic dysfunction, renal impairment, peripheral oedema** and was on a **regular diuretic***
- *He was initially transfused uneventfully with two units of red cells*
- *A TACO risk assessment was not performed and a fluid balance chart was not in place*
- *His post-transfusion Hb was 65g/L*
- *He was then given a third unit of red cells*

Bold text = risk factors for TACO

Continued…

Omitted transfusion-associated circulatory overload (TACO) risk assessment led to overtransfusion and TACO, with no structured investigation performed (2)

- *There were no signs of active bleeding*
- *He became wheezy, hypertensive, tachycardic, pyrexial and had rigors*
- *His oxygen saturations reduced to 75% and he had peripheral pitting oedema*
- *His post-transfusion chest X-ray showed consolidation thought to be caused by aspiration pneumonia and new bilateral infiltrates consistent with pulmonary oedema*
- *He received oxygen via continuous positive airway pressure, a diuretic, hydrocortisone, bronchodilator and antibiotics*
- *He was transferred to the high dependency unit (HDU) and later recovered*
- *The local procedural review identified single unit with review and not transfusing blood for iron deficiency as preventative actions*

Haemolytic Transfusion Reactions (HTR)

Reaction due to anti-B in platelet unit

- *An infant with blood group AB was transfused with group A platelets*
- *The platelets were labelled ‘not for neonatal transfusion’ and were not high-titre (HT)-negative*
- *The patient also received a group AB red cell top up*
- *A reaction was reported 8 hours following transfusion with an increase in the patient’s bilirubin, and no haemoglobin (Hb) increment was observed following the red cell transfusion*
- *Following investigation, it was identified that the issuing biomedical scientist (BMS) in the laboratory had been focused on whether the ‘not for neonatal transfusion’ label was applicable to a patient >1 year of age and failed to consider the need for a HT-negative unit*
- *Information regarding the anti-B titre in the transfused component was not available*

Investigations post transfusion identifying delayed haemolytic transfusion reaction (DHTR) and prompting patient follow up

- *An anaemic patient was transfused two units of red cells as an outpatient*
- *Two weeks later the patient attended for a routine check-up*
- *Direct antiglobulin test (DAT) was positive, a new anti-Jk^a was identified and eluted from her red cells*
- *In addition, her haemoglobin (Hb) had dropped to 64g/L from a pre-transfusion level of 78g/L with a rise in bilirubin and lactate dehydrogenase (LDH)*
- *The transfusion laboratory recommended that the patient was monitored for a delayed transfusion reaction*
- *A letter was sent to the patient asking her to attend the general practitioner (GP) surgery for further blood tests at which point the patient reported that she had been feeling unwell following the transfusion and her Hb had dropped further to 49g/L*

Uncommon Complications of Transfusion (UCT)

Stroke while sedated and on ventilation

- *A patient in his late 40s was admitted to the intensive care unit (ICU) with COVID-19 pneumonia*
- *He was recruited to the REMAP-CAP trial and received one unit of COVID-19 convalescent plasma (CCP)*
- *He was subsequently diagnosed with a stroke approximately 3 weeks later*
- *As the patient had been sedated for ventilation, the exact onset of the stroke could not be determined*
- *A head computed tomography (CT) scan confirmed a massive infarction*
- *The patient died soon after*

Stroke 3 days after receiving one unit of COVID-19 convalescent plasma (CCP)

- *A patient in his 70s with hypertension, asthma (on inhalers), pre-diabetes, chronic kidney disease, bilateral total hip replacement, thalassaemia trait, thrombocytopaenia and previous cerebrovascular accident (on clopidogrel) was admitted to the intensive care unit (ICU) with a diagnosis of COVID-19*
- *He was recruited to the REMAP-CAP trial and received one unit of CCP*
- *He was diagnosed with a cerebrovascular accident (CVA) 3 days later and deteriorated despite ongoing support*
- *The main cause of death was attributed to be COVID-19 infection and stroke*

Stroke diagnosed the day after receiving COVID-19 convalescent plasma (CCP)

- *A patient in his 70s with high blood pressure, asthma, gastro-oesophageal reflux, and ischaemic heart disease was receiving care in the intensive care unit (ICU) following a diagnosis of COVID-19*
- *The patient had been recruited to the REMAP-CAP trial and received one unit of CCP but was diagnosed with a cerebrovascular accident (CVA) the following day*
- *The patient continued to deteriorate despite supportive measures and died 2 days later*
- *The patient had been confused before intubation hence the exact onset of the stroke cannot be determined*

Patient death during transfusion and lack of regular observations

- *A patient in his 70s with type 2 diabetes mellitus, leg ulcers and hypertension was admitted to the hospital with signs of intestinal obstruction and a haemoglobin (Hb) of 73g/L*
- *A red cell unit was requested and transfused overnight*
- *Observations recorded for the patient an hour and 20 minutes after commencement of the transfusion had a national early warning score (NEWS) of 3 with O2 saturations of 94%; blood pressure (BP) 106/47 (which was drop from patient's baseline); no further observations were carried out until after 75 minutes when a cardiac arrest call was put out and cardiopulmonary resuscitation (CPR) commenced but the patient could not be revived*

Patient with cold agglutinins not given red cells through a warmer

- *A patient in his 70s was admitted to the urology ward with haematuria and received two units of red cells*
- *The transfusion laboratory was not aware of any acute adverse reactions to the transfused units at the time as no contact had been made by the ward*
- *The laboratory was notified by the haematology consultant 3 days later that the patient had died and queried if the blood transfusion may have been a contributory cause of death*
- *The patient had a strong cold autoantibody and hence, samples were sent to the red cell immunohaematology (RCI) laboratory for crossmatching red cells*

Continued…

Patient with cold agglutinins not given red cells through a warmer (2)

- *The two units had been issued by RCI as ‘suitable’ with accompanying comments that blood should be transfused through a blood warmer*
- *The ward was also contacted and directly relayed the same message regarding use of a blood warmer*
- *It subsequently transpired that the first unit of red cells was not administered via a blood warmer, and the patient became unwell*
- *The second unit that was prescribed was administered through a warmer*
- *Staff assessing the patient attributed the respiratory distress to COVID-19*

Acute deterioration and multiorgan dysfunction in a patient with chronic lymphocytic leukaemia

- *Limited details were available regarding the patient's clinical status and investigations results*
- *A patient in his mid-80s who had chronic lymphocytic leukaemia received leucodepleted red cell transfusions as an outpatient*
- *In view of previous treatment with purine analogue the patient needed irradiated blood components, but this was missed by the requesting medic and whilst the laboratory information management system (LIMS) had a note that the patient needed irradiated components, this did not create an alert flag nor prevent issue of non-irradiated blood components*
- *Two units of non-irradiated red cells were transfused uneventfully*
- *The patient started feeling unwell the next day, felt tired and was pyrexial*
- *He continued to deteriorate and developed tachypnoea with low oxygen saturations over the next 24 hours*

Continued…

Acute deterioration and multiorgan dysfunction in a patient with chronic lymphocytic leukaemia (2)

- *The patient was then taken to the emergency department (ED) the following day (day 3 post transfusion) and was admitted with a diagnosis of suspected infection*
- *There was a mention of multiple bilateral pulmonary emboli, acute kidney injury with worsening renal impairment and fluid overload*
- *The patient was initially stable but deteriorated and had deranged liver functions and diarrhoea*
- *The patient continued to deteriorate, and the decision was made after discussions with family that the patient was for end of life care*
- *The patient needed further transfusions and two red cell units were given which were again non-irradiated*
- *On this occasion, although it was recognised that the patient needed irradiated blood components, due to the urgency of transfusion in a deteriorating patient and potential delay in procuring irradiated components, the patient received standard blood components*
- *The patient deteriorated and died approximately 10 days following the initial transfusion*

Ischaemic cardiovascular event in a patient with myeloma following platelet transfusion

- *A woman in her 60s with refractory IgA lambda myeloma became acutely unwell 30 minutes after receiving a platelet transfusion*
- *She reported chest tightness, developed acute respiratory distress syndrome, became hypertensive and had bilateral chest wheeze with crepitations*
- *She continued to deteriorate despite being given chlorphenamine and intravenous (IV) hydrocortisone*
- *A peri-arrest call was put out and adrenaline administered. She was assessed by the crash team, furosemide was administered, chest X-ray indicated pulmonary oedema, blood gases showed pH 7.1, PO2 10, PCO2 8, Lactate 5.3 and a decision was made to transfer to the intensive care unit (ICU) for further management where the patient was intubated and ventilated*
- *An electrocardiogram (ECG) showed T wave inversion and ST depression in lateral leads*
- *The patient improved with supportive measures in the ICU and recovered completely*

Cell Salvage (CS)

Near miss where a patient could have potentially received another patient's blood

- *A woman in her 30s underwent an emergency caesarean section and intraoperative cell salvage (ICS) was facilitated*
- *Blood loss was estimated at 900mL*
- *At the end of the surgical procedure the patient was moved to recovery before the ICS process was completed producing 226mL of salvaged red cells (O D-positive)*
- *An anaesthetist then took the labelled reinfusion bag from theatres to the bedside of what they thought was the correct patient in recovery*
- *The bag was hung on a drip stand and connected to a cannula in the patient's arm, but the infusion was not commenced*

Continued…

Near miss where a patient could have potentially received another patient's blood (2)

- *The doctor was initially questioned by the patient 'is that mine?' and then challenged by the midwife*
- *Checking the patient's details on the labelled blood bag against the wristband revealed that the doctor was in the wrong bay with a different patient (B D-positive)*
- *The infusion was disconnected and removed*
- *The doctor had failed to follow the 4-point patient identity check at the bedside before connecting the transfusion*
- *Timely intervention by the patient and the midwife prevented the transfusion of the wrong blood into the wrong patient*
- *The process was updated following this incident whereby a patient receiving cell salvaged blood must leave theatre with the red cell transfusion connected and running*

Hypotension on reinfusion of salvaged red cells with a leucocyte depletion filter (LDF)

- *A woman in her 20s underwent an elective caesarean section and experienced an intraoperative haemorrhage post-delivery of approximately 4000mL*
- *Intraoperative cell salvage (ICS) was utilised with anticoagulation by acid-citrate-dextrose (ACD) with a collection volume of approximately 800mL*
- *Three units of allogeneic red cells were transfused prior to commencing salvaged red cells*
- *On commencement of the autologous transfusion through a LDF the patient exhibited a sudden drop in blood pressure and became tachycardic*

Continued…

Hypotension on reinfusion of salvaged red cells with a leucocyte depletion filter (LDF) (2)

- *The salvaged red cell infusion was stopped, and the patient received vasopressors and fluids and she quickly recovered*
- *The cell salvage transfusion of approximately 200mL was recommenced slowly without incident*
- *Towards the end of the infusion, the remainder of the volume within the bag was drawn into a 30mL syringe via a 3-way tap downstream of the filter*
- *Infusion of this bolus resulted in a second hypotensive event accompanied with tachycardia*
- *The patient was resuscitated with vasopressors and fluids and made a full recovery*

Paediatric Cases

Communication failure resulting in delay in provision of red cells

- *A preterm baby was born in a poor condition and required resuscitation*
- *The haemoglobin (Hb) on a blood gas was 50g/L*
- *Due to a communication error, the call for emergency blood was not received by the transfusion laboratory and no red cell units were provided before attempts at resuscitation were abandoned*

Case of necrotising enterocolitis following transfusion

- *An extremely preterm baby with respiratory distress, sepsis (site unspecified) and hypoglycaemia developed falling oxygen saturation and became pale with distended, tense abdomen 7 hours following a red cell transfusion for severe anaemia*
- *The baby continued to deteriorate despite resuscitation and abdominal x-ray showed a perforation*
- *Death was felt to be possibly related to transfusion*
- *This was a suspected case of transfusion-associated necrotising enterocolitis*

Hypotension during methylene blue-treated fresh frozen plasma (MB-FFP) infusion in child with pre-existing cardiac condition

- *A preterm baby developed significant hypotension and drop in oxygen saturation 5 minutes into an infusion of MB-FFP*
- *The baby responded to resuscitation*
- *Of note the baby had pre-existing fetal arrhythmia and reduced ventricular function so it is difficult to know the contribution of the pre-existing condition to the episode of hypotension*

Alloimmunisation in a patient with thalassaemia resulting from failure to provide phenotype matched red cells

- *A teenager with thalassaemia had previously had red cell phenotyping performed*
- *There was no alert on the laboratory system indicating that this patient required phenotyped red cells and they were transfused with E-positive red cells*
- *The patient developed an anti-E*

Lack of awareness of paediatric major haemorrhage protocol (MHP)

- *The paediatric MHP was activated in the emergency department (ED)*
- *The laboratory scientist was not aware that there was a separate protocol for children and advised the ED to contact the on-call consultant paediatric haematologist instead of preparing packs, resulting in a 20-minute delay in provision of the blood components*

Calculation error that illustrates the pitfalls but also safety mechanisms that worked

- *An infant received an overtransfusion due to a calculation error*
- *The haemoglobin (Hb) was 68g/L and there was an error in calculating the required dose (mL) of red cells*
- *The registrar used g/L (68) to calculate the volume rather than g/dL still in use in this department (6.8)*
- *The intended amount therefore was a tenfold error (432mL rather than 43.2mL)*
- *A safety net on the formula states a maximum transfusion volume of 20mL/kg (170mL) therefore this is how much was prescribed*
- *The nurses checking prescription both stated they did not check the formula themselves*
- *After handover a different nurse realised patient had received 110mL (12mL/kg) and paused the pump as it is unusual to give more than 10mL/kg to a patient with liver disease*
- *Repeat testing showed Hb was 96g/L*

Communication issues resulted in confusion about whether to utilise salvaged blood

- *Autologous re-transfusion was not performed for a teenager following scoliosis surgery despite the haemoglobin (Hb) being below the local postoperative transfusion threshold*
- *On review there had been uncertainty as to whether to give the transfusion of the salvaged blood to this patient and the blood expired before it could be transfused*

Overtransfusion of a young child resulted in transfusion-associated dyspnoea (TAD)

- *A child with leukaemia had been correctly prescribed 10mL/kg of red cells over 1 hour*
- *However due to an error in the pump programming 40mL/kg was administered over 4 hours*
- *This resulted in tachycardia and increased respiratory rate*
- *This settled without any specific treatment and no chest X-ray was performed and thus did not meet the criteria for transfusion-associated circulatory overload (TACO)*
- *Both the nurses checking the transfusion were inexperienced in checking transfusions and one had not performed this role at the hospital before*

Iatrogenic hyperkalaemia secondary to transfusion of large volume of irradiated red cells

- *An infant with Di-George syndrome with lymphopenia was taken to theatre for washout of infected cardiothoracic surgical wound*
- *The infant had a surgical complication and required urgent large volume, rapid red cell transfusion due to significant bleeding*
- *The red cell unit had been irradiated approximately 7 days previously*
- *The child developed abnormal electrocardiogram (ECG) secondary to hyperkalaemia from the transfused blood with an arterial blood gas showing a potassium of 8.5*
- *This was managed appropriately and the infant recovered and survived*

Haemoglobin Disorders

Hyperhaemolysis in a patient with sickle cell disease (SCD)

- *A young female with SCD received a two-unit top up transfusion*
- *There was a history of alloimmunisation with anti-S and therefore she received S-negative units*
- *The patient presented 5 days later with a haemoglobin (Hb) of 30g/L*
- *Urine high-performance liquid chromatography (HPLC) was reported as consistent with hyperhaemolysis*
- *A new anti-Fy^a antibody was identified, and a decision was made to transfuse further red cells*
- *The patient developed additional complications with transient encephalopathy and hypertensive crisis*
- *She was treated with corticosteroids, intravenous immunoglobulin, Eculizumab and Rituximab*

Delayed haemolysis in a patient with sickle cell disease (SCD)

- *A young female with SCD and a history of alloimmunisation received a red cell exchange transfusion*
- *She presented 8 days later with generalised body pains and fever*
- *She was known to have anti-Fy^{a} and anti-Jk^{b} but had now developed an anti-Fy3*

Unnecessary transfusion due to assumption by staff resulting in incorrect handover

- *A young male with sickle cell disease (SCD) was admitted and a group and crossmatch was requested to have red cells on standby in case of clinical deterioration*
- *The day nursing staff assumed that a transfusion was required and handed this over to the night nursing staff who then asked the junior night doctor to prescribe the blood which was then administered*

20-hour delay in transfusion for a patient with acute chest syndrome

- *A female in her 20s with sickle cell disease (SCD) was admitted with a vaso-occlusive pain crisis, increasing oxygen requirement and chest signs in keeping with acute chest syndrome*
- *The haematologist requested for the patient to be transferred to the haematology ward and to receive an urgent two-unit top-up transfusion*
- *Due to delays with bed availability the patient was not transferred until later that night, and the transfusion was not administered until 20 hours after the decision to transfuse*
- *There had been a clinical deterioration in the patient which the haematologist thought was due to delay in transfusion and subsequently the patient required a further two-unit blood transfusion*

Alloimmunisation after not receiving extended Rh-matched red cells in thalassaemia

- *A young patient with thalassaemia attended for routine transfusion but was not provided with extended Rh and K-matched red cells and subsequently developed an anti-E antibody*
- *The reason for the error noted was that no specific system flag was in place at the laboratory to provide extended phenotype-matched red cells*

Ambiguous antibody investigation report on national database (Sp-ICE)

- *A sickle cell disease (SCD) patient in his 40s received eight units of red cells during a red cell exchange procedure*
- *The laboratory checked the Sp-ICE record which stated there was a previous positive direct antiglobulin test (DAT) but insufficient sample for antibody investigation*
- *It was reported that there were no further instructions on what blood to crossmatch*
- *It was later confirmed after contacting the previous hospital the patient had visited that he had developed an alloantibody, but this had not been updated on Sp-ICE*

D-positive red cells transfused to female child with sickle cell disease (SCD)

- *Transfusion was requested for a young female with SCD with a known D-variant who should have received D-negative red cells*
- *The Blood Service supplied D-positive units following the 'over the telephone' request*
- *The laboratory information management system (LIMS) flagged up that there was a mismatch in relation to the specific transfusion requirement*
- *The laboratory staff overrode the system and issued the units*
- *Explanation provided by the laboratory staff for the error included low staffing levels and increased workload*

Laboratory not informed of a diagnosis of sickle cell disease (SCD) when requesting red cells

- *A male child with SCD was admitted to critical care and required a four-unit red cell transfusion*
- *The transfusion was requested by a junior doctor who did not state on the request that the patient had SCD, and the transfusion laboratory staff were not aware of the diagnosis or need to provide extended Rh and K-matched and HbS-negative red cells*

Seizures during transfusion

- *A pregnant patient in her 30s underwent an elective 10-unit red cell exchange for sickle cell disease*
- *This was the patient's seventh red cell exchange in the last 18 months and all previous procedures had been well tolerated*
- *The patient suffered a prolonged grand mal seizure during the 10th red cell exchange unit*
- *There was no change in blood pressure or other observations*
- *The patient received a calcium infusion, intravenous (IV) Diazepam, but had recurrence of seizures after 10-15 minutes*

Continued…

Seizures during transfusion (2)

- *The patient was intubated, ventilated and transferred for escalation of care*
- *A head computed tomography (CT) venogram showed no abnormality either*
- *The patient made a full recovery and was discharged 48 hours after admission*
- *There was no evidence of a serological or haemolytic transfusion reaction*
- *No biochemical abnormality was found*
- *It was later discovered that the patient did have a history of seizures which had not previously been recorded*
- *The seizure threshold could have been lowered due to pregnancy and other medication (Cyclizine, opiates, Venlafaxine) worsened by possible citrate with transient hypocalcaemia relating to the exchange transfusion*

Surgical team arranging transfusion in sickle cell disease (SCD)

- *A patient with SCD in his 50s was admitted for a renal transplant*
- *Three units of red cells were requested however the transfusion laboratory was not informed of the diagnosis of SCD*
- *Due to a grouping anomaly the laboratory contacted the patient's usual hospital and discovered the patient was known to have SCD*
- *The haematology team were only informed following transfusion that the patient was admitted*
- *The learning point highlighted by the reporter was that sickle cell patients requiring transfusion should be discussed with the haematology team*

Transfusion Errors in Transplant Cases

Communication failure and flag fatigue leads to D-mismatch platelet transfusion

- *A haemopoietic stem cell transplant (HSCT) patient transferred from another hospital was transfused with B D-positive platelets when they should have received D-negative platelets*
- *No communication was given to the laboratory that the patient was a post-HSCT patient*
- *No shared-care document from the transplanting hospital was received*
- *The transfusion sample showed anomalous results, the laboratory staff contacted the ward and obtained patient history that the patient had received an HSCT (donor O D-positive, recipient B D-negative)*
- *This was recorded in the laboratory information management system (LIMS) notepad, but the specific requirement flags were not updated on the LIMS*
- *A platelet component of the incorrect D-type was issued to the patient*
- *The biomedical scientist (BMS) overrode the warning flags, as the LIMS functionality was limited on management of blood component requirements of HSCT patients, and showed many alerts, leading to alert fatigue*

Inadequate remote issue algorithm resulted in transfusion of non-irradiated red cells

- *The transfusion laboratory informed the ward that the patient's red cells were ready for collection in the 'smart' blood refrigerator*
- *A nurse used remote issue to release a unit of red cells for the patient*
- *Early on in the transfusion the nurse realised blood issued should have been irradiated*
- *Red cells for patients who require irradiated components cannot be remotely issued by the smart refrigerator as algorithms are not configured to select irradiated blood*
- *There was a sign on the smart refrigerator to advise staff to contact the transfusion laboratory if the patient required irradiated red cells*
- *In this incident the ward contacted the transfusion laboratory who advised in error that the patient was suitable for remote issue*

Immune Anti-D in Pregnancy

Missed potentially sensitising event (PSE)

- *A primiparous woman in her 30s booked at 8 weeks, no alloantibodies were detected*
- *The woman had a fall at 9 weeks but no medical attention was sought at the time*
- *Maternal blood sampling for cell-free fetal deoxyribonucleic acid (cffDNA) predicted a D-positive fetus at 17 weeks*
- *At 28^{+3} the woman attended for a scan following concern regarding reduced movements which identified an intrauterine death (IUD)*
- *Anti-D was detected however there was no quantification*
- *No postmortem was performed according to communications with the SHOT team*

Detection of anti-D in early pregnancy

- *A primiparous woman in her 30s, body mass index (BMI) 46 booked at 8 weeks*
- *Alloimmune anti-D was detected at booking, quantification 13.38IU/mL, highest quantification 15.5IU/mL*
- *The woman delivered a D-negative infant at 37^{+3}*

Sensitisation despite ideal management

- *A primiparous woman in her early 20s booked at 8 weeks, group and antibody screen detected the mother to be D-negative, no alloantibodies detected*
- *She presented with abdominal pain at 12 weeks, no associated bleeding, scan did not detect any abnormality, she was reassured and discharged*
- *Maternal sample for cell-free fetal deoxyribonucleic acid (cffDNA) at 13 weeks predicted the fetus to be D-positive*
- *The maternal blood sample at 28 weeks prior to routine antenatal anti-D Ig prophylaxis (RAADP) detected alloimmune anti-D, quantification 0.7IU/mL, the highest recorded quantification at 36 weeks was 3IU/mL*
- *The pregnancy resulted in a live birth at 38/40, the baby showed no signs of jaundice, no treatment required*

Ideal management, gestation 41^{+5}

- *A primiparous woman, D-negative, 66kg in her late 30s, received ideal management throughout pregnancy receiving routine antenatal anti-D Ig prophylaxis (RAADP), no potentially sensitising events (PSE)*
- *Following delivery at 41^{+5} a maternal blood sample detected anti-D, quantification 2.7IU/mL*

Haemolytic disease of the fetus and newborn (HDFN) treatment

- *A D-negative woman in her 20s who weighed 87kg, gravida 2 para 1 was booked at 11 weeks*
- *The previous pregnancy was managed at a different healthcare provider and details of the prior pregnancy were limited*
- *In the previous pregnancy this woman received four doses of anti-D Ig, timing and dose not provided and she delivered a D-positive baby*
- *She suffered a postpartum haemorrhage*
- *In the index pregnancy, alloimmune anti-D was detected at booking*
- *The highest quantification of anti-D was 330IU/mL at 36 weeks*
- *The mother delivered a D-positive baby at 37^{+1}, the baby required phototherapy and due to increasing bilirubin levels was transferred to the neonatal unit and received immunoglobulin and an exchange blood transfusion*

Baby D-positive, cell-free fetal deoxyribonucleic acid (cffDNA) predicted D-negative fetus

- *A D-negative female in her 20s, gravida 3 para 2, weight 77kg, booking bloods did not detect alloimmune anti-D and cffDNA in the index pregnancy at 13 weeks predicted a D-negative fetus*
- *The woman as such did not receive routine antenatal anti-D Ig prophylaxis (RAADP)*
- *Maternal transfusion sample at delivery 37^{+1} detected alloimmune anti-D and anti-E, anti-D quantification 14.2IU/mL*
- *Following delivery, the baby was identified to be jaundiced, D-positive and DAT 3+, phototherapy was required*
- *The preceding pregnancy management was appropriate*

Maternal blood group transcription error

- *A D-negative woman gravida 2 para 1 presented in her second pregnancy*
- *In her first pregnancy due to the method of the test request the maternal blood group was not automatically transmitted to the maternity information technology (IT) system*
- *The maternal blood group was incorrectly transcribed A D-positive*
- *In the subsequent pregnancy the error was detected when the woman's booking bloods were resulted and identified her to be A D-negative with alloimmune anti-D, quantification 0.1IU/mL*
- *In the prior pregnancy no routine antenatal anti-D Ig prophylaxis (RAADP) nor treatment for a potentially sensitising event (PSE) was provided*
- *The pregnancy resulted in a live birth, baby was A D-negative*