Cases from the 2020 Annual SHOT Report

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

Donor Haemovigilance

Acute coronary syndrome in a new COVID-19 convalescent plasma (CCP) donor

- *A first time CCP donor in his 50s who had last donated blood in 1993. The donor donated CCP by plasmapheresis 4 months after he was diagnosed and hospitalised with COVID-19*
- *The donation was uneventful but the next day the donor experienced a brief episode of very sharp central chest pain and felt sweaty and 'not right' following exercise*
- *He was admitted to hospital and diagnosed with acute coronary syndrome and sinus bradycardia. Aspirin, clopidogrel, ramipril, isosorbide mononitrate and simvastatin were commenced*
- *The donor developed further similar symptoms while awaiting coronary angiogram. This demonstrated coronary artery disease for which angioplasty and stenting were performed*
- *All symptoms subsequently resolved. The donor has been withdrawn from further donations*

Delayed vasovagal reaction resulting in damage to donor teeth

- *A female donor in her 40s who had previously donated 20 times uneventfully had a delayed vasovagal reaction (faint) several hours post donation in the middle of the night when she got up*
- *The donor had consumed alcohol and reported feeling 'quite tipsy' when going to bed. She had fainted whilst downstairs and was found by a family member with front two teeth damaged significantly needing emergency dental surgery the following week*
- *She was withdrawn from future donations*

Irregular pulse detected at a routine pre-donation check in a regular platelet donor

- *A male platelet donor in his 30s, with no history of cardiac issues, was found to have an irregular pulse rate on a routine pre-platelet donation check*
- *The donor had donated upward of 25 whole blood and platelet donations uneventfully. He was not accepted for donation and was deferred pending further investigation*
- *A preliminary diagnosis of atrial fibrillation (AF) was made by the GP and he was referred to a cardiologist*
- *Following cardiology review it was concluded that the irregular pulse was due to sinus arrythmia and AF was ruled out, the donor was reinstated*

Human Factors

COVID-19-related organisational problems, but the report identifies only staff issues

- *An emergency patient was admitted straight to theatre during the night*
- *Red blood cell units were removed from the recovery room refrigerator by order of the anaesthetist and kept near the patient in theatre for the duration of the surgery. No temperature-controlled storage box was requested from the laboratory*
- *Due to the units being out of temperature-controlled storage for over 4 hours, and their close-proximity to a suspected COVID-19 positive patient they were wasted*

Near miss scored 10/10 for staff only, but interim change made to environment and major organisational improvement planned

- *A patient required a transfusion of irradiated platelets. During the pre-administration check of the unit of platelets in the clinical area, it was noted that the identification label containing the patient details stated that the component was irradiated*
- *Despite this the clinical staff detected that the irradiation blue-dot indicator sticker (RadTag®) was missing from the unit*
- *They alerted the laboratory staff; the unit was returned to the laboratory and it was confirmed that non-irradiated platelets had been issued.*
- *An incorrect transfusion that did not meet the patient's special requirements was prevented by diligent checking.*

Anti-D Immunoglobulin (Ig) Errors

Confusion caused by labelling of a cord blood sample

- *A midwife contacted the laboratory to enquire if a D-negative patient had received any anti-D immunoglobulin (Ig)*
- *According to the laboratory information management system (LIMS) the named patient had not had a post-delivery sample, or request for a Kleihauer. There was also no record of the baby or that the cord blood sample had been received*
- *On investigation by the laboratory, a sample for a baby with same date of birth and corresponding address to the mother was located, however the baby did not have the same surname and so had not been associated with the mother in question*

Late administration of anti-D immunoglobulin (Ig) post-delivery of twin infants

- *One infant tested D-positive to a D-negative mother*
- *However only one cord sample was sent to the laboratory at the time of delivery, which tested D-negative. There was no indication of a twin delivery therefore anti-D Ig was not issued to the patient*
- *Anti-D Ig was administered day 7 post-delivery*

Anti-D immunoglobulin (Ig) given to woman who had pre-existing anti-D antibodies (1)

- *A woman was referred to the fetal medicine institute for invasive sickle cell testing of fetus*
- *The presence of alloimmune anti-D antibodies was not adequately identified by the referring hospital report. Although written in the blood transfusion report, it was embedded in a paragraph of text and difficult to identify*
- *When the appointment was made the clerical team created a new record, although the woman had an existing record in the system (Failure to follow correct process of creating records by the administration team)*
- *A group and screen (G&S) sample was taken pre administration of anti-D Ig, but the midwives did not wait for the result to come back (usual practice) and issued anti-D Ig from the stock on the ward*

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Anti-D immunoglobulin (Ig) given to woman who had pre-existing anti-D antibodies (2)

- *The failsafe of a midwife checking the previous reports before issuing the anti-D Ig did not happen because the woman had two files and the report had been scanned into the wrong file. The research fellow did not identify that the patient had anti-D antibodies from the G&S report issued and prescribed anti-D Ig*
- *A second research fellow realised that the patient had alloimmune anti-D antibodies and alerted the consultant and fetal medicine midwives*
- *A second failsafe, writing all procedures including blood group and virology, on a white board in the midwives' office had not happened because the member of staff responsible had been delayed due to a train strike*

Apparent false positive cell-free fetal DNA (cffDNA) D-type due to vanishing twin syndrome

- *A cffDNA result issued by the Blood Service reference laboratory for a D-negative pregnant lady, predicted the fetus to be D-positive. Prophylactic anti-D immunoglobulin (Ig) was given to the patient based on cffDNA result*
- *A cord sample taken at delivery grouped as D-negative*
- *The laboratory confirmed the cord sample as fetal by performing alkali denaturation test. It was not possible to obtain repeat samples for testing as mum and baby has been discharged. The reference laboratory was notified*
- *Further hospital investigation indicated that the incorrect predicted cffDNA result could possibly be due to the 'vanishing twin syndrome' as the patient had IUD of a twin on the first scan during the pregnancy at 16^{+5} weeks*
- *It was unknown to be a twin pregnancy until the fetus had died. The cffDNA test was performed at 21 weeks*

Incorrect Blood Component Transfused (IBCT)

Dealing with two units of blood for two different patients at the same time

- *A patient in his 30s with oesophageal varices was having an endoscopy as an out-patient. Some bleeding was identified, and he was found to have deranged clotting and a haemoglobin of 91g/L. He was admitted to the ICU for monitoring and treatment*
- *The unit was treating patients with COVID-19. There were two patients (one located within the 'hot' zone and the other within the 'cold' zone) and the porters had been asked to collect their blood units at the same time*
- *Both units were collected and delivered to the 'hot' zone. The temporary agency nurse covering the shift set up the first unit and it was transfused to the patient quickly as he was actively bleeding*
- *The second unit was then set up for the same patient and administered. Soon into the transfusion, the patient complained of intense back pain, melaena and shivering. It was then identified that the unit intended for another patient had been set up and was immediately stopped*
- *Further information provided with the report alluded to poor lighting in the work environment as also being contributory*

Distraction during bedside checks

- *Patient 1 was a gentleman in his 80s who had recently had surgery for a fractured neck of femur but did not require a blood transfusion*
- *The nurse was dealing with Patient 2 in the next bed who did require a transfusion. The appropriate checks were made on the blood prescription, the unit of blood and the patient identification using a bedside checklist*
- *Before the transfusion could commence Patient 1, who was being cared for by an aspirant nurse*, became acutely unwell and required the assistance of the nurse. When Patient 1 was stable the nurse preceded to connect the unit of red cells for Patient 2 to Patient 1, without restarting the checking process, and commenced the transfusion*
- *The error was noted at a handover meeting approximately 15 minutes later, by this time Patient 1 had received approximately 15mL of the unit prescribed to Patient 2.*
- *This patient went on to have a delayed haemolytic transfusion reaction, and the patient subsequently recovered*

**Aspirant nurses were introduced nationally as a rapid response to staffing concerns during the first wave of the COVID-19 pandemic. This role enabled student nurses in the final 6 months of their training programme to be employed as Band 4 nurses to use the skills and experience they had attained whilst they were supported to complete their training, through observational assessment of the use of their knowledge and skills in practice. Although these nurses could manage the care of a group of patients under the supervision of a registered nurse, they were not able to administer medication or blood products.*

Transfusion of antigen-positive blood due to misidentification of alloantibodies in non-ideal working conditions

- *A male patient in his 50s undergoing chemotherapy required a red cell transfusion*
- *The antibody identification panel showed a historical anti-C, however a newly presenting anti-Fy^b was missed and an appropriate antigen-negative unit was not selected*
- *The BMS performing the panel was rushing to avoid leaving unfinished work for the next shift. They failed to perform full antibody exclusions on the panel and relied on previous history to guide decision making*
- *The unit was crossmatch-compatible by indirect antibody test and the mistake was detected 4 days later when panel results were second checked by a senior BMS*

Positive patient identification not carried out

- *A patient in his 60s with bladder cancer was being given a second unit of blood to increase his haemoglobin from 91g/L (result after first unit was transfused)*
- *A paper 'authority for collection of bloods and blood components' form was completed and was taken by the porter to the laboratory to collect the blood component. The patient's identification (ID) label should be added to this form, signed and dated by the nursing staff. The incorrect patient's ID label was put onto the request form, and this was used to collect the unit*
- *The unit of blood arrived on the ward with details on the tag matching those on the collection slip. The nursing staff failed to check the patient name on the unit of blood directly against the patient's ID wristband or to check the patients name, hospital number and date of birth on Prescribing Information and Communication* System *against the unit of blood*
- *The checks were made between the authority for collection of blood and blood components form only.*
- *After 15 minutes the patient began to experience shortness of breath and abdominal pain, the transfusion was stopped but the tag details were not checked. The doctor was informed and the advice was to wait until symptoms settle (thought to be related to underlying condition) and restart transfusion.*
- *The nurse then went off shift and the incorrect unit of blood was only recognised by the nurse on the next shift when they went to re-start the blood.*

Confusion over documentation leads to incorrect transfusion (1)

- *A patient (patient 1) in his 50s was being treated for a gastric adenocarcinoma with chemotherapy*
- *It was noted during his outpatient consultation that his haemoglobin had dropped to 44g/L. The patient was admitted to hospital for an urgent blood transfusion of three units of red blood cells*
- *The first two units were transfused without any issues. A few minutes after the third unit was commenced the patient complained of an 'impending sense of doom'*
- *A doctor, who was already dealing with an emergency elsewhere, advised giving hydrocortisone and chlorphenamine and to restart the blood if the patient settled. The medication was given as advised and the patient initially responded to the treatment and became settled but subsequently developed rigors*
- *It was then noted that the unit of blood connected to the patient was intended for another patient (patient 2) with the same surname*

Confusion over documentation leads to incorrect transfusion (2)

- *Staff from the security team are allocated to collect blood components overnight. The security member of staff went to the ward to obtain the paper collection card and then went to the blood collection room*
- *This collection card contained the details of patient 1. The staff member selected the correct compatibility slip in the blood collection room folder, placed the ward collection card in the appropriate box and went to the refrigerator to collect the unit of blood*
- *He recalled that the blood was not in the allocated shelf as indicated on the compatibility slip. He lost his place in the compatibility folder but could recall the patient's surname. He found patient 2's compatibility slip and proceeded to collect the unit of blood intended for patient 2*
- *The blood component should be tracked and signed out on Clinical Web Portal (CWP) using the computer in the blood room but the member of staff was unable to log on that evening and had experienced issues previously with the computer in this respect*
- *The blood was taken to patient 1's bedside and verbal checks were attempted but the patient complained about being woken up. The nurse recalls checking the surname (same surname as patient 2) on the patient's wristband and commencing the transfusion*

More than one unit of blood checked at the same time and bedside checks not carried out

- *A patient in his 50s with sickle cell disease was having a 'top up' blood transfusion in the haematology outpatients dept*
- *The nurses checked two units for two different patients at the same time against the electronic prescriptions and administered the unit intended for one patient to the other*
- *The alarm on the pump sounded as the cannula had blocked and was at this point it was realised the patient was being given a unit of blood intended for another patient and the transfusion was stopped*
- *The final checks had been completed by two nurses but away from patient's bedside. A bedside checklist had not been used and the final bedside checks had not been carried out. The patient was not wearing a wristband and positive patient identification was not made*

Bedside check not carried out leading to ABO incompatible (ABOi) transfusion

- *A patient in his 60s was being treated for anaemia which was still being investigated, pre-transfusion haemoglobin was 68g/L. A unit of blood was ordered and was collected by the healthcare assistant*
- *When the unit arrived on the ward two nurses undertook the pre-administration checking procedures at the nursing station, and not at the patient's bedside. One nurse then took the unit of blood and the associated paperwork to the patient's bedside (the other nurse was called away to deal with something else)*
- *The nurse proceeded to complete the bedside checks alone but did not carry out positive patient identification by checking the patient's identification wristband and the transfusion was started*
- *Approximately 35 minutes later the patient began to experience breathing difficulties and became 'shaking and jittery'. The transfusion was stopped and at this point it was noticed that the unit of blood being transfused was for another patient*
- *The patient was admitted to high dependency unit overnight for observations due to the reaction to the wrong blood administration.*

ABO incompatible transfusion caused by a distraction

- *A patient in her 80s was being treated in the Haematology day care unit for chronic anaemia and was due to have a blood transfusion. The unit was short staffed and another patient was seriously ill requiring the full attention of another qualified nurse*
- *The nurse collected red cell units for several patients and opened the transport box in the department, placing two units on the work surface*
- *Administration checks were carried out for patient 1 using the electronic blood tracking system with the correct unit. The nurse was momentarily distracted and when they turned back picked up a unit of blood, set this up and began administration via a pump*
- *When the nurse turned to deal with the second unit of blood (for patient 2) it was realised that the wrong unit had been started for patient 1*
- *The pump with the wrong unit was stopped immediately. No volume change had been registered on the pump so although it was connected and started it was unlikely that the patient had received any of the wrong blood, an estimate was less than 0.1mL of blood transfused if at all*

Two units of group O fresh frozen plasma (FFP) transfused to a group A recipient despite a laboratory information management system (LIMS) flag being present

- *A female patient in her 50s was admitted as a code red trauma patient following a road traffic accident. She suffered a massive haemorrhage, arrived in the emergency department and received several units of emergency group O red cells before a group and screen sample could be taken*
- *A sample was taken and processed by the laboratory, but the results showed dual populations because of the O red cells transfused and the group was inconclusive*
- *There was a historical blood group from 1992, but this could not be linked to the current record in the LIMS. The patient's blood group was manually edited to group O with a flag added to the LIMS record to give universal components only as stated in the laboratory procedure for this situation*
- *FFP was later requested and the biomedical scientist on duty selected, thawed, and issued two units of group O instead of AB or A as a universal plasma component*
- *The alert flag to give universal components was shown but not acted upon. Both units were collected and transfused with no reported harm to the patient.*

Group O COVID-19 convalescent plasma (CCP) transfused to a group A recipient

- *A female in her 30s who was blood group A, was enrolled on the convalescent plasma arm of the REMAP-CAP trial and was transfused with a unit of group O CCP*
- *On investigation there was no ABO-compatible convalescent plasma in stock and instead of ordering this from the Blood Service the BMS selected group O after discussion with a less experienced member of staff and thought this would be acceptable because the unit was high titre-negative*
- *The laboratory information management system (LIMS) had an alert flag for the ABO-incompatibility, but this was not heeded*
- *A unit of group O CCP was also issued to the same patient the previous day, however this was wasted as it had been stored inappropriately in the ward refrigerator*
- *The ABO-incompatibility was not detected upon return of this unit and was only raised when a different BMS was issuing the 2nd dose (3rd unit) and saw the ABO-incompatible units in the patient's history*
- *The laboratory has now had the LIMS updated to prevent group O plasma components being issued to a non-group O recipient. No patient harm was reported*

Handling and Storage Errors (HSE)

Red cells transfused after the units had expired

- *Two units of red cells due to expire at midnight that day were issued to a patient for a top up transfusion. The units were placed in the issue refrigerator ready for collection*
- *The first unit was collected at 22:00 and the second unit was collected at 06:10 the next day, which was over 6 hours past the midnight expiry. It also transpired that transfusion of the first unit was not completed until after the unit had expired*
- *On investigation the expiration date was highlighted on the blood collection slip and both units were collected by the same healthcare assistant, administered by the same nurse, and both failed to notice the expiry date of the units at collection and pre-administration checks*
- *The laboratory was proactive in creating corrective and preventative actions to avoid this happening again and now have a new procedure in place. Any units issued to a patient that expire at midnight on the day of issue are now kept within the laboratory awaiting collection, thus ensuring that they will not be transfused past expiry*

Blood storage refrigerator out of temperature for 2 hours due to failure to respond to temperature monitoring system alerts

- *A blood storage refrigerator core temperature exceeded its high limit for almost 2 hours*
- *The temperature monitoring service called the laboratory mobile phone as per standard procedure, but the laboratory did not answer as the phone battery was dead and the charger for the phone had gone missing. The caller left a voicemail on the mobile phone and emailed the site lead as per instructions*
- *The site lead missed the email and only found the alarm alert 2 days later whilst clearing another alarm received that day*
- *Three patients were transfused a total of five units of red cells that were out of temperature control for 1.5 hours. Another three units, that were also in the blood refrigerator at that time, had to be wasted*
- *The clinical teams looking after the 3 patients who were transfused were informed and no adverse reactions or harm were reported*

Avoidable, Delayed or Under/Overtransfusion (ADU)

Delayed Transfusion

Death from gastrointestinal bleeding with serial delays and miscommunications

- *An elderly woman on anticoagulants was admitted with a history of melaena. She was pale with hypotension, blood pressure 88/55mmHg, and tachycardia, and was assessed within 3 minutes of arrival*
- *She was noted to be in shock from blood loss. Her haemoglobin on the blood gas machine on admission was 41.8g/L*
- *The major haemorrhage protocol was not activated. Transfusion was delayed for almost 7 hours from admission and she died shortly after it was started*

Death related to gastrointestinal (GI) haemorrhage with multiple points of delay

- *An elderly man had a prolonged admission for renal problems. His anticoagulant for atrial fibrillation and omeprazole were discontinued*
- *Two months later after successful treatment he was awaiting discharge. His anticoagulant had been restarted. Unexpectedly he developed large volume melaena*
- *A group and screen sample taken at 10:01 was received in the laboratory at 13:15 (portering delays) but not processed due to incorrect labelling. The clinical team did not know this due to the laboratory information management system not interacting with the patient information system*
- *The full blood count sample was clotted, requiring repeat. At 16:26 haemoglobin 66g/L was noted and transfusion of two units requested*
- *The repeat sample for transfusion was delivered to the laboratory at 17:09 (diagnosis anaemia rather than GI bleeding) requesting blood for 20:00. However, at 19:00 he had a large rectal bleed and died.*

Delayed transfusion despite severe anaemia and gastrointestinal (GI) bleeding

- *An elderly woman presented to the emergency department with lethargy and a history of dark stools. She was taking apixaban for atrial fibrillation. Her haemoglobin was 36g/L*
- *Two units of blood were prescribed but not ordered from the laboratory*
- *There was delayed medical review*
- *She had a massive GI bleed after transfer to the ward and died without transfusion after a 9-hour delay*

Ruptured ectopic pregnancy with delayed diagnosis

- *A young woman presented with vaginal bleeding and three syncopal episodes at 17:45. Her blood pressure (BP) 62/30 improved with fluids to 95/53mmHg*
- *She was referred to gynaecology who were unable to review her in the emergency department, so she was transferred to the ward at 20:15. The diagnosis of ruptured ectopic pregnancy was then considered but not escalated*
- *She became increasingly hypotensive over the next 2 hours with tachycardia and haemoglobin 51g/L on venous gas. When taken to surgery at 23:55 she was haemodynamically unstable, systolic BP 45mmHg, tachycardia of 160 beats per minute*
- *It took more than 1.5 hours to stabilise her and secure venous access. The estimated blood loss was 5-6L. She was admitted to intensive care unit and made a full recovery*
- *The review noted that there had been failure to recognise how sick she was and there was delayed major haemorrhage protocol activation*

Death related to failure to transfuse in timely manner in a patient with autoimmune haemolytic anaemia (AIHA) (1)

- *An elderly man with chronic lymphocytic leukaemia complicated by autoimmune haemolysis (diagnosed in 2015) was on a small dose of prednisolone. He was recently noted to have critical aortic stenosis and presented with shortness of breath, dizziness, and blackouts. His haemoglobin (Hb) was 76g/L and red cells were requested*
- *Transfusion was delayed*
- *Due to a positive antibody screen (AIHA) the blood had to be crossmatched at the specialist red cell immunology laboratory. The correct procedure was not followed exacerbating the delay. The urgency of transfusion was not communicated to the referral service. The next day was a bank holiday. The samples arrived out-of-hours (could be 2 hours by taxi but took longer as sent using a Blood Service driver)*

(Continued)

Death related to failure to transfuse in timely manner in a patient with autoimmune haemolytic anaemia (AIHA) (2)

- *The local hospital made available the least incompatible units (ABO Rh-compatible and K-negative)*
- *Over the course of the next day the Hb result of 59g/L was delayed as samples were marked 'routine', the blood was not given, the patient deteriorated and died*
- *The units were available from the Blood Service within 4 hours of the discussion about urgency. The available local hospital units were 'not collected as the ward environment was considered too unsafe to give a transfusion' because of high level of patients needing intense input*
- *The transfusion laboratory was understaffed*

Newly diagnosed autoimmune haemolysis results in delayed transfusion

- *A patient with chronic lymphocytic leukaemia developed severe anaemia (haemoglobin 53g/L) due to new autoimmune haemolysis*
- *Blood samples were obtained at 19:00. A 20-hour delay in obtaining red cells resulted because the samples needed to be sent out to a specialist laboratory*
- *There was poor communication with failure to escalate to haematology consultants and misunderstanding about the concessionary release policy*
- *The patient sustained myocardial ischaemia due to the anaemia (major morbidity)*

A dangerous antibody in pregnancy

- *An anti-K antibody in a pregnant woman found at booking (at about 12 weeks) was not reported in a timely manner and was noted by the midwife 4 weeks later when the titre was 1 in 512*
- *This delay impacted referral to the fetal medicine unit*
- *Serial intrauterine transfusions were required starting at about 18 weeks for anaemia*

Delay in providing blood for neonatal exchange transfusion due to multiple factors

- *A neonate with haemolytic disease of the fetus and newborn required an exchange transfusion*
- *Blood was requested from the Blood Service but was not received within the expected timeframe (2.5 hours)*
- *When blood was finally delivered 4.5 hours from order time, there were further delays in the hospital laboratory due to problems with the maternal sample and staff misunderstanding of results*

Bleeding in a high-risk patient after total hip replacement (THR) requiring interhospital transfer

- *A man in his 50s underwent THR. He had significant comorbidity with a metallic aortic valve replacement and renal disease*
- *He also had a history of bleeding after several procedures in the past including a previous THR and renal biopsy. This history was missed at preoperative assessment as the old notes were not available.*
- *He was seen by anaesthetist but there was no haematology collaboration. His renal team had suggested he should be managed at level 3 site, but this letter was sent only to the general practitioner*
- *A high dependency unit bed was booked for post-operative care and his anticoagulants were resumed later on day of surgery. Early next morning oozing was noted and two units of red cells were requested from the main site*
- *There was a delay of 6 hours due to confusion about how to request components and lack of a major haemorrhage protocol at the treating site. His haemoglobin on the blood gas machine was 60g/L.*
- *He returned to theatre for wound exploration – general ooze, received five units of red cells and cell salvage. Later four units of fresh frozen plasma and then needed to transfer to another hospital for level 3 care including renal dialysis*
- *He recovered and was discharged 10 days later*

Severe anaemia with delayed transfusion leads to cardiac arrest

- *A man in his 70s was admitted with symptomatic anaemia (haemoglobin 41g/L) due to gastrointestinal (GI) bleeding*
- *One unit of red cells was prescribed at 13:15 but not given. A second sample was sent at 15:00, four units were issued at 16:45*
- *Following transfer to medical admissions unit he had a cardiac arrest at 20:00 then was transfused all four units 7 hours after they were issued*
- *He should have been reviewed before transfer out of the emergency department, the urgency of transfusion was not indicated to laboratory and transfusion request forms not correctly completed*
- *He could have received emergency group O red cells*

Delay and death due to lack of venous access

- *An elderly man with many comorbidities had a major haemorrhage call put out but there was delay (25 minutes) in finding the crash trolley which had the intraosseous gun needed to obtain venous access, and administration of emergency red cells*
- *The patient died and the review felt that failure of timely receipt of blood was contributory. Site of bleeding not stated*

Misinterpretation of black stools - missed diagnosis of gastrointestinal (GI) bleeding with delayed transfusion (1)

- *An elderly man attended the emergency department with a history of loose black stools which were observed on admission. He was on chemotherapy for myelodysplastic syndrome and had been transfused 2 days before*
- *On this admission his haemoglobin (Hb) was 64g/L, he was hypotensive (blood pressure 89/47) and was treated for sepsis with intravenous fluid and antibiotics. He was noted to have a raised urea (17.4mmol/L, normal range 2.5-7.8) with a normal creatinine. He was known to have been anaemic and the black stools were attributed to his treatment with ferrous sulphate*
- *After this 4-hour admission he was discharged home to continue oral rehydration*
- *Two days later he was readmitted (at 11:23) having collapsed at home. He was short of breath, had evidence of myocardial ischaemia and blood gas analysis showed Hb 52g/L*

(Continued)

Misinterpretation of black stools - missed diagnosis of gastrointestinal (GI) bleeding with delayed transfusion (2)

- *Transfusion was prescribed but delayed to 15:35 as one of the two samples was rejected. He received 3 units, post transfusion Hb 76g/L*
- *The following day he became progressively more unwell with evidence of heart failure and falling Hb to 50g/L*
- *Transfusion did not take place as not prescribed. He died on the 4th day of this admission*
- *In addition to the black stools, the considerably raised urea with a normal creatinine was an important clue to gastrointestinal bleeding*

Delayed transfusion due to fever

- *An elderly woman presented after chemotherapy with epistaxis, fever of 39^{o}C and shortness of breath. Her haemoglobin was 57g/L and platelets 9x10^{9}/L*
- *Blood component therapy was withheld due to fever until the following morning. This was due to misunderstanding by the junior doctor of what to do*
- *Death some days later was not contributed to by this 6 hour delay*

Incorrect sample labelling and delayed collection contribute to death

- *An elderly woman with comorbidities was not transfused until the second day of her admission. Her haemoglobin had reduced from 77 to 66g/L*
- *The first transfusion sample was not processed as it was wrongly labelled with an addressograph label*
- *When the blood was ready there was a delay in collection. The transfusion delay was considered to contribute to her death*

Delayed transfusion despite severe anaemia and gastrointestinal bleeding

- *An elderly woman presented to the emergency department with lethargy and a history of dark stools. She was taking apixaban for atrial fibrillation*
- *Her haemoglobin was 36g/L. Two units of blood were prescribed but not ordered from the laboratory. There was delayed medical review*
- *She had a massive gastrointestinal bleed after transfer to the ward and died without receiving the blood after a 9-hour delay*

Delayed transfusion and failure to recognise deterioration

- *A woman in her 70s was admitted with acute leukaemia and sepsis*
- *There was failure to identify her deteriorating condition over several hours despite a high early warning score and poor communication between teams*
- *The non-specialist staff were reluctant to start transfusion because the patient had a fever*
- *She was admitted to intensive care and transfused after more than 12 hours but died a few hours later*

Avoidable Transfusions

Inappropriate management of anaemia

- *A woman in her 60s with minimal symptoms was found to have a haemoglobin (Hb) 62g/L*
- *She was transfused with three units of red cells without checking the Hb until afterwards when it was 103g/L. She was then found to have B12 deficiency*
- *Three days later when Hb was 89g/L she was given another unit, and a further unit the next day when Hb was 94g/L*

Get the blood sample details right first time – potentially avoidable use of O D-negative blood at delivery

- *The initial sample from a woman's booking visit to the antenatal clinic was successfully grouped without incident (A D-positive), however a subsequent sample taken 6 months later gave a different result (O D-positive).This discrepancy was flagged on the analyser but was not acted on correctly by the member of staff processing the samples, instead the result was amended manually and transmitted*
- *Three weeks later the group was again O D-positive but was now flagged as a wrong blood in tube. The next grouping sample was clotted. The fifth sample was taken when the woman was in the delivery suite*
- *By now there were two records of A D-positive and two that were O D-positive. Emergency O D-negative blood was issued as the blood grouping results did not match either of the previous results*
- *Neither the acceptance of the discrepant result on the analyser or its subsequent amendment on the laboratory information management system (LIMS) were in accordance with laboratory standard operating procedures*
- *Further information was provided in the investigation report submitted by the reporter. It stated that the provider of LIMS systems was subsequently contacted, and a call logged to investigate whether it would be possible to limit access to the grouping results editor function to higher level staff. On this occasion the member of staff had used this function instead of following documented laboratory procedures.*
- *LIMS access rights could not be restricted*

Avoidable transfusion of group O D-negative units in an emergency

- *The major haemorrhage protocol had been activated for a patient on the obstetric delivery unit*
- *The porter arrived in the laboratory to collect the shock pack. The biomedical scientist (BMS) selected a bag containing two units of red cells from the refrigerator, signed them out and handed them to the porter*
- *They were transfused and retrospectively assigned to the patient. This occurred towards the end of a shift.*
- *When the next BMS on duty came to replace the shock pack they noticed that although the O D-positive units were signed out and allocated, the O D-negative shock pack was actually given to the porter and had been transfused*
- *The patient's group was O D-positive, this had been checked before the shock pack was collected and was the reason the BMS intended to give the O D-positive units instead of the O D-negative units*
- *On realising the mistake, the BMS allocated the correct units to the patient.*

Under or Overtransfusion

Overtransfusion in a case of abdominal aortic aneurysm (AAA) (case 1)

- *A man in his 80s collapsed at home. He was found to have a ruptured AAA and proceeded to surgery receiving a total of more than 3L of red cells and cell salvage material*
- *The postoperative haemoglobin was 202g/L*
- *He died later the same day (death 'possibly related' to transfusion)*

Overtransfusion in a case of abdominal aortic aneurysm (AAA) (case 2)

- *This case was associated with estimated blood loss of more than 10L and a postoperative Hb 181g/L*
- *The review (death unrelated to transfusion) noted that reliance was placed on Hb estimation from serial blood gases and formal laboratory tests (FBC, clotting screen and fibrinogen) were not undertaken until the patient was admitted to the ICU postoperatively*
- *Overtransfusion might have been avoided if near patient testing had been supplemented by formal laboratory blood tests during surgery*
- *However, the case review noted that 'the patient was cardiovascularly unstable with catastrophic blood loss and corresponding aggressive fluid replacement which meant that accurate assessment of fluid balance would have been challenging whatever means of assessment were used'*

Unexpected complication of pregnancy

- *A woman in her 30s was found to have an unexpected placenta praevia at caesarean section and suffered major haemorrhage*
- *She received massive transfusion of red cells, plasma, platelets, and cell salvage*
- *Her preoperative Hb was 123g/L and postoperative was 173g/L indicating that she had received more red cells than she needed*

Haemoglobin (Hb) not checked between transfused units

- *A woman in her 90s presented with breathlessness due to heart failure and was transfused two units of red cells on the basis of Hb 56g/L*
- *Her Hb was not checked between units and post transfusion was 160g/L suggesting the first result had been incorrect. In addition, the pre-transfusion Hb result of 140g/L on the blood gas machine was not noticed*
- *Fortunately, she did not experience worsening heart failure as a result*

An excess of platelet transfusions

- *A young man with leukaemia and history of retinal haemorrhages received excessive doses of platelets (three units)*
- *The decision to transfuse had been made taking into account a historical note in the patient's medical records that the platelet target should be $50x10^9$/L. The patient was known to have poor increments to transfused platelets*
- *When the case was reviewed after all the 3 units were given it was noted that these units were avoidable as the patient platelet count was acceptable and the retinal haemorrhages had occurred several days previously so the platelet target was no longer required*
- *This advice had not been updated in a timely manner in the patient's records*

Second unit of red cells transfused without authorisation or clinical need

- *An elderly woman with pelvic fractures following a fall received a unit of red cells with a post transfusion haemoglobin 85g/L*
- *A second unit was subsequently transfused that was not indicated or prescribed due to miscommunication during handover*
- *The nurse administering the second unit saw that there was another unit available for the patient but did not check the medical notes or blood prescription prior to administering the second unit*

Prothrombin Complex Concentrate (PCC)

Three cases of suspected intracranial haemorrhage (ICH) with delayed infusion

1. *In a patient on warfarin with a head injury, there was a 4-hour delay while the patient was moved between departments and the prescription was lost*

2. *Following a head injury in a patient on apixaban for atrial fibrillation the infusion was set to run at 1mL/hour instead of 1mL/minute. This was recognised after running for 16 hours*

3. *A man in his 80s with suspected ICH had delayed administration because each vial was collected separately from the transfusion laboratory rather than all collected together*

Near Miss – Wrong Blood in Tube (WBIT)

Misidentification of an adult triplet

- *A woman attended the early pregnancy unit wearing a facemask (COVID-19 precautions). The midwife asked for her name, first line of address and date of birth. Blood samples were taken but allocated to the wrong patient record*
- *She was one of triplets with the same date of birth, family name and address. The first name was misheard but very similar to the others, differing only by a letter*
- *The patient was concerned that this might have happened and clarified her name when the results were telephoned*
- *The triplets were advised for any hospital attendance always to ensure they were identified in addition by their middle names which were different*

Patient identification errors by three different members of staff (1)

- *Before admission, a ward clerk updated a patient name for a child <5 years of age (Patient 1) from 'baby' to a name already belonging to another patient (Patient 2)*
- *On admission no ID band was put on, Nurse 1 sampled the patient without positive identification and labelled the sample using patient notes. This sample from Patient 1 (labelled with Patient 2 details) was rejected due to an insufficient amount of blood in the sample tube*
- *Nurse 2 (without required competency for transfusion) took another sample again without positive ID from Patient 1 (labelled with Patient 2 details) labelling it away from the bedside using the request form and prescription chart. This sample was also rejected as there was no signature to confirm the patient had been identified*
- *A blood group request was made on the computer with Patient 2's details, further samples were taken from Patient 1 and accepted by the transfusion laboratory. The blood group result was entered on Patient 2's record (sample was from Patient 1)*

(Continued)

Patient identification errors by three different members of staff (2)

- *A request was made for platelets using the correct details for Patient 1, but the laboratory staff now asked for blood samples as they did not have a confirmed group*
- *The ward staff knew their patient had several blood samples taken earlier and the nurse was asked to confirm the ID of the patient she had sampled. She then confirmed with the mother that this was Patient 1 who had been misidentified as Patient 2*
- *Platelets were transfused with delay while the child was admitted to the high dependency unit and an ID band was applied*

A D-negative mother apparently had a D-negative baby

- *An antenatal cell-free fetal DNA test predicted the baby would be D-positive*
- *Laboratory testing of the paired samples showed that maternal blood was present in both mother and 'cord' sample bottles. Repeat sampling from the baby confirmed the group as D-positive*
- *The reporter noted: 'There have been several WBIT errors from midwives and the transfusion practitioners have been taken off the training programme for face-to-face sessions so there is a reminder about sample labelling to be included in the drills and skills'*

A mother identifies that her baby cannot be D-positive

- *Blood was taken from a neonate for grouping as the mother was known to be D-negative. The baby's sample grouped as B D-positive*
- *The mother was informed of her requirement for anti-D Ig, but she informed the staff that the child's father was also D-negative.*
- *The baby was bled again twice and grouped as A D-negative on both occasions*

Right Blood Right Patient (RBRP)

Incorrectly labelled emergency components transfused due to clerical error

- *During core hours a major haemorrhage protocol was pre-activated on unknown Patient 1 (a male in his 50s) who was issued with the next emergency ID (ID X) on the list of ID used for unknown patients. This was not entered onto the system immediately as the member of staff was not aware of the full procedure but was trying to help*
- *Before Patient 1's arrival in the ED, an unknown Patient 2 was issued with ID X and this was entered on the system*
- *When Patient 1 arrived, a new ID had to be issued (ID Y) but the required blood components had been issued using ID X*
- *The error was recognised but the patient was peri arrest and medical staff felt that the delay caused by re-labelling would be detrimental to the patient's outcome*

Patient 2 appears to have had patient 1's unit of red cells

- *Two patients on the same ward were to receive blood*
- *Patient 1 was prescribed two units on the transfusion documentation but only one was recorded as given. Patient 2 was prescribed one unit on the transfusion documentation, but it was recorded that two had been given*
- *The second unit documented as given to Patient 2 was one issued for Patient 1*
- *A two-person independent checklist was completed but the compatibility tag was applied to the transfusion documentation retrospectively away from the bedside at the nurses' station*
- *This was a documentation error; the patients did receive the correct units*

Laboratory Errors

Historical transfusion of a unit of red cells resulted in antibody formation

- *An antenatal booking group and screen for a patient in her 30s at 16 weeks' gestation revealed a positive antibody screen*
- *The sample was sent to the reference laboratory at the Blood Service for antibody identification and titration. Two antibodies were confirmed, anti-K and anti-Fy^{a}, both with high titration levels*
- *On investigation by the hospital transfusion laboratory, it was found that this patient had been transfused one of two units of red cells issued in 2014 during a postpartum haemorrhage*
- *The unit transfused was found to be K-positive and Fy^{a} status was not known*

Red cell antibody identification error due to heterozygous cell selection (1)

- *A male patient in his 50s was admitted with haematemesis and a haemoglobin of 53g/L. The antibody screen was positive, and the initial antibody panel appeared to identify anti-c and anti-E*
- *A full crossmatch was performed with c-negative and E-negative units and were found to be incompatible. The results were referred to the senior BMS who noted that anti-M and anti-S had not been excluded from the initial antibody panel and suggested it was probably anti-M and to select and crossmatch four M-negative units while more panel work was being done*
- *One of these four units was found to be compatible, it was issued and subsequently transfused to the patient*
- *A further four M-negative units were requested from the Blood Service and crossmatched but only one of these four was compatible. At this point the patient refused any more blood so the remaining compatible unit was kept on standby*

(Continued)

Red cell antibody identification error due to heterozygous cell selection (2)

- *The next day samples were sent to the Blood Service for antibody investigation as anti-S had still not been excluded*
- *The Blood Service later rang the laboratory to say the patient had a historical anti-S from a sample sent from a different hospital and these results were available on the Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment (Sp-ICE) system*
- *On investigation the cells selected to exclude or confirm anti-M were homozygous but were heterozygous for the S antigen and gave a negative result (dosage effect)*
- *The Blood Service were contacted, and they confirmed the unit transfused was S-negative as was the unit on standby so there was no patient harm*

Anti-D immunoglobulin (Ig) omitted due to misleading information in product instructions for use (IFU) document (1)

- *A female patient in her 20s had antenatal booking blood samples received in the transfusion laboratory at hospital A. She was found to be D-positive (with a 3+ reaction strength) and had no antibodies detected, these results were also found at 28 weeks*
- *Her care was later transferred to hospital B who used the same grouping analyser as hospital A. At hospital B she also had a 3+ strength reaction with anti-D, however her result was entered as D-negative, her sample was sent to the reference laboratory for confirmation and she was provided with anti-D Ig prophylaxis*
- *The sample was further tested within international blood group laboratory and the result found to be a D variant*
- *For the analyser used by both sites, a 3+ reaction requests the BMS to review and acknowledge the results and the IFU documentation states 2+ or <2+ reactions are to be confirmed by an alternative method*

Anti-D immunoglobulin (Ig) omitted due to misleading information in product instructions for use (IFU) document (2)

- *No referral took place from hospital A as the results were 3+ for D grouping, however hospital B had experienced a previous incident regarding reaction strengths in 2017 and now referred all D-positive reactions of 3+ strength or below to the reference laboratory*
- *Despite this previous incident, and this case being raised at user group meetings, the reporter had indicated they were yet to receive a field safety notice highlighting this issue, nor had the IFU been updated, though the manufacturer had indicated they would escalate this matter*
- *The manufacturer had communicated to the reporter that they believed a review of 3+ reaction strength was a sufficient safety measure.*
- *Locally, the standard operating procedure at hospital A was updated and all staff informed of the change in procedure.*
- *This patient was scheduled to be followed up at 6 months post-delivery to determine if sensitisation to the D antigen had occurred*

Sickle Cell Disease (SCD) patient with a haemoglobin (Hb) of 51g/l transfused incorrect red cells (1)

- *A six year old female patient who was unknown to the hospital was admitted with SCD and a Hb of 51g/l. A sample was sent for a group and antibody screen*
- *The blood group was processed and a dual population of red cells was seen in the D type. The biomedical scientist (BMS) rang the ward to ask for the patient's transfusion history but they did not have any details*
- *The BMS then translated the blood group to O positive as the population of D positive cells looked greater than the D negative cells. This was also done in the assumption that the patient had been given group O D negative blood at another hospital*
- *The BMS then issued two group O D positive red cell units and both were transfused. The laboratory procedure is to give O D negative red cells when the patient's D type cannot be established, if the patient is a woman of childbearing potential or a child <16 years old. This was not done in this case*

(Continued)

Sickle Cell Disease (SCD) patient with a haemoglobin (Hb) of 51g/l transfused incorrect red cells (2)

- *For SCD patients, it is also required to transfuse red cells that are negative for HbS and to perform and Rh phenotype and issue phenotype compatible units, but this was also not done*
- *The Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment (Sp-ICE) system was checked the next day and it was found that the patient was a D variant requiring D negative, E negative and HbS negative red cells for transfusion*
- *On investigation it was found that not only were both units D positive, but one unit was E positive and only one was HbS negative*

Red cells and cryoprecipitate issued with incorrect date of birth (DOB)- Cryoprecipitate transfused (1)

- *A female patient in her late teens was admitted to hospital B as an emergency transfer from hospital A. The laboratory had been given advance notice of the patient as a haematological referral (acute promyelocytic leukaemia with disseminated intravascular coagulation and multisite bleeding)*
- *The laboratory information management system (LIMS) at hospital B has a shared database with hospital A and the patient identification details had been registered on this prior to transfer*
- *Patient had received two units of emergency O D negative red cells prior to transfer. The laboratory at the receiving hospital B received group and screen samples and a request for four units of red cells at 20:22*
- *The samples were booked in against the patient details accessed by the LIMS from hospital A, however there was a discrepancy in DOB which was not detected at this stage*
- *A further request was received for two units of cryoprecipitate and these issued and collected and transfused at 22:30hrs. The four red cell units moved to the Critical Care Fridge at 23:00*

(Continued)

Red cells and cryoprecipitate issued with incorrect date of birth (DOB)- Cryoprecipitate transfused (2)

- *When a nurse checked the patient details on the first unit removed for transfusion, a DOB discrepancy was noticed, and the laboratory was informed. When the BMS checked the patient information on the request form and samples against the laboratory information management system (LIMS), the error in DOB on the LIMS was noticed*
- *The red cell units were recalled, error corrected on the LIMS and red cells re-labelled, but the two units of cryoprecipitate had already been transfused*
- *On investigation the DOB error occurred in hospital A and the laboratory was aware but was unable to amend as the record had become locked, but did not alert hospital B of this*
- *The laboratory in hospital B has a sample to LIMS second check process in place prior to analysis and the paperwork was signed to say this had been completed but the error had not been picked up*
- *The nurse who transfused the cryoprecipitate failed to notice the error in the pre administration checks*

Febrile, Allergic and Hypotensive Reactions (FAHR)

Inappropriate treatment of a febrile reaction

- *A patient in his 50s with acute myeloid leukaemia attended the haematology day unit for a routine platelet transfusion*
- *On completion he developed rigors, fever, and breathlessness. His temperature rose to 40.1°C from a baseline of 37.4°C and oxygen saturations fell to 94% on oxygen*
- *He was given IV hydrocortisone and antihistamine with little effect. He was subsequently administered 1mg adrenaline, 4.5g piperacillin with tazobactam (tazocin) (antibiotic) IV, 1g paracetamol and IV fluids*
- *His symptoms settled over the following hour, but he was admitted for observation. Blood cultures were negative and there was no rise in mast cell tryptase.*

Inappropriate treatment in the presence of a potential haemolytic transfusion reaction

- *A lady in her 70s with myelodysplastic syndrome and known alloantibodies attended for a scheduled two-unit blood transfusion. The units had been crossmatched at the reference laboratory due to slight reaction on crossmatch when performed in-house.*
- *Halfway through the second unit the patient developed rigors, a rise in temperature (38.4°C from baseline 37.7°C) and elevated blood pressure (130/60 to 167/88 mmHg)*
- *The nurse stopped the transfusion and asked for medical review. The registrar prescribed 10mg antihistamine and 100mg hydrocortisone and told the nurse to continue the transfusion in 30 minutes*
- *However, the patient's symptoms worsened, and she complained of pain in her kidneys. She was given a further 100mg hydrocortisone and 1g paracetamol. Her symptoms resolved within a few hours*
- *Samples sent for serological investigation revealed no evidence of a haemolytic transfusion reaction*

Appropriate treatment

- *A man in his 20s who had suffered polytrauma received a postoperative blood transfusion*
- *After 30 minutes, routine observations revealed a temperature rise from 37.6 to 39°C*
- *He was treated with IV paracetamol and transfusion was continued. His temperature continued to reduce until returning to baseline around 12 hours post transfusion*

Transfusion-Related Acute Lung Injury (TRALI)

Possible transfusion-related acute lung injury (TRALI)

- *A woman in her 80s was readmitted 4 hours after an outpatient two-unit red cell transfusion, with sudden onset of cough and breathlessness*
- *Chest X-ray showed bilateral pulmonary oedema but also dense consolidation in the right upper lobe. A COVID-19 test was negative, and she had normal C reactive protein and electrocardiogram*
- *She died on the night of admission. Investigation of donors showed a human neutrophil antibody 1b (auto)antibody in one donor which was cognate with the recipient however this was not detectable on the archive sample from the time of donation*
- *The history appeared fairly classical, possibly with pneumonia acting as a 'first hit'. The case has been classified as 'TRALI type II' in the consensus redefinition schema due to the presence of another risk factor for lung injury (consolidation on chest X-ray)*
- *In the SHOT classification schema the case has been classified as "equivocal TRALI". We are unable to exclude the pneumonia being the sole cause; the significance of the late detected antibody is unclear but should be considered as possibly causative given that it is not uncommon in other contexts, particularly neonatal alloimmune thrombocytopenia, for morbidity to occur with an antibody becoming subsequently detectable*

Highly likely transfusion-related acute lung injury (TRALI)

- *A dialysis-dependent man in his 70s received a two-unit transfusion while on dialysis, with fluid removal taking account of the transfusion volume*
- *He developed acute pulmonary oedema around the time of the second unit. Fluid overload was suspected but he deteriorated following further ultrafiltration. Echocardiogram was normal. He improved after 24 hours of supportive care*
- *Multiple human leucocyte antibodies (class I and class II) cognate with the recipient were identified in the donor of the first unit*
- *The features are consistent with a classical antibody-mediated TRALI, and thus has been classified as 'highly likely TRALI'. The case has been classified as 'TRALI type I' in the consensus redefinition schema because of the absence of other risk factors for acute lung injury*

Transfusion-Associated Dyspnoea (TAD)

Severe shortness of breath and agitation

- *A patient in her 70s admitted with suspected acute coronary syndrome had multiple co-morbidities: lung cancer, chronic kidney disease, paroxysmal atrial fibrillation, and hypertension*
- *The patient had a deterioration in her respiratory status in the 12 hours prior to transfusion*
- *During a red cell transfusion, the patient developed severe shortness of breath and agitation*
- *Hydrocortisone, chlorphenamine and diuretics were given with no effect and the patient went into cardiac arrest*

Cardiac arrest following transfusion

- *A man in his 70s was admitted with shortness of breath and suspected community acquired pneumonia*
- *He had acute kidney impairment, congenital isolated hyperinsulinism, right bundle branch block, hypertension and had clinical evidence of fluid overload prior to transfusion*
- *Whilst being transfused a unit of red cells, the patient's condition deteriorated quickly leading to cardiac arrest*
- *The patient was resuscitated, admitted to Intensive care following arrest, but died 4 days later*

Respiratory distress and tachycardia following a platelet transfusion

- *A man in his mid-70s with metastatic prostate cancer and bone marrow failure was admitted following collapse for further evaluation and treatment*
- *During transfusion of irradiated apheresis platelets, the patient developed acute respiratory distress and tachycardia*
- *There was no clinical evidence of circulatory overload. No information regarding input/output was available. He had received two red cell units in the 24 hours prior to this*
- *He was given steroids, diuretics and oxygen. The diuresis response was not recorded*
- *The patient worsened, was reviewed by the critical care team, and a decision was made for no escalation in care and to remain on the ward for palliative care*
- *The chest x-ray post transfusion showed patchy consolidation in the right lower zone*

Transfusion Associated Acute Lung Injury (TRALI) type II

- *A patient in his 70s, with metastatic lung adenocarcinoma, was admitted with community acquired pneumonia and suspect sepsis*
- *He was transfused two units of red cells for haemoglobin (Hb) 54g/L, 5 hours and 40 minutes later the patient went into respiratory failure requiring non-invasive ventilation and admission to Intensive Care Unit. He later deteriorated and died*
- *The case was discussed with the Blood Service consultant and investigated for TRALI*
- *A chest x-ray done post transfusion showed bilateral ground-glass opacities with relative sparing of lung apices. Blunting of the costophrenic (CP) angles was seen, more on the left suggestive of pleural effusion. Findings were consistent with pulmonary oedema*
- *TRALI investigations revealed human leukocyte antigen (HLA) class I antibodies in the donor of this unit, but not cognate to the patient. No HLA class II antibodies or granulocyte-specific antibodies were found. These results do not support a diagnosis of antibody-mediated TRALI*
- *This case has been included in Transfusion Associated Dyspnoea (TAD) and would qualify for TRALI type II under the consensus redefinition*

Imputability 1 (possible) (1)

- *A woman in her mid-20s was admitted to the maternity unit having suffered an eclamptic seizure at home at 27^{+5} weeks gestation. Intrauterine fetal demise was diagnosed due to a large abruption*
- *She then underwent an emergency caesarean section, was coagulopathic and developed severe post-partum haemorrhage (PPH)*
- *She received several blood components: four units of fresh frozen plasma (FFP), four pools of cryoprecipitate, four units of packed red cells and one unit of platelets*
- *After leaving theatre, she was transferred to intensive care unit. At this point a positive bacterial culture (BactAlert) from the platelets had been reported to the Blood Service consultant who then contacted the clinical area to inform them of potential contamination. There were no infective issues reported at the time*

Imputability 1 (possible) (2)

- *The organism was later identified as Propionibacterium acnes. The patient did not recover as would be expected postoperatively. Her chest x-ray showed non-specific diffuse ground glass shadowing consistent with acute respiratory distress syndrome (ARDS). There were no positive blood cultures from the patient*
- *A head computerised tomography (CT) scan 4 days after surgery showed changes consistent with posterior reversible encephalopathy syndrome (PRES). The chest CT showed ARDS. She deteriorated and was increasingly difficult to ventilate so was transferred for extracorporeal membrane oxygenation (ECMO) and improved slowly*
- *A possible diagnosis of Transfusion Associated Acute Lung Injury (TRALI) was considered 4 days after the transfusions. Human leukocyte antigen (HLA) A2 Ab detected not cognate to the patient*

Haemolytic Transfusion Reactions (HTR)

Haemolytic Transfusion Reaction (HTR) investigation prompted by a failure in haemoglobin (Hb) increment post transfusion

- *A patient with B cell lymphoma was transfused to treat chronic anaemia*
- *A non-specific antibody was reported in the pre-transfusion antibody investigation and two units of crossmatch-compatible red cells were issued*
- *The patient did not show any clinical symptoms of HTR except that they failed to show the expected increment in Hb post transfusion*
- *Repeat samples were sent to the transfusion laboratory. The post-transfusion direct antiglobulin test (DAT) was positive and anti-Jk^{a} was identified in the plasma*
- *The pre-transfusion serology was reviewed, and it was concluded that the pre-transfusion sample also showed evidence of anti-Jk^{a}*

Failure to issue extended rhesus (Rh) matched units

- *A young patient with sickle cell anaemia received an exchange transfusion in 2014 without being tested for an extended phenotype*
- *In 2020 the patient was given another exchange transfusion. The patient had the Ro (D+C-c+E-e+) phenotype however the units transfused were only matched for ABO and K type*
- *Following transfusion, the patient showed signs of haemoglobinuria, jaundice and a falling haemoglobin (Hb) and anti-C and anti-E were detected in the post-transfusion sample*

Transfusion-Transmitted Infections (TTI)

Probable Hepatitis B (HBV) TTI case: (Morbidity: 0; imputability: 2 probable) (1)

- *A male in his 50s was diagnosed with an acute HBV infection following a routine dialysis screening, which included testing for HBsAg. The case was initially reported to Public Health England (PHE) by the renal team following the first HBsAg positive result*
- *Retrospective testing of patient samples found HBV DNA in a December 2019 sample; samples tested prior to that were negative for HBV including anti-HBc*
- *No other source or risk factors for HBV infection were identified, but it should be noted that the patient was born in a part of the world where HBV is endemic, and hence reactivation cannot be completely excluded*
- *Staff and patient screening were performed, and no obvious source was found. The patient had not been vaccinated against HBV and did not present with any symptoms*

Probable Hepatitis B (HBV) TTI case: (Morbidity: 0; imputability: 2 probable) (2)

- *Blood transfusions from the previous 6 months were identified; these included 11 donor exposures. A total of 10 returning donors tested negative for anti-HBc, the remaining blood donor tested positive for anti-HBc. They had given three previous donations, and these were found positive for anti-HBc in retrospective testing. HBV DNA was detected in the implicated red cell donation at 8.6IU/mL; lookback into FFP and two HBV DNA-negative donations are still on-going. All three donations were HBsAg negative on screening, and no HBV DNA was detected at the time of donation. This is in keeping with an Occult Hepatitis B infection (OBI) in the donor, who was born in an HBV endemic country. The donor has been informed that they have OBI and has been referred for specialist care. They can no longer donate blood*
- *A large volume follow-up sample was obtained from this donor to allow further sequence comparison between their sample and recipient sample. Unfortunately, HBV DNA was not detectable on the donor sample despite concentration (note low levels of fluctuating HBV DNA is typical in OBI). The recipient sample was identified as HBV genotype E; the common type identified in Sub-Saharan Africa and keeping with transmission*

2019 - Probable Hepatitis E (HEV) TTI case from 2019

- *This was a multi-transfused female in her 20s with aplastic anaemia and Turners syndrome. She was diagnosed with HEV infection in August 2019, and although the virus has now cleared from her blood, anti-viral treatment has not been stopped yet (due to her immunosuppression). Fortunately, her Alanine Aminotransferase (ALT) levels have remained normal and she has not developed a hepatitis*

- *It was identified retrospectively that a red cell donation she received in June 2019 contained a small amount of HEV RNA (31 IU/mL). This unit was tested correctly at the time of donation testing, but HEV RNA was not detectable with the screening assay at this level (a detection limit around 500IU/mL). Due to the small viral load, we could not do sequencing to confirm the transmission and hence the case is reported as probable. It is recognised that the current HEV screening in place in England will not be able to identify donations with a very small amount of HEV RNA*

Cell Salvage (CS)

Massive obstetric haemorrhage patient unable to receive reinfusion of red cells due to suspected machine failure

- *In an emergency caesarean section, 3L of blood was collected and was being processed*
- *The cell salvage operator became concerned that the quality of the reinfusion product was suboptimal as the device was not showing the washing efficiency as it normally would. The machine was swapped for a second device and the same issue occurred*
- *After discussion with the anaesthetist, the cell salvage process was abandoned and a decision to use allogeneic blood made*
- *Subsequent investigation revealed that the cell salvage devices had been serviced by a third-party engineer. The programming was changed to factory default settings with the wash quality settings routinely used in the hospital turned off. This had not been communicated to the cell salvage lead and the devices were assumed to be working as normal after servicing*

Cell salvage used outside of guidelines in massive obstetric haemorrhage with successful outcome

- *A parturient in her 20s, with an abnormally invasive placenta, underwent an emergency caesarean section. Massive blood loss ensued, estimated in the region of 10L, and a hysterectomy was required*
- *Cell salvage was utilised and within the urgency of the situation the surgeons made an on the spot decision to salvage blood lost from the vagina as well as the abdomen*
- *This was not communicated to the cell salvage operator or anaesthetist at the time*
- *Blood salvage from vaginal loss was outside of national guidelines. All blood collected was processed and 2496mL of salvaged red cells reinfused without the use of a leucocyte reduction filter, along with over 30 units of allogeneic blood components*
- *The patient recovered well without the need for intensive care unit admission. There were no signs of transfusion reaction or bacterial contamination*

Paediatric Cases

Transfusion delay and death due to multiple factors

- *A young infant had a liver biopsy performed*
- *Post procedure they developed internal bleeding, and this was not noticed*
- *There was then a delay activating the major haemorrhage protocol and a delay in recognising the need for the neonatal O D-negative blood, which was available*
- *This resulted in a delay of over 3 hours before the infant received any red cells. This was partly due to communication issues*
- *The patient did not survive*

Delay in recognising major haemorrhage

- *A 2kg infant was admitted to the Emergency department (ED) overnight with rectal bleeding following a suction rectal biopsy which had been performed the day before*
- *There was history of 2 blood filled nappies at home and a further nappy in the ED which was filled with blood and clots*
- *There was a nearly 2-hour delay in obtaining intravenous (IV) access, including a delay in escalation to intra-osseous access*
- *The major haemorrhage protocol was not activated. The baby became significantly acidotic.*
- *During resuscitation the baby suddenly developed bleeding from the mouth and nose and had a cardiopulmonary arrest*
- *A chest X-ray performed shortly afterwards showed a 'white out'. Overall significant volumes of red cells and Octaplas® were given*
- *The child was transferred to Paediatric intensive care unit but did not survive*
- *Delays in recognising the severity of the bleeding and activation of the major haemorrhage protocol contributed to patient death*

Infant with Di George syndrome received non-irradiated components

- *A young infant was transferred to a cardiac surgical centre for repair of a ventricular septal defect (VSD)*
- *Red cells were ordered in preparation for the surgery and the Biomedical Scientist (BMS) asked the clinicians if irradiated components were required. The conclusion was that there was a low risk of Di George and so non-irradiated units were issued*
- *The next morning the laboratory was informed that genetic testing had confirmed Di George syndrome and that the clinicians wanted components for future transfusions to be irradiated*

Multiple non-irradiated components given to an infant with Severe Combined Immunodeficiency (SCID)

- *An infant with suspected SCID, on paediatric intensive care unit (PICU) with seizures, diarrhoea and a cytomegalovirus (CMV) infection, was given five red cell transfusions before the transfusion laboratory were informed of the need for irradiated blood*
- *The intensive care medical staff were not aware of the need for irradiated components in this patient group*

Overtransfusion of solvent detergent Fresh Frozen Plasma (FFP) to a neonate

- *A bleeding neonate on cardiopulmonary bypass received 105mL of solvent detergent FFP instead of 15mL*
- *The reporter describes that the unit was not clamped after the bolus*

Use of gravity for red cell transfusion in an infant

- *A neonate received an emergency red cell transfusion*
- *The unit was administered by gravity rather than via an infusion pump and the child was transferred to another hospital with a nurse escort who had no paediatric training*

Use of anti-D Ig in a D-negative neonate who had received a D-positive platelet unit

- *A 500g neonate received a transfusion from an adult-specification unit of D-positive platelets due to clinical urgency*
- *Multiple discussions took place regarding the requirement for anti-D Ig for the baby*
- *The baby received 500IU of anti-D Ig via two intramuscular injections*
- *The neonatal team had given the standard adult prophylactic dose of anti-D Ig and the message that haematology and transfusion experts had been consulted had not reached the treating consultant*
- *No harm occurred; however, the team were not aware of the window of time that could be taken before administration and also that an intravenous (IV) formulation was available*

Incorrect blood results viewed for a child resulting in overtransfusion and Transfusion Associated Circulatory Overload (TACO)

- *A stable neonate whose haemoglobin (Hb) had been between 140g/L and 160g/L for several days was accidentally given a 10mL/kg transfusion based on the Hb results from a different child*
- *Following the transfusion, the neonate became hypertensive and desaturated. The Hb post transfusion was 211g/L on the gas machine and 177g/L in the laboratory*
- *The child underwent venesection/dilutional exchange and recovered*
- *During incident investigation, it was noted that the electronic records of several neonates were open at the same time, the hospital uses an electronic system which means a laptop on wheels is taken to each cot space*
- *The margin of error for looking at the wrong screen for the wrong patient is therefore quite high*

Haemoglobin Disorders

Delay due to inappropriate sample rejection

- *A young male with Sickle Cell Disease (SCD) was admitted with a sickle cell crisis and was deemed to require transfusion*
- *During sample processing, the laboratory inappropriately rejected the group and screen sample*
- *A further sample was requested however the second sample was appropriately rejected due to being incorrect*
- *A senior Biomedical Scientist (BMS) noticed the original sample was in fact acceptable for processing*
- *These delays resulted in the transfusion being administered over 8 hours after initial bloods were taken*
- *No harm to the patient was reported*

Infusion pump set up incorrectly

- *A young female with Sickle Cell Disease (SCD) attended for routine transfusion*
- *The infusion pump was set up incorrectly resulting in overtransfusion*
- *The staff member was not familiar with the local policy and the prescription was not checked*
- *The error occurred during transfusion when the pump was reprogrammed*
- *The patient was reviewed following the incident and no harm to patient was reported as a result of this overtransfusion*

Failure to merge report from the reference laboratory with historic report on local hospital system

- *A young female with Sickle Cell Disease (SCD) received a two-unit episodic transfusion*
- *Following transfusion, the laboratory staff noticed there was a discrepancy between the genotyping result available on Sp-ICE and the phenotyping results on the Laboratory Information Management System (LIMS) transfusion record*
- *A sample had been tested by the reference laboratory and the patient found to have Rh variant C and e antigens. These genotyping results had been uploaded to the Specialist Services Electronic Reporting System (Sp-ICE) but the local laboratory had not been informed via a letter*
- *Prior to the discrepancy being noted the patient had received red cells matching the phenotype and subsequently developed anti-C and anti-e*

Sickle Cell Disease (SCD) patient receives antigen-positive blood despite informing clinical team of his specific requirements

- *A patient with SCD admitted to a hospital outside his local area with acute pain episode was transfused due to fall in haemoglobin (Hb)*
- *The patient was aware he had red cell antibodies and asked the medical team to ensure he got appropriate blood*
- *The laboratory team did not see the clinical information on one of two group and antibody screen request forms, indicating the patient had historic alloantibodies, and therefore the patient did not receive antigen negative units*

Ambiguity in the diagnosis and indication for transfusion in Sickle Cell Disease (SCD)

- *A young child with SCD was transfused*
- *The child's Haemoglobin (Hb) was 71g/L and the indication for transfusion was documented as anaemia*
- *The request form stated '? sickle cell disease'*
- *The laboratory team failed to flag this potential diagnosis and therefore patient did not receive Rh and Kell matched units*

An example of a D variant leading to difficulties with matching

- *A young child with sickle cell disease was admitted to a hospital outside of the local area overnight with a sickle crisis and Hb of 51g/L*
- *Blood grouping for D showed a dual population of red cells and the group was misinterpreted as D-positive as the population of D-positive cells looked greater*
- *The D group could not be easily confirmed with standard phenotyping, however, the BMS thought the patient was D-positive and issued 2 such units of red blood cells, both of which were D and E-positive*
- *The laboratory policy is that where D status cannot be determined D-negative red cells are given*
- *The following day the Specialist Services Electronic Reporting System (Sp-ICE) record was checked, which confirmed the patient to have a D variant and according to the Blood Service report, and should have received D-, E-, e+ blood. In addition, only one of the two red cell units given was HbS negative*
- *The child was followed up for development of an antibody*

ABO-incompatible transfusion in Sickle Cell Disease (SCD)

- *A patient group O with SCD was inadvertently administered the blood intended for a different patient*
- *Two units for two different patients were incorrectly checked only against their electronic prescriptions*
- *The nurse set up the blood transfusion for the SCD patient using group A blood that had been collected for the other patient*
- *Following infusion of 3mL of blood the cannula failed causing the pump to alarm and at this point the nurse noticed the wrong blood was being transfused and stopped administration*
- *No adverse outcome to the patient was reported*

Hyperhaemolysis in a child with prior alloimmunisation and an e antigen variant

- *A child with Sickle Cell Disease and a history of alloimmunisation including anti-S, anti-Jk^{b} and e antigen variant was listed for an elective splenectomy and therefore had preoperative transfusion*
- *She presented 2 days following transfusion with flank pain and dark urine*
- *There was a decline in Haemoglobin from 104g/L immediately following transfusion to 67g/L*
- *The patient was treated with immunoglobulin and steroid*
- *The Direct Antiglobulin Test (DAT) was positive and pan-reactive anti-e was demonstrated in the eluate*

Case of further antibody development in a patient with previous alloimmunisation

- *A young male with Sickle Cell Disease and a history of anti-Fy^{a} underwent an elective exchange transfusion*
- *Twelve days later he presented with fever and abdominal pain and a decline in Hb from 105g/L immediately post transfusion to 78g/L and 55g/L 2 days later*
- *Anti-S was identified post-transfusion*
- *The patient made a full recovery*

A case of poor increment in haemoglobin following blood transfusion

- *A middle-aged patient with Sickle Cell Disease received six units of red blood cells over a 6-day period*
- *The post-transfusion Direct Antiglobulin Test (DAT) was positive, but antibody screen remained negative*
- *Indications listed for transfusions included sickle cell crisis, anaemia, and poor increment in haemoglobin following blood transfusion*
- *Once a Haemolytic Transfusion Reaction (HTR) was suspected the patient received steroids and made a full recovery*

Haemolytic Transfusion Reaction (HTR) not initially recognised

- *A middle-aged female with Sickle Cell Disease had recently received transfusion for an acute painful episode affecting legs, and then presented with a further painful episode affecting arms*
- *A decline in haemoglobin (Hb) was noted and a decision was made to further transfuse. This resulted in further decline in Hb to 38g/L and dark urine*
- *The patient was discussed with the regional specialist haemoglobinopathy team and treated with immunoglobulin and steroid for post-transfusion hyperhaemolysis*

Acute Haemolytic Transfusion Reaction (HTR) in Sickle Cell Disease (SCD)

- *A middle-aged female with SCD and a history of anti-S had an elective exchange transfusion prior to total hip replacement for avascular necrosis*
- *Within 24 hours of transfusion there was a decline in Hb from 98g/L to 36g/L. Patient's symptoms included dyspnoea, dark urine and jaundice*
- *Anti-Jk^b was subsequently identified*

Acute chest syndrome in Sickle Cell Disease (SCD) pregnancy and recurrent hyperhaemolysis

- *A young female with a history of multiple alloantibodies and previous hyperhaemolysis required a red cell exchange transfusion for acute chest syndrome following a stillbirth*
- *The patient was treated pre-emptively with immunoglobulin and steroids but developed another severe Haemolytic Transfusion Reaction with a decline in haemoglobin to 41g/L, with associated haemoglobinuria and hyperpyrexia*
- *The Direct Antiglobulin Test (DAT) was positive, but no antibody identified in the eluate*

Immune Anti-D in Pregnancy

Difficulty in determining whether anti-D detected was due to prophylaxis or alloimmune anti-D in pregnancy

- *A primiparous woman in her 30s, booked at 10-weeks gestation (booking weight 73kg) and no alloantibodies were detected*
- *A group and antibody screen was taken at 28 weeks and then routine antenatal anti-D prophylaxis (RAADP) was given. The sample was rejected due to incorrect annotation of the label*
- *A further sample was taken the following week, anti-D detected, quantification less than 0.1IU/mL. At the time this was considered most likely prophylaxis*
- *A further sample was taken at 34 weeks, the quantification remained less than 0.1IU/mL and was again considered most likely prophylaxis*
- *No potentially sensitising event (PSE) was reported*
- *A D-positive baby was delivered at 41^{+1}. A group and screen sample taken at delivery demonstrated a strong antibody reaction, quantification 4IU/mL, confirming alloimmune anti-D*

Ideal management of twin pregnancy

- *A primiparous woman in her late 30s, booked at 10-weeks gestation, booking weight of 61kg*
- *She was D-negative, and no alloantibodies were detected*
- *Routine antenatal anti-D prophylaxis (RAADP) was given at 28 weeks*
- *This was a twin dichorionic diamniotic pregnancy, delivered at 37^{+4}, both twins were D-positive and anti-D Ig was given post-delivery*
- *Alloimmune anti-D was detected by chance following a preoperative assessment 3 months postpartum 0.8IU/mL and remained persistent after 6 months*

Omission of Routine antenatal anti-D prophylaxis (RAADP)

- *A primiparous woman in her early 20s presented to triage at 37^{+5}, having not attended since booking at 18 weeks*
- *A diagnosis of maternal preeclampsia was made, fetal tachycardia was detected, and a caesarean section performed*
- *A D-positive baby was delivered, Direct Antiglobulin Test (DAT) positive, and the baby required no interventions for Haemolytic Disease of the Fetus and Newborn (HDFN)*
- *This patient was lost to follow up and did not receive RAADP, no PSE were identified retrospectively*

Presentation of severe Haemolytic Disease of the Fetus and Newborn (HDFN) during first pregnancy

- *A primiparous woman in her late 30s, booked at 12 weeks, booking weight 64kg*
- *Maternal antibody screen at booking and 28 weeks was negative. The mother received routine antenatal anti-D prophylaxis (RAADP), no evidence of a potentially sensitising event (PSE)*
- *She presented at 36 weeks with suspected abruption, underwent caesarean section and it was concluded that abruption was unlikely.*
- *The baby was D-positive with Hb 40g/L, and a strongly positive Direct Antiglobulin Test (DAT). Maternal antibodies anti-D, C and S were detected, and anti-D quantified as 247.9IU/mL*
- *The baby recovered following exchange transfusion for HDFN*

Sensitisation associated with concealed pregnancy

- *A woman in her 20s, gravida 2 para 1 (booking weight 67kg) had anti-D detected at 11-weeks gestation with a quantification of 0.1IU/mL, which peaked at a quantification of 4.6IU/mL. A D-positive baby was delivered at 39^{+6}. No neonatal treatment was required*
- *The preceding pregnancy was concealed, and no antenatal care was received. The woman had presented at 40 weeks, and a D-positive baby was delivered vaginally. The fetomaternal haemorrhage (FMH) estimation was less than 2mL, the woman received 500IU anti-D Ig*

Sensitisation associated with obesity and multiple previous pregnancies

- *A woman in her 30s, gravida 5 para 1(live birth) +3 (miscarriages), booked at 13-weeks gestation, with a booking weight of 92kg*
- *Anti-D was detected with a quantification of 0.1IU/mL. The peak quantification at 31-weeks gestation was 60.4IU/mL*
- *Induction progressed at 36^{+5}, a D-positive baby was delivered and required phototherapy*
- *In the preceding pregnancy the mother had been booked at 10 weeks, with a booking weight of 120kg. Routine antenatal anti-D prophylaxis (RAADP) was given, no potentially sensitising events were identified during the pregnancy, and postpartum fetomaternal haemorrhage (FMH) estimation was less than 2mL, for which she received 500IU anti-D Ig*

Ineffective and sub-optimal clinical decision-making pathways

- *A woman in her 30s, gravida 3 para 2, booked at 8-weeks gestation, with a booking weight of 83kg*
- *Maternal cell free fetal DNA (cffDNA) screening test predicted the fetus to be D-positive at 16 weeks*
- *Anti-D was detected at 20 weeks, quantification was not performed. This error was identified at the third trimester antenatal appointment, the fetus was scanned and demonstrated signs of hydrops*
- *The mother was transferred to a fetal maternal unit. A D-positive baby was delivered at 34 weeks requiring exchange blood transfusion*
- *In the preceding pregnancy the mother had been booked at 10 weeks with a booking weight of 63kg, routine antenatal anti-D prophylaxis (RAADP) was given, and there were no PSE identified. Delivery was at 39 weeks and postpartum prophylaxis was adequate (FMH less than 2mL, 1500IU anti-D Ig)*