

Cases from the 2018 SHOT Annual Report

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

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Donor Haemovigilance

Venepuncture-related persistent arm pain more than one-year post donation (1)

- *A regular female whole blood donor who had donated 13 times previously without any adverse event, reported persistent problems with her donation arm >1-year post donation*
- *She remembered the donation being initially slow.*
- *This prompted staff to reposition the needle, which immediately resulted in discomfort*
- *The donor did not report this symptom at the time and a full donation was taken*

(Continued)

Venepuncture-related persistent arm pain more than one-year post donation (2)

- *The donor was left with a constant pain at the venepuncture site with an intermittent stinging sensation travelling up her arm towards her shoulder joint. Although her range of movement was preserved, she described her arm as heavy and occasionally supported it with a cushion*
- *She had no local bruising*
- *The donor was referred to a vascular surgeon and clinical neurophysiologist*
- *A small neuroma was queried however this was excluded by a normal ultrasound scan*
- *No evidence of a peripheral nerve lesion was evident on nerve conduction studies. The donor has been withdrawn from blood donation*

Rare complication of DVT post venepuncture

- *A regular female donor felt that her arm was a little tight and tender after giving blood; no bruising was noted*
- *From 2 days post donation, her upper limb and ipsilateral chest wall became increasingly red, swollen, itchy, sore and heavy; the veins appeared prominent when compared with the left side (Urshel's sign)*
- *The donor was short of breath on minimal exertion*
- *She contacted the Blood Service 1-week post donation and was advised to attend the emergency department urgently*
- *An extensive upper extremity deep venous thrombosis (UEDVT) and pulmonary embolus (PE) were confirmed*
- *She was discharged on Rivaroxaban and will likely remain on this, with follow up, for at least 6 months*
- *The donor's only risk factor for UEDVT was use of the combined oral contraceptive pill (OCP), commencing a few weeks prior to this donation. The donor has been withdrawn from blood donation*

Delayed vasovagal reaction resulting in injury/fracture and hospitalisation within 24 hours post donation

- *A regular female whole blood donor who had donated over 30 times previously without any adverse event, reported that she had fainted on the evening following her donation*
- *The donor gave a whole blood donation in the afternoon without any adverse event*
- *The donor went out for a meal in the evening.*
- *During the meal the donor became warm and stood up to take her sweater off, the donor then lost consciousness falling forward onto her face*
- *The donor sustained facial injuries including maxillae fractures*
- *Surgery was performed the following day and the donor was discharged from hospital 2 days later. The donor has been withdrawn from blood donation*

Human Factors

Culpability attributed solely to staff member(s), but system problems also identified (1)

- *The clinical picture and observations supported acute blood loss, so fluids were started in recovery and a venous blood gas was taken (now thought to be from the drip arm). The haemoglobin (Hb) result was 50g/L compared to a preoperative Hb of 145g/L*
- *A venous blood sample sent to the laboratory gave a Hb result of 19g/L, with abnormal clotting, and again this is thought to have been from the drip arm*
- *Laboratory staff deleted all results except the Hb and clotting screen and added a comment to repeat these tests as they were spurious results*
- *There was clear indication that the Hb result of 19g/L was incorrect as comments were added*
- *It is unusual that a result of 19g/L would be reported and the laboratory manager has concluded all the results should have been removed and not validated*

(continued)

Culpability attributed solely to staff member(s), but system problems also identified (2)

- *Two units of red cells were crossmatched for transfusion within 15 minutes of these erroneous results being received*
- *A repeat full blood count (FBC) was not taken until after the two units had been transfused (post-transfusion Hb 105g/L)*
- *It is difficult to know if the blood gas Hb of 50g/L was correct, but the post-transfusion Hb results suggests it was from a drip arm*
- *A review of observations, including a drop in blood pressure, shows they were consistent with acute blood loss and with a post-transfusion Hb of 105g/L it is likely that this patient would have needed transfusion regardless of the erroneous results. However, one unit may have been sufficient*
- *Lessons learnt: samples should not be taken from a drip arm; spurious results should be deleted, with new samples requested and, if clinically indicated, a single unit should have been transfused*

No scores given for human factors, but many system issues were identified

- *A patient was prescribed fresh frozen plasma (FFP) but cryoprecipitate was issued from the transfusion laboratory. The error was not detected at collection or at the final bedside administration, so an incorrect component was transfused*
- *The following organisational and system problems were identified in the incident investigation:*
 - *Busy night shift and lone working, so laboratory worker was tired*
 - *There was no second check in the laboratory due to lone working*
 - *The cryoprecipitate had been put in the wrong section of the freezer*
 - *Due to staffing levels a routine stock check had not taken place when scheduled*
 - *The laboratory information management system (LIMS) did not state the component being issued (LIMS now changed to do this and a new electronic blood-tracking system is planned)*
 - *Two units were brought to the ward, but only one had been requested*
 - *The ward was very busy*
 - *The blood component label has small print which was being read in poor lighting*
 - *Second check on the ward was done by a nurse who had just returned from a break*
 - *Nursing knowledge and understanding of the different components may be an issue*
 - *A safety critical checklist resource for staff to carry and access at the bedside is to be developed*
 - *The transfusion record is to be updated to include a components section as part of the pre-transfusion checklist*

Anti-D Immunoglobulin (Ig) Errors

Anti-D immunoglobulin (Ig) not collected from the refrigerator

- *A known D-negative woman had an elective caesarian section following induction of labour, failure to progress and a large baby*
- *Post delivery the baby's group was determined to be D-positive and anti-D Ig was issued day 1 postnatally*
- *The mother did not receive anti-D Ig until day 5 postnatally*

Failure to check blood results

- *A patient informed a newly qualified midwife that she was 'due a jab' at 28 weeks*
- *This information was acted on rather than following policy and checking the blood group first*
- *The patient was new to the hospital and had no obstetric notes with her*
- *The woman was D-positive and received 1500IU anti-D immunoglobulin (Ig) unnecessarily*

Anti-D immunoglobulin (Ig) given to a woman with known immune anti-D

- *A sample was received from a patient who had to come in every 4 weeks for anti-D quantification*
- *The biomedical scientist (BMS) noted on the form that there was a tick in the box for anti-D Ig having been administered*
- *The transfusion manager was informed who asked the transfusion practitioner to investigate*
- *The transfusion practitioner checked the patient's notes and found evidence that anti-D Ig had been administered despite a laboratory report stating that it was not to be given*

Anti-D immunoglobulin (Ig) given to a woman with known immune anti-D

- *A patient with known immune anti-D was given 500IU prophylactic anti-D Ig when attending a day assessment unit in a maternity hospital following a potentially sensitising event (PSE)*
- *The midwife did consult the doctor who suggested that the patient should be given it*

Misunderstanding of cell free fetal deoxyribonucleic acid (cffDNA) test result

- *The International Blood Group Reference Laboratory (IBGRL) reported that the cffDNA test predicted the fetus to be D-negative*
- *This document was scanned onto the maternity system and the electronic record completed correctly*
- *This flagged that the fetus was D-negative*
- *Later in pregnancy the woman presented with a per vaginal (PV) bleed*
- *There was a request for Kleihauer and anti-D immunoglobulin (Ig)*
- *The Kleihauer was reported as not required with the comment that the fetus of this pregnancy was predicted to be D-negative*
- *The obstetrics and gynaecology registrar prescribed anti-D Ig*
- *Anti-D Ig was issued and administered to the woman*

Positive patient identification (ID) not carried out prior to administration of anti-D immunoglobulin (Ig)

- *A dose of anti-D Ig intended for a D-negative patient was incorrectly administered to the wrong patient (who was D-positive)*
- *The midwife performed a verbal ID on the name only (which the patient confirmed) but did not check the date of birth or patient ID wristband*

1500IU vial of anti-D immunoglobulin (Ig) split

- *A lady who had miscarried booked in to see her general practitioner (GP) for anti-D Ig administration*
- *The GP gave anti-D Ig from midwives' clinic stock and only gave 0.3mL of the 1500IU in a 1mL vial*

Patient given anti-D immunoglobulin (Ig) without waiting for results of blood group and save sample

- *A patient had a group and save taken prior to administration of anti-D Ig for a per vaginal (PV) bleed at 15 weeks gestation*
- *The sample was rejected and no further sample was taken prior to the injection*
- *Therefore, it was not known if the patient had immune anti-D*

Kleihauer sample found to be haemolysed after anti-D immunoglobulin (Ig) had been issued

- *A sample was received into the laboratory post delivery for neonatal grouping and Kleihauer request on a D-negative lady*
- *The anti-D Ig was issued and the sample was centrifuged before the Kleihauer film was spread*
- *The sample was found to be haemolysed the following day, too late to test a repeat sample as the anti-D Ig had been administered*
- *A further repeat sample was then not requested in order for the quantification to be carried out for fetomaternal haemorrhage (FMH)*

Anti-D immunoglobulin (Ig) issued before group and screen completed

- *A Kleihauer was performed for a potentially sensitising event (PSE) at 37 weeks gestation for a patient who was historically AB D-negative*
- *The anti-D Ig was administered to the patient the next day*
- *However, 4 days later, the blood transfusion laboratory realised that the group and screen had not been completed*

Incorrect Blood Component Transfused (IBCT)

Failure to perform the administration checks at the bedside leads to transfusion of ABO-incompatible red cells and results in major morbidity (1)

- *The nurse checked the details on the unit of red cells against the prescription with one of the ward doctors*
- *The checks were performed, and the prescription was signed at the nurse's station, not at the bedside*
- *The nurse failed to positively identify the patient, failed to perform any bedside checks and did not ask another trained and competent member of staff to perform the same checks at the bedside*
- *The transfusion was commenced on the wrong patient*

(continued)

Failure to perform the administration checks at the bedside leads to transfusion of ABO-incompatible red cells and results in major morbidity (2)

- *The patient received approximately 50mL of incompatible red cells, (donor group A D-positive, recipient group O D-negative)*
- *Symptoms of reaction included; desaturation to SpO2 88%, the respiratory rate increased to 40 breaths per minute and the patient was 'feverish'*
- *The patient was treated with hydrocortisone, chlorphenamine and oxygen and moved to critical care and monitored for organ damage*
- *She remained in critical care for several days before moving back to a general ward and being discharged home*

Major morbidity following transfusion of ABO-incompatible (ABOi) red cells due to misinterpretation of manual ABO grouping (1)

- *Group-specific red cells were requested urgently, during core hours, for a patient with an upper gastrointestinal bleed*
- *No transfusion history was available for the patient at the time of issue*
- *The emergency department (ED) requested group-specific red cells due to the perceived risk to the patient of a delay*
- *Red cells were released prior to completion of the serological crossmatch due to the urgency of the situation*
- *Serological crossmatching identified that the red cells were incompatible*
- *The manual ABO grouping of the patient had been interpreted incorrectly as B D-positive (correct group was A D-positive)*

(continued)

Major morbidity following transfusion of ABO-incompatible (ABOi) red cells due to misinterpretation of manual ABO grouping (2)

- *A second member of staff was available, but it was not policy to second check the result*
- *No testing on a second sample was undertaken to confirm the group and the policy did not specify issuing group O red cells until a second group was obtained*
- *The biomedical scientist (BMS) did not routinely work in the transfusion laboratory*
- *The patient received approximately 90mL of incompatible red cells and was admitted to the intensive therapy unit (ITU) due to the adverse transfusion event*
- *No further ill effects were observed*

Interpretation error and inappropriate electronic issue (EI) resulted in the wrong ABO group transfused to a liver transplant patient

- *Red cells were requested out-of-hours for a patient who underwent an ABO-mismatched liver transplant (patient B D-positive, donor liver O D-positive) in a different centre three weeks earlier*
- *The patient had previously been grouped manually but a historical record was available on the laboratory information management system (LIMS) at the time*
- *The analyser identified anti-B in the patient plasma, but the result required manual interpretation on the LIMS and was misinterpreted as B D-positive*
- *The LIMS then allowed EI when serological crossmatch should have been performed and the electronic tracking system did not alert as the blood issued matched the patient's group*
- *Following transfusion, the patient had a spike in temperature and became tachycardic, tachypnoeic, with an increased oxygen requirement*
- *The transfusing hospital rarely dealt with transplant patients*

Failure to correctly complete the checking process at the administration step leads to transfusion of ABO-incompatible red cells

- *A unit of red cells (group B D-positive) was correctly collected, prescribed and delivered to the clinical area*
- *Two registered nurses using a 'dependent check' checked the unit against the laboratory paperwork and prescription but not the patient*
- *The nurse then went to the wrong patient and commenced the transfusion (patient group A D-negative)*
- *The doctor on the ward noticed that a transfusion had been commenced on his patient for whom he had not prescribed blood, he investigated and immediately stopped the transfusion*
- *The investigation revealed that the patient was not wearing an identification band and would not be able to identify himself*

Failure of the correct checking process at both collection and administration steps leads to transfusion of ABO-incompatible red cells

- *The wrong unit of red cells was collected by a healthcare assistant (HCA) from a remote issue refrigerator without any formal checks*
- *The collection slip included the correct patient details for whom the transfusion was intended*
- *The HCA had been trained and competency-assessed to collect blood components, but this had expired*
- *Red cells were taken for another patient with a similar surname*
- *The nurse on the ward failed to notice the wrong unit of red cells had been collected and then failed to complete the administration checks at the bedside, including failure to positively identify the patient*
- *The patient (group O D-positive) received the full unit of group A D-positive red cells. The patient was admitted overnight as a precaution, no signs of reaction noted and was discharged home the following day*

Intentional transfusion of ABO-mismatched cryoprecipitate

- *Cryoprecipitate was requested for a patient (group A) with ongoing bleeding as per advice from a consultant haematologist*
- *Group A was initially thawed but had to be discarded as not used within the 4-hour time limit. There were no further units of group A cryoprecipitate in stock, only group O*
- *The biomedical scientist (BMS) checked the standard operating procedure (SOP) and blood transfusion policy and could not find any definite statements that said group O could or could not be given to a group A patient*
- *After liaising with a senior BMS and checking the Joint United Kingdom (UK) Blood Transfusion and Tissue Transplantation Services Professional Advisory Committee (JPAC) website (<https://www.transfusionguidelines.org/transfusion-handbook/2-basics-of-blood-groups-and-antibodies/2-4-theabo-system>), group O high-titre negative units of cryoprecipitate were issued and transfused with no adverse impact noted*

ABO-incompatible fresh frozen plasma (FFP) issued following an interpretation error during testing

- *FFP was requested urgently for a patient with no historical record. A rapid immediate spin of the blood group was performed on the first sample (group B) to allow defrosting to commence*
- *The sample was then placed on the analyser as urgent to perform the group and screen. A further immediate spin was performed on a second sample (again group B) before component issue*
- *The results of the first sample were still not available on the analyser after 40 minutes so the FFP was issued based on two immediate spin groups*
- *When the analyser group was available it was found to be group AB with a weak A antigen*
- *The laboratory had recently installed a new analyser that was configured for efficiency rather than speed and the group did not get processed independently of the antibody screen*
- *At the time the senior biomedical scientist (BMS) was the only competent person in the laboratory and was training and supervising two new BMS staff*

ABO-incompatible cryoprecipitate selected in error

- *A patient with obstetric haemorrhage required cryoprecipitate to maintain their fibrinogen above 2g/L*
- *The patient was group B and the only cryoprecipitate available was either group A or group O high-titre (HT) negative*
- *Although the standard operating procedure (SOP) stated the patient should receive group A the biomedical scientist (BMS) thought that considering it not being HT-negative they would issue group O*

Use of a 'dependent check' at the administration step leads to transfusion to the wrong patient

- *A ward sister confirmed the date of birth with the patient against the identification band and prescription*
- *A healthcare assistant (HCA) as the 2nd checker failed to check these details against the compatibility label*
- *A bedside checklist was not in use in this hospital*
- *Recommendations – Trust/Health Board to explore if the use of HCA as 2nd checkers for blood administration is appropriate and consider the use of electronic clinical systems*

Use of a 'dependent check' and failure to identify the patient at the administration step leads to transfusion of the wrong patient

- *Two registered nurses performed a dependent check (one nurse checked the identification band and the other nurse checked the blood component and the prescription)*
- *They did not positively identify the patient*
- *Both were competency-assessed and knew they should perform the check using an independent check*
- *The event took place in the emergency department (ED), and was extremely busy and a shortage of staff was noted*

Transfusion to the wrong patient despite the use of an electronic system to alert staff of an error

- *The wrong identification band was placed on a child which was intended for another child that was also due a transfusion that day*
- *The nurse took a unit of red cells to the child wearing the wrong identification band*
- *Although there was an electronic prompt to carry out a verbal positive identification check, this did not take place*
- *The electronic system was unable to alert the nurse this was the wrong patient because the unit matched the wristband*

ABO-incompatible fresh frozen plasma (FFP) selected incorrectly for a neonate

- *A neonate required plasma exchange in the early evening out-of-hours during a shift handover*
- *Due to resource pressure on the laboratory and the fact that the laboratory was not familiar with neonatal transfusion, group O plasma was selected for a group A patient*
- *Soon after starting the shift the biomedical scientist (BMS) on duty was under pressure when clinical staff came to collect the FFP*
- *Assuming the previous BMS staff had selected the correct component and under pressure the BMS ignored the warning flag and overrode it*
- *The clinical staff were unaware that, unlike red cells, group O is not the universal plasma group*
- *The laboratory had logged a request with the laboratory information management system (LIMS) supplier to block issue of group O plasma components to non-group O recipients, but this work had not been completed*

Handling and Storage Errors (HSE)

Poor handover between two nurses overseeing the same patient leads to excessive time to transfuse (1)

- *Nurse 2 received a handover from nurse 1 at 15:30 to look after a patient receiving a transfusion*
- *When nurse 2 went to the patient, it was identified from the blood transfusion tag that the transfusion sample for the patient had expired at 14:00*
- *Nurse 2 stopped and discontinued the transfusion at that time*
- *On further investigation the unit had been collected from controlled temperature storage (CTS) at 10:15, the transfusion had been running for 5 hours 15 minutes*

(continued)

Poor handover between two nurses overseeing the same patient leads to excessive time to transfuse (2)

- *As the sample for the patient had expired at 14:00 and this was clearly marked on the transfusion tag, the transfusion should have been discontinued at that time or nurse 1 should have ensured that there was adequate time to infuse the unit according to local policy*
- *On investigation nurse 1 had recognised that the transfusion should have been running at an appropriate rate and had requested assistance with this task*
- *Furthermore, although nurse 2 stopped the transfusion, neither nurse 1 or 2 had undertaken the appropriate safe transfusion practice training*
- *The patient did not experience any clinical reaction*

Multiple staff missed opportunities to perform patient observations following transfusion

- *The laboratory issued four units of red cells to an acute clinical ward. The patient received two units*
- *When the transfusion laboratory was undertaking traceability checks, it was identified that the first unit transfused had exceeded the recommended time to transfuse from removal of the component from controlled temperature storage*
- *On further scrutiny of the transfusion form it was identified that the patient had baseline observations undertaken at 15 minutes, however no further observations were taken until the start of the second unit 6 hours and 35 minutes later*
- *The patient was being transferred with transfusion in situ, and there was inadequate communication as to whose overall responsibility it was*
- *Multiple staff missed carrying out checks and the unit was taken down shortly after arriving on the new ward*

Poor communication during transfer of a patient between hospitals

- *A unit of O D-negative was removed from the emergency blood refrigerator without informing the laboratory staff*
- *Almost two months later no documentation had been returned to the referring laboratory in relation to this unit*
- *On investigation the unit was transfused to the patient while the patient was being transferred to another hospital*
- *The referring hospital requested the documentation to be forwarded, however this did not happen, and a complaint was raised*
- *The nurse who escorted the patient during the transfer recalled that the blood had been given prior to transfer but could not recall the patient details*
- *The emergency department (ED) record stated the patient required blood but the transfusion record/chart was transferred with the patient*
- *It is still not known if the unit had been transfused*

Avoidable, Delayed or Under/Overtransfusion (ADU)

Delayed Transfusions

Delayed transfusion with contribution from multiple assumptions

- *A man in his 80s was in the high dependency unit (HDU) following elective aortic aneurysm repair and had a haemoglobin (Hb) of 77g/L due to haematuria*
- *He had ischaemic heart disease (IHD)*
- *A transfusion was prescribed in the evening but he did not receive the transfusion and suffered cardiac arrest the following morning*

Delay treating gastrointestinal (GI) haemorrhage

- *A man in his 80s was admitted (at 08:55) with a GI bleed (history of blood in stools) and Hb 76g/L*
- *He was unwell, hypotensive (blood pressure 93/42mmHg) dizzy and unable to stand, with a raised early warning score*
- *Two units were requested at 10:16, available at 12:07, but were not prescribed and never transfused*
- *He was on warfarin for atrial fibrillation (AF) and his international normalised ratio (INR) was 7 for which he received timely treatment with prothrombin complex concentrate (PCC) and intravenous (IV) vitamin K*
- *He deteriorated and had a cardiac arrest within 5.5 hours (at 14:26) and died due to prolonged untreated hypovolaemic shock*
- *The primary cause of death was recorded as massive upper GI haemorrhage due to gastric ulcers*

Death from gastrointestinal (GI) haemorrhage due to failure to recognise and treat this in a timely manner

- *A man in his 70s was admitted with back pain and shortness of breath and died while receiving a red cell transfusion 2 days later*
- *Multiple co-morbidities included ischaemic heart disease (IHD) with previous stroke, chronic kidney disease and atrial fibrillation (AF) for which he was on warfarin*
- *He had known previous anaemia and received iron injections at home*
- *On admission his haemoglobin (Hb) was 83g/L so he was prescribed a unit of red cells in the evening of Day 1*
- *His international normalised ratio (INR) was >7 for which he received a suboptimal dose of 1mg vitamin K; during the admission he had several episodes of melaena*
- *He was transferred from the emergency department (ED) to the medical admissions unit (MAU) and then to a ward but the transfusion did not start until the morning of Day 3 when he then had a cardiac arrest*

Delay in recognising serious gastrointestinal (GI) bleeding (1)

- *A man in his 70s was admitted with community-acquired pneumonia reporting a 10-day history of productive cough on a background of chronic obstructive pulmonary disease (COPD)*
- *During admission his haemoglobin (Hb) level fell from 151g/L on admission to 128g/L on Day 2*
- *Repeat blood tests and rectal examination were not done on Day 3, despite the patient complaining of black stools and being on medication which could cause bleeding (aspirin)*
- *On Day 5 (a Saturday) he had episodes of melaena - 'a large amount' - and was noted to be hypotensive with a tachycardia; Hb was 89g/L*

(continued)

Delay in recognising serious GI bleeding (2)

- *He was stable so oesophago-gastroduodenoscopy (OGD) was planned for Day 7 (Monday), The patient had a two-unit red cell transfusion due to a further fall in Hb to 61g/L on Day 6 (Sunday) associated with tachycardia and repeated episodes of melaena*
- *In the early hours of Day 7 (Monday) he became agitated and complained of abdominal pain*
- *His Hb was 60g/L and four units of red cells were given*
- *He deteriorated further and suffered cardiorespiratory arrest*
- *Cardiopulmonary resuscitation (CPR) was commenced but was unsuccessful*

Multiple causes for delay with death from hypovolaemic shock due to gastrointestinal (GI) bleeding (1)

- *A woman in her 80s was seen at home for a chest infection (Day 1) and refused to come to hospital*
 - *The following day (Day 2) she was seen again by the general practitioner (GP) and again declined admission although she was noted to be very pale and hypotensive (94/54mmHg, pulse rate 96 beats per minute (bpm))*
 - *On Day 3 the ambulance crew were called to her home where she was found collapsed, very short of breath and cyanosed*
 - *The working diagnosis was an acute exacerbation of chronic obstructive pulmonary disease (COPD)*
 - *She was admitted at 11:05 and waited in a chair for 3 hours*
- (continued)*

Multiple causes for delay with death from hypovolaemic shock due to GI bleeding (2)

- *Blood results available at 17:20, 6 hours after admission, showed Hb 65g/L*
- *She was then noted to have melaena at 19:00 so a diagnosis of GI bleeding was made, and red cell transfusion authorised*
- *At 8 hours after admission (19:00), a blood sample was taken for crossmatch (which arrived in the laboratory 1.5 hours later)*
- *Blood was issued within an hour, however the transfusion was delayed and did not take place at all*
- *At 01:46 she had a cardiac arrest and died*
- *The cause of death was recorded as cardiac arrest due to hypovolaemic shock and GI bleeding*
- *The report notes communication failures and staff distractions due to the unit being very busy*

Delay related to poor communication

- *A frail woman in her 80s died from hypovolaemic shock with bleeding from a leg haematoma*
- *When blood was requested the laboratory requested a second sample as clinicians had not communicated the urgency*
- *There was a delay of more than 2 hours*

Intraoperative death from haemorrhage

- *An elderly patient was admitted with trauma*
- *During planned surgery on Day 7 of admission there was unpredictable and catastrophic bleeding (estimated more than 2.5L within minutes)*
- *The patient arrested and died in theatre*

Potentially unsafe use of O D-negative blood in an emergency in a patient with red cell alloantibodies at a hospital with no overnight transfusion laboratory support (1)

- *A woman in her 70s on peritoneal dialysis presented to her local hospital with acute bleeding overnight when the laboratory was closed*
- *Anticoagulation with full dose low molecular weight heparin had been started on this day, and she developed a very large subcutaneous haematoma*
- *This was treated as major haemorrhage and she received two units of emergency O D-negative blood while awaiting crossmatched blood from another site*
- *However, neither the laboratory staff (who could have come in) nor haematologist was contacted*

(continued)

Potentially unsafe use of O D-negative blood in an emergency in a patient with red cell alloantibodies at a hospital with no overnight transfusion laboratory support (2)

- *The clinical staff did not note that she had atypical antibodies (anti-N and auto anti-e) and therefore that the O D-negative units might be incompatible*
- *She was transferred to the dialysis unit at another hospital where she later died as a result of complications of this bleed*
- *There was no adverse reaction to the O D-negative units and the crossmatch of further units was completed at a distant site*
- *Six compatible units were issued 12 hours after admission and one transfused*

Delay caused by misunderstanding of abbreviations

- *Red cells were requested with the clinical details 'IUT 27+6/40 PROM'*
- *The biomedical scientist (BMS) interpreted IUT as 'intrauterine transfusion' and ordered red cells suitable for this*
- *However, in this instance, IUT meant 'in utero transfer'; the blood was required for the mother, not the baby*
- *There was additional miscommunication during a telephone call resulting in delay to provision of red cells for the mother, and wastage of three units that had been provided as 'suitable for intrauterine transfusion'*
- *On review of this case the haematologist suggested that all requests for intrauterine or exchange transfusion should go through a senior member of the transfusion laboratory staff*

Transfusion inappropriately delayed overnight with misinterpretation of guidelines

- *An elderly woman (with diabetes) was admitted with a low haemoglobin (Hb) of 46g/L due to severe iron deficiency*
- *The medical team refused to authorise transfusion overnight despite adequate ward staffing with three very experienced nurses more than capable of managing a transfusion reaction*
- *She was prescribed two units of red cells. The on-call medical team were not happy for the patient to be transfused overnight in view of minimal medical cover to provide support for possible transfusion reaction*
- *Although clinically stable at the time, the patient was at high risk due to her very low Hb*
- *The hospital transfusion policy, while stating that consideration must be given to the safety of the transfusion, notes that the patient's clinical condition must be taken into account*
- *The policy does not prohibit transfusion at night*

Delayed transfusion: failure to recognise and respond appropriately to a haematological emergency in an elderly man

- *The elderly man with chronic lymphatic leukaemia (CLL) and significant co-morbidity complicated by known autoimmune haemolytic anaemia (AIHA) was admitted as an emergency with Hb 44g/L*
- *He did not receive transfusion until 15 hours later*
- *Referral to the haematology team (to whom he was known) was not made for nearly 12 hours when treatment was rapidly escalated but there were additional delays*
- *The second unit of blood was delayed as the patient transferred between wards*

Urgent blood release delayed after postpartum haemorrhage (PPH) because of a verbal error in the order

- *The laboratory issued group-specific A red cells for Patient 1 following a 2L PPH but the blood was required for a different patient, Patient 2, whose group was O*
- *There were two patients with the same first name who delivered at the same time*
- *The midwife ordering the blood heard the wrong name and ordered blood for another woman*
- *The group A red cell unit could not be collected from the electronic kiosk because the identification (ID) on the pick-up slip did not match the ID on the electronic system*

A young person with significant multisystem injuries

- *A very seriously injured young person was transferred with multiple trauma: head injury with raised intracranial pressure, major chest injuries, significant intra-abdominal uncontrolled haemorrhage from a high-grade liver laceration and very high-grade splenic injury*
- *Peripheral injuries included stable pelvic fracture, femoral shaft fracture and the patient was haemodynamically unstable*
- *The patient received red cells and plasma in transit*
- *Following admission during complex surgery and resuscitation they received 19 units of red cells, 14 units of fresh frozen plasma (FFP), three units of platelets and four of cryoprecipitate*
- *Post-transfusion haemoglobin (Hb) was 199g/L requiring venesection*

Unexpected bleeding during surgery

- *An elective nephrectomy for a tumour was converted from a laparoscopic to an open procedure with estimated 2L blood loss from the renal vein*
- *The patient received 15 units of red cells, five of fresh frozen plasma (FFP), two of platelets and two of cryoprecipitate*
- *The pre-transfusion haemoglobin (Hb) was 123g/L and 4 hours later was 156g/L*
- *The patient suffered cardiac arrest and was transferred to the intensive therapy unit (ITU) postoperatively, but this was not attributed to the transfusion*

Inaccurate estimate of bleeding

- *Unexpected blood loss into a drain (300mL) following mastectomy resulted in activation of the major haemorrhage protocol (MHP)*
- *This was considered to be an inappropriate activation with an overestimation of the blood loss*
- *The patient received two units of blood and the fresh frozen plasma (FFP) was wasted*
- *The post-transfusion haemoglobin (Hb) the next day was 123g/L*

Avoidable Transfusions

Wrong details provided by ambulance staff

- *A patient was transferred from another hospital with ruptured abdominal aortic aneurysm*
- *Patient details were wrong on the ambulance transfer form (the hospital-based identification (ID) band and addressograph labels were not used) and then these wrong details were used for the hospital's information system*
- *Several samples with different spelling of the first name were sent to transfusion; group O D-negative red cells were used in the interim*

Wrong bleep number

- *Emergency O D-negative red cells were used as the emergency department (ED) could not get through to the laboratory staff*
- *They were using the wrong bleep number*

Potentially unsafe use of O D-negative units in a patient with autoimmune haemolytic anaemia (AIHA)

- *A patient with AIHA secondary to non-Hodgkin lymphoma and haemoglobin (Hb) 25g/L had refused blood on religious grounds but on the 3rd day consented to transfusion*
- *Three blood samples were rejected by the laboratory*
- *When satisfactorily repeated, the patient was found to have irregular red cell antibodies*
- *The clinical team decided to use uncrossmatched O D-negative units*

Panic at low haemoglobin (Hb) result led to major haemorrhage protocol (MHP) activation and inappropriate transfusion of three different components for folate deficiency

- *A woman in her 30s was admitted as an emergency and found to have Hb 30g/L with mean cell volume (MCV) 118fL*
- *The laboratory staff requested a repeat sample, but this advice was ignored*
- *She had no evidence of bleeding or decompensation, was normotensive and had no symptoms of anaemia to warrant transfusion*
- *The haematology registrar had noted the high MCV and advised that haematinics should be checked and not to transfuse the patient*
- *However, a trainee activated the MHP*
- *The biomedical scientist (BMS), not aware of the clinical situation, did not challenge this and the woman received an inappropriate transfusion of four units of O D-negative red cells together with two of fresh frozen plasma (FFP) and one of platelets (count $45 \times 10^9/L$)*
- *The folate result (<1.6 microg/L indicating severe deficiency) was available 11 hours after the MHP activation*

Near miss – avoidable transfusion for one patient is associated with ABO-incompatible transfusion in another due to failure of bedside identification

- *An elderly patient was admitted after a fall with two fractures*
- *Her haemoglobin (Hb) was 82g/L and she was transfused with one unit of red cells*
- *A second unit was collected but not given, as it was decided not necessary*
- *This decision should have been made before the unit was collected*
- *However, after checking the unit with the doctor at the nurses' station, transfusion of this unit was started in error on another patient who was also being transfused*
- *This wrong patient received ABO-incompatible red cells as a result and suffered major morbidity (Case 8.1 in Chapter 8, Incorrect Blood Components Transfused (IBCT))*

Patient transfused despite religious objection

- *A woman in her 70s with religious objection received a red cell transfusion (despite having specified that she did not want transfusion) due to failure of handover when she was transferred to the intensive therapy unit (ITU)*

An elderly man with repeated transfusions against his religion was detected incidentally

- *An elderly man with renal disease was transfused red cells on six occasions over a 3-year period but with no evidence of consent*
- *His religion was not consistently recorded in the notes nor is there evidence that alternatives to red cells were discussed, nor whether or not he consented to red cell transfusion on the last two occasions*
- *This was picked up incidentally at a morbidity and mortality review following trauma management*
- *In 2014 there was evidence of consent for transfusion for serious bleeding when the haemoglobin (Hb) was 51g/L*
- *On three other occasions he was transfused with no record of consent*
- *The renal physician commented regarding past refusals of transfusion, there is no evidence that this was followed up*

Missed advance directive

- *A patient with religious objection and an advance directive in place was transfused following gastrointestinal (GI) bleeding at a time when lacking capacity*
- *This was discovered later and was due to communication factors and failures to follow hospital policy*

An inappropriate platelet transfusion due to confusion over names and failure of correct patient identification

- *A haematology patient informed his consultant that he had been called in for a platelet transfusion 3 months earlier*
- *Despite repeated questioning at the time by the patient, and a normal platelet count of $230 \times 10^9/L$ a month before, he received this transfusion without a check of his count on the day*
- *The doctor had made a verbal instruction to the booking clerk*
- *Two patients had the same surname and the wrong one was called in for transfusion*
- *The other one, who needed platelets and who had been informed verbally by the doctor, was admitted as an emergency the day before*

Inappropriate fresh frozen plasma (FFP) transfusion based on coagulation results from heparinised syringe (1)

- *Three units of FFP were transfused for abnormal coagulation results prior to surgery*
- *These results were caused by the blood being taken into a heparinised syringe and were therefore invalid*
- *The patient had possible ascending cholangitis and an endoscopic retrograde cholangiopancreatogram (ERCP) was planned*
- *The white cell count was raised at $23.8 \times 10^9/L$ (normal range $4-10 \times 10^9/L$), with normal coagulation and platelet count*
- *The next day the white cell count was still raised, and the platelet count had fallen (335 on admission down to $177 \times 10^9/L$)*
- *The coagulation screen was abnormal, and repeat was also abnormal with prothrombin time (PT) 23 seconds (s) (normal range (NR) usually 11 to 13.5s), activated partial thromboplastin time (APTT) 40s (NR usually 30-40s but varies with method and range was not given in this case report), and thrombin time (TT) 18s, (NR 12-14s)*
- *Two days later the platelet count had fallen to $54 \times 10^9/L$*

(continued)

Inappropriate FFP transfusion based on coagulation results from heparinised syringe (2)

- *The patient was very difficult to bleed; several attempts had been made by different members of staff*
- *It was decided to take an arterial blood sample (and the laboratory had agreed to this)*
- *The doctor knew the arterial blood gas kit contained heparin, but he knew the laboratory staff were aware*
- *Blood was taken and then transferred into the coagulation sample tube and into tubes for a full blood count and electrolytes*
- *The platelet count was $27 \times 10^9/\text{L}$ consistent with continued fall*
- *The coagulation screen results were more abnormal with PT 24s, TT 46s and no APTT result could be given*
- *The laboratory comment was 'results abnormal, repeat'*
- *The consultant haematologist reviewed these and previous results, being aware that the patient was difficult to bleed*

(continued)

Inappropriate FFP transfusion based on coagulation results from heparinised syringe (3)

- *He decided not to repeat the bloods and advised 10mg intravenous (IV) vitamin K and one unit of platelets followed by a full blood count 1-hour post transfusion to confirm that the platelets incremented by 30-40*
- *He advised that the patient should receive 1 to 2 litres of FFP and be monitored for overload*
- *The following morning a full blood count and coagulation screen showed that the platelet count was $20 \times 10^9/L$ and the coagulation was normal*
- *Another request was made for a unit of platelets preprocedure*
- *The junior doctor who had come back on duty noted the grossly abnormal results from the previous evening*
- *He asked his colleague if there had been any difficulties taking the sample*
- *At this point the junior doctor realised what had happened regarding the results due to the heparin contamination*

Under or Overtransfusion

Confusion about dose of red cells in a young child

- *A young child was given a smaller volume of red cells than required due to confusion over the calculations and involving two units of red cells*

Transfusion not monitored properly after patient transfer

- *An elderly woman admitted with gastrointestinal bleeding received O D-negative blood in the emergency department but about 6 hours later checking established that only a small volume had been given*
- *The transfusion had not been properly monitored and repeat haemoglobin (Hb) results suggested this might also have been an avoidable transfusion*

A second case of inadequate monitoring of transfusion

- *An elderly woman with fractured neck of femur was undertransfused*
- *Six hours after a unit of red cells was set up it was noted that the pump had been switched off and the patient had not received the full unit*
- *The patient died but this was unrelated to the transfusion*

Death related to overtransfusion

- *A patient in her 70s, weight 38kg, presenting with a rectal bleed was overtransfused, receiving three units*
- *The pre-transfusion haemoglobin (Hb) was 158g/L and post transfusion was 195g/L*
- *The patient was venesected but 2 days later had a cerebral event*
- *She died 5 days after the transfusion and a further cerebral event*
- *The transfusion was thought to be contributory to her death*

Incidents Related to Prothrombin Complex Concentrate (PCC)

Prothrombin complex concentrate (PCC) given at an inappropriate rate due to lack of knowledge

- *Treatment was indicated for insertion of a chest drain in a patient with a haemothorax*
- *PCC was started at the wrong rate of 8mL/hour instead of 8mL/minute*
- *The prescribing doctor did not state a rate and was not competent to administer it*
- *This was a fraught situation including cardiac arrest during the transfusion*
- *As a result, further training was provided in the emergency department (ED) and there was discussion with all staff involved*

Inadequate dose required urgently for intracranial haemorrhage

- *Urgent treatment was required for an elderly patient on warfarin, international normalised ratio (INR) 3.5, with intracranial haemorrhage*
- *This site only had 500IU in stock and there was a delay in obtaining the rest of the 1500IU from another site resulting in delay of 1.5 hours*
- *Although stock checks had taken place the staff had not ensured further supplies were ordered*
- *The procedures have been tightened up*

Treatment delay due to lack of knowledge

- *Emergency surgery for a perforated ulcer was delayed because the ward staff were unclear how to obtain and administer prothrombin complex concentrate (PCC)*
- *Training needs were identified and have been resolved*

Confusion over similar trade names results in wrong product transfusion

- *An elderly man was admitted with gastrointestinal bleeding*
- *There was confusion over similar blood component/product names*
- *The patient was admitted with bleeding needing warfarin reversal*
- *The patient also received emergency group O D-negative red cells (three), and platelets*
- *Octaplas® (solvent-detergent fresh frozen plasma (SD-FFP)) was requested verbally without informing the laboratory staff about the need for warfarin reversal, and five units of Octaplas® were issued after 2 hours waiting for the correct documentation*
- *Three units were transfused before the written request clarified what was required, and Octaplex® (PCC) issued with a delay of 3.5 hours for treatment*
- *The laboratory biomedical scientist (BMS) agreed they should not have released the product without written confirmation*

Immune Anti-D in Pregnancy

D-variant

- *A primiparous woman in her 30s, with a booking weight of 95kg (body mass index (BMI) 35), typed as D-positive*
- *She had a live birth at 42 weeks gestation*
- *Alloimmune anti-D was detected on the delivery sample*
- *Samples were referred to the Blood Service for investigation, and the woman typed as partial D category DIV*
- *The baby required no interventions for haemolytic disease of the fetus and newborn (HDFN)*

Delivery at 42+6 weeks

- *A primiparous woman in her 30s, with a booking weight of 61kg (gestation at booking 8 weeks), received a single dose of routine antenatal anti-D prophylaxis (RAADP) (1500IU) at 28 weeks*
- *She delivered at 42+6 weeks*
- *Alloimmune anti-D was detected at delivery (titre 1 in 256), and there were no reported potentially sensitising events (PSE)*
- *The baby required no interventions for haemolytic disease of the fetus and newborn (HDFN)*

A small antepartum haemorrhage (APH) at 8-9 weeks, thought to be clinically insignificant

- *A primiparous woman in her 20s, with a booking weight of 58.3kg, had a cell-free fetal deoxyribonucleic acid (cffDNA) test at 17+5 weeks which was inconclusive*
- *She received a single dose of routine antenatal anti-D prophylaxis (RAADP) (1500IU) at 28 weeks*
- *A sample taken at this time was subsequently shown to contain alloimmune anti-D 12.8IU/mL, rising to a level of 66IU/mL at 34+2 weeks gestation*
- *The baby was delivered at 35 weeks gestation and required exchange transfusion and phototherapy*

Lack of follow up for clearance of fetal cells

- *A woman in her 30s received a single dose of routine antenatal anti-D prophylaxis (RAADP) (1500IU) at 28 weeks in the preceding pregnancy*
- *She had an elective caesarian section at 38 weeks gestation*
- *The Kleihauer test showed a fetomaternal haemorrhage (FMH) of >4mL and flow cytometry confirmed a 16mL FMH*
- *The woman was given a total of 2500IU anti-D immunoglobulin (Ig) but there was no evidence that she was followed up to confirm clearance of the fetal cells*
- *Alloimmune anti-D was detected at 28 weeks gestation in the next pregnancy*
- *In this case a further error in management occurred as the anti-D detected at 28 weeks in the index pregnancy was interpreted as passive, due to RAADP, which was given after the blood sample had been taken*
- *The pregnancy was not followed up serologically and the baby was delivered as an emergency at 34 weeks and required an exchange transfusion*

Management followed current guidelines

- *A woman in her 30s received a single dose of routine antenatal anti-D prophylaxis (RAADP) (1500IU) at 28 weeks in the preceding pregnancy*
- *She had no potentially sensitising events (PSE), and had an emergency caesarian section at 41 weeks gestation*
- *The Kleihauer test showed a fetomaternal haemorrhage (FMH) of 2.7mL*
- *The woman received 500IU anti-D immunoglobulin (Ig) postpartum*
- *Alloimmune anti-D was detected at 10 weeks (booking appointment) in the next pregnancy*
- *The baby required no interventions for haemolytic disease of the fetus and newborn (HDFN)*

Apparently ideal care in the preceding pregnancy but possible risk in the way fetomaternal haemorrhage (FMH) is reported

- *A woman in her 40s (alloimmune anti-D at booking in the index pregnancy) had apparently ideal care in the preceding pregnancy (in vitro fertilisation pregnancy)*
- *She was not obese, received routine antenatal anti-D prophylaxis (RAADP) (1500IU anti-D immunoglobulin (Ig) into the deltoid at 28 weeks gestation), and had no potentially sensitising events (PSE)*
- *The baby was delivered by emergency caesarian section at 31 weeks*
- *FMH was measured by flow cytometry and reported as <12mL*
- *She received the 'standard' dose of anti-D Ig used at this hospital (1500IU) but was not followed up for clearance of fetal cells*

Misinterpretation of antibody screen at 28 weeks

- *A woman in her 40s attended the early pregnancy unit at 10 weeks gestation with vaginal bleeding*
- *A transvaginal ultrasound scan confirmed a viable intrauterine pregnancy*
- *Anti-D immunoglobulin (Ig) was not given*
- *At the 28-week appointment the antibody screen was weakly positive but was incorrectly assumed to be due to routine antenatal anti-D prophylaxis (RAADP)*
- *The woman attended triage following trauma to her abdomen at 31 weeks gestation, 1500IU anti-D Ig was given and the Kleihauer showed <4mL fetal cells*
- *At delivery, anti-D quantitation showed an increased level of 9.7IU/mL and the baby required phototherapy*

Near Miss – Wrong Blood in Tube (WBIT)

Historic wrong blood in tube (WBIT) may have led to anti-D immunisation

- *A patient had booking bloods taken at antenatal clinic and was grouped as O D-positive*
- *This did not match the result of a sample taken in 2015 following a termination of pregnancy (TOP) which grouped as A D-negative*
- *A repeat sample confirmed the group as O D-positive*
- *The sample taken in 2015 was incorrect*
- *It is not known if the patient was given anti-D immunoglobulin (Ig) prophylaxis in 2015*
- *The patient whose blood was in the sample tube may not have been identified and would have been at risk of anti-D immunisation*

Detection of wrong blood in tube (WBIT) prevents potentially inappropriate anti-D immunoglobulin (Ig) prophylaxis

- *A Kleihauer request was received in the hospital transfusion laboratory*
- *The patient had a historical group on file of O D-positive and would not require a Kleihauer test*
- *The sample, however, grouped as A D-negative with a positive antibody screen consistent with prophylactic anti-D Ig*
- *The midwife who saw this patient stated that they had not presented with per vaginal (PV) bleeding and did not require a Kleihauer test*
- *The patient who was bled but incorrectly identified was contacted to attend the clinic the next day when a Kleihauer test was taken and prophylactic anti-D Ig given within 72 hours*

Mislabeled cord requires repeat baby sample for group confirmation

- *Mother and baby samples received in transfusion and both grouped as AB D-negative which was the previous group recorded for the mother*
- *The cell-free fetal deoxyribonucleic acid (cffDNA) test had predicted D-positive*
- *An initial test failed to identify the baby's blood group*
- *The baby was rebled and grouped as B D-positive*
- *Anti-D Ig was issued for the mother and given within 72 hours*

Near miss ABO-incompatible transfusion due to circumventing the group-check policy

- *Two group and save samples were received from the emergency department (ED) on a patient with a suspected hip fracture*
- *The samples were timed as being taken ten minutes apart*
- *On grouping, both samples were found to be B D-positive*
- *The historical group on file was A D-negative*
- *A further sample was obtained and confirmed this historical group*
- *The samples had been taken by an ED consultant and passed to a foundation year one (FY1) doctor to label as being taken at different times*
- *The FY1 had not felt confident to question the consultant on practice they knew to be unsafe*
- *ED policy requires two group and save samples to be taken on admission*
- *The samples met the criteria of the group-check policy*
- *If there had been no historical group, the patient could have received incompatible blood*

Wrong blood in tube (WBIT) due to electronic scanning of an unworn wristband for label generation

- *Two group and save samples were received for a patient*
- *The first sample taken at 12:54 grouped as A D-negative and matched the patient's historical record*
- *The second sample taken at 14:57 grouped as AB D-positive*
- *Both samples were labelled using BloodTrack® personal digital assistant (PDA)*
- *Trauma patients at this hospital are given consecutive hospital numbers and are issued blood components on a single group sample*
- *The nurse had labelled a sample taken by somebody else*
- *The sample label had been generated by scanning a wristband that was not attached to the patient*
- *The sample had actually been taken from the patient in the next bay*

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

- *A group and save sample was received for a patient and the resulting group of B D-negative was found to be discrepant from the many historical groups of O D-positive*
- *The member of staff taking blood for grouping, correctly positively identified the patient checking all the required identifiers with the patient - first name, last name, date of birth and first line of address, which were all confirmed as correct*
- *The hospital number however belonged to the other patient which generally patients do not know and are not asked at phlebotomy*
- *A member of clerical staff had merged two patients on the organisation-wide patient administration system (PAS) based on the same first name, last name and date of birth even though the National Health Service (NHS) number and address were different*

Patient incorrectly registered leads to many incorrect results in patient's record

- *A phlebotomist went to take bloods from a patient and asked them to confirm their details*
- *These did not match the request form or the patient's wristband*
- *When this was investigated it was found that the patient had been wrongly identified and registered as a different patient with the same name*
- *This had gone undetected over a 2-day period*
- *All bloods sent during this time were labelled with the incorrect patient's details*

Right Blood Right Patient (RBRP)

Important to check patient identification (PID) against the label attached to the blood component and the wristband (1)

- *A major haemorrhage protocol (MHP) was activated in the emergency department (ED) for a patient who had no previous historical records*
- *Emergency O D-negative units were requested*
- *The biomedical scientist (BMS) proceeded to issue O D-negative blood however when entering information on the laboratory information management system (LIMS) they linked the patient to a unique identifier belonging to another patient*
- *The porter collecting the emergency O D-negative blood arrived at the transfusion laboratory without a collection slip*

(Continued)

Important to check PID against the label attached to the blood component and the wristband (2)

- *The BMS gave the blood to the porter, who in turn delivered it to the ED*
- *There were no staffing issues or other emergencies identified in the laboratory area at that time, although this patient was declared as a major haemorrhage*
- *The nurse was confused as to why the emergency blood had another patient's details on the tag*
- *However, as it was an emergency the nurse and another member within the team checked the prescription and confirmed the patients name and date of birth (DOB) with the PID band*
- *The patient's unique ID was checked against the prescription but not checked against the label attached to the bag*

Error missed during a two-person bedside check

- *A foundation year one doctor spelt the surname incorrectly on the transfusion prescription or authorisation record*
- *This form was used as part of the collection process*
- *The healthcare support worker failed to notice the spelling error at collection*
- *Subsequently two nurses undertaking the bedside check, failed to recognise the error*

Laboratory Errors

Biomedical scientist (BMS) issued anti-D immunoglobulin (Ig) because the midwife was persistent and did not seek further guidance

- *A request was received out-of-hours for 500IU anti-D Ig for a patient with a per vaginal (PV) bleed*
- *The BMS informed the clinical area that the patient had an immune anti-D and that prophylaxis was inappropriate, but the midwife was insistent that the patient required anti-D Ig*
- *The BMS issued it without seeking further clinical guidance although the hospital policy clearly stated that anti-D Ig was not to be issued in cases where an immune anti-D was present*
- *Both the BMS and the midwife were aware of this policy stipulation*

Failure to look at Sp-ICE* results in a patient receiving incorrectly phenotyped units (1)

- *Eight units of red cells for a patient with newly diagnosed sickle cell disease (SCD) were requested*
- *The request form identified that the patient had received previous transfusions*
- *The biomedical scientist (BMS) contacted the clinical area to gain a further understanding of these transfusions, but was incorrectly informed the patient had not been previously transfused*
- *Two samples were grouped, and ABO/D/K compatible red cell units were electronically issued*

(Continued)

**Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment*

Failure to look at Sp-ICE results in a patient receiving incorrectly phenotyped units (2)

- *Two months later the laboratory received a sample and the antibody screen was positive, but the identification panel was inconclusive*
- *The BMS then checked with the National Health Service Blood and Transplant (NHSBT) Sp-ICE database which held a record stating that this patient had known antibodies detected 6 years earlier in another hospital*
- *Had this been identified in the first instance the electronic issue (EI) would have been negated and the correct phenotype blood requested*

Omission or late administration of anti-D immunoglobulin (Ig) as biomedical scientist (BMS) fails to follow standard operating procedure (SOP) accurately as they had not been trained to issue anti-D Ig

- *A BMS was checking outstanding work on the laboratory information management system (LIMS) and found the 'anti-D Ig' field was still pending on a patient record*
- *The system was further checked and identified that the anti-D Ig had not been issued*
- *On checking the request form and baby's blood group to see if anti-D Ig had been omitted it was found that >72 hours had elapsed*
- *No follow up call was received from the maternity ward*
- *On investigation it was found that the BMS had not followed the SOP accurately, as they were not fully trained and competent to issue anti-D Ig*
- *The request should have been placed in the appropriate file, to allow anti-D Ig to be issued by another BMS who was trained and competent*

Biomedical scientist (BMS) fails to notice a wrong component was selected and continues to not notice even when the alert on the laboratory information management system (LIMS) highlights the error (1)

- *A haemato-oncology day case patient (group AB D-negative) required transfusion of irradiated red cells*
- *The BMS took two units from the irradiated drawer but failed to notice one was A D-negative and the other A D-positive*
- *The BMS then failed to respond to the alert on the LIMS highlighting the group difference and issued both units*
- *The process failed again during the component labelling as the blood group difference between unit and patient was not noticed*

(Continued)

BMS fails to notice a wrong component was selected and continues to not notice even when the alert on the LIMS highlights the error (2)

- *The clinical area did not have any competent staff on duty available to collect the red cells, so the same BMS checked out the components and again failed to notice the group difference*
- *The clinical area did not complete adequate bedside checks before transfusion and also missed the error*
- *This component selection error was discovered on a later sample from this patient, when it was identified that they had developed an anti-D antibody*
- *At the time of this incident the BMS involved had a history of stress and anxiety and the laboratory had an increased workload*

Biomedical scientist (BMS) selects wrong component without following the standard operating procedure (SOP) or seeking further advice

- *A request for red cells was received out-of-hours for a leukaemia patient transferred from another centre*
- *Two samples were received and analysed, and both showed a weak mixed field reaction with anti-B in the forward group*
- *No historic group was available on the laboratory information management system (LIMS)*
- *The BMS contacted the clinical area and was informed there had been no previous transfusions or haemopoietic stem cell transplant (HSCT)*
- *The BMS believed the sample 'looked' like group B, therefore they crossmatched and issued group B red cells, without checking the SOP (that stated 'to give group O red cells if a clear group cannot be determined') or seeking advice from a senior member of staff working in haematology*
- *The patient was subsequently grouped some time later and did group as B without any mixed field result*
- *This event occurred in the early hours of the morning during a busy time in the laboratory*

Biomedical scientist (BMS) incorrectly interprets a warning flag as an error on the information technology (IT) system resulting in expired units being transfused

- *A unit of red cells was removed from a refrigerator controlled by an electronic blood management system (EBMS) at 00:43 hours*
- *The unit had expired at midnight and the EBMS alerted the nurse collecting the unit with a message that the unit had expired and to contact the laboratory*
- *The out-of-hours BMS incorrectly assumed the EBMS alert was related to an earlier network failure and allowed the clinical staff to take the unit back to the ward*
- *When an attempt was made to receipt the unit in the clinical area, a second alert occurred via the personal digital assistant (PDA) again, explaining that the unit had expired and not to continue*
- *The transfusion was started despite the alerts and pre-transfusion checks at the bedside failed to pick up the error.*
- *Within a few minutes the BMS looked into the alerts further and realised their error*
- *The ward was contacted immediately and told to stop the transfusion however, the transfusion had already commenced*

Previous patient's compatibility labels still attached on units and transfused to another patient

- *A major haemorrhage protocol (MHP) was activated for a patient and the appropriate blood components were issued and transfused*
- *The patient was to be transferred to a local specialist unit along with further blood components*
- *The biomedical scientist (BMS) contacted the ward to discuss the transfer of blood components and during this phone call the BMS was informed that the MHP had been activated again and blood was needed urgently*
- *The MHP bleep went off and when the BMS was putting down the phone to switchboard the porter was already in the laboratory looking shaken and visibly panicked*
- *The porter stated they wanted blood urgently and the BMS, knowing the patient was A D-positive, selected two O D-positive units from the refrigerator and boxed up these units even though these two units still had another patient's compatibility labels on them, and they were subsequently transfused*
- *The BMS made a conscious decision due to the clinical urgency of the situation, the ward staff were aware of different patient details but knew units were compatible for the patient in the clinical emergency*

Information Technology (IT)

Electronic issue (EI) of granulocytes to a patient with red cell antibodies

- *Buffy coats were required for a patient with acute myeloid leukaemia (AML) with a red cell antibody, but the red-cell rich component was issued electronically rather than serologically crossmatched*
- *Granulocytes are infrequently used and therefore unfamiliar to many laboratory staff*
- *Laboratory information management system (LIMS) control of EI eligibility may not cover non-red cell components and therefore it is important to include this in the standard operating procedure for buffy coat and granulocyte issue*

Febrile, Allergic and Hypotensive Reactions (FAHR)

Febrile reaction inappropriately treated with an antihistamine and steroid

- *A day case patient in their 60s with myelodysplasia, haemolysis and neutropenia developed a temperature rise to 39.7°C, rigors and nausea during a red cell transfusion*
- *They were treated with hydrocortisone, chlorphenamine, paracetamol, antibiotics and admitted on to a ward*
- *Future transfusion management was stated to be pre-medication with an antihistamine and steroid*
- *Although it is not clear if steroid treatment may be beneficial for the management of their haemolysis it is unlikely to prevent a further febrile-type reaction and may make infection more likely in a vulnerable, neutropenic patient*

Reducing the number of units given at each transfusion episode as a reaction prevention strategy

- *A patient in their 60s with chronic transfusion dependent anaemia received a red cell transfusion as an inpatient*
- *During the transfusion, they developed a temperature of 38°C associated with chills and rigors*
- *The rate of the transfusion was reduced and they were given paracetamol, however their symptoms reoccurred therefore the transfusion was discontinued*
- *Future management was to limit transfusion episodes to a single unit of red cells and was reported to be effective*

Use of iron to avoid the need for red cell transfusion

- *A patient in their 80s was admitted to the ambulatory care unit for a two-unit red cell transfusion for symptomatic iron deficient anaemia*
- *Chlorphenamine and ondansetron were given pre transfusion*
- *On completion of the first unit the patient developed a temperature rise of more than 2°C, rigors, nausea and was treated with paracetamol*
- *They were discharged later the same day and intravenous iron agreed as future management*
- *It is unclear what the expected benefit was of pre-transfusion chlorphenamine, however treatment with paracetamol and future management with intravenous iron are rational*
- *If intravenous iron is given prior to the development of symptoms this is likely to prevent the need for further urgent admission and red cell transfusion*

Pulmonary Complications of Transfusion

Transfusion-Related Acute Lung Injury (TRALI)

Antibody-negative TRALI - post mortem diagnosis without serology

- *A male patient in his late 60s, with recent diagnoses of advanced myelodysplasia and prostate cancer presented to the emergency department (ED) with abdominal pain, hypotension and a platelet count of 6*
- *He had a raised C-reactive protein, metabolic acidosis with raised lactate, low albumin and renal impairment prior to transfusion and received two units of red cells and a unit of platelets on the day of admission uneventfully*
- *Over 24 hours later, 10 minutes after starting a platelet transfusion, he became acutely breathless and hypoxic with a further fall in blood pressure and deterioration in renal function*
- *In view of his underlying diagnoses, a decision was made not to escalate care further and he suffered a cardiac arrest shortly afterwards*

Transfusion-Associated Circulatory Overload (TACO)

Rapid correction of anaemia can precipitate TACO in the absence of other comorbidities and risk factors (1)

- *A male in his 50s presented to the emergency department (ED) with a 3-4-week history of weakness and dizziness, and had felt unwell for the past 6 months*
- *He was hypotensive (blood pressure (BP) 92/47) but did not show signs of acute haemorrhage though there was some altered blood on rectal examination*
- *On admission his haemoglobin (Hb) was 34g/L, ferritin 26micrograms/L and the electrocardiogram (ECG) showed cardiac ischaemia*
- *He was transfused two units of red cells with a plan for endoscopy and intravenous (IV) iron the following day*
- *A third unit was planned if the post-transfusion Hb was <60g/L*

(Continued)

Rapid correction of anaemia can precipitate TACO in the absence of other comorbidities and risk factors (2)

- *The first unit was transfused over 31 minutes and the second over 65 minutes*
- *After the second unit his oxygen saturations began to fall despite being on supplemental oxygen and his post-transfusion Hb was 51g/L*
- *A third unit was transfused over 125 minutes and he developed worsening hypoxia, dyspnoea and crackles on chest auscultation*
- *The chest X-ray showed an enlarged cardiac silhouette and pulmonary congestion*
- *He was treated with diuretics and improved*
- *Fortunately, the attending doctor cancelled the fourth unit which had been planned*

Excessive red cell volume given to an overloaded small patient where TACO was not initially suspected (1)

- *A female in her 80s was admitted with a fractured neck of femur*
- *She weighed 40kg and had a preoperative haemoglobin (Hb) of 109g/L*
- *She received 2L of Hartmann's in theatre and returned to the ward with a positive fluid balance (+2425mL)*
- *Her postoperative Hb was 65g/L and she was haemodynamically stable*
- *She was prescribed three units of red cells and her pre-transfusion vital sign observations were normal*
- *Her vital sign observations after the first unit were normal but her fluid balance was then +3454mL*

(Continued)

Excessive red cell volume given to an overloaded small patient where TACO was not initially suspected (2)

- *The second unit was given after which she became shaky and developed hypertension (175/82), pyrexia (38oC), tachycardia (102 beats per minute), tachypnoea (22 breaths per minute) and her oxygen saturation was 96% on 5L of oxygen*
- *This was reported to the on-call orthopaedic doctor who requested further fluid to be administered stat (250mL Hartmann's) which resulted in a further deterioration of her respiratory status*
- *The attending doctor suspected acute lung injury or sepsis (not circulatory overload)*
- *A chest X-ray was performed on the advice of the consultant haematologist whose opinion had been sought for a possible transfusion reaction*
- *This was consistent with pulmonary oedema*

A complex presentation with difficult decision-making (1)

- *A male in his 60s with history of factor XI deficiency and chronic obstructive pulmonary disease (COPD) had been referred to the colorectal team on a two-week pathway for investigation of anaemia (haemoglobin (Hb) 82g/L, platelets 92×10^9 /L)*
- *He had felt increasingly unwell and presented to the emergency department (ED)*
- *His Hb was 34g/L, platelets 27×10^9 /L, neutrophils 0.58×10^9 /L, he had renal failure (eGFR 36mL/min), hypoalbuminaemia, and prolonged clotting times (prothrombin time (PT) 23.1 seconds (s) and activated partial thromboplastin time (APTT) 90s)*
- *Per rectum examination showed melaena and endoscopy was planned for the following day*
- *He had tachycardia and hypotension*

(Continued)

A complex presentation with difficult decision-making (2)

- *The ED consultant suspected acute gastrointestinal bleeding and the patient was transfused a total of four units of red cells, three units of fresh frozen plasma (FFP), and one dose of platelets over 9 hours (total >2L in volume)*
- *He developed hypoxia (oxygen saturations <70%) and bradycardia (heart rate 35 beats per minute), and was pale and clammy*
- *He was given oxygen therapy (15L) and diuretics which produced a good diuresis*
- *He received cardiac monitoring and was transferred to the intensive therapy unit (ITU)*
- *The chest X-ray was consistent with pulmonary oedema and peripheral blood film was reported later and showed blast cells*

Transfusion-Associated Dyspnoea (TAD)

Death possibly related to the transfusion (transfer from TACO)

- *A woman in her 80s under investigation for pancytopenia developed bruising and a petechial rash*
- *She was transfused with red cells (haemoglobin (Hb) 58g/L) and later with platelets but developed fever and was admitted. She became increasingly hypoxic with oxygen saturation falling to 76%*
- *Chest X-ray showed widespread patchy shadowing. She had a cough with haemoptysis and chest pain*
- *She also received intravenous immunoglobulin (IVIg) 1g/kg*
- *Chest X-ray did not show evidence of fluid overload or consolidation*
- *She declined further active intervention and died 2 days after admission*
- *The TRALI review panel agreed that this case was more likely to be a combination of fluid overload and progressive lung infection on a background of pre-existing pulmonary fibrosis*
- *The causes of death were recorded as 1a acute respiratory distress syndrome (ARDS), 1b pulmonary haemorrhage, TRALI and 1c immune thrombocytopenia*

An elderly man with haemorrhage who developed pulmonary and renal complications (transfer from TRALI; death possibly related to transfusion)

- *A man in his 80s was admitted to the intensive therapy unit from the emergency department with multiple organ failure following admission with hypovolaemic shock and a burst varicose vein*
- *The major haemorrhage protocol was activated, and he rapidly received seven units of red cells (15-30 minutes per unit) in addition to four units of fresh frozen plasma and one of platelets*
- *The pre-transfusion Hb was 110g/L*
- *He was noted to have bilateral pulmonary infiltrates and crackles on auscultation*
- *His troponin increased from 55 to 208ng/L and his pro-B-type natriuretic peptide (BNP) from 551 to 973pg/L and he required renal dialysis*
- *He died within 24 hours of admission*
- *This reads more like circulatory overload*

Transfusion for menorrhagia results in respiratory failure (transfer from TRALI; major morbidity)

- *A woman in her 40s received a transfusion of six units of red cells for menorrhagia (continuous bleeding for 22 days)*
- *Her haemoglobin (Hb) was 45g/L (90g/L post transfusion)*
- *She had a history of chronic anaemia and previous transfusions*
- *A pre-transfusion chest X-ray showed diffuse patchy infiltration/consolidation*
- *She developed shortness of breath within 2 hours of transfusion with saturation of 90%, no fever, heart rate 87 and normal blood pressure*
- *Chest X-ray post transfusion showed asymmetrical pulmonary oedema*
- *She required continuous positive airway pressure (CPAP) and then mechanical ventilation for 3 days*
- *Her condition worsened despite steroids and diuretics*
- *The donor of the triggering unit was an untransfused male so the local Blood Service decided this was not TRALI*

Haemolytic Transfusion Reactions (HTR)

Hyperhaemolysis post allogeneic stem cell transplant

- *A haematology patient with T-cell lymphoma post stem cell transplant developed symptoms consistent with hyperhaemolysis following a four-unit red cell transfusion*
- *The patient was transfused a further five red cell units, but the bilirubin continued to rise and the haemoglobin (Hb) to fall*
- *The patient developed impaired renal function and died 9 days later*

Hyperhaemolysis in a patient with Rosai-Dorfman Syndrome

- *A patient with known Rosai-Dorfman syndrome was admitted with symptomatic anaemia, and a haemoglobin (Hb) of 24g/L*
- *The patient had previously confirmed autoimmune haemolytic anaemia*
- *The patient was treated with steroids, erythropoietin and rituximab in addition to red cell transfusion*
- *Within 7 hours of transfusion the patient experienced fever, back and chest pain, dyspnoea and haemoglobinuria*
- *The patient's Hb dropped from 81g/L immediately post transfusion to 20g/L, the bilirubin and lactate dehydrogenase (LDH) became raised and spherocytes were detected on the blood film*
- *The patient developed impaired renal function and died 6 days later*

Antibody detectable pre transfusion in eluate

- *The patient was admitted for laparotomy for a small bowel obstruction*
- *Fully automated pre-transfusion testing was performed, and a negative antibody screen result obtained using the Ortho AutoVue Innova*
- *Blood was crossmatched by electronic issue*
- *During the transfusion the patient's heart rate increased and their temperature rose by 2°C*
- *The transfusion was stopped, and a transfusion reaction investigation requested*
- *As part of the investigation the antibody screen on the pre-transfusion sample was repeated as negative, however a direct antiglobulin test (DAT) was also performed on this sample*
- *The DAT was positive and anti-Jk^a was detected in the eluate. Anti-Jk^a was also detected in the post-transfusion sample and in an eluate performed from this sample*
- *One of the units transfused was confirmed as Jk^a-positive*

Discrepant pre-transfusion results obtained using automated analysers

- *Blood was issued by electronic crossmatch following a negative antibody screen result using the Ortho AutoVue analyser*
- *Ninety minutes post transfusion the patient experienced rigor, back pain and fever*
- *Samples were sent to the laboratory for investigation of a transfusion reaction*
- *Pre- and post-transfusion samples were tested on a second Ortho AutoVue analyser*
- *They both gave positive reactions and anti-Jk^a was subsequently identified*
- *This was reported to the analyser manufacturer for investigation*
- *Following testing of the antibody titre it was concluded that the antibody was at a level that was below the minimum level for detection*

New or Unclassifiable Complications of Transfusion (UCT)

Reaction to platelets (transfer from FAHR)

- *A neutropenic man in his 20s on chemotherapy for Hodgkin lymphoma reacted to a platelet transfusion with tachycardia (from 90 to 150 beats per minute), anxiety and flushing after 10 minutes*
- *The transfusion was stopped*
- *He was treated with intravenous antihistamine and hydrocortisone (HC)*
- *The following day he received another unit of platelets uneventfully with HC and antihistamine cover*

Pain associated with transfusion

- *A man in his 50s admitted with abdominal pain, jaundice and fever and many co-morbidities developed pain in his hands and leg with cramping during transfusion after the fourth and fifth units*
- *The local review suggested the cause might be citrate toxicity as the symptoms could be reproduced by tourniquet application*
- *It was decided to minimise transfusion and to transfuse in future with medical supervision and electrocardiogram (ECG) monitoring*

Severe adverse reaction after a platelet transfusion

- *A woman in her 60s reacted to platelets with vomiting and was faecally incontinent*
- *She was on therapy for leukaemia and already had infection and diarrhoea 1 week post chemotherapy*
- *This may have been a vasovagal response but is reported here as it was severe and incapacitating*

A reaction to platelets

- *An elderly woman on treatment for myelodysplastic syndrome (MDS) developed a reaction to platelet transfusion with agitation, flushing and respiratory distress*
- *She had previously had a minor reaction to platelets and so had received premedication before transfusion*
- *She was treated with chlorpheniramine and hydrocortisone and recovered*
- *Investigations for allergy and transfusion reaction were negative*
- *It was decided that she should receive washed platelets in future*

Reaction without symptoms but change in vital signs

- *A man in his 80s with haematuria due to bladder cancer received red cells*
- *An hour into transfusion the patient developed fever, 38.4°C, tachycardia and an increased respiratory rate with a rise in blood pressure*
- *He had no symptoms*
- *This was thought at the time to be an anaphylactic type of reaction but this was not confirmed*

Probable *Staphylococcus epidermidis* (Morbidity: moderate; imputability: 2-probable) (1)

- *A young child received one standard unit of a 7-day old apheresis platelet*
- *The child was receiving blood components due to ongoing chemotherapy for an underlying medical condition*
- *Three hours prior to the platelet transfusion they had received a unit of red cells through a tunnelled central venous catheter with no adverse reaction*
- *Within 5 minutes of the platelet transfusion being started the child experienced an anaphylactoid reaction including a rise in temperature to 40°C that lasted for 24 hours*
- *This was treated empirically with intravenous antibiotics to cover the possibility of either a bacterial TTI or a central line infection*
- *The patient made a good recovery and was discharged home within days to complete a week of antibiotics*
- *Staphylococcus epidermidis was repeatedly isolated from recipient blood cultures and a transfusion reaction investigation was commenced by NHSBT*

(Continued)

Probable *Staphylococcus epidermidis* (Morbidity: moderate; imputability: 2-probable) (2)

- *Routine bacterial screening of the transfused platelet unit was negative but on return to the NHSBT national bacteriology laboratory Staphylococcus epidermidis was isolated from the index pack*
- *This isolate was sent for typing along with isolates from the recipient's blood cultures and they were shown to be indistinguishable*
- *Associated components were recalled, however one associated 4-day old platelet unit had already been transfused into a patient in whom no adverse reactions were reported*
- *It is possible that this does not represent a TTI, but rather a central venous catheter infection in the recipient*
- *In this case, the isolate in the recalled index pack might represent contamination with blood from the recipient*
- *However, the chronology of the presentation, the clinical picture and the lack of reaction during an earlier red cell transfusion make a bacterial TTI probable in this case*
- *Donor investigations are ongoing*

Indeterminate viral HBV TTI case 1: (Morbidity: minor; imputability: N/A)(1)

- *In 2011, a man in his 40s received multiple blood transfusions over the course of 3 months, amounting to three units of pooled platelets and four units of apheresis platelets*
- *The transfusions were given during treatment for Hodgkins lymphoma*
- *Many years later in mid-2018 the patient was tested for hepatitis B virus (HBV) following a prolonged period of raised alanine aminotransferase (ALT) and was found to have HBV markers for chronic infection (HBsAg positive, HBeAg positive, core antibody positive, IgM negative)*
- *Following this an investigation was launched into blood components as a possible source of the infection*

(Continued)

Transfusion-Transmitted Infections (TTI)

Indeterminate viral HBV TTI case 1: (Morbidity: minor; imputability: N/A)(2)

- *Given the time period, there were no index samples available for testing, but 16 donors were identified that related to the seven units the patient received*
- *Half of these donors had donated in the past three years and so had a recent archive sample available for testing, all of which had negative results for HBV*
- *The other eight donors had not recently donated due to personal choice or medical reasons (unrelated to hepatitis B) and so no samples were available for testing for them*
- *Of these seven had returned at least once since the implicated donation*
- *This meant NHSBT were unable to ascertain whether transfusion was the source of this patient's HBV infection and a classification of indeterminate was therefore assigned*

Probable viral HBV TTI case 2: (Morbidity: major - death; imputability: 2-probable) (1)

- *After being admitted to hospital in late 2017, a woman in her 70s received two units of red cells in response to a low haemoglobin level of 83g/L*
- *She had multiple medical conditions including liver cirrhosis due to non-alcoholic steatohepatitis (NASH)*
- *Approximately 6 months later she was re-admitted to hospital with acute hepatitis and diagnosed with acute hepatitis B infection*
- *She developed acute-on-chronic liver failure and unfortunately died about 5 weeks after the HBV diagnosis*
- *The patient had tested negative for HBV infection in late 2016 and further samples from the patient were deemed to be consistent with a recent HBV infection (anti-HBcore IgM antibodies detected and anti-HBcore antibody avidity results compatible with a recent HBV infection)*

(Continued)

Probable viral HBV TTI case 2: (Morbidity: major - death; imputability: 2-probable) (2)

- *The virus was identified as genotype D2*
- *Investigations external to NHSBT took place which looked at the hospital and lifestyle as possible sources of infection, these were excluded as possible sources*
- *Blood transfusion was therefore the only risk factor identified and an investigation was launched by NHSBT*
- *The two donors associated with the units transfused to the patient were identified*
- *One was a repeat donor who had an archive sample from the implicated unit and another archive sample for a subsequent donation; both tested negative for HBV*

(Continued)

Probable viral HBV TTI case 2: (Morbidity: major - death; imputability: 2-probable) (3)

- *The other donor was a new donor, the archive sample from the implicated donation was retrieved and tested positive for anti-HB core antibodies with anti-HBs of 9.60 mIU/mL but negative for HBV deoxyribonucleic acid (DNA) using singleton nucleic acid testing (NAT)*
- *The donor kindly provided a large volume sample which was concentrated and then tested*
- *In this concentrated sample, HBV DNA was detected at a level below the level of detection of our routine screening tests, and even if singleton testing had been used in screening it is unlikely DNA would have been detected*
- *The concentrated sample was sent for confirmatory testing but unfortunately this was unable to detect HBV DNA and unable to perform sequencing*

(Continued)

Probable viral HBV TTI case 2: (Morbidity: major - death; imputability: 2-probable) (4)

- *Investigations confirmed that this donor had an occult HBV infection and he had likely had a completely asymptomatic HBV infection as a child, as he was born in HBV endemic country*
- *For these reasons, this infection could not have been picked up by donor questionnaire or by testing*
- *It was noted that this donor was born in a region where genotype D2 HBV infection is prevalent*
- *Since it was not possible to sequence the sample, transmission cannot be confirmed*
- *However, since no other risk factors were identified in the recipient, despite extensive investigations, and because the virus found in the recipient had a genotype prevalent in the donor's country of birth, it is was concluded probable that the blood transfusion was the route of HBV transmission*

Confirmed viral HEV TTI case 3:

(Morbidity: major; imputability: 3-confirmed) (1)

- *In late 2018, as part of routine screening, NHSBT identified a regular apheresis platelet donor who tested positive for hepatitis E virus (HEV) ribonucleic acid (RNA), indicating an acute HEV infection, and this donation was discarded*
- *The donor had donated in the previous month and following the usual lookback process an archive sample from this previous donation was tested and found to be HEV RNA positive with a very low viral load*
- *This previous donation had been tested for HEV in a pool of 24 donations, as per normal screening procedures, and was issued as screen negative at the time*
- *The low viral load detected in individual screening would have been below the level of quantification in the pooled screening, hence the screen negative result*
- *Based on previous work this viral load was thought to be very unlikely to transmit by transfusion (Tedder et al. 2017)*

(Continued)

Confirmed viral HEV TTI case 3:

(Morbidity: major; imputability: 3-confirmed) (2)

- *Both platelet packs from the previous low-level HEV-positive donation had been issued and the hospitals were contacted and recipients identified*
- *One recipient had died shortly after the transfusion from their underlying conditions*
- *The other platelet recipient was a haematology patient undergoing chemotherapy at the time of the transfusion*
- *The patient was informed and a blood sample was taken 11 weeks post transfusion, this tested positive for HEV RNA*
- *Samples from the donor and recipient were sequenced and the hepatitis E virus isolated was found to be identical at the nucleotide level therefore making this a confirmed TTI*
- *Testing of a follow-up sample from the donor indicated that they had cleared the infection and, at the time of writing, the recipient had not experienced symptoms of HEV infection, but they continue to be monitored*
- *This is the first recorded case of an HEV TTI since universal screening was introduced in April 2017*

Post-Transfusion Purpura (PTP)

Probable PTP in a patient with immune thrombocytopenia

- *A female patient in her 70s was given one unit of red cells and two units of platelets for acute bleeding*
- *She had a platelet count of $43 \times 10^9/\text{L}$ prior to transfusion, ascribed to immune thrombocytopenia (ITP)*
- *Ten days after discharge she was readmitted with abdominal pain and a purpuric rash*
- *Her platelet count had fallen to $5 \times 10^9/\text{L}$, and anti-HPA1a antibodies were subsequently demonstrated in her blood*
- *She was treated with intravenous immunoglobulin (IVIg) and methylprednisolone, and achieved a platelet count $>50 \times 10^9/\text{L}$ 11 days after starting treatment*

Cell Salvage (CS)

Leucocyte depletion filter (LDF) not used for reinfusion of red cells in a urological case with malignancy

- *A patient in their 50s undergoing elective open partial nephrectomy with malignancy experienced a major haemorrhage*
- *Intraoperative cell salvage (ICS) was being used and autologous red cells were available for reinfusion*
- *The transfusion was initiated without the use of a LDF as the operator was unaware of the patient's malignancy status*
- *Only 20mL was infused before the error was noted*
- *The transfusion was stopped and a LDF used for the remainder of the infusion*

Sepsis, disseminated intravascular coagulation (DIC) and renal failure following re-infusion cell salvaged blood (imputability: 1, possible)

- *A patient in her 20s, undergoing emergency caesarean section (Category 2) for failure to progress following induction of labour for high blood pressure, received a re-infusion of 450mL of cell salvaged blood in recovery*
- *She went on to become septic, developed DIC and renal failure requiring dialysis*
- *Her renal function did not significantly improve leaving the patient in need of a renal transplant*

Cardiac arrest during re-infusion of cell salvaged blood during nephrectomy (imputability: 0, excluded or unlikely)

- *A patient in their 80s underwent an elective nephrectomy for malignancy and suffered significant blood loss*
- *Cell salvaged blood was re-infused intraoperatively using a LDF with a member of theatre staff applying manual pressure to speed up the rate of transfusion*
- *Having re-infused 50mL over 5 minutes the patient suffered a cardiac arrest from which they were successfully resuscitated*
- *The patient also became bradycardic and required the insertion of a permanent pacemaker*
- *The anticoagulant used for cell salvage was acid-citrate-dextrose solution (ACD)*

Allergic reaction to salvaged red cells (imputability: 2, likely/probable)

- *A patient in her 30s undergoing myomectomy developed red tracking marks proximal to the cannula on reinfusion of salvaged red cells*
- *The reinfusion was stopped and the marks disappeared only to reappear on resumption of the infusion*
- *The reinfusion was therefore discontinued*
- *There were no further complications and the patient made a complete recovery*
- *The anticoagulant used was acid-citrate-dextrose solution (ACD)*

Hypotension on reinfusion of salvaged red cells in an obstetric case with the use of a leucocyte depletion filter (LDF) (imputability: 2, likely/probable)

- *A patient in her 30s underwent an elective caesarean section where cell salvage was used with acid-citrate-dextrose solution (ACD) as the anticoagulant*
- *On reinfusion of the salvaged red cells via a LDF, the patient's pulse increased from 81 to 130 beats per minute (bpm) and blood pressure (BP) dropped from 107/72 to 54/34mmHg*
- *The patient reported feeling light-headed, dizzy and nauseous*
- *The reinfusion was stopped and infusion of clear fluids commenced with continuous patient monitoring*
- *The patient quickly improved and reinfusion of the salvaged red cells was recommenced at a slower rate at the patient's insistence with no further issues*

Hypotension on reinfusion of salvaged red cells in an orthopaedic case without the use of a leucocyte depletion filter (LDF); (imputability: 3, certain)

- *A patient in their 70s underwent revision hip surgery of adverse reaction to metal debris (ARMD)*
- *During reinfusion of 240mL of salvaged red cells over 2-3 minutes, the patient exhibited a profound hypotension with systolic blood pressure (BP) of 60mmHg for approximately 5 minutes*
- *This was corrected with the use of vasopressors and fluid infusion*
- *The anticoagulant used for cell salvage was acid-citrate-dextrose solution (ACD)*

Paediatric Cases

TACO and death following accidental overtransfusion of three times the volume required

- *A preterm infant required a double volume exchange for high bilirubin*
- *The baby deteriorated markedly 1 hour after the exchange transfusion was commenced*
- *At this point it was noticed that nearly three times the required volume had been administered (175mL) than had been removed (70mL)*
- *This was due to three syringes of blood being accidentally run concurrently*
- *The baby developed pulmonary oedema and then an intracranial haemorrhage*
- *The neonatal unit involved performs approximately 5-10 procedures per year but the investigation commented that this is still sufficiently infrequent to mean that many nurses and members of the junior medical team will have limited experience*

Transfusion of red cells of the wrong group to a neonate due to a failure to communicate the previous intrauterine transfusions (IUT)

- *A baby received three transfusions of group O D-negative red cells in utero*
- *Following delivery, the baby's group was reported as O D-negative, and group O D-negative plasma and platelets were issued and transfused*
- *In view of the IUT the baby should have received group AB plasma components*
- *This error occurred because the fetal and newborn case records had not been merged*

Child with DiGeorge syndrome transfused non-irradiated components

- *A child was under-going tetralogy of Fallot repair in theatre but the surgical team had not been informed of the diagnosis of DiGeorge syndrome*
- *The genetic results were available but had been filed in a second set of temporary notes for the patient and only the original set was available at time of operation*
- *In addition, the parents had not been informed of the result*

Acting upon erroneous blood test results

- *A child presented as an emergency*
- *The full blood count showed pancytopenia and a platelet transfusion was administered overnight*
- *When a cannula was re-sited the next day the blood count was repeated and was normal*
- *Blood transfusion was discontinued*
- *The initial sample was erroneous*

Miscalculation of red cell transfusion volume required

- *An infant requiring transfusion of red cells, weight 6.2kg, haemoglobin (Hb) 110g/L aiming at 140g/L, was prescribed a unit over 3 hours*
- *The post-transfusion Hb was 190g/L, following a transfusion of over 30mL/kg*
- *The error in prescription was noted the next day resulting in venesection of 50mL and replacement with fluid*
- *The electronic prescribing programme used in this paediatric intensive care unit defaulted to units and the prescriber had to go to a second page, which was not done in this case*
- *The review noted this system was not fit for purpose in paediatrics and was to be entered onto the risk register*

Failure to communicate short expiry of neonatal exchange red cell unit

- *The neonatal unit requested red cells for neonatal exchange from the transfusion laboratory*
- *The time that the exchange transfusion was scheduled to occur was later than planned and the red cells provided by the Blood Service had only 4 hours before expiry*
- *The exchange had to be stopped before the full volume had been delivered and further blood had to be crossmatched the next day*
- *The short expiry should have been discussed with the hospital prior to supply of the units*

Incorrect infusion pump settings resulting in three times the rate of infusion intended

- *A young child (<10 years) was due a unit of red cells (270mL)*
- *This was intended to be infused over 3.5 hours*
- *In error the volume to be infused was set as the rate and the volume was infused over 1 hour*
- *The child did not suffer any ill effects*

Neonate transfused ten times the required volume of platelets

- *A 2.9kg neonate with thrombocytopenia absent radii syndrome was prescribed 290mL instead of 29mL of platelets to be given prophylactically to cover a procedure*
- *The prescription was written on a paper prescription chart*
- *An adult sized pack of platelets was issued and transfused by the neonatal team*
- *Approximately 200mL was administered before the error was noticed*
- *The child developed respiratory distress and reduced oxygen saturation with chest X-ray changes consistent with fluid overload*
- *Post-transfusion platelet count was $767 \times 10^9/L$*
- *Diuretics and supplemental oxygen were given and the baby made a full recovery*