Avoidable, Delayed and Under or Overtransfusion (ADU) Case Studies

Delayed Transfusion

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Delay in provision of alternative blood component contributes to the death of a paediatric patient (imputability 2 – probable)

- *A neonatal consultant requested platelets for an unwell neonate who was waiting to be transferred to a specialist unit*
- *The urgency of the transfusion was not clearly communicated by the clinical team initially*
- *In addition, the transfusion biomedical scientist (BMS) was not aware of alternative options available*

Failure to recognise bleeding contributed to the death of a new mother (imputability 1 – possible)

- *A woman experienced a significant bleed following the birth of her baby*
- *There was a delay in the clinical team recognising the severity of bleeding and escalating care appropriately*
- *This was due to multiple factors including issues with equipment and focus on an alternative diagnosis*
- *The MHP was not activated, delaying appropriate transfusion support*
- *Coagulopathy was not promptly recognised and addressed; fibrinogen replacement was initiated too late to be effective*
- *The patient suffered multiple cardiac arrests, and despite surgical intervention and intensive care, she died a few days after giving birth with disseminated intravascular coagulation*

Multiple issues contributed to the delay in transfusion during major haemorrhage (imputability 2 – probable)

- *A patient with postoperative bleeding failed to receive a timely blood transfusion out-of-hours*
- *There was a 3-hour delay in recognising the severity of bleeding and therefore the major haemorrhage protocol was not activated*
- *The initial group and screen (G&S) sample was rejected, and the urgency of the transfusion was not clearly communicated to laboratory staff*
- *The clinical team on the ward were unfamiliar with the management of patients with major bleeding and were not aware of the procedures for accessing emergency blood components*
- *The patient suffered a cardiac arrest and died*

Assumption resulted in a 10-hour transfusion delay (imputability 2 – probable)

- *An elderly patient with a gastrointestinal (GI) bleed and a haemoglobin (Hb) of 45g/L was prescribed a unit of red cells*
- *There was a misunderstanding regarding who should request the red cell units from the transfusion laboratory*
- *The prescribing doctor assumed the nurses would request the blood as this was routine practice in the clinical area where they previously worked*
- *Conversely, the nurses assumed the doctor would be requesting the blood as this was routine practice on the current ward*
- *The error was noticed when the doctor reviewed the patient 10 hours later, the Hb had dropped to 38g/L*
- *The patient was transfused one unit of red cells but suffered a cardiac arrest and died*

Multiple issues during major haemorrhage resulted in avoidable delays in accessing blood components

- *A patient with a suspected ruptured ectopic pregnancy presented to the emergency department (ED)*
- *O D-negative red cells were requested for immediate transfusion, but staff were unable to access units from the blood refrigerator despite multiple attempts*
- *Similar issues occurred when trying to obtain red cells from the theatre and maternity refrigerators*
- *The major haemorrhage protocol (MHP) was activated, but the incorrect obstetric alert was issued, delaying an appropriate response*
- *The patient was transferred to theatre, where blood components were finally administered*
- *The patient had lost 3L of blood and required intensive care unit (ICU) admission*
- *A subsequent investigation revealed that an electronic blood management system upgrade had prevented units from being removed from the blood refrigerator*

Multiple issues and delayed decision-making contributed to a delay in blood component provision during a major haemorrhage

- *A patient with significant bleeding required an urgent transfusion, but rejection of multiple samples delayed the provision of crossmatched red cell units*
- *When emergency red cell units were requested, further delays occurred due to problems accessing the remote blood refrigerator*
- *By the time emergency red cell units were obtained, the patient had lost approximately 1000mL of blood, suffered a cardiac arrest and was admitted to the intensive care unit*

Failure to contact the laboratory during major haemorrhage resulted in blood component delays

- *A patient was found in the hospital grounds with a massive upper gastrointestinal bleed*
- *The major haemorrhage protocol was activated, but no blood components were sent from the laboratory*
- *Upon investigation, the transfusion laboratory had not received the notification of the activation, leading to a significant delay in blood provision*
- *Emergency O D-negative red cells units were administered from the emergency department, but the patient required further transfusion support and intensive care unit admission*
- *Multiple follow-up calls with communication gaps, compounded by confusing terminology contributed to the delay*
- *In-person visits to the laboratory were necessary to clarify the request and obtain the required components*

Delay in provision of blood components during a major haemorrhage due to red cell antibodies

- *Provision of emergency blood components caused delays for a woman with a massive obstetric haemorrhage*
- *A new red cell antibody was identified in the group and screen sample*
- *The clinical team was advised that they needed approval from the haematology specialist registrar before emergency group O or group-specific red cell components could be issued*
- *This led to a delay in blood provision for a bleeding patient*

Patient put at risk due to staffing issues in the laboratory

- *A woman with suspected ectopic pregnancy presented to the emergency department out-of-hours*
- *Group and screen samples were sent to the transfusion laboratory for urgent crossmatch*
- *The transfusion laboratory was not staffed and a lone-working biomedical scientist in the biochemistry department received undue pressure to also cover the transfusion service*
- *Clinical site managers at the hospital were not aware of the situation*
- *The clinical team knew how to access emergency blood components, and the patient was transfused with full recovery*

Multiple issues resulted in a delay in blood for a patient with a gastrointestinal (GI) bleed

- *A patient with multiple co-morbidities and an upper GI bleed due to varices required blood components*
- *The major haemorrhage protocol was activated, and multiple clinical specialties were involved in his care*
- *There was a delay in accessing blood components, the patient did not have a valid group and screen (G&S) and the laboratory requested a G&S sample*
- *The porter was subsequently unable to access the blood refrigerator*
- *The patient suffered cardiac arrest as the blood was being transfused and was transferred to intensive care unit where he died, unrelated to the delay*

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

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

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

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

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

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

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

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

Printer failure caused delay in transfusion

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

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

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

Failure to recognise internal haemorrhage with fatal outcome

- *A man in his 70s arrived in the emergency department (ED) at 10:01 with chest pain and confusion. He had previously been discharged 2 days earlier with a chest infection and COVID-19 on doxycycline (which can enhance the anticoagulant effect of warfarin)*
- *He was on warfarin together with low-molecular-weight heparin (LMWH) as bridging for a low international normalised ratio (INR) (anticoagulated for an artificial heart valve)*
- *On admission his blood pressure at 11:17 was 97/57 falling to 89/52 at 12:34 with a raised early warning score (10) and he was drowsy*
- *He was covered in bruises and haemoglobin had reduced from 139g/L, taken 2 days earlier, to 86g/L on admission; 77g/L at 16:43 and later to 62g/L*
- *His INR was 3.7 and was not reversed*
- *After 12 hours in the ED at 22:08 he was found unresponsive (last seen at handover at 19:30); at 22:10 noted to be in asystole*
- *Cardio-pulmonary resuscitation was started.*
- *The major haemorrhage protocol was called at 22:33, but he died at 23:11*
- *He had extensive flank bruising and was thought to have had a catastrophic intra-abdominal bleed*

Failure to respond to ongoing gastrointestinal bleeding in a timely manner

- *An elderly man was admitted with melaena on a Wednesday with a haemoglobin (Hb) of 49g/L and was treated with two units of red cells*
- *Repeat Hb was 68g/L and 2 days later a further unit was given*
- *He was not reviewed by the appropriate team nor were blood components prescribed to treat signs of ongoing bleeding and hypovolaemia over a 4-day bank holiday weekend*
- *The on-call doctor noted his blood pressure was 90/50, and heart rate 90bpm but stated the patient was haemodynamically stable*
- *The nursing team had identified clinical deterioration and attempted to escalate this concern to the medical team*
- *The Hb remained low and the major haemorrhage protocol was activated in the evening of the first normal working day (Tuesday)*
- *Despite transfusion he had ongoing bleeding and was too unstable for endoscopy*
- *Treatment was withdrawn and he died the following day (7 days after admission)*

Delayed red cell transfusion and death in a patient with gastrointestinal haemorrhage

- *An elderly person (known anaemia due to chronic myeloid leukaemia) was seen in the emergency department at 18:20 with coffee-ground vomit*
- *Blood samples ('routine') were received in the laboratory 3 hours later (21:24), Hb 58g/L*
- *Red cell units were requested (not identified as urgent) but irregular antibodies were detected, delaying provision of compatible units until 23:00*
- *The major haemorrhage protocol was activated at 23:40 and due to communication failures, the patient received emergency group O D-negative units (possibly incompatible); the patient was hypovolaemic, arrested and died*

Delayed platelet transfusion in a patient with severe thrombocytopenia due to acute myeloid leukaemia (AML)

- *An elderly man with AML had a Hb of 65g/L and platelets 2x10^9/L at an outpatient visit*
- *He was contacted to return for transfusion*
- *Platelets were ready at 15:30*
- *He attended the emergency department at 17:00, and fell at 19:30 sustaining a head injury*
- *He was transfused platelets at about 22:30*
- *He died of a subdural haematoma with brain herniation as a result of traumatic head injury following the fall*
- *The 5-hour delay in platelet transfusion was considered contributory*

Delayed transfusion and death - sample errors and failure to recognise gastrointestinal (GI) bleeding

- *A woman in her 60s, recently in hospital with myocardial infarction, was readmitted 3 weeks later at 04:10 with recurrent chest pain, vomiting and acute anaemia*
- *Her haemoglobin (Hb) had fallen from 113g/L to 68g/L over 3 weeks. She was thought to have further myocardial infarction secondary to anaemia*
- *The first sample at 04:30 was rejected; transposed first and last names*
- *The same error was repeated with a second sample at 08:26*
- *The biomedical scientist made several unsuccessful attempts to contact the emergency department, unanswered telephone calls*
- *Eventually new samples were received at 11:39; two red cell units were available at 13:36*
- *However, the major haemorrhage protocol was activated at 13:04 (Hb 34g/L) and four units of emergency O D-negative red cells were used*
- *Despite this she died. Her anticoagulants had not been reversed and the GI bleeding was not identified until the very low Hb was recorded*
- *A serious incident investigation was undertaken to establish what caused the delay in identification of GI bleeding; noted that the patient's first language was not English, and this may have been a contributory factor*

Delayed transfusion due to haemolysis contributes to death

- *An elderly woman was admitted to the emergency department at 20:06 following collapse at home (chemotherapy 10 days earlier)*
- *Hypotension improved with intravenous fluids*
- *Venous blood gas haemoglobin was 54g/L*
- *Blood tests were uninterpretable due to haemolysis (including blood group, antibody screen and crossmatch)*
- *The haematology consultant advised immediate transfusion of emergency group O red cells with steroid cover*
- *At 03:13 prednisolone was given but no red cells*
- *She suffered cardiac arrest at 05:10 with successful resuscitation but resuscitation was not attempted after another cardiac arrest*
- *Death was considered 'possibly related' to this delay*

Delayed transfusion in a patient with sickle cell disease (SCD) associated with clinical deterioration

- *A patient with SCD, and a haemoglobin of 64g/L, had two units of red cells authorised to be given as soon as available, but was not transfused until the following day*
- *Nursing staff were unclear when the blood was meant to be given despite verbal handover the day before*
- *The patient deteriorated with worsening chest pain and new oxygen requirement and subsequently required exchange transfusion*

Delayed transfusion due to communication failures and lack of clarity in the major haemorrhage protocol (MHP)

- *A woman experienced unexpected major bleeding the day after routine cholecystectomy (accidental damage to the portal vein) resulting in MHP activation*
- *She was haemodynamically unstable with a pre-transfusion haemoglobin of 36g/L*
- *There was a 15-minute delay in the issue of red cells because the biomedical scientist was unclear about the patient location (transferred from the intensive care unit to theatre) and whether formal patient identification was needed*
- *She received 15 units of red cells, six of plasma, one of platelets and fibrinogen*

Delayed transfusion for gastrointestinal (GI) bleeding contributes to death

- *A woman in her 70s on anticoagulants for atrial fibrillation suffered GI haemorrhage*
- *Her haemoglobin (Hb) of 97g/L had reduced over 4 days to 63g/L and at 00:41 the Hb on the blood gas machine was 40g/L*
- *The decision to transfuse was made several hours earlier at 16:00*
- *A sample sent to the laboratory got lost in transit*
- *Following repeat sampling, crossmatched units were issued for collection at 20:30*
- *The first unit was collected at 00:38*
- *The major haemorrhage protocol was activated at 00:50 as the first unit was set up*
- *There were multiple delays: with decision and prescription; there were staffing issues, and a sample lost in transit*

Delayed transfusion in gastrointestinal (GI) bleeding with confusion over the arrest call

- *A cardiac arrest call was made at 01:39 for a patient in his 40s with acute severe upper GI haemorrhage*
- *The doctor asked nursing staff to make an 'adult cardiac arrest call' and 'major haemorrhage protocol' activation, however this resulted in only the cardiac arrest call*
- *The major haemorrhage call was put out 20 minutes later*
- *The patient had antibodies and needed confirmation from a haematologist about which components to issue*
- *Resuscitation continued for 20-25 minutes, with ongoing bleeding and was discontinued at 02:08*
- *Blood arrived at 02:15*
- *The blood was packed and ready at 02:07 so took 16 minutes from time of activation ready*
- *The clinical team identified 2 delays that resulted in the patient not receiving urgent components in a timely manner - the delay in the call being put out and in receiving the blood from the laboratory*

Delayed transfusion of platelets following head injury

- *A middle-aged male alcoholic fell and suffered subdural haemorrhage*
- *His platelet count was 35x10^9/L and he required platelet transfusion prior to transfer to another hospital*
- *There were communication problems about the urgency, and group A platelets were provided an hour after the initial request*
- *After transfer he was not fit for surgery, having fixed dilated pupils and was declared dead*

Delayed recognition of postoperative bleeding contributes to death

- *An elderly woman was admitted with a tibial plateau fracture*
- *On admission her haemoglobin (Hb) was 134g/L*
- *Three days later her Hb was 87g/L*
- *Early the next day at 03:05 the major haemorrhage protocol (MHP) was activated*
- *There was clinical evidence of bleeding and concern about vacant episodes*
- *Two units of red cells were given to the patient as part of the MHP activation*
- *She showed mild improvement but developed severe metabolic acidosis and died the following day*

Delayed transfusion with lack of knowledge about policies

- *An elderly woman with multiple medical problems was reviewed at 08:30 for melaena with hypotension*
- *Her haemoglobin was 65g/L; adequate blood pressure was restored with fluids*
- *The plan for transfusion was delayed by misunderstandings and poor communication*
- *The ward staff wrongly thought a second sample was needed but it was not required*
- *Although a group and screen was requested at 11:43 this did not include red cells*
- *She was found unresponsive and hypotensive at 13:11 when red cells were requested but she died before any blood was transfused*
- *The use of emergency group O units was not considered, and the urgency of transfusion had not been communicated to laboratory staff*

Delayed transfusion associated with myocardial infarction and irregular antibodies

- *A patient with Hodgkin lymphoma and recurrent anaemia on chemotherapy required urgent transfusion, haemoglobin (Hb) 76g/L*
- *However, due to a lack of beds this was planned for 4 days later*
- *The Hb the day before the planned transfusion was 52g/L with atypical antibodies*
- *She attended the emergency department at 19:46 for urgent transfusion requiring irradiated, and crossmatched red cells from the Blood Centre*
- *She developed chest pain and had a myocardial infarction at 04:29 the following morning*
- *She was transfused at 10:15 (waiting for crossmatched components for more than 12 hours)*
- *The patient had autoimmune haemolysis requiring admission to the coronary care unit*

Urgent need for blood during surgery - pager failure

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

Delayed transfusion contributes to death due to myocardial ischaemia

- *A man in his 80s with myocardial ischaemia and anaemia, haemoglobin (Hb) 63g/L, received a first unit of red cells but the second was delayed for 12 hours contributing to his death. There were several issues:*
- *The request form had incorrect details so was rejected*
- *The revised request form could not be found when the porter came to collect the unit. The porter did not inform the clinical area of this*
- *A further collection form had to be sent*
- *All these factors and poor communication contributed to the delay. It is important that transfusion requests are completed accurately to avoid delays – 'Get it right first time every time'*

An unexpected death from sickle cell disease

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

Death from gastrointestinal bleeding with serial delays and miscommunications

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

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

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

Delayed transfusion resulted from looking at the wrong result

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

Slow provision of components due to lack of clear communication

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

Patient struggled with breathing overnight due to delayed transfusion

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

Delayed transfusion due to staff shortage (1)

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

Delayed transfusion due to staff shortage (2)

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

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

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

Incomplete testing results in delayed intrauterine transfusion

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

Red cells sent to the wrong hospital

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

Miscommunication results in cancelled crossmatch and overnight admission of the patient

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

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

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

Major haemorrhage protocol (MHP) activated for the wrong patient

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

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

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

Delayed transfusion despite severe anaemia and gastrointestinal (GI) bleeding

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

Ruptured ectopic pregnancy with delayed diagnosis

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

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

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

(Continued)

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

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

Newly diagnosed autoimmune haemolysis results in delayed transfusion

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

A dangerous antibody in pregnancy

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

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

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

Bleeding in a high-risk patient after total hip replacement (THR) requiring interhospital transfer (1)

- *A man in his 50s underwent THR*
- *He had significant comorbidity with a metallic aortic valve replacement and renal disease*
- *He also had a history of bleeding after several procedures in the past including a previous THR and renal biopsy*
- *This history was missed at preoperative assessment as the old notes were not available*
- *He was seen by anaesthetist but there was no haematology collaboration*
- *His renal team had suggested he should be managed at level 3 site, but this letter was sent only to the general practitioner*

(Continued)

Bleeding in a high-risk patient after total hip replacement (THR) requiring interhospital transfer (2)

- *A high dependency unit bed was booked for post-operative care and his anticoagulants were resumed later on day of surgery*
- *Early next morning oozing was noted and two units of red cells were requested from the main site*
- *There was a delay of 6 hours due to confusion about how to request components and lack of a major haemorrhage protocol at the treating site*
- *His haemoglobin on the blood gas machine was 60g/L*
- *He returned to theatre for wound exploration – general ooze, received five units of red cells and cell salvage*
- *Later four units of fresh frozen plasma and then needed to transfer to another hospital for level 3 care including renal dialysis*
- *He recovered and was discharged 10 days later*

Severe anaemia with delayed transfusion leads to cardiac arrest

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

Delay and death due to lack of venous access

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

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

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

Continued…

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

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

Delayed transfusion due to fever

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

Incorrect sample labelling and delayed collection contribute to death

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

Delayed transfusion despite severe anaemia and gastrointestinal bleeding

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

Delayed transfusion and failure to recognise deterioration

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

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

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

Continued…

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

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

Delayed treatment of gastrointestinal haemorrhage

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

Delayed treatment of severe anaemia

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

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

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

Continued…

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

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

Continued…

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

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

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

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

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 gastrointestinal (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*

Death as a result of delayed transfusion for autoimmune haemolytic anaemia

- *A man in his 60s presented with Hb 38g/L secondary to autoimmune haemolytic anaemia (AIHA)*
- *The hospital laboratory referred the sample to an external reference laboratory (2 hours away) for further analysis due to the presence of a strong pan-reactive autoantibody*
- *The patient died before the results were issued and without receiving any red cells*
- *There had been an opportunity for a group and screen (G&S) sample to be sent a day earlier when the patient first presented*
- *It was noted that there was no haematology consultant on site overseeing the patient's care out-of-hours due to centralisation of specialist services*

Delayed transfusion contributes to death from haematemesis (1)

- *A non-English-speaking man in his 40s with a history of alcohol dependence, hepatitis C and substance misuse (on a methadone programme) attended the ED with haematemesis after a 999 call by his friends at 03:20*
- *The patient was not triaged appropriately (ambulance records of vomiting blood, pulse 130 beats per minute (bpm), blood pressure (BP) 94/60mm Hg) and his clinical state was not monitored adequately in accordance with hospital guidelines (no hourly observations and no early warning score monitoring)*
- *He should have been seen within 10 minutes but was seen after 1.5 hours*
- *At 04:28 the Hb was 56g/L*

Continued…

Delayed transfusion contributes to death from haematemesis (2)

- *The laboratory contacted the ED to report this result and later at 05:45 to offer emergency O D-negative blood*
- *This advice was declined and fully crossmatched red cells were requested at 05:09 with 'routine' priority*
- *The patient's clinical deterioration was not detected by nursing or clinical staff*
- *The major haemorrhage protocol (MHP) was not activated*
- *The patient died at 08:06 following cardiac arrest with further large haematemesis and melaena prior to receiving any blood components*

Delayed transfusion for severe anaemia related to gastrointestinal (GI) haemorrhage contributes to death

- *A man in his 70s presented with a 2-day history of bilateral leg pain and was found to have a Hb of 49g/L at 08:00*
- *He had multiple comorbidities including a history of angiodysplasia and ischaemic heart disease with multiple stents with atrial fibrillation for which he was on aspirin and rivaroxaban*
- *Blood was requested (although the first sample was rejected due to incorrect date of birth) and available for collection at 11:49*
- *The plan (at 13:54) was to transfuse to Hb >90g/L cautiously given a high risk of transfusion-associated circulatory overload (TACO)*
- *However, the patient was not transfused until the following day, when found unresponsive with an unrecordable BP, metabolic acidosis and Hb 34g/L*
- *He was transfused four units of red cells (post-transfusion Hb 73g/L) and three units of fresh frozen plasma (FFP) (international normalised ratio (INR) >2.5) and admitted to the ITU*
- *The patient died 24 hours after admission from cardiogenic shock related to profound anaemia in the context of cardiomyopathy*

Access to the laboratory refrigerator contributed to delay in provision of emergency blood

- *A man in his 60s, managed on ITU for ongoing variceal bleeding, deteriorated acutely with a further massive haemorrhage*
- *Two units were issued at 02:56, the first was collected at 03:31*
- *He became unstable with resistance to fluids and two units of red cells*
- *The MHP was activated at 03:38; units were available by 03:47 but it took 36 minutes for further red cell units to reach the ward*
- *The patient was profoundly hypotensive throughout this period and was not suitable for resuscitation by the time the blood components arrived*

Failure to follow MHP correctly contributes to delay and death

- *A man in his 80s was admitted to the ED with massive haemorrhage (no further details)*
- *The MHP was activated*
- *Emergency O D-negative units and pre-thawed FFP were available and issued for use by the laboratory in a timely manner*
- *The blood components were available to collect but the clinical staff were not aware of this and another doctor contacted the laboratory 20 minutes after the components had been issued*
- *The patient was then transferred to the radiology department but the components were delivered to the ED*
- *The patient died the same day*

Delayed transfusion in a patient with cardiac ischaemia contributes to major morbidity

- *A man in his 50s was admitted from the endoscopy unit with chest pain confirmed due to non-St-elevation myocardial infarction (NSTEMI)*
- *The Hb was 43g/L at 10:45 (he had a previous history of GI bleeding)*
- *At 13:37 red cells were available for collection but were not transfused until 16:25*
- *The reason for the delay is unclear, although there was likely inadequate communication as a contributory factor*
- *The patient was admitted to ITU and made a full recovery*

Delayed transfusion in a patient with chest pain due to lack of knowledge about how to manage critical anaemia in the presence of pan-reactive antibodies

- *A woman in her 50s with chronic significant gynaecological haemorrhage was admitted from clinic with Hb 56g/L at 16:00*
- *She was clinically stable*
- *A G&S sample was not sent until 08:58 the following morning*
- *She was found to have a pan-reactive antibody which required further testing and the sample was sent to the local external reference laboratory*
- *At 14:00 the patient became acutely unwell with crushing central chest pain and a respiratory rate >40 breaths per minute (/min), thought to be secondary to cardiac ischaemia*
- *A repeat blood count showed Hb 46g/L*
- *Blood was not available until 17:00, 3 hours after the development of cardiac symptoms*

Wrong patient details supplied to laboratory in a major obstetric haemorrhage

- *A woman in her 20s had a postpartum haemorrhage leading to MHP activation*
- *The midwife gave the wrong patient details to the laboratory staff which was not recognised until the red cells (incompatible ABO group) arrived in the maternity unit*
- *They were returned and correct details applied but this resulted in a 25-minute delay to provision for the group O patient*

Lack of knowledge about emergency blood provision in patients with alloantibodies leads to delayed transfusion

- *A man in his 50s with variceal haemorrhage related to alcoholic liver disease was admitted to the ED*
- *A MHP call was instigated at 01:40*
- *The patient had alloantibodies, anti-K and anti-C^w*
- *The biomedical scientist (BMS) was reluctant to issue the shock pack (four units of red cells and four of FFP) and informed the ED not to use the emergency O D-negative blood in the local refrigerator*
- *A consultant haematologist was contacted 25 minutes after the MHP call and authorised the transfusion*
- *Blood was collected at 02:16*
- *The patient was admitted to ITU and eventually made a full recovery*

Change in status of the patient and poor communication compound the delay (1)

- *A young man was admitted with trauma from a road traffic accident with closing speed of 70 miles per hour*
- *He was initially stable; four units of blood were requested urgently to be available at 18:55*
- *The BMS acknowledged that these would be available in 10 minutes*
- *However, the blood sample was not taken until 19:00, was booked into the laboratory at 19:20 but had to be reprocessed at 19:47 as the antibody screen had not been done*
- *During computerised tomography (CT) scanning the patient started to deteriorate with an increase in pulse rate to 135 beats/min such that the internal bleeding was now thought to be greater than it seemed at first*

Continued…

Change in status of the patient and poor communication compound the delay (2)

- *A porter was sent to collect the blood and a telephone request was made for platelets and plasma as indicated by thromboelastogram (TEG) testing*
- *Although there was an agreed TEG protocol in place for a 1:1 red cells to plasma ratio the BMS noted that this request would require authorisation by the haematology registrar (as this had not triggered the MHP)*
- *The BMS did not inform the ED staff that there had been a problem with the antibody screen*
- *The MHP was called at 20:37 when blood and plasma were issued and collected*
- *Plasma was infused at 21:15 and platelets at 22:15*
- *The ED staff could have used the emergency O D-negative units*

Telephone check prior to high risk surgery detects failure of process

- *A woman was scheduled for elective caesarean section for placenta praevia; blood samples were sent for group and crossmatch four units of red cells 2 days prior to the procedure*
- *At the time of surgery, after the spinal anaesthetic had been placed, a telephone call to the laboratory established that no units were available due to a laboratory error in processing the request*
- *The request form had been put in the wrong location for crossmatch requests at the time of a shift changeover*
- *The four units were made available within 40 minutes*
- *The start of surgery was delayed but the red cells were not used*

Refrigerator incorrectly stocked for remote electronic issue (EI)

- *Two high-risk cases, both blood group A, were anticipated to require significant amounts of blood during surgery*
- *The group A drawer of a remote electronic issue refrigerator was full so additional units were put in the 'crossmatched blood' drawer*
- *As expected the group A blood was rapidly depleted and the clinicians were warned by the EBMS that the supplies were low*
- *However, the BMS viewing the stocks remotely could see that there were plenty of group A units remaining*
- *These were not available for remote electronic issue and had to be issued from the laboratory*

Death after haematemesis due to delay in transfusion

- *A man in his 70s admitted with haematemesis and on anticoagulants for atrial fibrillation died associated with failure to activate the MHP and 5-hour delay in transfusion*
- *His haemoglobin (Hb) was 69g/L at 00:15*
- *The biomedical scientist (BMS) was lone working and had attempted to contact the emergency department (ED) to inform them of the abnormal blood result, but did not get an answer*

Death in a patient with coagulopathy who failed to receive FFP (1)

- *A man in his 70s presented with a month-long history of constitutional symptoms and jaundice. Investigation raised the suspicion of pancreatic malignancy with blockage of bile drainage and he was admitted (day 1) for planned endoscopic retrograde cholangiopancreatography (ERCP)*
- *An initial attempt at ERCP failed on day 4 and he was then listed for a radiologically guided attempt at decompressing the biliary obstruction (percutaneous transhepatic cholangiogram - PTC)*
- *ERCP was attempted but failed again on days 5 and 6. A decision was made to perform PTC under general anaesthetic. In parallel the patient had deteriorated with hospital-acquired pneumonia, a fall, worsening liver function tests and the development of a coagulopathy*
- *On day 7 a further ERCP failed and the PTC under general anaesthesia was organised. The complex coagulopathy was noted on the morning of day 7 which was not reversed by vitamin K*

Continued…

Death in a patient with coagulopathy who failed to receive FFP (2)

- *The consultant arranged for FFP to be administered to the patient prior or during the attempt at PTC under anaesthetic. Despite the FFP being ordered from the transfusion laboratory, (issued at 12:54) and being prescribed this was not administered prior to the PTC on the ward, during the procedure (in the radiology department) or in the immediate post-procedure period (in theatre recovery)*
- *The FFP was returned to stock at 16:17. The patient was transferred to the ward without having received blood components and deteriorated later that evening*
- *He became moribund and despite attempts at fluid resuscitation and the administration of blood components he died. The coroner noted that the cause of death was intra-abdominal haemorrhage and that the failure to administer FFP was an important factor in the cause of death of the patient*

Delayed transfusion contributes to death

- *An elderly man with shortness of breath was admitted to the ED at 11:45*
- *He had a suspected posterior myocardial infarction*
- *Blood samples were taken at 12:30*
- *A low Hb was confirmed at 15:00, a tentative diagnosis of acute myeloid leukaemia was made, and decision to transfuse*
- *At 16:00 blood tests were repeated and discussed with the haematology consultant*
- *The patient was difficult to crossmatch and the laboratory staff did not advise the clinical team that they could have used emergency O D-negative units*
- *The blood group was put on the analyser at 14:57 but suitable units were not issued until after 20:40 (a delay of more than 5 hours)*
- *The transfusion laboratory was contacted at 19:35 and 20:20*
- *The patient suffered a cardiac arrest at 21:14.The first unit of blood was begun at 21:24 and the second at 21:45 but death occurred shortly afterwards at 22:15*

Death related to leaking abdominal aortic aneurysm (AAA) where transfusion was suspended during transit

- *An elderly man was transferred by ambulance from the ED to another hospital with a 9cm leaking AAA*
- *Red cell transfusion stopped in transit as there was no nurse or doctor present on the transfer due to insufficient staffing levels*
- *The patient arrived with systolic blood pressure (BP) of 47mm/Hg and a Glasgow coma score (GCS) of 10*
- *The patient was taken immediately to theatres at the receiving hospital where he subsequently died*
- *The reporter noted staffing issues which contributed to the need to suspend the transfusion during transfer*

Delay in acting on abnormal blood results contributes to patient death

- *An elderly lady was admitted with Hb 33g/L at 13:30*
- *There were several communication failures*
- *The staff noted at 22:20 that no sample had been taken (9 hours from admission)*
- *The patient had a cardiac arrest and died at 00:31*

Major morbidity in relation to delayed access to emergency O D-negative units

- *At 19:15 a porter attempted to collect a unit of emergency O D-negative blood from the ED blood refrigerator for woman in her 30s who was bleeding complicated by cardiac arrest but was informed that he was not allowed to take the blood as it was for ED patients only*
- *The porter then proceeded to the main theatre blood refrigerator and collected an emergency unit there*
- *This patient was admitted to intensive care and made a full recovery*
- *She received five units of red cells and two of FFP*

Failure to follow MHP with misunderstandings and ambiguity in the protocol

- *A trauma patient in their 40s was admitted to the ED with major haemorrhage at 22:00*
- *The BMS failed to respond to the MHP activation but the root cause analysis noted that several aspects of the MHP were unclear (including the role of the haematology registrar and the porter's role in collection and delivery), and this was the second incident within a month*
- *The patient received 3L of red cells, 2750mL of FFP, two adult doses of platelets and 479mL of cryoprecipitate but died with delay in transfusion as a contributory factor*
- *The MHP was revised and all BMS staff were reminded of their roles and responsibilities*

Blood components were delayed for 40 minutes from MOH activation

- *A woman in her 20s had a major PPH of 2.5L with ongoing bleeding*
- *The MOH protocol was activated and she was transferred to obstetric theatre to obtain haemostasis*
- *There was a 40-minute delay in receiving O D-negative blood from the transfusion laboratory*
- *The patient was hypotensive and required vasopressors to maintain her blood pressure while waiting for blood transfusion*
- *She quickly improved once the blood was transfused*

Communication failure and misunderstandings resulting in delayed supply of FFP - MOH activation did not result in the BMS in transfusion being informed (1)

- *An obstetric patient delivered (forceps) at 02:06 but then developed a PPH with estimated blood loss 3.5L at around 03:15; an initial PPH call was made by the clinical team at 03:33 and escalated to MOH at 03:57*
- *The theatre nurse contacted the transfusion laboratory to inform the BMS that two O D-negative units had been used but did not have the patient details or location. Activation of the MOH did not include contact with the laboratory and clinical staff were unaware they needed to contact the laboratory to inform them of requirements for transfusion support*
- *Two further O D-negative units were removed at 04:10; then the BMS telephoned the delivery suite to find out who the patient was. When the MOH pack A (six units of red cells and four FFP) was requested at 04:15 with the patient details the BMS had no transfusion sample for grouping*

Continued…

Communication failure and misunderstandings resulting in delayed supply of FFP - MOH activation did not result in the BMS in transfusion being informed (2)

- *Once the group was established at 04:40, FFP could be thawed out. This was received 1 hour 15 minutes after the MOH call. The BMS was lone working and had not had time to process the FBC and coagulation samples*
- *The patient developed a coagulopathy (results at 05:00) and received FFP, platelets and cryoprecipitate, and was transferred to the intensive care unit. She had evidence of acute kidney injury but recovered well and was discharged on the 5th day*
- *The root cause analysis noted that there were staff shortages*

Delayed provision of FFP due to poor practice by BMS

- *A woman in her 40s with a massive PPH had a delay of 20 minutes in provision of FFP during MHP due to poor communication between the BMS in the hospital transfusion laboratory*
- *The BMS who put the FFP in the plasma thawer finished their work shift and did not handover to the next shift*
- *When theatre staff came to collect the FFP for the emergency the units were not ready and were found to be in the plasma thawer and there was a delay until the FFP was labelled and issued*

Providing a new but unnecessary sample causes delay

- *A large number of units of blood were issued electronically to a remote satellite refrigerator for a patient at high risk of bleeding intraoperatively*
- *To be sure a current valid sample was available, a new sample was sent by the anaesthetist at the beginning of the list*
- *The first unit was collected without any problems but on collecting the second unit, access was blocked and no other units could be removed from the refrigerator*
- *This was because the unnecessary sample became the new 'valid sample' and remote electronic issue could not take place until a new result was available on the laboratory information management system (LIMS)*

Electronic prescribing does not include blood components and this causes confusion

- *Prophylactic fresh frozen plasma (FFP) was not given to a patient undergoing a difficult endoscopic retrograde cholangiopancreatography (ERPC) procedure for obstructive jaundice and this was thought to have contributed to the peri-procedural bleeding*
- *One cause of this omission was the fact that fluids and drugs were prescribed electronically but blood components were not so the prescription was overlooked and the component, thawed for use by the laboratory, was not transfused*