Paediatric Case Studies

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Lack of platelet concessionary release policy for a neonate with thrombocytopenia (imputability 2 – probable)

- *A very sick preterm neonate required a platelet transfusion prior to tertiary centre transfer*
- *The baby had disseminated intravascular coagulation and required a central line*
- *Platelets were requested but no neonatal/infant specification units were available on site*
- *Due to a lack of concessionary release policy for emergency and failure of the clinical team to communicate the urgency of transfusion, 6 hours elapsed before an adult specification component was authorised*
- *This delayed transfer and contributed to the death*

Transfusion-associated circulatory overload (TACO) following red cell transfusion in an infant with severe iron deficiency anaemia (imputability 2 - probable)

- *A 10kg infant was admitted to the emergency department with severe iron deficiency anaemia (haemoglobin (Hb)18g/L)*
- *The child received a total of 140mL (14mL/kg) of red cells in 3 aliquots over a 2.5-hour period*
- *The post-transfusion Hb was 51g/L*
- *The child had not received any other fluids and had no previous cardiac disease*
- *Following transfusion, the child deteriorated with evidence of fluid overload and heart failure and was admitted to the paediatric intensive care unit (PICU)*
- *There was some response to furosemide, however, the child died*

Transfusion-associated circulatory overload (TACO) causing major morbidity in an infant following overtransfusion of red cells

- *A 2.5kg infant received 121mL of red cells (48mL/kg) due to a prescribing and administration error*
- *The infant became bradycardic and suffered a cardiac arrest*
- *The pre-transfusion Hb was 77g/L, post-transfusion Hb 190g/L*
- *Chest x-ray showed pulmonary oedema*
- *The infant also developed hyperkalaemia with a potassium of 8.5mmol/L*
- *Venesection and treatment for hyperkalaemia was required*
- *The following pre-transfusion risk factors for TACO were also present: additional crystalloid, cardiac disease, and renal impairment*

Incomplete testing for a child with autoimmune haemolytic anaemia (AIHA)

- *A young child presented to the emergency department with a haemoglobin of 24g/L and a presumptive diagnosis of AIHA*
- *The major haemorrhage protocol was activated, and the patient was appropriately transfused with group O D-negative red cells*
- *A subsequent group and screen sample showed a dual population of group O and group A red cells*
- *Antibody screen was weakly positive and the direct antiglobulin test (DAT) was strongly positive for IgG and C3d*
- *Antibody testing was reported as negative in-house on an alternative method, and two units of red cells were manually crossmatched by the hospital transfusion laboratory and transfused to the patient*
- *Samples should have been sent to the reference laboratory for further testing and antibody identification but instead the component was issued in the hospital*

Confusion around the requirement for a maternal sample in a neonate

- *A neonate had symptomatic anaemia (pallor, tachypnoea, and desaturation, haemoglobin 79g/L) and a paedipack was requested*
- *The baby had been transfused 2 days previously*
- *The maternal transfusion history had been checked (negative for antibodies) on an antenatal sample, but a current maternal sample had not been obtained or tested*
- *The laboratory picked up the earlier error when a new request for transfusion was made*
- *At this point a maternal sample was requested*
- *The mother was bought back into the hospital, a sample taken, and the red cells eventually transfused after a 7-hour delay*

Avoidable red cell transfusion due to issues with a blood sample and not looking at trend

- *A teenager with sarcoma was undergoing proton beam therapy and was reviewed in the shared care centre*
- *The haemoglobin (Hb) was noted to be 79g/L, and a two-unit red cell transfusion was requested (a Hb of 100g/L was the transfusion threshold for proton beam)*
- *A full blood count taken prior to the second unit was 131g/L but the result was not seen until after the unit was given*
- *In retrospect, the initial Hb of 79g/L was considered unexpected based on the trend for the patient*
- *In addition, there was miscommunication between the oncology centre and shared care as it was not realised that chemotherapy had been discontinued 4 months previously*

Undertransfusion during exchange transfusion for a neonate

- *Insufficient red cells were administered to a neonate (pre-exchange haemoglobin (Hb) 136g/L) undergoing an exchange transfusion, resulting in a post-transfusion Hb of 108g/L*
- *This was due to the use of a fluid giving set (with a smaller diameter) rather than a blood giving set which resulted in fewer red cells being transfused than anticipated*
- *The neonate became hypovolaemic and had a cardiac arrest but survived*

Overtransfusion in a child with sickle cell anaemia due to a prescribing error

- *An overtransfusion error was discovered in retrospect following an audit of practice*
- *A teenager with sickle cell anaemia was admitted with diarrhoea and vomiting*
- *Pre-transfusion haemoglobin (Hb) was 83g/L*
- *The transfusion calculation was performed incorrectly and 1080mL (26mL/kg) of red cells were given*
- *Post-transfusion Hb was not recorded*
- *There was insufficient documentation to be able to judge whether the transfusion was indicated at all*

Recurrent acute haemolytic transfusion reactions in a complex post haemopoietic stem cell transplant (HSCT) child

- *A young child post HSCT for immunodeficiency had a gradually dropping haemoglobin*
- *The pre-transfusion direct antiglobulin test (DAT) was positive (C3d) with investigations and crossmatch being performed by the Blood Service*
- *Following transfusion of only 60mL of red cells the child developed fever, abdominal pain and dark urine*
- *The post transfusion eluate was difficult to resolve with both an autoantibody and possible anti-E and anti-Jk^{b}*
- *The child received two further red cell transfusions with sequential changes to management including: lowered transfusion threshold, phenotype-matched red cells, folate supplementation, treatment for mycoplasma, blood warmer, immunosuppression for presumed autoimmune haemolytic anaemia (steroids and intravenous immunoglobulin (IVIg))*
- *Post-transfusion investigations showed a pan-reactive red cell antibody with the only negative reaction being in the cord blood cell*
- *Further serology from the International Blood Group Reference Laboratory (IBGRL) showed ongoing incompatibility with all cell types (including cord, In(Lu), adult ii and A1)*
- *Fortunately, the patient responded to immunosuppression and has not required further transfusion*
- *A follow-up sample was planned to be sent to IBGRL 3 months from the last transfusion for further investigation*

High potassium in a bypass circuit for a neonate undergoing cardiac surgery

- *High potassium levels (19 mmol/L) were found in an irradiated large volume transfusion unit when performing equipment prime prior to bypass*
- *The unit was day 3 post donation, and it was 15 hours post irradiation*
- *The unit was filtered and washed and due to clinical urgency, was transfused once potassium levels were within normal/usual range*
- *Subsequent testing of the donor by the Blood Service confirmed that the donor was heterozygous for a genetic variant, associated with familial pseudohyperkalaemia*

Death due to bowel perforation within 24 hours of red cell transfusion

- *An extreme preterm neonate (a month old) received a red cell transfusion for anaemia*
- *Eight hours later the neonate developed significant deterioration including a distended abdomen and required reintubation*
- *Abdominal X-ray was suggestive of necrotising enterocolitis*
- *The neonate subsequently developed bowel perforation and metabolic acidosis and died*

Adult O D-negative red cells given to a neonate in error when neonatal red cells were available

- *A bleeding neonate required an emergency red cell transfusion*
- *The laboratory instructed the clinical team use the 'emergency paedipack' from the satellite refrigerator*
- *An adult pack was accidentally selected and transfused to the neonate*

Preterm neonate erroneously assigned as blood group O

- *The laboratory assigned a preterm neonate as group O and issued group O fresh frozen plasma (FFP)*
- *It was subsequently determined that the neonate had been grouped as A at birth in a different hospital where they were transfused with emergency blood group O red cells*
- *Of note, the laboratory should have issued group AB FFP as only one group result was on record*

Platelet transfusion given to a non-bleeding teenager with acute immune thrombocytopenic purpura (ITP)

- *A teenager presented with acute ITP*
- *The platelet count was 14x10^9/L, on repeat 10x10^9/L*
- *A platelet transfusion was requested by the ear nose and throat (ENT) team and administered*
- *The patient had no bleeding*

Delay in concessionary release of adult specification platelets for a neonate with significant bleeding

- *Emergency platelet transfusion was requested for a severely thrombocytopenic neonate with liver failure and both rectal and intracranial bleeding*
- *Neonatal/infant specification platelets were not available on site*
- *The clinical team asked for standard adult specification platelets but there was a 2-hour delay in authorising their release due to difficulty in contacting the haematology medical team and the laboratory's inability to authorise emergency release*

Delay in red cell transfusion for critically unwell teenager with sickle cell disease (SCD) due to failure to issue red cells urgently under concessionary release

- *A teenager with SCD and multiple red cell antibodies was on the point of cardiac arrest due to rapidly progressive anaemia (from 97g/L to 45g/L), hypoxia, and acidosis*
- *Whilst awaiting frozen thawed red cells, the Blood Service consultant on call advised transfusing ABO, Rh matched, K-negative red cells given the urgency*
- *There was a 3-hour delay in issuing red cells*
- *The pre-transfusion haemoglobin was 26g/L immediately prior to transfusion*
- *The delay contributed to major morbidity in this patient*

Delay in provision of appropriate red cells for a teenager with sickle cell disease and red cell antibodies

- *A teenager with sickle chest syndrome required emergency red cell exchange transfusion*
- *There was a 24-hour delay due to poor communication between laboratory and clinical staff regarding degree of urgency, and to failure to send crossmatch samples of sufficient volume to allow required antibody testing*
- *The patient recovered fully with no adverse impact from the delay*

Overtransfusion in a preterm neonate due to illegible prescription

- *An extremely pre-term infant (birth weight 0.5kg) with necrotising enterocolitis was prescribed platelets*
- *The prescription should have been 7.5mL but was misread as 75mL*
- *The neonate received 43mL (83mL/kg) before this was noticed and subsequently was hypertensive*
- *The reporter commented that electronic prescribing had not been implemented in paediatrics due to complexities*

Allergic reaction to red cell component in multiply transfused patient

- *A child receiving regular red cell transfusions for a haemoglobinopathy, developed coughing followed by drowsiness after only 4mL of red cells*
- *There was increased work of breathing and prolonged expiratory phase, with a drop in blood pressure*
- *The child received intravenous antihistamine and adrenaline, then further adrenaline with hydrocortisone was administered when the reaction was prolonged*
- *The child recovered and was subsequently given washed red cells*

Preterm baby received an adult platelet component

- *A preterm baby who had sepsis and low platelets required an emergency platelet transfusion*
- *An adult platelet component was incorrectly collected from the transfusion laboratory*
- *The neonatal intensive care unit team noted that the unit was much larger than usual and did not have the standard compatibility label*
- *As it was the same blood group as the patient it was decided to transfuse to the baby*
- *Part way through the transfusion the laboratory rang to inform the ward team of the error*
- *Of note the unit was not cytomegalovirus-negative*

Failure to provide irradiated blood component for a potentially immunodeficient infant with DiGeorge syndrome

- *Clinicians failed to communicate the diagnosis of DiGeorge syndrome to the laboratory for a child who was a few months of age, and they did not receive irradiated red cells*
- *Of note the transfusion was urgent due to haematemesis*
- *The child had not previously been known to the hospital and no assessment of immune function was recorded*

Management of abnormal results following exchange transfusion

- *A term neonate received an exchange transfusion for hyperbilirubinemia*
- *Following the procedure, the fibrinogen was found to have dropped to 0.8g/L*
- *The neonate was given cryoprecipitate but was well with no bleeding and with no invasive procedure planned*

Failure to activate the major haemorrhage protocol (MHP)

- *A teenage patient was admitted with major bleeding*
- *There was a delay in provision of fresh frozen plasma due to the switchboard team activating two trauma calls rather than activating the MHP call*
- *This meant that a porter was not sent to collect the blood components*

Management of iron deficiency

- *A teenager presented with symptomatic iron deficiency anaemia with a haemoglobin of 65g/L*
- *There was a delay in obtaining red cells due to problems with sample labelling, which resulted in the need for repeat samples and failure to request the red cells*
- *This caused many hours of delay before the first unit was commenced*

Delay to provision of platelets

- *There was a delay in provision of platelets to a child with an acute lymphoblastic leukaemia*
- *This delay was due to communication issues around when the unit was required*
- *The prescriber had specified that apheresis platelets should be provided*

Delay in provision of red cells for a child with sickle cell disease (SCD) due to incorrect exchange unit ordered

- *A young child with SCD required a red cell exchange*
- *A neonatal exchange unit was erroneously requested for the child*
- *This resulted in a delay in provision of the red cells*

Error with infusion line clamps resulted in overtransfusion following cell salvage

- *During transfer from theatres to the paediatric intensive care unit the clamps on the infusion line were left open which resulted in an overtransfusion and at too high a rate*
- *The child required venesection/dilutional exchange to reduce the haemoglobin from 173g/L to 148g/L over the next 12 hours*

Overtransfusion due to prescription of incorrect volume

- *One unit of red cells was prescribed for a child with neuroblastoma*
- *The increased volume compared to usual was noticed by the parent*
- *The reporter commented that a full red cell unit had been prescribed rather than 15mL/kg*
- *The child had received 290mL (25mL/kg)*

Infusion pump programming error in a neonate

- *A preterm baby received red cell transfusion at only 1.4mL/hour instead of 5mL/hour for the first 2.5 hours of a transfusion*
- *The member of staff had not followed the unit policy of having a second check for pump programming*

Transfusion-associated circulatory overload (TACO) following transfusion for severe anaemia in a neonate

- *A term neonate was born with a haemoglobin of 44g/L secondary to severe fetomaternal haemorrhage*
- *The neonate received an initial 18mL (5mL/kg) red cell transfusion via 'slow bolus' followed by 18mL/hr for 3 hours*
- *Between 2-6 hours following transfusion the neonate developed increasing respiratory distress requiring intubation and ventilation*
- *Furosemide was given with improvement in clinical status*

Abdominal pain during transfusion

- *A young child developed abdominal pain part way through a transfusion and was subdued and lethargic*
- *No other symptoms were reported, and the pain had settled following defaecation and 30 minutes after the end of the transfusion the child was back to normal*
- *The team decided to give both chlorpheniramine and hydrocortisone prior to subsequent transfusions*

Communication failure resulting in delay in provision of red cells

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

Case of necrotising enterocolitis following transfusion

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

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

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

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

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

Lack of awareness of paediatric major haemorrhage protocol (MHP)

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

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

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

Communication issues resulted in confusion about whether to utilise salvaged blood

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

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

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

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

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

Transfusion delay and death due to multiple factors

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

Delay in recognising major haemorrhage

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

Infant with Di George syndrome received non-irradiated components

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

Multiple non-irradiated components given to an infant with severe combined immunodeficiency (SCID)

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

Overtransfusion of solvent detergent fresh frozen plasma (FFP) to a neonate

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

Use of gravity for red cell transfusion in an infant

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

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

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

Incorrect blood results viewed for a child resulting in overtransfusion and transfusion-associated circulatory overload (TACO)

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