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

Under or overtransfusion

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Death from severe drug-induced haemolysis and ineffective transfusion (imputability 1 – possible)

- *An elderly person died from probable severe drug-induced haemolysis with haemoglobinuria and ineffective transfusion*
- *The patient had an infected joint prosthesis and was receiving Rifampicin*
- *Over a 4-day period, red cell transfusions were provided using best-matched concessionary release red cells together with steroids and intravenous immunoglobulin*
- *However, there was insufficient response in the haemoglobin due to the rampant haemolysis*

Extravasation of transfusion and inadequate monitoring

- *An elderly patient presenting with rectal bleeding received a transfusion of red cells which extravasated extensively with bruising of his arm*
- *The patient received no benefit from the transfusion which was also not adequately monitored*
- *They were very unwell with fluid overload and renal dysfunction and died but unrelated to the transfusion*

Undertransfusion during exchange transfusion: use of wrong giving set

- *A neonate underwent exchange transfusion for haemolytic disease of the fetus and newborn but was significantly undertransfused*
- *The wrong giving set was used resulting in a lower volume transfusion than planned*
- *The hospital's supplier produced two paediatric giving sets that looked very alike, one for transfusion and one for fluids*
- *Exchange transfusion was very infrequently performed in this hospital*
- *The infant developed hypovolaemic shock with cardiac arrest and required ventilation*
- *The child recovered when appropriately transfused*

Overtransfusion of a child with thalassaemia

- *An infant with known beta thalassemia was prescribed 80mL red cells but was transfused 210mL in error*
- *There were additional concerns: there were significant delays in providing the blood components due to mislabelled samples, conflicting information regarding whether irradiated units were required, how fresh the blood should be, and what component type i.e., large volume unit vs paediatric packs*
- *The child was not harmed*

A patient with sickle cell disease could not complete their exchange transfusion

- *A young person was receiving an exchange transfusion via an implanted central venous line which stopped functioning during the procedure*
- *Two red cell units were returned to the refrigerator but as they had been out of temperature control for 31 minutes, they were not subsequently released to finish the transfusion*
- *The patient was not harmed*

A patient died following surgery where overtransfusion was justified (1)

- *Shortly after an uneventful elective surgery (exchange of ureteric stents), the patient developed hypotension and tachycardia and was only minimally responsive to intervention (including intravenous fluids and vasopressors)*
- *The abdomen appeared distended, and the patient began complaining of back pain*
- *The patient was thought to have major haemorrhage and was transfused three units of red blood cells and two units of fresh frozen plasma (emergency major haemorrhage protocol)*
- *Computed tomography scan showed no evidence of bleeding, but there was evidence of pulmonary oedema*
- *The patient was transferred to critical care and remained extremely unstable*

A patient died following surgery where overtransfusion was justified (2)

- *Transfusion-associated circulatory overload was considered but not supported by bedside echocardiography*
- *Sadly, the patient died*
- *Subsequently blood cultures from the patient grew E coli*
- *This death was referred to the coroner who concluded multi-organ failure, E Coli urosepsis with chronic ureteric obstruction caused the patient's death*
- *The blood transfusion could have contributed to the patient's deterioration, but the relationship to the patient's outcome was not certain*

Wrong blood in tube (WBIT) in full blood count (FBC) sample impacts two patients (1)

- *A patient was transfused based on a wrong FBC result involving incorrectly labelled blood samples*
- *Labels for Patient 1 were printed, but the phlebotomist was unable to get a sample from the patient*
- *At the same time, there was a request for bloods to be taken from Patient 2 but the information technology (IT) system defaulted to the Patient 1's record following an incorrect hospital number data entry*
- *This resulted in labels belonging to Patient 1 being printed*
- *Positive patient identification was not undertaken correctly at the time of phlebotomy, and the incorrect labels were attached to the FBC sample which contained Patient 2's blood*
- *The FBC results were issued against Patient 1*

WBIT in FBC sample impacts two patients (2)

- *The laboratory staff noticed the discrepant haemoglobin (Hb) result in relation to the previous results from this patient but attributed this to surgery because the request had originated from a surgical ward*
- *The junior medical and nursing staff had also discussed the discrepancy of both Hb and mean cell volume but the possibility of WBIT was not considered*
- *Patient 1 was unnecessarily transfused a unit of red cells resulting in a post-transfusion Hb of 151g/L with no adverse symptoms*
- *Patient 2, whose Hb had been 91g/L fell to 71 then 69g/L resulting in a delay before they were transfused*
- *A mismatch between workload, staff provision, an ineffective IT system and communication factors were noted to be contributory factors in this incident*

Hypotension attributed to gastrointestinal (GI) bleeding results in overtransfusion

- *An elderly woman with pre-existing cardiac failure and poor renal function suffered a major GI bleed requiring a red cell transfusion and endoscopy which confirmed arterial bleeding from a duodenal ulcer*
- *She was stabilised but the following morning had hypotension*
- *No formal laboratory sample was taken between the first transfusion and the second the day after*
- *An urgent haemoglobin (Hb) was recorded mistakenly as 49g/L but on the venous gas was 119g/L*
- *Based on the erroneous result, she received six units of red cells; her Hb rose to 198g/L and she required venesection*
- *Computed tomography angiogram showed no evidence of bleeding*
- *She was admitted to the intensive care unit following interventional radiology treatment with gastroduodenal artery coil*
- *Four days later she returned to the ward, Hb 152g/L*
- *Although she subsequently died this was not related to the overtransfusion*

Splenic rupture with major haemorrhage requiring interhospital transfer

- *An elderly man on oral anticoagulants developed abdominal pain found to be caused by splenic rupture*
- *He required emergency transfer to another hospital site for interventional radiology (IR)*
- *Transfusion of red cells was started and planned to continue throughout the transfer*
- *He also received prothrombin complex concentrates and tranexamic acid*
- *There was no nurse available to accompany the patient, and the paramedics did not know how to manage the infusion pump when it stopped working and the transfusion was not completed*
- *The transfusion laboratory at the transferring hospital had not been informed of the transfer, so the available crossmatched red cell units and patient sample were not sent with him*
- *During the IR procedure he was peri-arrest and received emergency group O D-negative units and fresh frozen plasma*
- *The splenic embolisation was successful and he was transferred to a ward*

Overtransfusion during major haemorrhage

- *An elderly woman had an estimated gastrointestinal blood loss of about 500mL and was peri-arrest*
- *A major haemorrhage call was made; she received six units of red cells and two of fresh frozen plasma*
- *Her haemoglobin (Hb) post transfusion was 179g/L*
- *There was no pre-transfusion Hb, and it was not assessed during the treatment*

Undertransfusion caused by a bleed back into red cell bag associated with peri-arrest in a man with gastrointestinal bleeding

- *A man in his 60s was admitted with haematemesis and melaena and a haemoglobin of 54g/L*
- *The first unit of red cells was transfused but the bag was disconnected from the pump and put on the bed while he had an urgent computed tomography scan at night and then needed to use the urine bottle*
- *While the nurse was fetching the second unit, about 500mL bled back into the first bag; the patient complained of chest pain and a feeling of doom*
- *An arrest call was put out; he received further transfusion and recovered*

Excessive transfusion for folate deficiency

- *A woman in her 70s and a low body weight of 29kg was admitted with symptoms of anaemia and a haemoglobin (Hb) of 61g/L*
- *She received two units of red cells*
- *On the following day she was reviewed by another consultant and was transfused a further two units*
- *The post-transfusion Hb was 155g/L*
- *Her anaemia was due to severe folate deficiency*

Overtransfusion for gastrointestinal (GI) bleeding

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

Unexpected bleeding during elective surgery

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

Concealed blood loss after caesarean section

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

Misreading the blood count results

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

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

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

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

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

Unexpected complication of pregnancy

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

Haemoglobin (Hb) not checked between transfused units

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

An excess of platelet transfusions

- *A young man with leukaemia and history of retinal haemorrhages received excessive doses of platelets (three units)*
- *The decision to transfuse had been made taking into account a historical note in the patient's medical records that the platelet target should be 50x109/L. The patient was known to have poor increments to transfused platelets*
- *When the case was reviewed after all the 3 units were given it was noted that these units were avoidable as the patient platelet count was acceptable and the retinal haemorrhages had occurred several days previously so the platelet target was no longer required*
- *This advice had not been updated in a timely manner in the patient's records*

Second unit of red cells transfused without authorisation or clinical need

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

Haemorrhage during surgery with fatal outcome (1)

- *A woman in her 40s with advanced rectal cancer bled during surgery*
- *The patient started bleeding at varying rates in surgery at 14:00, until this increased at 16:00*
- *There are conflicting reports of when the major haemorrhage protocol (MHP) was activated by the theatre team and the correct procedure was not followed*
- *The biomedical scientist (BMS) reported that the team requested red cells and to withhold the fresh frozen plasma (FFP)*
- *The patient was being monitored with thromboelastography (TEG) so samples were not sent to the laboratory for clotting*

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Haemorrhage during surgery with fatal outcome (2)

- *FFP was not required because the thromboelastogram was normal*
- *Misinterpretation of Hb levels contributed and there was no documentation of blood loss during surgery*
- *The patient became haemodynamically unstable and the first suggestion of coagulopathy was made at 3 hours from the start of surgery*
- *A request for FFP was then made and haematology contacted for advice*
- *In total she received 26 units of red cells, but only six of plasma, two of platelets, two pools of cryoprecipitate and fibrinogen concentrate once the coagulopathy was evident, but she unfortunately died 3 hours later during the surgery*

Prescription of five times the correct dose of cryoprecipitate

- *A young woman was admitted as an emergency with a diagnosis of myeloma with spinal cord compression*
- *During admission she developed marked haemoptysis with evidence of deranged coagulation*
- *Following transfusion of fresh frozen plasma (FFP), she was prescribed '10 units' of cryoprecipitate and received seven of these*
- *The correct dose was two units (two pools of five)*
- *There was confusion between the locum doctor, who had no experience of prescribing cryoprecipitate, and the haematology registrar, and this prescription was not challenged either by the laboratory or the nursing staff*
- *It was clear that all staff groups required education about the correct dose of cryoprecipitate*

Overdose of platelets

- *A man in his 80s with a platelet count of 15x109/L received four adult therapeutic doses of platelets prescribed by a consultant, where one dose would have been appropriate*
- *The request of 1 'mega' unit was interpreted as being 4 normal therapeutic units and all were transfused*
- *The use of 'nonconventional' terminology by the requesting clinician was compounded by failure to clarify what was required for the patient by several people involved in this incident*
- *The patient made a complete recovery*

Confusion about dose of red cells in a young child

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

Transfusion not monitored properly after patient transfer

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

A second case of inadequate monitoring of transfusion

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

Death related to overtransfusion

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

Undertransfusion in a patient with GI bleeding probably contributes to death

- *A man in his 50s presented with postural hypotension*
- *It was not initially recognised to be secondary to GI bleeding as initially he was physiologically well-compensated*
- *On decompensation it came apparent that he had had a significant GI bleed*
- *Two units of red cells were transfused but the patient died and was probably under filled*

Failure to check response to transfusion led to overtransfusion and possibly contributed to a poor outcome

- *A man in his 70s had a cardiac arrest, while in a CT scanner, following an endovascular aneurysm repair (EVAR)*
- *The arrest was thought to be secondary to major haemorrhage and the MHP was initiated*
- *Four units of red cells and two units of FFP were transfused*
- *The pre-transfusion Hb was 154g/L*
- *No repeat FBC was taken before transfusing a further four units of red cells*
- *The post-transfusion Hb was 269g/L*
- *The patient required venesection but subsequently died*

Inadequate clinical monitoring leads to overtransfusion and contributes to intensive care admission

- *A woman in her 70s was admitted with a chest infection and Hb 66g/L due to suspected myelodysplastic syndrome (MDS)*
- *She also had a history of chronic obstructive pulmonary disease and ischaemic heart disease*
- *A chest X-ray (CXR) on admission suggested a left lower respiratory infection*
- *Four units of red cells were given over a 9-hour period; unit one was given over 60 minutes, units two and three over 90 minutes and unit four over 120 minutes*
- *There was no recorded clinical review or repeat Hb between the units*
- *The patient deteriorated and required admission to intensive care for ventilator support*
- *Case review by respiratory and ITU consultants with the post-transfusion CXR concluded this was primarily left lobar pneumonia and not TACO*

Inadequate monitoring and overtransfusion for iron deficiency in a patient with low body weight

- *A woman in her 40s was admitted with severe iron deficiency and Hb 28g/L*
- *She weighed 33.4kg and was haemodynamically stable*
- *Over the course of 3 days she received nine units of blood*
- *A FBC was not repeated until all units had been given at which point the Hb was 171g/L*

Miscommunication and failure to challenge an unusual order leads to massive overtransfusion of cryoprecipitate

- *A man in his 70s was admitted with a stroke requiring thrombolysis*
- *He later deteriorated with suspected (intracranial?) haemorrhage*
- *The on-call haematology registrar advised cryoprecipitate if the fibrinogen level was less than 1.5g/L*
- *Ten units of cryoprecipitate were requested and transfused*

Undertransfusion because blood label specification was incorrect

- *A neonatal exchange transfusion was required because of maternal red cell antibodies causing haemolytic disease of the fetus and newborn (HDFN)*
- *The volume required to undertake the exchange was calculated by the clinical area and this amount was ordered from the transfusion laboratory*
- *Unfortunately, when the unit was re-processed by the Blood Service to provide the correct specification for the procedure, the initial volume was printed on the label, not the new (lower) volume with the result that the neonate received an exchange transfusion with insufficient blood*