8. Inappropriate, Unnecessary and Under/Delayed Transfusion (I&U)

Definition

- Transfusions given on the basis of erroneous, spurious or incorrectly documented laboratory testing results for haemoglobin, platelets and coagulation tests.
- Transfusions given as a result of poor understanding and knowledge of transfusion medicine, such that the decision to transfuse puts the patient at significant risk or is actually harmful.
- Under-transfusion or delayed transfusion resulting in poorer patient outcome.

DATA SUMMARY

Total number of cases	**110**	*Implicated components*		*Mortality/morbidity*	
		Red cells	**91**	Deaths due to transfusion	**0**
		FFP	**11**	Deaths *probably/likely* due to transfusion	**0**
		Platelets	**6**	Deaths *possibly* due to transfusion	**2**
		Cryoprecipitate	**2**	Major morbidity	**4**
		Unknown	**0**		

Gender		*Age*		*Emergency vs. routine and core hours vs. out of core hours*		*Where transfusion took place*	
Male	**41**	≥18 years	**98**	Emergency	**41**	A&E	**9**
Female	**64**	16 years to <18 years	**2**	Routine	**63**	Theatre	**7**
Not known	**5**	1 year to <16 years	**9**	Not known	**6**	ITU/NNU/HDU/recovery	**1**
		>28 days to <1 year	**0**			MAU	**15**
		Birth to ≤28 days	**1**	In core hours	**70**	Wards	**64**
		Not known	**0**	Out of core hours	**37**	Community	**1**
		Total	**110**	Not known	**3**	Outpatient/day unit	**0**
						Not known	**2**

MAU, Medical Assessment Unit

There has been a further increase in the number of reports to this category, from 92 in 2009 to 110 this year. This includes 2 cases of delayed transfusion following the initiation of a major haemorrhage procedure.

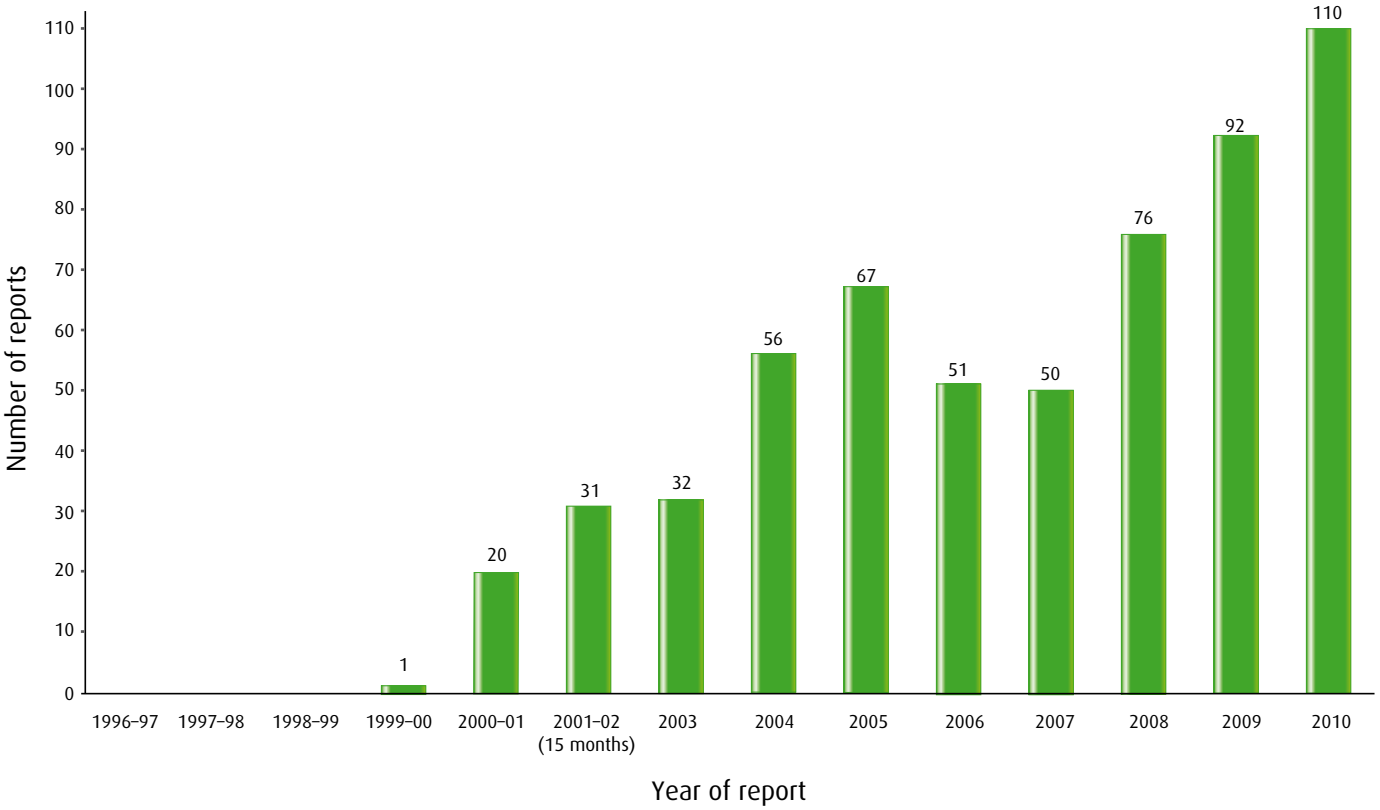
Overall mortality *n* = 2

There were 2 deaths in this group in which the management of the transfusion episode possibly contributed to the death of the patient (imputability 1). One relates to the over-transfusion of red cells and in the second a delay in initiating the major haemorrhage procedure could have contributed to the patient's outcome.

Overall morbidity *n* = 4

There were 4 cases in which the over-transfusion of the patient caused morbidity, including 1 paediatric case, which is discussed in more detail on page 123.

Figure 6
Cases of inappropriate and unnecessary transfusion 1996–2010



INAPPROPRIATE AND UNNECESSARY TRANSFUSION *n* = 108

Mortality *n* = 1

Case 1

Failure to monitor the transfusion requirements during a GI haemorrhage

An elderly patient was admitted to the MAU with a haematemesis and an initial Hb of 10.6 g/dL. No details are provided of her observations or the findings on endoscopy but she had further episodes of vomiting blood. Five units of red cells were transfused before a repeat Hb was performed, which was 20.4 g/dL. The patient was recognised to have circulatory overload and died shortly thereafter.

This patient was inadequately monitored from a laboratory perspective. Although in a massive haemorrhage situation it is acceptable to repeat the laboratory tests after transfusing 4 units of red cells (with other components), in cases where there is lesser haemorrhage, more frequent monitoring is required.

Major morbidity *n* = 4

Three cases are reviewed below and the fourth, involving a premature neonate, is discussed on page 123.

Case 2

Over-transfusion requiring venesection

An elderly patient with a severe GI bleed had repeat Hbs of 6.1 and 6.4 g/dL. Six units of red cells were transfused prior to rechecking the Hb, which was 17.1 g/dL. The patient developed circulatory overload and required venesecting 2 units.

This case is comparable with Case 1 and the same lesson applies. In this year's report, 7 out of the 11 instances of patients being excessively transfused were due to infrequent monitoring of Hb in patients with GI haemorrhage.

Learning point

- Patients with GI bleeding not meeting the criteria for massive haemorrhage must have frequent monitoring of their Hb.

Case 3

Unnecessary transfusion based on the Hb result from WBIT

Patient A with obstructive jaundice secondary to a pancreatic mass had an Hb of 10 g/dL. A crossmatch was requested for Patient B, who shared the same blood group and had an Hb of 6 g/dL but was labelled with Patient A's details. Patient A was prescribed 3 units of red cells, became hypoxic after the transfusion of the first and required ventilation. TRALI was suspected but not confirmed on serology. (No details of CXR given.) The patient's subsequent death was unrelated to the transfusion.

The primary error was WBIT, which could not be detected in the laboratory due to the 2 patients having the same blood group. However, the second error relates to prescribing blood for a patient who clearly was not in need of transfusion, suggesting that the doctor neither knew the patient nor reflected on the known Hb of the patient when prescribing the blood.

Case 4

Over-transfusion leading to polycythaemia and a cerebral infarct

An elderly female patient of low body weight (29 kg) was admitted with an initial Hb of 7 g/dL. Three units of red cells were prescribed and the post-transfusion Hb was 17 g/dL, confirmed with a repeat sample the following day. She sustained a cerebral infarct 48 hours following the transfusion, which resulted in long-term morbidity. The reporters were apparently very confident of the initial Hb and felt that an inappropriate volume had been prescribed.

If the empirical paediatric formula[1] of (desired Hb g/dL – actual Hb g/dL × weight in kg × 3) had been applied in prescribing for this 29 kg patient, she would only have been given 261 mL red cells in optimal additive solution (OAS) to raise her Hb from 7 g/dL to 10 g/dL. She received, however, 3 units of red cells (approximately 900 mL), which on applying the formula gives a predicted increment in Hb of 10 g/dL, as seen here. There are no studies that confirm the validity of using this paediatric weight-related formula when prescribing red cells for adults. A previous study in adults has applied the patient's body weight and predicted blood volume in conjunction with the Hb content of the units of red cells to calculate the number of units to be transfused,[2] but this approach is not practicable in a routine setting. However, the notion that 1 unit of red cells gives an approximate increment in Hb of 1 g/dL in all adults is flawed and can lead to over-transfusion in low body weight patients. A trial applying the paediatric formula for prescribing red cells in adults is warranted.

Transfusions based on wrong Hb, platelet or coagulation result *n* = 56

Table 27
Transfusion based on wrong Hb result *n* = 48

Clinical causes of falsely low Hb value	No. of cases
Falsely low Hb due to phlebotomy from drip arm or 'diluted sample' with repeat requested by laboratory	6
Faulty sample (clotted, short, etc.), laboratory requested a repeat but request ignored and wrong blood result used	7
Transfusion based on an old Hb although a more recent result was available	4
Hb result belonged to another patient (including 3 WBIT)	9
Blood gas machine Hb used	5
Erroneous result from POCT Hb estimation device	3
Incorrect POCT device used (measured glucose rather than Hb)	1
Unauthorised results viewed from ward and acted on	1
Substitution of white cell count (WCC) for Hb (transcription error)	3
Verbal miscommunication of results	3
Haematology laboratory causes of falsely low Hb result	
Hb reported from blood-stained pleural tap, but source of sample not reported to ward	1
Authorised results from mis-sampling reported	1
Authorised result from clotted sample	1
Other	1
Unknown	2
Total	**48**

The most common cause of an incorrect Hb relates to a problem with the sample, either diluted due to being taken from a drip arm or in other ways inadequate. Without exception, laboratory staff appreciated that there could be a problem but transmitted the result to the clinical area with advice that a further sample should be taken. However, this advice was overlooked by the clinical teams. Furthermore in many cases there was no assessment of these laboratory results with respect to historical results or the clinical condition of the patient.

A second common error related to the incorrect transmission of verbal results provided by the laboratory. These results were either assigned to an incorrect patient or the values given were recorded incorrectly at the clinical end. CPA standard (G3) requires that the laboratory establishes a procedure when giving telephoned results for ensuring a confirmation of correct transmission.[3]

There is still evidence that blood gas machines are being relied on for measurement of the Hb on which to base the decision for transfusion. These instruments produce a calculated Hb result that for many reasons may be inaccurate. POCT in use within an organisation should be governed by the quality framework described in the CPA additional standards.[4]

The following case illustrates the dangers of untrained personnel having access to using such equipment.

Case 5

Lack of POCT device knowledge leads to erroneous result and transfusion

A consultant anaesthetist anaesthetised a paediatric patient for a procedure. Halfway through surgery it was estimated the patient had a blood loss of approximately 700 mL and he asked the operating department practitioner (ODP) for a POCT Hb estimation. The ODP returned from recovery to state that they did not have the model requested but a different model was available. The ODP assumed that this was an alternative device for Hb estimation. It was in fact a device for checking blood sugar.

The result of 7.2 was consistent with clinical suspicion and the anaesthetist requested blood on this basis. After 100 mL of blood had been transfused the ODP informed him that they had checked with recovery staff and the machine used was for blood sugar testing. The transfusion was stopped and a sample was sent to the laboratory. The result was 11.6 g/dL.

Table 28
Causes of falsely low platelet count *n* = 6

Causes of falsely low platelet count	No. of cases
Platelet clumping	3
Clot in sample	1
Analyser error	2

Table 29
Causes of incorrect coagulation results *n* = 2

Causes of incorrect coagulation results	No. of cases
WBIT	1
Unauthorised results viewed in ward and acted on (sample clotted)	1

Learning points for laboratories

- 12% of unnecessary transfusions could be avoided if laboratories did not transmit results they know or suspect to be inaccurate, but instead requested a second sample.
- A further 12% of unnecessary transfusions could be avoided if laboratories required confirmation of correct transmission of telephoned results.

Transfusions based on poor basic knowledge, incorrect decision making or poor prescribing *n* = 52

Table 30
Categories of poor knowledge or prescribing *n* = 52

Categories of poor knowledge or prescribing (excluding use of erroneous Hb)	No. of cases
Excessive volume/rate of red cells transfused to infant or child	3
Excessive red cell transfusion resulting in Hb above the normal range	11
Transfusion of red cells for chronic iron deficiency	9
Inappropriate transfusion of patient with megaloblastic anaemia	1
Incorrect component requested and given	4
FFP transfused to patient on warfarin with prolonged international normalised ratio (INR) but no bleeding	3
FFP transfused to patient with normal coagulation screen	2
FFP and platelets prescribed despite normal results	1
Use of flying squad when crossmatched units or valid group and screen were available	6
Transfusion of an asymptomatic patient with correctable anaemia	3
Red cells transfused that were not prescribed	2
FFP transfused that was not prescribed	1
Overnight transfusion for patient for whom a transfusion had previously been deemed not necessary	2
Red cells prescribed for incorrect patient	2
Inappropriate transfusion for patient with chronic renal failure	1
Incorrect (double dose) FFP prescribed	1
Total	**52**

It has been noted from the cases of morbidity and mortality above that over-transfusion in adults is usually due to a failure to frequently monitor patients who have ongoing blood loss. A second cause of over-transfusion relates to a lack of knowledge of prescribing for paediatric cases, which is discussed further on page 123.

A total of 14 patients received transfusions with no justification.

Nine patients with chronic iron deficiency were transfused, the majority of whom were asymptomatic. Several were referred by their general practitioners (GPs) to a MAU with a specific request for transfusion rather than being referred to a haematologist for further advice or parenteral iron. In 1 case, a previous decision taken in hospital not to transfuse was over-ruled on discharge into the community.

Case 6
Patient given a transfusion despite responding to oral iron
Following iron deficiency during pregnancy, a female delivered with an Hb of 7.8 g/dL. A decision was taken in conjunction with the patient not to transfuse her, but to discharge her on oral iron. Nine days later, her Hb was checked by the midwife and found to have risen to 8.9 g/dL. Two weeks later, without a further check on her Hb, she was admitted to the community hospital for a blood transfusion at the GP's request.

Three young patients who were anaemic post-operatively and were asymptomatic were also transfused unnecessarily as was a patient with asymptomatic megaloblastic anaemia. The final patient had chronic renal failure and a stable Hb and the transfusion was prescribed by a FY2 doctor without consultation with senior colleagues.

Learning point

- Patients referred by their GPs to A&E or MAUs for blood transfusion must be referred to a haematologist.

Case 7

Lack of communication between shifts

A patient with known hereditary spherocytosis was admitted with an Hb of 7.2 g/dL. The consultant haematologist decided in consultation with the patient that a transfusion was not necessary. However, the low Hb was noted by a nurse on night shift who informed the on-call doctor, who then prescribed 4 units of red cells. Two were given overnight before the decision to stop transfusing was taken the following day.

This is 1 of 2 cases where a decision taken during the day that was documented in the case notes was overlooked by night staff. This shows a concerning lack of continuity of patient care and unnecessary transfusions being given out of hours. The on-call doctor appears to have had no knowledge of the patient or the condition and is unlikely to have had sufficient time in an on-call situation to review the clinical need for blood.

Case 8

Incorrect component type requested and transfused despite a lack of prescription

A patient's potential need for blood components was discussed with the nurse practitioner. The doctor verbally mentioned FFP but prescribed blood and platelets, and documented this prescription in the notes. The nurse practitioner thought that as she had been trained to take a G&S sample she was then able to request components and proceeded to send a request to the hospital transfusion laboratory for platelets and FFP.

The FFP when thawed was checked at the bedside by two nurses who both signed, dated and timed the traceability label and medication chart. However, neither nurse noted that there was no prescription for the FFP, which was administered. The error was noticed when a third nurse replaced the patient's venflon and noticed the empty FFP bag hanging on the stand.

This case is disturbing in that the nurse requested blood components without being trained and assessed as competent for this task. In doing so a request was made for a component that was neither prescribed nor documented in the case notes. A further error was made by the nurses administering the FFP in the absence of a prescription. There were a number of points in the process where the incorrect transfusion could have been prevented but these were overlooked.

There were 2 further examples of nurses transfusing all the red cells that had been crossmatched by the laboratory even though not all of the units had been prescribed.

Learning point

- In a non-urgent situation, no prescription – no transfusion.

Case 9

Transfusion of unnecessary components and with inappropriate doses

A patient was bleeding after a sub-total colectomy and a request was made for 2 doses of platelets and 2 units of FFP. The patient had a normal platelet count (245 × 10^9/L) and a normal INR of 1.2. The doctor did not check these results. The BMS did not telephone these results to the doctor or contact the consultant haematologist in order to challenge the inappropriate decision.

With the exception of when dealing with a massive haemorrhage, there is never any justification for requesting platelets and FFP for a bleeding patient without taking into account the current laboratory results. Furthermore there was a lack of knowledge of the appropriate doses of these two components. Although the responsibility for these errors rests with the clinician, the BMS missed the opportunity to communicate the normal results and to question the request given the findings, prior to issuing the unnecessary components.

Learning point

- In accordance with Better Blood Transfusion 2007/001, protocols should be in existence which empower laboratory staff to question the appropriateness of requests for transfusion.[5]

Case 10

Lack of communication leads to the unnecessary use of emergency O RhD negative red cells

A patient with a GI bleed had a group and screen sample taken the previous evening that had been processed by the laboratory. However, without contacting the laboratory, the clinical staff proceeded to transfuse emergency O RhD red cells the following day.

This is 1 of 6 cases in which the clinical team transfused emergency O RhD negative red cells when compatible units could have been available within minutes. It is possible that in these cases that there was no awareness by the clinical team that a sample had previously been taken or that there was no understanding of the time frame of responsiveness of the laboratory to provide either group specific or compatible units. In either instance, there was an absence of communication from the clinical team to the laboratory.

UNDER AND DELAYED TRANSFUSION *n* = 2

Mortality *n* = 1

Case 11

Lack of knowledge of how to initiate the major haemorrhage protocol in A&E

At 20.01 a middle-aged male was admitted to A&E with a Glasgow Coma Score (GCS) of 3/15 and received 1 L colloid. A sample was taken for G&S within 10 minutes of arrival, which was booked into the laboratory at 20.20. At 20.30 the patient had a pulseless electrical activity (PEA) arrest and a further litre of colloid was infused, and at 20.40 he sustained a massive haematemesis.

No Incident Communication Coordinator had been identified in A&E and the alarm to alert the transfusion laboratory to activate the major haemorrhage protocol was not raised. The clinical staff in A&E were unaware of how to access the emergency O RhD negative units and the porter arrived at the transfusion laboratory at 20.50 to collect 2 such units. A further 2 units of red cells were then requested and issued as group specific at 21.10. The clinicians also requested FFP and cryoprecipitate but the BMS referred to the major haemorrhage protocol then in existence, which required that a coagulation screen should have been interpreted by a haematologist prior to releasing these components. The patient subsequently arrested and died at 21.30, having received 10.5 L of colloid and 4 units of red cells.

An internal investigation concluded that this incident constituted a serious systems failure due to a lack of familiarity and understanding of the Trust's major haemorrhage policy among clinical staff and that communications between all parties had been poor in the absence of a coordinator. It also highlighted the need to consider a more aggressive blood loss policy. The man died from a massive haemorrhage from a major vessel and it is uncertain whether the timely provision of relevant blood components would have affected the outcome. Nevertheless, this patient with massive blood loss received totally inadequate blood component support over a period of 1.5 hours.

The Trust is conducting a multidisciplinary review of its policy for the management of major haemorrhage, in line with the recommendations of the NPSA Rapid Response Report 2010/017,[6] which will include the need to monitor laboratory tests results frequently, but will advocate providing component support in keeping with the patient's blood loss rather than awaiting authorisation of their release on the basis of test results. It will also consider the need to locate emergency O RhD negative units in the A&E department.

Case 12

Delay in obtaining units following major haemorrhage protocol being initiated

A child involved in a road traffic accident (RTA) was found to be asystolic at the scene and cardiopulmonary resuscitation (CPR) was commenced. The ambulance staff had alerted A&E to major blood loss and had requested blood to be available there on arrival. The major haemorrhage protocol, however, required a unique patient number to be allocated prior to issuing emergency O RhD negative units from the transfusion laboratory and it took 15 minutes following the patient's arrival in A&E for any red cells to be made available. The trauma team felt that this delay was unacceptable and the major haemorrhage protocol has since been reviewed.

In this case the lack of immediate red cell support would not have influenced the outcome. However, it does demonstrate the need to balance the requirement for confirmation of patient identity prior to releasing blood with the urgent requirement of red cell support in a massive blood loss situation. Although traceability of all blood components is of paramount importance, this requirement must not stand in the way of resuscitative measures since it can be undertaken in parallel or even retrospectively.

COMMENTARY

The number of reports of I&U transfusions continues to rise with similar findings to previous years with respect to the causes of misleading laboratory results. There is also evidence of lack of knowledge among medical staff in that red cell transfusions are being given unnecessarily for correctable anaemias and other blood components are prescribed inappropriately. This year there are also cases in which inadequate handover between clinical teams appears to be in evidence, including the following examples:

- Previously made and documented decisions are overturned between shifts.
- Red cells are prescribed for the incorrect patient.
- The incorrect component is prescribed for the correct patient.
- Emergency O RhD negative blood is used when there is a lack of appreciation that compatible blood is or can be made available from the laboratory.

This year has also witnessed 2 reports of delays in accessing emergency O RhD negative red cells. In 1 case this delay could possibly have influenced the outcome. While there has been a tendency to reduce the number of satellite fridges in hospitals in order to comply with MHRA requirements and to minimise the wastage of emergency O RhD negative red cells, those without cold storage facilities in A&E and maternity units must ensure that their major haemorrhage procedures do not compromise the resuscitative requirements of the clinical teams.

Recommendations

- Every Trust/hospital must ensure compliance with CPA standards when giving telephoned results, in obtaining confirmation of the correct transmission.

  Action: Leads/directors of pathology

- Every Trust must review its major haemorrhage protocol to ensure that it meets the recommendations of the NPSA Rapid Response Report 'The transfusion of blood and blood components in an emergency' NPSA/2010/017.[6]

  Action: HTCs

- All nurses and midwives making the clinical decision and providing the written instruction for blood component transfusion must operate within a governance framework ratified by the Trust and be aware of their professional accountability.[7]

  Action: HTCs, clinical governance committees

- Handover information must include the decisions that have been taken with respect to transfusion support and the laboratory tests that have been requested.[8]

  Action: Clinical governance committees

For active recommendations and an update on their progress, please refer to the SHOT website.