# Avoidable, Delayed or Undertransfusion (ADU) n=241

**7**

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## Delayed transfusion n=94

## Definition:

**Where a transfusion of blood/blood component was clinically indicated but was not undertaken or was delayed with impact on the patient's care (not restricted to emergency transfusion).**

> ### Key SHOT message
>
> • Delays in transfusion contribute to death and morbidity, and are often caused by poor communication between the clinicians and laboratory staff

The number of delays reported has increased each year (2010–2015) Figure 7.1. In 63 cases the reporter identified delay as the primary error, 5 reports identified delay associated with another error. A further 21 reports were selected as delay by description of the event and 5 were transferred in from other categories.
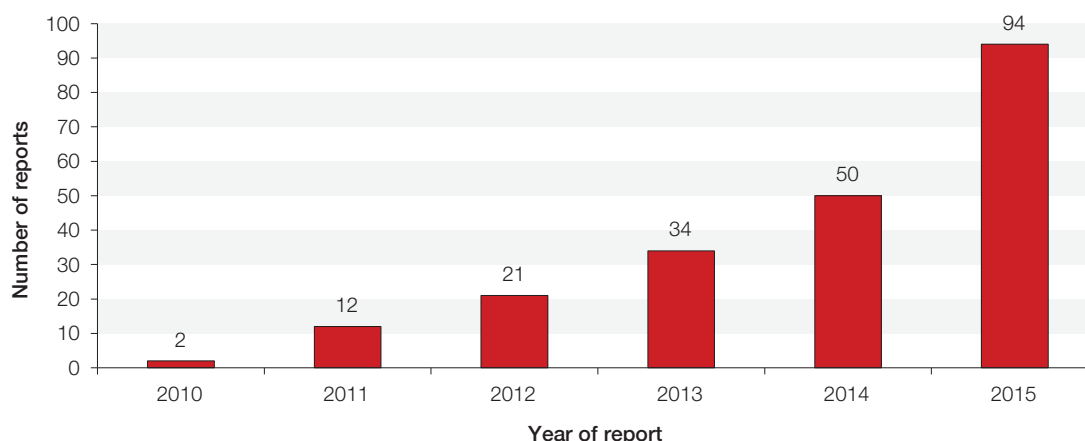


Figure 7.1:
Delayed transfusion reports by year 2010–2015

### Deaths in which the delay contributed n=6

**Case 7.1: Failure in correct patient identification contributes to fatal delay in transfusion**

*An elderly woman was admitted for elective aortic aneurysm repair. The aneurysm had been identified when she attended the emergency department (ED) with gastroenteritis. She was transferred to another hospital where she was an inpatient for several days. On admission for surgery a week later, blood samples were taken and 6 units of red cells crossmatched. When the blood was required in theatre a discrepancy in the spelling of the patient's name was discovered (one letter was incorrect). The case notes and consent form had the wrong spelling but the blood was labelled correctly. The units were returned to the transfusion laboratory according to the hospital protocol. There was subsequently a delay in transfusion which contributed to her deterioration with development of coagulopathy and death later that night.*

*How did this happen? The name was correct on the original transfer letter but was entered incorrectly into the patient information system. This was discovered prior to her admission when checking against her general practitioner records, the electronic patient record was then updated, but not the hard copy case records. On admission the wristband was correct. However this was not accessible at surgery (under drapes) so the blood bags were checked against the hardcopy notes which still had the wrong spelling. Two new blood samples were sent to the laboratory who advised a delay of 45-50 minutes to provide crossmatched units. However, surgical complications followed requiring urgent transfusion but emergency group O D-negative units were not stored in the theatre refrigerator as it had inadequate temperature control so that there was a delay in arrival in theatre.*

The root cause analysis (RCA) identified several issues:

- Failure to initiate a major haemorrhage call

- Poor communication between surgeon and anaesthetist

- Incorrect patient identification labels in the patient records

- No contingency plan for storage of emergency O D-negative blood

- Blood gas machines not functioning

- Several documentation issues

### Case 7.2: Slow responses and communication failure in a critical situation

*A 65 year old man fell at home and sustained a head injury complicated by a subdural haematoma detected on a scan 3 hours after admission. Delayed provision of platelets contributed to death.*

*His platelet count on admission was $9x10^9$/L (result at 09:48) and platelets were prescribed at 10:36 following confirmation of the low count on a second sample. The transfusion laboratory, unaware that this was an urgent sample, requested a blood group-check sample at 10:55. At 13:00 the patient fell a second time. Platelets arrived at 13:26 by standard courier and were issued at 15:30 following the receipt of the group-check sample. They were transfused at 16:00, approximately 9 hours after admission. Intravenous immunoglobulin was prescribed at 15:00 but not given until 04:50 the following morning. The patient deteriorated and died as a result of the head injuries about 44 hours after admission.*

**Comment:** Good communication is essential. The laboratory were not made aware of the urgency for platelets resulting in a request for a group-check sample, failure to request urgent blue light transport and delay in administration of platelets.

### Case 7.3: Delay in collection after crossmatching at the Blood Centre

*This 77 year old was admitted for an urgent blood transfusion from the medical day unit. She had irregular antibodies and required crossmatching by the local Blood Centre laboratory. The units arrived on site at 01:30 for her. However, they were not collected until 09:55 by which time she arrested and died.*

**Comment:** The incident review noted that there were multiple communication problems during shift handovers where the urgency was not passed on to either the laboratory or clinical areas, and the laboratory staff were also not informed of the ward to which the patient had been admitted. In the morning the doctor reviewed the patient and realised the transfusion had not taken place.

### Case 7.4: Lack of leadership

*An 83 year old man with a leaking aortic aneurysm was transferred from another hospital. The major haemorrhage protocol (MHP) was activated but there was delay and confusion in providing red cells with multiple different people contacting the laboratory, issues with a printer and reluctance of the surgeon to use emergency O D-negative units.*

### Case 7.5: Cumulative delays followed by death

*An 85 year old man with pneumonia and a gastrointestinal bleed had Hb 54g/L, the result being telephoned through to the ward at 10:41. This anaemia was confirmed on a repeat sample, Hb 53g/L. No request for blood was made at this stage. A sample was taken at 11:15 for group and screen but was not received by the laboratory until 14:00. A 2-unit request was telephoned to the laboratory at ~15:15, blood issued and placed into the blood refrigerator by 16:30. However, the blood was not taken to the patient until 23:00, more than 12 hours after the severe anaemia was identified, when he was found dead.*

### Case 7.6: Massive obstetric haemorrhage with slow response

*A 37 year old lady pregnant with twins was admitted at 32/40 weeks with a history of antepartum haemorrhage. The patient was delivered by caesarean section complicated by major haemorrhage, suffered a cardiac arrest and later died. The cause of death was acute blood loss. A delay in activation of the major haemorrhage protocol and a need for earlier involvement of obstetric consultants were noted in the review.*

### Major morbidity related to delay n=5

Two of these were obstetric emergencies. Delay resulted in one case because 'all available personnel were tied up with clinical emergencies'. The other two patients had irregular antibodies which resulted in the need for identification/crossmatch to be performed off site at red cell specialist laboratories with consequent inevitable delay. Both cases demonstrated poor understanding (by medical staff) and poor communication between the clinical and laboratory areas.

### Case 7.7: Cardiac ischaemia exacerbated by delay

*A 77 year old man with myelodysplastic syndrome was admitted for routine immunoglobulin treatment but reported that he had chest pain in the night. The Hb was reported as 49g/L at 11:00. There was difficulty crossmatching resulting in the sample being sent to the red cell specialist laboratory, but the urgency of the transfusion was not communicated to the local nor specialist laboratory so that it was processed as routine and not urgent. Chest pain recurred in the afternoon and further ischaemic cardiac damage was detected on the electrocardiogram (ECG) with elevated troponin. The transfusion started at 22:30. The delay in transfusion was considered to contribute to the myocardial damage.*
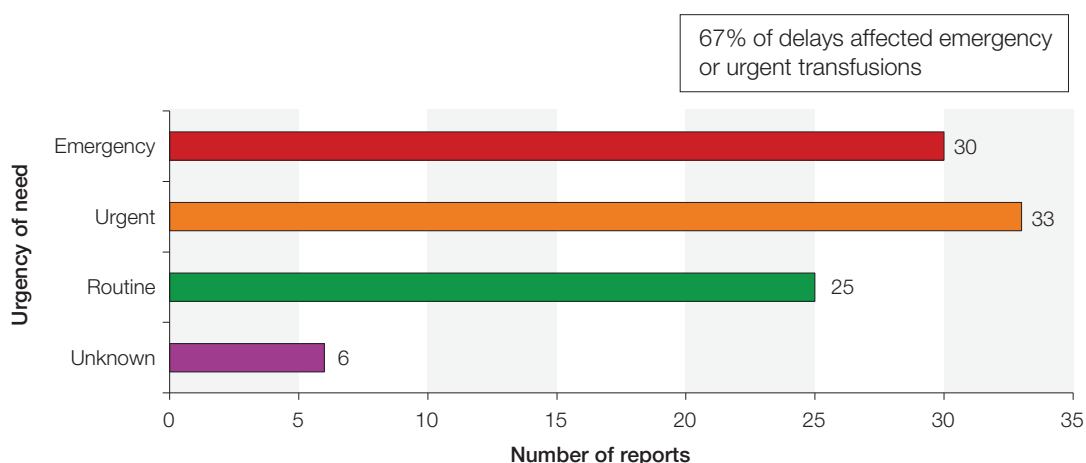


67% of delays affected emergency or urgent transfusions

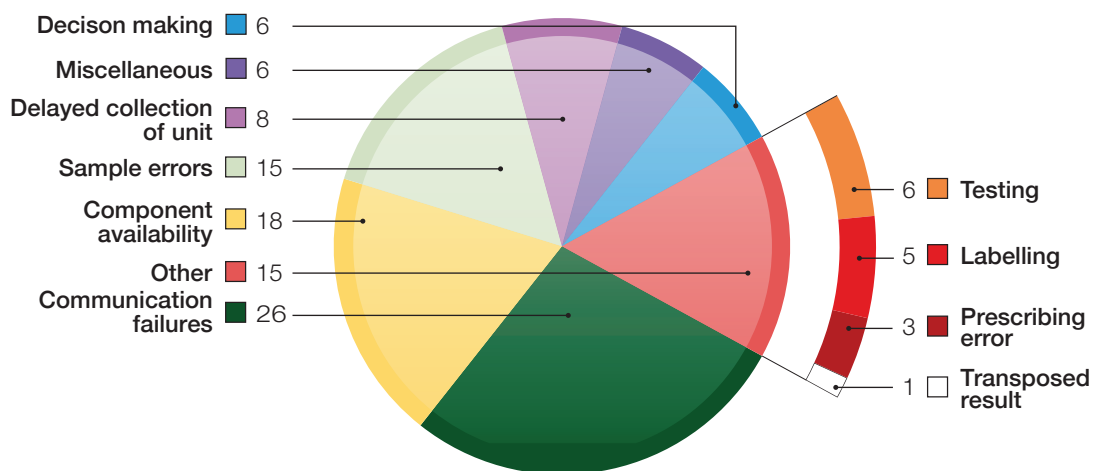Figure 7.2: Summary of delayed transfusions 2015

**Comment:** Most delays occurred in acute situations: urgent (33/94) or emergency (30/94), together 63/94 (67.0%). Delays were also reported in routine transfusions highlighting system failures that resulted in delayed treatment for patients. Examples included delayed component availability due to ordering, packing or delivery errors, sample labelling errors and instances of wrong blood in tube (WBIT).

An observational study of major haemorrhage management in trauma from 22 UK hospitals noted delays in administration of platelets and cryoprecipitate in particular, but also of fresh frozen plasma (FFP). The authors note that only 2.0% of all patients with massive haemorrhage received FFP:red cells at a ratio of at least 1:2 and conclude that there is more work to be done to understand and remove barriers to timely component transfusion (Stanworth et al. 2016).

The most important cause of delay was **communication failure.**

Some communication failures were inter-disciplinary and others involved external service providers e.g. specialist laboratory services.

Figure 7.3: Causes of delayed transfusion n=94



Decison making 6
Miscellaneous 6
Delayed collection of unit 8
Sample errors 15
Component availability 18
Other 15
Communication failures 26

6 Testing
5 Labelling
3 Prescribing error
1 Transposed result

**Case 7.8: Failures of telephones at two Blood Centres**

*An 81 year old man admitted in the middle of the night with haematuria required urgent transfusion of platelets (count 4x10$^9$/L) and red cells. The biomedical scientist (BMS) ordered 2 units of platelets electronically at 03:13. Approximately 30 minutes later, the emergency department consultant asked for the platelets urgently. The BMS tried to phone two Blood Centres on two different numbers but all, including the emergency number, were unobtainable. He was also crossmatching blood, and was unable to find compatible blood. He then tried to contact the red cell specialist laboratory but again was unable to get through on several attempts. Eventually, after leaving this number ringing out for approximately 5-10 minutes, it was answered. He then requested an emergency crossmatch. This message was not understood, as became evident some hours later, when another BMS working the day shift contacted the red cell laboratory on the same number for an update. The BMS was advised that she should not be using this telephone number unless we required an emergency crossmatch, to which she replied that she did. These miscommunications resulted in a delay to the transfusion of both platelets and red cells.*

The root cause was identified as a telephone service outage. During planned changes on the network an unexpected problem resulted in 32 sites experiencing a loss of telephone service. A major incident was declared by the service provider and a full root cause analysis was initiated following the event resulting in several learning points and preventive and corrective actions for the service provider and the Blood Service. No other patients were impacted by this loss of business continuity.

**Case 7.9: Failure of correct patient identification in an emergency**

*Two patients with the same first name were having identical procedures in theatre. The first patient bled excessively, but the MHP was activated for the wrong patient. Red cells were sent to the clinical area for the patient who was not subject to a MHP. The blood was returned to the transfusion laboratory issue refrigerator. Blood was then sent to theatres for the correct patient. The incident occurred out-of-hours at the end of a week. The notes of the wrong patient were used for identification.*

**Case 7.10: Delay due to power failure at refrigerator**

*Red cell units could not be released in an emergency from a remote issue refrigerator due to power failure. The patient had irregular antibodies and the units had been prepared in advance of his elective surgery but were required urgently when he bled during the procedure (Hb 57g/L). After a 20-minute delay group-specific units were supplied from the main laboratory and further units crossmatched.*

**Case 7.11: Delay due to computer confusion**

*Three units of FFP issued for Patient 1 were returned to stock. The units were re-issued to Patient 2 on the following day. On removal from the secure remote refrigerator the 'XM' to 'ISSUE' status message related to Patient 1 not Patient 2 as expected. The units were now at 'ISSUE' status in the blood inventory on the laboratory information management system (LIMS) for Patient 1, 'ISSUE' in blood product history (audit trail) on LIMS for Patient 2 and 'XM' in patient file in LIMS for Patient 2. Furthermore the 'ISSUE' status was transmitted to the hospital information system for Patient 1 not Patient 2 so the units could not be electronically given to the correct patient. This caused significant delay to the patient's transfusion and required a manual process to be applied by the transfusion practitioner. This is an information technology (IT) issue to be resolved by the provider.*

In 16/26 (61.5%) cases reported as communication failure, the components were required for an urgent or emergency situation.

**Sample errors n=15**

| Type of sample error | Number of cases |
|---|---|
| Sample labelling error | 2 |
| Sample delayed in reaching laboratory or no sample available | 4 |
| Wrong blood in tube (group and screen) | 7 |
| Wrong blood in tube (full blood count) | 1 |
| No second sample available. Preoperative assessment at another hospital | 1 |
| **Total** | **15** |

Table 7.1: Sample error categories

**Case 7.12: Delayed transfusion due to poor practice**

*A patient required a 2-unit transfusion following rectal bleeding at 13:25. A sample with a crossmatch form was sent by the locum doctor but the form was not signed. The sample was discarded and no further sample received until the patient had a cardiac arrest. There was a 7-hour delay from the blood being requested to patient receiving a transfusion.*

There were 15 sample errors leading to delayed transfusion. In 4/7 WBIT cases, patient details had been incorrectly entered on to the hospital patient information system. In all four cases the error was detected at the final check prior to transfusion; however the reports documented that there were delays in treatment until the problems were resolved.

### Paediatric cases of delayed transfusion

Twenty cases were reported in children (4 described below) illustrating difficulties in obtaining appropriate components urgently, or communication failures resulting in delay.

### Case 7.13: Delayed urgent transfusion

*There was a delay of 2 hours to obtain red cells suitable for neonatal use for a neonate with Hb 47g/L, but there was no discussion with a haematologist to consider concessionary release of adult units.*

### Case 7.14: Irradiated unit without adequate labels

*A 3 day old baby required urgent red cell exchange for hyperbilirubinaemia. A suitable irradiated unit was sent from the Blood Centre but without confirmation-of-irradiation labels attached. The delay to obtain another unit would be 3-4 hours, so this unit was given concessionary release and transfused with a 3-hour delay.*

### Case 7.15: Exchange transfusion but poor communication

*A 31 weeks gestation baby at 24 hours of age required exchange transfusion with the decision made at around 01:00. Neither the verbal or written request indicated that this was an exchange. The baby's bilirubin levels had been above the exchange transfusion threshold 12-13 hours earlier. When blood arrived at 03:30 it did not meet the requirements for neonatal exchange transfusion (i.e. blood was not less than 5 days old and was not irradiated).*

### Case 7.16: Communication confusion with misunderstanding of antibody information

*A sample was received for a group, direct antiglobulin test and crossmatch late at night. The information on the request form stated 'maternal anti-E and -C antibodies' and that the patient had received intrauterine transfusions (IUT) although the question 'Has the patient previously been transfused?' was answered 'No'. The BMS crossmatched blood appropriate for the antibody information (the IUT and delivery had been performed in a different hospital so there was no way of confirming the maternal details out-of-hours), but the blood was found to be incompatible. The BMS spoke to the registrar at 05:21 who confirmed the blood transfusion was not urgent yet. On investigation it was discovered that the information about the maternal antibodies was incorrect. These were actually anti-c and anti-Jk[a]. This explained the incompatible crossmatch. It then took the Blood Centre a further 5 hours to provide suitable blood. The baby had a considerable delay to transfusion of more than 12 hours due to inaccurate information being provided initially.*

**Comment:** The combination of anti-E with anti-C is very unusual and might have prompted the BMS to query the accuracy. This case demonstrates how important it is to have an accessible database with historic sensitisation information.

## Avoidable transfusions n=143

## Definition:

**Where the intended transfusion is carried out, the blood/blood component is suitable for transfusion and compatible with the patient, but where the decision leading to the transfusion is flawed. This includes transfusions based on poor knowledge, communication failures, incorrect decisions or poor prescribing.**

**This section includes avoidable use of emergency O D-negative blood where group-specific or crossmatched blood was readily available for the patient.**
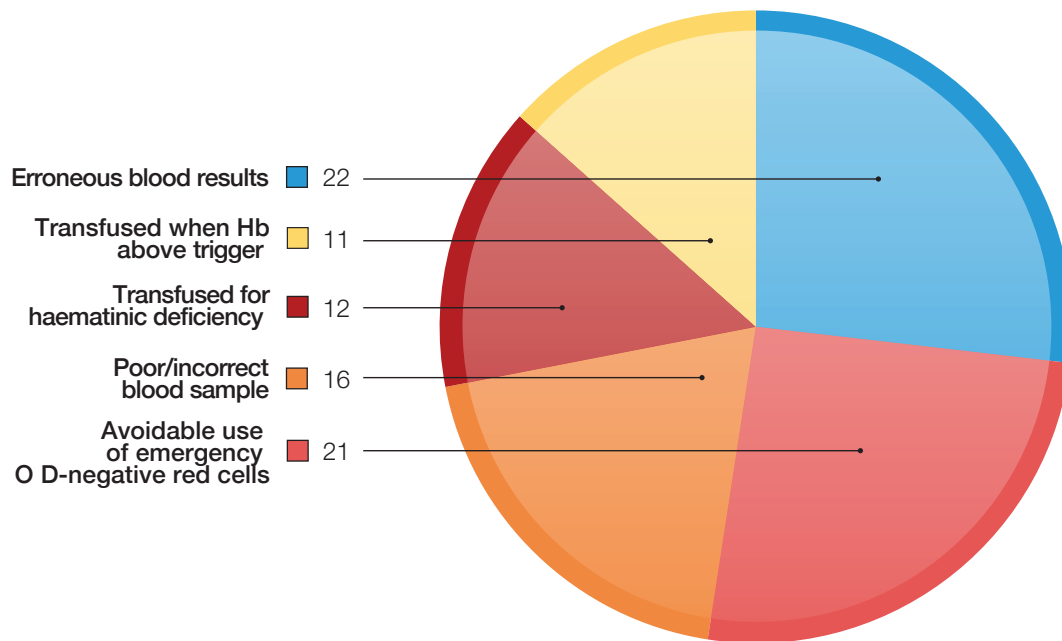


Erroneous blood results — 22
Transfused when Hb above trigger — 11
Transfused for haematinic deficiency — 12
Poor/incorrect blood sample — 16
Avoidable use of emergency O D-negative red cells — 21

Figure 7.4: Causes of avoidable transfusions: Top 5 causes n=82 cases



FFP used for warfarin reversal non-bleeding — 2
Pump error — 3
Not prescribed — 2
Low body weight not considered — 2
Transfused despite normal platelet count — 4
Erroneous result from BGA/POCT — 7
Failure to follow instructions — 8
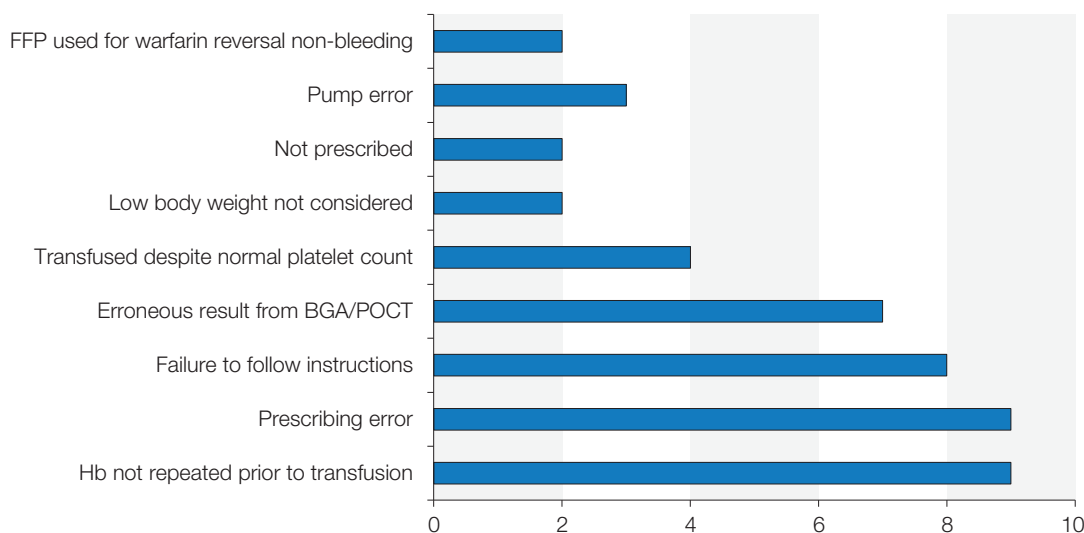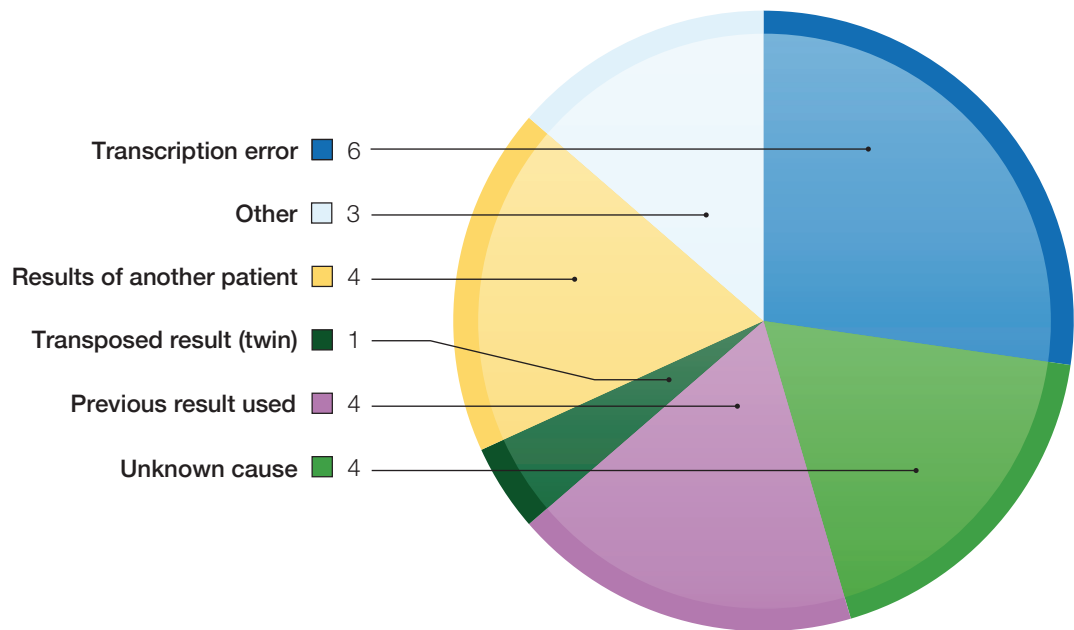Prescribing error — 9
Hb not repeated prior to transfusion — 9

Figure 7.5: Other causes of avoidable transfusions n=46

*BGA: blood gas analyser POCT: point of care test (Note: 15 miscellaneous cases not included)*

Pre-transfusion assessment is a fundamental part of the transfusion process and can prevent avoidable transfusions. The principles of patient blood management and better blood transfusion are comprehensive means of pre-transfusion assessment prior to taking the decision to transfuse (NBTC 2014).

**Transfusion based on the erroneous blood results n=22**

Figure 7.6: Causes of erroneous blood results n=22

| | |
|---|---|
| Transcription error | 6 |
| Other | 3 |
| Results of another patient | 4 |
| Transposed result (twin) | 1 |
| Previous result used | 4 |
| Unknown cause | 4 |

**Case 7.17: Transposition of results for twins results in one delayed and one unnecessary transfusion**

*Twins in the neonatal unit had their Hb checked. Twin 1 had previously been transfused and the Hb was 134g/L. Twin 2 had Hb 76g/L. At some point during the night shift the results for Twin 1 and 2 were transposed. Twin 1 received an unnecessary transfusion resulting in Hb 171g/L. The staff realised the error when this result was reviewed together with Twin 2's repeat Hb which was 74g/L. Twin 1 was kept under observation, and Twin 2 given a top up transfusion (post-transfusion Hb 114g/L). Fortunately there were no adverse sequelae.*
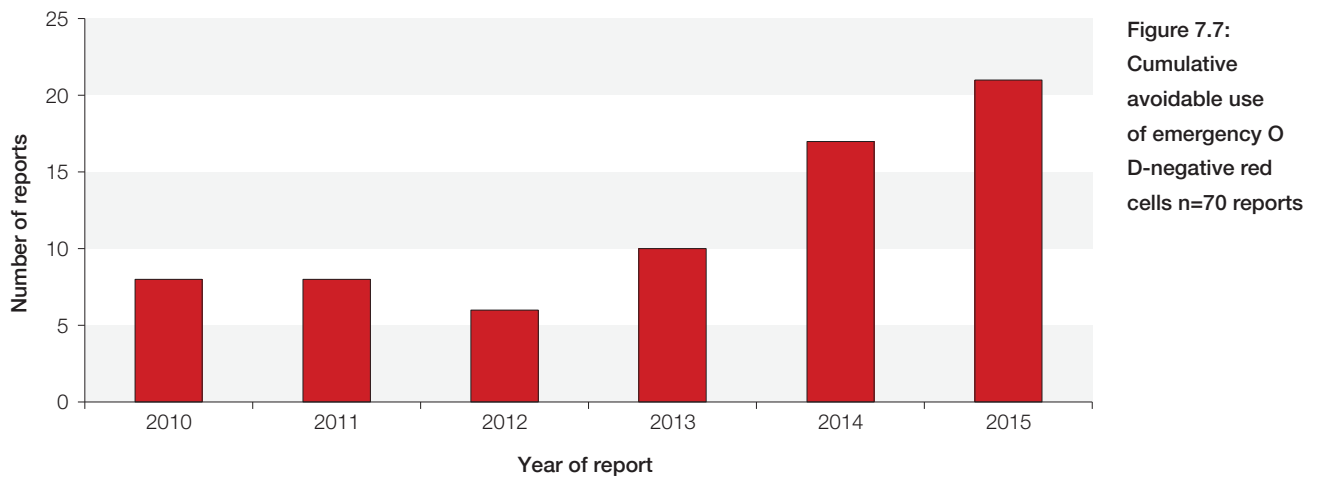
**Good practice point**: The incident review determined that the usual practice for recording telephoned results was to write them on a piece of paper without any formal identification step. There was then no confirmation of results or identity before prescribing the transfusion. Telephoned results are now to be transcribed directly into the patient record using all patient identifiers and the results are to be repeated back (BCSH Milkins et al. 2013).

**Avoidable use of emergency O D-negative red cells n=21**

Table 7.2: Avoidable use of emergency O D-negative units n=21

| Reason | Number of cases |
|---|---|
| Crossmatched units available | 8 |
| Group-specific units available/could have been made available | 4 |
| Sample labelling error | 3 |
| Failure to ensure 2 samples prior to theatre | 2 |
| No blood requested for AAA surgery | 1 |
| No valid group and screen sample for surgery | 1 |
| Hb results did not indicate transfusion required | 1 |
| Incorrect sample used for crossmatching | 1 |
| **Total** | **21** |

*AAA: abdominal aortic aneurysm*

Figure 7.7:
Cumulative
avoidable use
of emergency O
D-negative red
cells n=70 reports

There has been a steady increase of reports of avoidable use of emergency O D-negative blood. In the majority of cases it has been used instead of available crossmatched or group-specific red cells. Only two reports related to the lack of a group-check sample.

Emergency O D-negative red cells are an essential resource in the emergency situation when no other options are available. These are not suitable for everyone, for example D-negative red cells (cde/cde) are, by definition, incompatible for individuals who have developed anti-c (BCSH Milkins et al. 2013). Clinical staff are encouraged to communicate with the laboratory to ensure a safer option is offered to the patient (O D-positive R1R1 (CDe/CDe) units do not have the c antigen).

### Haematinic deficiency n=12

The majority (11/12) of these were patients with iron deficiency anaemia. The diagnosis and management of patients with iron deficiency is well documented (Goddard et al. 2011, NICE 2015, RCN 2015, CMFT 2013) to guide clinicians.

### Blood gas analyser and point-of-care (POC) testing errors n=7

SHOT consistently receives a small number of these cases each year. The causes may be that the machine is not quality-assured for this purpose or that the test was poorly carried out by inadequately trained staff.

Two cases resulted in the unnecessary transfusion of emergency O D-negative red cells. This also included one instance where a blood glucometer was used to measure the patient Hb in error.

### Case 7.18: Incorrect Hb result obtained from use of wrong point-of-care testing device

*A 64 year old patient was bleeding heavily during arterial surgery (1200mL). The anaesthetist asked the operating department assistant (ODA) to order 4 units of red cells and the transfusion laboratory advised that this would take around 40 minutes. The Hb result of 5.7g/dL from point-of-care testing was lower than anticipated but was feasible in the circumstances. The anaesthetist decided he could not wait for the crossmatched units and requested emergency O D-negative units instead.*

*The nurse who came to help in theatre identified that the Hb had been measured using a glucometer and there was no haemoglobin testing device in the department.*

There were a number of issues identified in the RCA:

- ODA working in an unfamiliar environment

- The incorrect piece of equipment was identified to test the Hb

- No label on the device to clearly identify what it was

- Lack of knowledge of operator

- Busy, stressful environment and a difficult case

- Miscommunication about what equipment was available

- Inadequate pharmacy stocks

- Missing and/or broken equipment

Review of POC machines demonstrated that haemoglobin and glucose monitors can look surprisingly similar.

### Commercial branding may result in an increased risk of errors

There is a dichotomy between the commercial benefits of branding and a potentially higher risk of errors resulting from brand-led confusion. Branding can be defined as 'a set of associations that a person (or group of people) makes with a company, product, service, individual or organisation' (Design Council, 2013). The aim of branding is to create a presence in a commercial market in order to attract and retain loyal customers. A strong brand can enhance a company's financial worth (Keller 1993) and brand awareness has been shown to be a dominant factor in consumer choice (Hoyer et al. 1990).

Elements of branding include common themes between products, such as logos, colours, style and mode of use in order to reinforce the company's image. However, while such branding might encourage purchases, it can both enhance safety and conversely increase the risk of error. Branding similarities enhance marketing purposes, by making products easily recognisable. This may have positive safety implications, especially from familiarity with the operation of a product, so if for example one point of care testing apparatus works in a similar way to another, then an operator familiar with one will be able to operate the other. Conversely, there is a risk of error if two POC testing products look almost identical and can be confused at the time of use.

Research from over a decade ago showed that there was little evidence within the NHS of an understanding of the value and significance of design to improve patient safety (Clarkson et al. 2004). The continuing opportunity for confusion between POC testing analysers indicates there remains a split between commercial branding values and patient safety error reduction requirements.

### Prescribing errors n=9

In one instance the IT set up was not fit for purpose: the electronic prescribing system defaulted to the volume of an adult unit for neonatal intensive care unit (NICU) patients – discussed in Chapter 10, Information Technology (IT) Incidents.

### Sample errors n=16

Table 7.3:
Full blood count
sample errors n=16

| Reason | Number of cases |
|---|---|
| Dilute sample | 8 |
| Wrong blood in tube | 3 |
| Clumped/clotted | 3 |
| Insufficient/short sample | 2 |
| **Total** | **16** |

### Near miss cases n=7

Similar lessons can be learnt from near miss cases that were detected before the patient received an avoidable or inappropriate transfusion.

| Point in the process | Type of error made | Number of cases |
|---|---|---|
| Request | Requested on the basis of erroneous results | 2 |
| | Requested for incorrect patient | 2 |
| Sample taking | Wrong blood in tube FBC* sample | 2 |
| Prescription | Laboratory issued blood that had not been requested or prescribed | 1 |
| **Total** | | **7** |

*FBC: full blood count

Table 7.4: Near misses that could have led to unnecessary transfusions n=7

### Inappropriate transfusion of FFP n=3

In 3 cases FFP was transfused inappropriately. These do not include Case 11.4 in Chapter 11, Acute Transfusion Reactions (ATR) and another patient who experienced transfusion-associated circulatory overload (TACO) following inappropriate transfusion of FFP (NICE 2015).

## Transfusion of inappropriate volumes:

### Undertransfusion n=4 (not included in the total 143 avoidable transfusions)

Most of these were failures to transfuse sufficient components in the face of bleeding. One adult patient was unnecessarily transfused a single unit of FFP.

### Overtransfusion n=27

There were 27 avoidable transfusions that resulted in overtransfusion. Poor decisions were made in 16 of these cases.

## Inappropriate or delayed administration of prothrombin complex concentrate n=4 (not included in the total 143 avoidable transfusions)

In 2015 SHOT asked reporters to submit summaries of incidents involving the inappropriate or delayed administration of prothrombin complex concentrate (PCC). Four cases were submitted to SHOT by email (not included in the overall number of SHOT reports).

### Case 7.19: Wrong, wrong and wrong

*An 80 year old man on warfarin was admitted to the emergency department (ED) with possible gastrointestinal haemorrhage. He was inappropriately supplied with 6 vials of PCC as a 'take home' prescription; this dose was supposed to have been administered while an inpatient when he was first admitted (international normalised ratio (INR) 5.1), but as a result of delay and transfer between wards, the INR fell without treatment to 1.6. He did not need the PCC at all.*

### Case 7.20: PCC administered to wrong patient

*An 82 year old man was admitted to the ED with a 1-week history of reduced mobility and left sided weakness. A computerised tomography (CT) scan showed a large cerebral haematoma. The junior doctor tried to contact the neurosurgical team by telephone (at another hospital) to discuss the results of the CT scan. While she was waiting on the telephone, she was also trying to arrange a CT scan for another patient. When asked about the patient's INR result she read results from the wrong case notes in error. Treatment with PCC and vitamin K was advised by the haematology consultant. PCC was issued and checked with the staff nurse before administration. Another staff nurse on the ward advised that the patient actually receiving PCC had not had an INR sample taken. The administration was stopped after 1.5mL. The patient came to no harm.*

**Case 7.21: Inappropriate PCC prescription**

*A patient with liver disease and acute renal failure needed a central line. Coagulation tests showed minimal derangement (normal fibrinogen, borderline activated partial thromboplastin time, and prothrombin time of 22.8 seconds). PCC was given inappropriately as it was not indicated for this clinical scenario. No repeat coagulation tests were performed.*

**Case 7.22: Confusion over batch numbers for a blood product**

*A dose of 2500IU PCC was requested. The BMS selected 1 vial from one batch and 2 vials from another batch. The BMS did not realise the mistake and the wrong batch labels were attached to the vials. This was not detected at the final check prior to administration.*

**Comment:** SHOT is taking reports of delayed, and inappropriate or unnecessary PCC administration. Please contact the SHOT office if you have a case to report.

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