5. Incorrect Blood Component Transfused (IBCT)

Definition

The category Incorrect Blood Component Transfused (IBCT) comprises all reported episodes where a patient was transfused with a blood component or plasma product that did not meet the appropriate requirements or that was intended for another patient.

DATA SUMMARY

Total number of cases	**332**	*Implicated components*		*Mortality / morbidity*	
		Red cells	**257**	Deaths due to transfusion	**0**
		FFP	**13**	Deaths in which reaction was contributory	**0**
		Platelets	**27**	Major morbidity	**7**
		Other (cryo)	**4**		
		unknown	**31**		

Gender		*Age*		*Emergency vs. routine Core hours vs. out of core hours*		*Place of transfusion*	
Male	**156**	<16 years	**22**	Emergency	**83**	A & E	**5**
Female	**158**	<1 year	**11**	Routine	**209**	Theatre	**10**
unknown	**18**	<4 weeks	**12**	Not known	**40**	ITU/HDU/Recovery	**15**
						Wards	**129**
		Total	**45**	In core hours	**108**	Community	**2**
				Out of core hours	**74**	Other	**0**
				Not known/applicable	**150**	Not known	**171**

Information technology and appropriateness of transfusion (in the opinion of the SHOT reviewer)		
In how many cases was failure or absence of IT a factor?	**25**	See section 5.2
In how many cases was a transfusion possibly unnecessary or inappropriate?	**49+**	See page 35

Reports of IBCT

This year 352 IBCT questionnaires were received. Seventeen reports were withdrawn during the course of analysis because they did not meet the criteria for the categories currently included in IBCT. An additional 3 cases were 'right blood to right patient' incidents in which the patient received the intended component despite a serious breach of protocol. These have been included in a separate section (page 63) and are not included in the total. There is 1 report of an adverse event relating to autologous blood transfusion on page 48, and there are 2 reports of adverse reactions relating to cell salvage in the ATR chapter; these are discussed together in a section on adverse incidents in autologous transfusion on page 110.

There are separate chapters discussing laboratory-related IBCT reports and the role of IT errors and problems in IBCT cases. These are also included in the total number of IBCT cases. Anti-D related reports have not been included in IBCT this year and have been separated into a discrete chapter on page 65.

This section describes the findings from 332 analysed IBCT cases. There are text boxes associated with some cases listing corrective actions taken at the hospitals concerned. Some of these represent excellent practice. The issues surrounding identification of useful corrective actions are discussed in a separate section on page 116.

Figure 4
IBCT and ABO incompatible cases 1996–2007

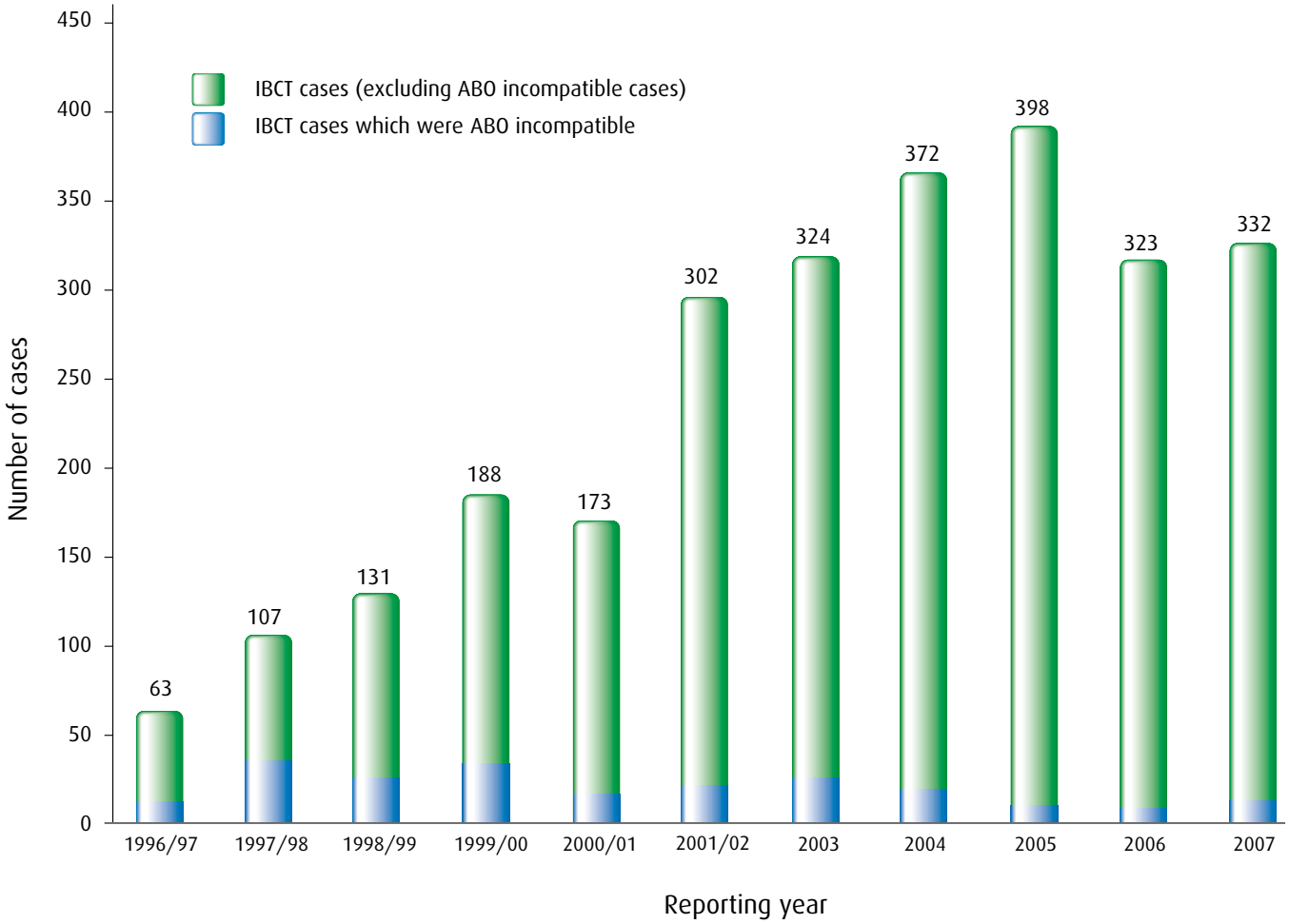

Table 7 shows the number of IBCT reports expressed as per 100,000 components issued in each year from 2003 to 2007 (excluding anti-D cases).

Table 7
IBCT reports 2003–2007

Year	Number of IBCT reports	Reports per 100,000 components
2003	324	9.5
2004	372	11.1
2005	398	12.8
2006	323	10.6
2007	332	11.4

Mortality

There are no fatal cases from IBCT this year.

Major morbidity

There were 7 cases of major morbidity, 4 from ABO incompatibility (Cases 1-4), 2 from inappropriate transfusion causing TACO and cardiac failure respectively (Cases 11 and 12), and 1 from over-transfusion causing a dangerously high Hb (22 g/dL) requiring venesection (Case 14).

ABO-incompatible transfusions n = 14

There were a total of 14 ABO-incompatible transfusions, 10 as a result of clinical errors (including 1 phlebotomy wrong blood in tube (WBIT) error) and 4 as a result of laboratory errors. One of the administration errors related to platelets, and 1 of the laboratory errors to FFP, leaving 12 cases of ABO-incompatible red cell transfusion.

D-incompatible transfusions n = 7

Three D-incompatible transfusions were given as a result of clinical errors (including 1 from a WBIT phlebotomy error), and 4 occurred as a result of laboratory error. Of the laboratory cases, 1 involved platelets and the remaining 3 related to red cells.

Table 8
Summary of IBCT results

Type of event	Number of cases	
Administration of wrong blood		**24**
• ABO incompatible	9	
• D incompatible	2	
• Compatible wrong blood	10	
• Incorrect component type	3	
Wrong blood in tube		**7**
• ABO incompatible	1	
• D incompatible	1	
• Incorrect Hb	4	
• Compatible	1	
Inappropriate or unnecessary transfusion		**50**
• Based on wrong Hb	28	
• Based on POCT INR/plt count	2	
• Haem/coag lab errors	3	
• Poor knowledge and prescribing	17	
Handling and storage errors		**118**
• Technical administration errors	15	
• Transfusion of expired red cells	12	
• Excessive time to transfuse	57	
• Cold chain errors (incl. 20 lab-related)	34	
Special requirements not met – CMV/irrad		**76**
• Clinical errors and omissions	49	
• Laboratory errors and omissions	25	
• Blood Service errors and omissions	1	
• Unclassifiable	1	
Special requirements not met – other		**17**
• Laboratory related cases	15	
• Clinical related cases	2	
Additional laboratory errors (including ABO- and D-incompatible)		**40**
• Wrong blood issued	15	
• Wrong ABO/D type for SCT patient	5	
• Pre Tx errors – testing	5	
• Pre Tx errors – procedural	15	
TOTAL		**332**

Each of these sections will be discussed in detail in the following pages.
Overall assessment of primary errors in the 332 IBCT events revealed that there were 96 errors originating in the laboratory and 235 primarily clinical errors plus 1 blood establishment error.

There was an approximately equal male: female ratio among the reported cases.

Of the settings in which blood components were transfused, 82 cases were regarded as having occurred in emergency settings and 208 in routine settings. In a further 16 cases this information was not known. In 26 of the 332 cases no answer was given.

Table 9
Broad indications for component transfusions

Indication for transfusion	Cases
Elective surgery	26
Emergency surgery	13
Trauma	9
Bleeding from various causes (this included 21 gastrointestinal bleeding from various sites)	47
Bone marrow failure	36
Haemolysis	2
Anaemia from various causes	148
Not given	51

The question about the time the IBCT episode took place was poorly answered in questionnaires with the section left blank in 148 questionnaires out of 332 (45%). Of the remainder, 109 took place between 8 a.m. and 8 p.m., 38 between 8 p.m. and midnight and 37 between midnight and 8 a.m.

ADMINISTRATION OF WRONG BLOOD n = 24

There were 24 cases in which blood components were administered to the wrong patient as a result of clinical errors and omissions. Of these 23 involved nursing and midwifery staff and 1 involved medical staff. Only 1 paediatric patient was involved, an infant 8 weeks of age. There were 12 cases involving female patients and 12 involving male patients.

Nine ABO-incompatible transfusions resulted from these errors of which 1 was both ABO and D incompatible. In addition there were 2 cases of transfusion of D positive blood to D negative patients because of administration errors. One of the ABO-incompatible transfusions caused an immediate reaction with risk to life requiring emergency exchange transfusion; 3 caused immediate reactions with symptoms and signs of intravascular haemolysis; and 2 more caused a less dramatic reaction. In the remaining 3 cases there was no reaction. None of the patients involved in the ABO-incompatible transfusions were children.

Only those cases resulting in a transfusion reaction need to be reported to MHRA via SABRE. The relevant 6 cases were reported to MHRA, but in addition another 14 were also reported to MHRA which were not required to be.

There were 15 cases in which there was an error in the collection of the component from the storage site, i.e. the blood bank refrigerator, satellite refrigerator or the agitator. Of these 15 cases, 8 of the errors in collection were made by a registered nurse or midwife, 3 by porters, 1 by an unqualified nurse, 2 by junior doctors and 1 by a healthcare support worker.

ABO-incompatible transfusions n = 9

There were 9 cases in this group. Seven of the 9 involved collection of the wrong unit from the storage site. This incorrect unit was then transfused to the patient for whom the transfusion was intended. The remaining 2 cases involved a correct unit of blood being collected for a patient requiring transfusion but transfused to a different patient on the ward by the nursing staff.

Major morbidity n = 4

One case suffered a severe immediate reaction with threat to life, requiring red cell exchange.

Case 1

Two ABO-incompatible units transfused resulting in need for red cell exchange transfusion

A man with metastatic prostate cancer presented in the Emergency Department (ED) with a Hb of 5.3 g/dL and gastrointestinal bleeding. Two units of blood were collected by a registered nurse from the issue fridge and commenced via two cannulae. The patient became pyrexial with rigors, loin pain and hypotension and 1 hour after starting the transfusion the nurse called the doctor who stopped the transfusion: by this time most of both units was transfused. The doctor found that the red cell units were for a different patient, and that the units were incompatible, the patient being O D positive and the two transfused units B D negative. The patient received immediate supportive care and further advice was sought from the haematology consultant. A red cell exchange of 4 units of correct ABO/D group red cells took place. The patient suffered worsening renal impairment, and was later discharged to a hospice.

In 3 cases there were documented symptoms and signs of immediate intravascular haemolysis:

Case 2

Classic patient ID error involving two similar patients in adjacent beds: multiple errors

Two male patients with similar names were in adjacent beds with acute epistaxis. Patient A was awaiting a platelet transfusion, and patient B had had a red cell crossmatch requested. Patient B was stable with an Hb of 8.7 g/dL and the junior doctor decided not to transfuse overnight. Platelets were written up for patient A. The laboratory called to say that blood was available for patient B and a healthcare support worker, who had never been to the blood issue fridge, was sent to collect a unit, which she left in the treatment room. Nurse 1 (unqualified) set up a saline infusion on patient A, awaiting platelets, and found he had no wristband, so she made one from the notes and drug chart and attached it to patient A. She then fetched the red cell unit crossmatched for patient B, and commenced the transfusion without any bedside checks at approximately 19.00. Patient A felt unwell, but observations were apparently stable, although documentation only shows recordings at 12.40 and 19.55. At 19.15 patient A complained of back spasm, palpitations and feeling unwell and had pinpoint pupils. Nurse 1 checked that the blood was running and reassured the patient. She went on a break handing over to nurse 2. At 19.45 nurse 2 was called to patient A, who was purple in the face and shaking uncontrollably. She noticed that blood was running instead of platelets and stopped the transfusion. She then noticed that the unit was labelled for patient B in the next bed. She called the junior non-specialist doctor who gave a verbal prescription for IV hydrocortisone and piriton and came to see the patient. Observations were satisfactory apart from a pulse of 125bpm. By 20.30 patient A was a little better. The junior non-specialist doctor was unable to persuade the medical specialist trainee doctor to attend. By 22.00 the transfusion co-ordinator had informed the haematology consultant and transfusion BMS of the error and investigations were initiated, as well as IV fluid and frusemide.

Corrective actions reported from involved hospital Trust

- Raise awareness of blood/platelet transfusion procedures at senior nurses' meeting, and via the risk group, and governance structure.
- Highlight wristband identification policy to all admitting areas and ward nursing staff. Re-audit compliance with policy.
- Continue with training programme of all clinical staff involved in the transfusion process. Only trained personnel to be permitted to collect and administer blood and monitor patients undergoing transfusion.
- Education of all relevant staff in the recognition of transfusion reactions and in appropriate intervention, investigation and documentation.
- Involvement of medical director and clinical directors in the training of specialist trainee doctors and junior doctors, including cascading via grand round and clinical governance structures.

Case 3

Red cell units 'checked' at nurses' station

An 84-year-old male patient was awaiting top-up transfusion for anaemia due to prostate cancer. A unit for another patient had also been collected from the issue fridge. Units were checked at the nurses' station. A nurse then took 1 unit and commenced the transfusion on one of the patients without performing any bedside checks. This patient who was O D positive thus received a unit of blood intended for another patient which was A D negative. He developed fever, haemoglobinuria, hypotension and loin pain which resolved with full recovery.

Case 4

Second unit of a routine transfusion administered without checks

A nurse removed a red blood cell unit from a satellite blood fridge without checking the patients ID details or signing the blood register. The 75-year-old male patient, group O D positive, was still finishing the first unit of a 2 unit transfusion for myelodysplastic syndrome (MDS). The nurse left the second unit in the treatment room and subsequently forgot that she had not checked the unit against the prescription form or compatibility label and put it up without checking the patient's ID wristband. At approximately 21.40, after the blood had been running for 15 minutes, the patient developed rigors and pyrexia, and the transfusion was stopped. The unit was found to be for a different patient with the same first name. Piriton and hydrocortisone were given, and salbutamol as the patient became wheezy. Haemoglobinuria was observed. The patient made a full recovery.

Minor morbidity n = 2

Two patients suffered a mild reaction from the incompatible units with full recovery. There was no reported evidence of intravascular haemolysis.

Case 5

Worrying lack of comprehension of reasons for standard procedures, and disregard for consequences

A patient receiving a red cell transfusion complained of severe back pain, and then developed rigors. The deputy nursing sister attended the patient, noticed it was the wrong blood, took it down and bleeped the junior non-specialist doctor. The ward then phoned blood bank requesting a further unit of blood for another patient as the first had been 'wasted'. Only when the blood bank manager asked for the bag was it revealed that the unit had erroneously been given to the wrong patient. The blood bank manager contacted a consultant haematologist who went to see the patient immediately. The sticky label from the blood bag tag had been removed from the medical notes, and the name had been crossed out on the blood bag label. The bag of blood had been thrown into the sharps bin and was retrieved by consultant haematologist. The nurse who put up the blood admitted she had not performed any bedside checks.

Case 6

Red cells administered by doctors in theatre without checking

A 69-year-old man was in theatre undergoing emergency repair of an abdominal aortic aneurysm. A junior doctor collected an incorrect unit of group A D positive blood from the theatre fridge. The identity of the unconscious patient, who was group O D positive, was not checked against the unit of blood. It was administered by an anaesthetist. The patient developed renal failure postoperatively, which resolved but may in part have been due to the incompatible transfusion.

ABO-incompatible transfusions with no reaction n = 3

Case 7

Two units of ABO-incompatible red cells given despite 'checks'

Patients A and B were in adjacent beds and both were crossmatched. Patient A (an 84-year-old female patient, group A D negative) was prescribed 3 units of red cells for anaemia. Patient B (group AB D negative) was also crossmatched for 2 units of red cells, but the blood had not been prescribed. The registered nurse who went to collect blood for patient A took patient B's blood in error. The unit was then taken to the ward when it was 'checked' by 2 trained nurses prior to being transfused but the error was not detected. The 15 minute observations were performed, but the patient did not display any signs or symptoms of a transfusion reaction. When the first unit was completed it was fated via the computer system (EU Directive traceability). The next unit was collected, and the same error was repeated. Again the check by 2 qualified staff on the ward failed to detect the error and the second unit of patient B's blood was given to patient A. It was unclear what documentation was used in the collection process and where the final check occurred. The 15 minute observations were not performed for the second unit. The error was detected when the transfusion was complete.

There was 1 case of ABO incompatibility in which platelets were given to a patient instead of FFP, but there was no adverse reaction.

Case 8

Lack of understanding about different component types

Four units of FFP were requested for a 68-year-old female patient on warfarin who had a haematoma following access to an AV fistula. An unqualified healthcare support worker was sent to collect the FFP but she removed a unit of stock platelets from the platelet agitator instead. These had not been issued for a patient and therefore had no patient labels attached. A second agency support worker came to collect the second unit of FFP and instead removed a second unit of stock platelets from the platelet agitator. This unit had expired at midnight the night before. The patient was O D positive and both bags of platelets were A D positive. Both of these units were checked by 2 staff nurses and were transfused before the error was detected. Both nurses noticed that the units bore no patient labels but still proceeded with the transfusion. There was no untoward reaction.

In one remaining case in which there was no reaction, the patient received less than 50 mL of blood. The transfusion was stopped when the error was noted because the patient asked whether the blood was irradiated or not.

Case 9

Well-informed patient averts possible catastrophe

No patient identification was taken to the blood fridge, and as a result the wrong unit of red cells was removed by a registered nurse and taken to the ward for an 81-year-old female patient with chronic lymphocytic leukaemia (CLL). On the ward another nurse administering the transfusion assumed that the checks had been completed, and because of this assumption no bedside checks were performed. The patient received non-irradiated group A D positive red cells, instead of irradiated O D positive red cells. The error was noticed when the patient asked whether the unit was irradiated. Consequently <50 mL was transfused.

D-incompatible blood n = 2

There were 2 cases in which D positive blood was given to D negative patients, owing to bedside errors in which blood was not given to the patient for whom it was intended.

Case 10

Simultaneous transfusion of two patients leads to wrong unit being transfused

Blood for two patients was delivered, in two separate blood transport boxes, to the nursing station by the porter, where the units were 'checked'. One unit was taken out of each box and transfused to the appropriate patient. After the first patient, a 19-year-old man with chronic renal failure and a post-op Hb of 5.2 g/dL, had received the first 2 units of blood, an unqualified nurse collected a third unit for him. However, she did not check that she picked up the correct unit from the blood box. She then put the unit up and commenced the transfusion. A few minutes later, a qualified staff nurse responsible for the second patient went to get the second unit from the transport box and found the unit missing. It was then discovered that patient 1, group O D negative, was receiving the unit of blood intended for patient 2, group O D positive.

Errors identified for corrective action at the involved hospital

- **Qualification for transfusion:** student nurses were giving blood transfusions but they are not qualified to do so
- **Supervision:** the qualified nurses on the ward did not notice the students nurse's actions
- **Checking and traceability:** it was found that the registered nurses had checked that the blood in each box was for the two patients and then signed the traceability/compatibility labels and left the units in the boxes, from where they would be taken one at a time for transfusion

Case 11

Unit checked against crossmatch report

An intensive therapy unit (ITU) staff nurse took the incorrect patient's crossmatch report as identification to collect 2 units of red cells from the issue fridge. The units collected matched units on the report, and therefore were wrong for the intended patient. Once back at the ward the units were checked, again using the crossmatch report, and not the patient identification band. Thus 2 units of O D positive red cells were transfused to an O D negative male patient in error.

The NPSA Safer Practice Notice, SPN 14, advises that compatibility forms should be phased out as this prevents the erroneous practice of checking units against compatibility forms instead of patient ID. However, the above case clearly demonstrates an equivalent error involving a crossmatch report form (which is the paper report sent to the ward from the lab when the elective crossmatch has been performed). This highlights the need for sufficient depth of education regarding the reasoning behind protocols, as training to the protocol alone does not avoid errors.

Commentary on administration of wrong blood to patient

There are a number of themes common to the above cases, many of them highlighting that not only are training and competency essential for safe collection and administration of blood components, but that levels of knowledge and understanding are required for the following of protocols to be performed safely. Staff need to understand the process and the rationale for it in order to act appropriately when situations deviate from 'normal'.

There are three particular areas of concern highlighted by these 11 cases, many of which recur in other sections of this chapter.

Errors in following process for collection of components:

Poor knowledge and recognition of different component types
Failure to act appropriately on discovering an 'unlabelled' component
Deployment of unqualified staff to collect components
Use of inappropriate documentation, or no documentation, to collect component

Failures of bedside checking procedure:

- **No checking done at bedside**
- **Persistent misunderstanding that 'checking' can be performed remotely from the patient's side**
- **Checking against paper documents being substituted for cross-checking against the patient's ID wristband**

Non-recognition of a transfusion reaction:

- **Lack of understanding of the imperative to monitor patients receiving blood components**
- **Failure to recognise a transfusion reaction, due to insufficient knowledge or experience**
- **Not acting appropriately when a patient suffers a reaction, due to lack of appreciation of the potential seriousness**

All of these cases would have been prevented by following the proper process for carrying out a bedside check of patient ID and component details. However, in order for this to take place universally, it must be carried out by staff with levels of knowledge and skill that allow them to appreciate the rationale behind this imperative. Competency assessment for blood component collection and administration is essential also, but this should not be used as a way of allowing staff with insufficient knowledge or experience to undertake this critical task. Nursing and medical staff must take responsibility and are professionally accountable. Staff should not undertake tasks for which they themselves feel poorly prepared.

Wrong blood transfusions which happened to be compatible n = 10

There were a further 10 cases in which blood intended for a different patient was transfused and in which, by chance, there was no ABO or D incompatibility and thus no reactions took place.

There were 6 instances in which the correct blood had been collected for the patient from the storage site but once it was on the ward it was checked away from the patient and then subsequently given to the wrong patient. In one pair of cases two patients were given each other's red cell units, fortunately of the same group. These cases highlight weaknesses in the training of staff in the blood checking process, in that staff still carry out the so called 'check' remotely from the patient. It must be made clear that full, safe checking of a component is impossible without the patient. Blood cannot be checked away from the patient and must not be checked against compatibility forms or other paper documentation. Components must always be checked against the patient's wristband and the patient's verbal account of their name and date of birth.

Case 12

'Helpful' nurses and doctor administer platelets to the wrong patient

Platelets arrived in ITU and the nursing sister took them to a patient's bedside. This was not the bedside of the patient to be administered platelets. Finding the patient unconscious and without an ID bracelet she went to write a wristband. Two other nurses saw the platelets and checked them by asking other staff if it was the correct patient. Finding the platelets were not written up for that patient, they asked the doctor to prescribe them, which he did. The platelets were then given to this patient, who did not require them, instead of another patient on the unit. There was no adverse reaction.

Case 13

Lack of understanding of possible consequences of actions

Two qualified nurses checked a unit of blood at the nurses' station and a nurse then walked into a 6 bedded bay and connected it to the wrong patient with no bedside check. The nurse then realised her mistake, disconnected the giving set from the wrong patient and reconnected it directly to the right patient. A senior colleague queried her actions as she had used a fluid giving set, not a blood giving set. The nurse was sent away and the senior nurse changed the giving set as she was unaware of the previous mistake. The rest of the transfusion was then administered (to the right patient). The patient who had received a part unit of wrong blood was not monitored and nothing was documented in the notes.

There were 2 cases in which units were mistaken for 'flying squad' blood and removed from controlled temperature storage, and given in an emergency situation to a patient. However, in both these cases the blood removed from the storage site was not flying squad blood but had been crossmatched for another patient.

Case 14

After 'losing' the flying squad blood, units crossmatched for another patient are taken and transfused

During a massive obstetric haemorrhage emergency O D negative blood was collected from a satellite fridge and taken to theatre, but 'lost'. An anaesthetist went back to the satellite fridge and collected 2 more units of red cells which were in fact crossmatched for another patient. These were transfused before it was realised that they were not the emergency O negative units. The patient was B D positive and received O D positive blood with no clinical consequences.

There are 2 cases in which the wrong unit was collected from controlled temperature storage by portering staff and the bedside check failed to detect that the unit was not for the intended patient and it was transfused.

Case 15

A porter collects blood without adequate documentation

During the night, a unit of blood was collected for top-up transfusion of an 85-year-old female patient by a porter who was given only the patient's name. He collected blood for another patient in error, whose name differed by only one letter. The date of birth and the hospital number were not checked as the porter did not have them. On the ward, 2 nurses checked the blood against the compatibility form – which matched the unit. They did not check the patient's wristband or the prescription sheet. The whole unit was transfused and the error identified only when the next unit was put up. The unit transfused was group O D positive and the patient was group A D negative. There was no adverse outcome.

Errors and omissions identified at the hospital

- It was not appropriate that this routine top-up transfusion was taking place overnight
- The portering controller was not given the patient's full name, hospital number and date of birth for collecting blood products
- The porter failed to check even the limited details given adequately
- The nursing staff did not check that the porter had collected the correct unit, and did not follow the hospital policy for the checking of blood products, which is for single nurse checking
- In addition they did not check the medical notes or prescription chart, nor the patient ID (verbally or wristband)

Incorrect component type given to correct patient n = 3

There were 3 cases in which the patient had more than 1 component type available and the wrong component type was collected and transfused despite a correct prescription. In 2 of these cases red cells were transfused where platelets had been prescribed, although the red cells were for the same patient. In both cases the wrong component, i.e. red cells, were collected by nursing staff from the issue refrigerator instead of collecting platelets from the agitator as per the prescription.

Case 16

Confusion regarding components results in unwanted red cell transfusion and delayed surgery

A 77-year-old man had prophylactic platelets written up prior to spinal decompression surgery. Night nurses erroneously collected red cells which were also available for the same patient as they were crossmatched for the morning list. Two units of red cells were transfused over 30 minutes each, and no platelets. In the nursing notes the transfusions were documented as platelets, and it seemed that the staff were unfamiliar with the different types of blood component. The surgery had to be delayed in the morning when the day staff discovered the error.

In 1 case platelets were given instead of FFP. In this example the platelets were collected erroneously by the porter instead of FFP and the bedside check did not detect this discrepancy. The report also suggests that the transfusion of FFP was not clinically indicated.

Case 17

Porter collected platelets instead of FFP

An 8-week-old female child with severe metabolic disorder and sepsis required blood component support. Both platelets and FFP were available in blood bank. The porter was asked to collect FFP but took platelets. Nurses performing the bedside check did not notice the error and transfused the platelets resulting in the platelet count rising from 90 to 126 x 10^9/L.

The case above raised the issue as to whether non-clinical staff can safely be trained to collect different components which are superficially similar. It is perhaps unreasonable to expect non-clinical staff to be responsible for making this differentiation.

WRONG BLOOD IN TUBE ERRORS n = 7

In these cases an incorrect patient was bled either for haemoglobin estimation or for a group and save/crossmatch sample and all cases resulted in incorrect or inappropriate transfusion. One case resulted in ABO-incompatible transfusion and another in D-incompatible transfusion. Four cases resulted in the wrong patient being transfused as the haemoglobin was actually that of another patient. There was 1 case in which a D group was actually that of another patient but was in fact compatible.

Case 1

Phlebotomy error results in ABO-incompatible transfusion

An 83-year-old female patient who was previously unknown to the hospital had a routine sample sent requesting a crossmatch of 2 units of red cells. The sample grouped as A D positive and two compatible units were issued and transfused to the patient. The patient suffered no transfusion reaction and was discharged home. She was readmitted 6 weeks later for recurrent anaemia. A sample sent requesting a further 2 unit crossmatch, grouped as O D positive' this was confirmed on a repeat sample. It appears that on the initial admission the patient received 2 units of incompatible (A D positive) blood as a result of a phlebotomy error.

Case 2

D-incompatible blood given as a result of a phlebotomy error

A 58-year-old male patient was grouped as O D negative and transfused 2 units of O D negative blood. Six weeks later a second sample was grouped as O D positive. A third sample was taken to confirm the patient's blood group as O D positive.

In 4 of these cases the phlebotomy had definitely been carried by a junior hospital doctor and in a fifth case this was probably the case although it is not entirely clear from the report.

In all these cases the recipients were adults.

INAPPROPRIATE or UNNECESSARY TRANSFUSION n = 50

There were 50 cases in this category, of which 37 were reported to SHOT only and 13 were reported to MHRA via SABRE. In fact none of these cases were reportable to MHRA, as even the laboratory-related errors were related to the haematology laboratory rather than the transfusion laboratory.

In 47 of the 50 cases the junior doctor was at the root of the problem, although in 6 of these cases this was not categorically stated in the report but was implied by the narrative. However, this still leaves 41 out of 50 cases where a junior doctor was directly implicated in an inappropriate or unnecessary transfusion.

[There are 2 cases which have been included in the blood administration section as they concerned nursing staff transfusing a greater quantity of blood than was prescribed. They are less apposite here as the main theme in this section is poor decision making rather than error.]

Three cases involved patients under 4 weeks old at the time of the inappropriate transfusion. An additional one was under a year old. Four further cases were in patients between 1 and 16 years old; in 1 case the patient was 18 years old.

In 17 cases recipients were male and in 31 cases female (in 2 cases gender was not recorded).

Eighteen cases were emergencies, 27 were routine, 3 were unknown and 2 were unrecorded.

Transfusions based on wrong haemoglobin result n = 28

Table 10
Inappropriate transfusion based on incorrect haemoglobin value

Cause of falsely low Hb value	Cases
Falsely low Hb due to phlebotomy from drip arm	5
Hb from massively haemodiluted patient	1
Erroneously low Hb from Hemacue/point of care testing/blood gas analyser	4
White cell count mistaken for Hb	6
Transcription error from telephoned Hb result	4
Albumin value misinterpreted as Hb	1
Hb value misread from computer screen	1
Poor sampling technique resulting in clots, stasis in syringe, etc.	6
TOTAL	**28**

Drip arm (and haemodilution) n = 6

There were 5 cases reported in which an inappropriate decision to transfuse was based on a falsely low haemoglobin level because the sample was taken from a drip arm. In an additional sixth case the patient was described as 'haemodilute', apparently resulting in a falsely low Hb estimation.

Case 1

Falsely low Hb from a drip arm results in unnecessary transfusion

A patient had a full blood count (FBC) performed at night and was found to have a Hb of 5.5 g/dL. 4 units of red cells were ordered and issued and 1 unit was transfused. A further sample was sent later the same morning and found to have a Hb of 11.1 g/dL. No further units were transfused, and the original sample was rechecked and the result of 5.5 g/dL confirmed. On investigation, it emerged that the original sample was taken from a drip arm and was therefore diluted. The patient suffered no immediate harm.

In many of these cases there was a lack of engagement by the junior doctor with the results. Taking stock of the change in haemoglobin from the previous sample and evaluation of the clinical condition of the patient might have prevented some of these unnecessary transfusions.

Erroneous Hb result from POCT equipment n = 4

These cases include results from blood gas analyser and Hemacue™ devices – a result not of malfunctioning of the equipment but of poor training and unfamiliarity. There were 4 cases in this group relating to erroneous haemoglobin. [Two further POCT errors are reported separately as they apply to platelet and international normalised ration (INR) results.]

Case 2

Hb of 3 g/dL not queried by medical staff

A 74-year-old male patient in recovery post hip replacement was drowsy, hypotensive and tachycardic. A haemoglobin estimation from a blood gas analyser was 3 g/dL. A FBC sample was sent to the laboratory, but in the interim 1 unit of 'flying squad' (uncrossmatched group O D negative) blood was commenced. The new Hb result from the laboratory was 11.2 g/dL and recovery staff informed of this result advised medical staff to discontinue the transfusion. The patient suffered no apparent ill effects as a result of the over-transfusion or uncrossmatched unit.

Unnecessary transfusion based on transposed Hb and white cell count (WCC) results n = 6

This category comprises 6 cases in which as a result of misreading of laboratory reports or miswriting of results, the white cell count was taken to be the haemoglobin. The patient was thus transfused on the basis of what was apparently a low haemoglobin but which was actually the white cell count.

Case 3

White cell count mistaken for Hb resulting in unnecessary transfusion

A 70-year-old woman presented in ED looking very pale and had fainted at home. Full blood count run on a POCT analyser in ED showed a WBC of 7.9x10^{9}L, which was mistaken for the Hb, and a 2 unit transfusion was prescribed. The error was identified when the post-transfusion Hb was 16.3 g/dL. The patient was informed of the error, but she stated that she was happy as she felt much better.

Transcription errors n = 6

There were a further 6 cases of transcription errors. Four of these involved telephoned results written down in the ward. In 2 cases the source of the alleged telephoned result could not be traced. In a further case an albumin of 6 g/L was incorrectly supposed to be the patient's haemoglobin and the patient was transfused unnecessarily. In the fourth case the haemoglobin result was written in the wrong set of notes and a patient who did not require transfusion was given red cells in error.

There is also an incident in which the decision to transfuse a patient, made on a ward round and jotted in junior doctor's notebook, was later transcribed into a wrong patient's notes. In the final case a doctor admitted she had misread the results from a computer screen and ordered blood for a patient who did not need it.

Case 4

Danger of poorly documented telephoned results

Routine blood tests were performed on a 64-year-old male patient on ITU following an emergency laparotomy during which 3 units of packed cells had been given. Biochemistry results were phoned to ICU, and an albumin of 6 g/L reported, but a nurse documented this result as a Hb of 6 g/dL. Four units of blood were then transfused on the basis of this result. In fact the pre-transfusion (preoperative) Hb had been 10.4 g/dL, and post transfusion it was 17.6 g/dL.

Poor sampling technique leading to erroneously low haemoglobin level n = 6

Case 5

Difficult phlebotomy results in falsely low Hb

A sample was taken with great difficulty from an elderly female patient with a hip fracture, giving a Hb of 3.6 d/dL. The BMS phoning the result stated that it was a very small sample and that it should be repeated. This was communicated to a second doctor, but, finding the patient to be tachycardic and pale, he prescribed 3 units of red cells. Later another doctor also prescribed 3 more units, plus FFP and platelets. On review the patient had signs of pulmonary oedema and was therefore given frusemide. A repeat Hb taken a few hours later was 12.6 g/dL.

This case is typical of this group in which difficulties in phlebotomy encountered by junior doctors resulted in haemodilute samples, partially clotted samples or samples that were in a syringe for such a long time that settling of the red cells took place.

Inappropriate or unnecessary transfusion of FFP and platelets based on POCT results n = 2

Case 6

FFP transfused on basis of erroneous INR even though repeat lab test result was available

An 84-year-old man admitted postoperatively with a retinal bleed was tested using a point-of-care coagulation device on the ward. An INR of 6.1 was recorded and a venous sample was sent to the laboratory for confirmation. Four units of FFP were requested urgently and prescribed, and subsequently a normal INR of 1.1 from the venous sample was recorded in the patient's medical notes. The FFP was nevertheless transfused inappropriately 9 hours later despite normal coagulation screen and no evidence of active bleeding.

Case 7

Bizarre results from ED not queried

A 76-year-old female patient was admitted with a dislocated knee. FBC processed POCT equipment in ED, produced a platelet count of 67 x 10^9/L. The accompanying Hb was 24 g/dL. The anaesthetic junior doctor ordered some platelets, and did not discuss the peculiar results with the haematology team. The BMS did not query the request in the light of Trust protocols for platelet transfusion. The junior non-specialist doctor prescribed the platelets to run over 2 hours. A normal count was later obtained from the main laboratory.

In the cases above, as in the previous ones, there appears to be a failure to query the veracity of the results based on the clinical picture, or to view the results as a whole, including WCC, platelets and indices as well as accompanying chemistry results. All of these may appear very abnormal in a situation such as Case 7. Full evaluation of the patient is essential and there must always be awareness that results can be incorrect.

Haematology and coagulation laboratory errors (i.e. not transfusion laboratory) n = 3

In 2 cases a patient prone to platelet clumping in ethylenediaminetetraacetic acid (EDTA) was transfused platelets unnecessarily on account of this. In both cases the laboratory had issued a report showing a low platelet count. In 1 case the caveat was added to – that there was clumping and that a citrated sample should be sent to check the platelet count more accurately. However, the junior doctor still prescribed platelet prophylaxis on the basis of this erroneously low count.

In another case an INR was performed on a partially clotted sample and this was not spotted in the laboratory. The patient was therefore given FFP unnecessarily on the basis of her erroneously high INR result.

BMS staff in the hospital transfusion laboratory should certainly feel able to query requests, but frequently results such as these are from separate laboratories, geographically separate from the transfusion laboratory, and the results cannot be easily checked.

Transfusions based on poor basic knowledge and prescribing n = 17

Inappropriate transfusion based on lack of knowledge or understanding n = 4

These are cases in which there is some confusion or lack of certainty among junior doctors as to what exactly they need to order or what their patient really requires. In 1 case platelets and cryoprecipitate were ordered when the patient really needed FFP. In another case a doctor seemed unclear as to the reasoning behind asking for a group and save, or asking for crossmatch. Having requested the latter, the doctor was uncertain as to whether this led to transfusion.

Case 8

Junior doctor uncertain of implications of group and save (G and S) or crossmatch

After some instructions from her consultant, a junior doctor requested an urgent '2 unit crossmatch' on an 85-year-old female patient with a suspected bowel perforation admitted at 05.00. The Hb was not available. Later the laboratory rang the admitting ward to tell them the blood was ready, and the nurse contacted the doctor to inform her and to remind her that the blood had to be prescribed. The doctor was very busy so the ward sent a support carer to meet her to complete the documentation. The nurse commenced the transfusion at 07.05. At 09.00 the patient's consultant stopped the transfusion as he knew the Hb was 13.9 g/dL. The intention had been to request an urgent G and S to cover a possible bleed but the patient was not to be transfused until further results were available. The junior doctor was confused between a 'crossmatch' and 'group and save' request.

In the case below a patient was given platelets unnecessarily, owing to lack of familiarity with the guidelines for platelet transfusion prior to insertion of a Hickman line. This resulted in the junior non-specialist doctor transfusing platelets against the advice of the haematology consultant.

Case 9

Disagreement about necessity of prophylactic platelets

A 47-year-old man with acute lymphoblastic leukaemia (ALL) was booked for insertion of a Hickman line. Platelet cover was on standby and the consultant haematologist instructed that platelets were not to be given if the count was > 50 x 10^9/L. The platelet count was 57 x 10^9/L, but the radiologist would not insert the Hickman line without platelets being transfused prior to the procedure. The patient was returned to the ward where the junior non-specialist doctor prescribed the platelets against the consultant's advice and outside of national guidelines. The patient returned to X-Ray where the line was inserted.

Finally there is a case in which there was inappropriate use of emergency group O D negative blood when in fact the patient was crossmatched and blood was available for them in the same refrigerator. There had clearly been lack of communication or handover regarding what components were available for the patient, and the patient was taken to theatre without the personnel involved checking the status of laboratory requests.

Case 10

Emergency blood given in haste by a junior doctor

A 28-year-old man required a repair to an arterial laceration in the anticubital fossa. A surgical junior doctor demanded 2 units of O D negative emergency blood. In fact the patient's group was known and 4 units had been crossmatched and were already available in the same refrigerator.

Excessive volume of components prescribed (or given) n = 13

In this group of cases excessive quantities of components were given as a result of lack of communication, and insufficient knowledge and experience of the junior doctors who required guidance for prescribing appropriately. There were no incorrect or misleading laboratory results influencing decision making.

Two cases (Cases 11 and 12) resulted in severe life-threatening transfusion-associated circulatory overload (TACO), while a third (Case 13) resulted in dangerously high haemoglobin levels requiring venesection.

There are 13 cases in which doctors (junior and senior) prescribed excessive volumes of components often because of miscalculation of the required dose for the patient. Omitting to check the baseline haemoglobin or to monitor Hb following transfusion was a contributory factor in several cases. In 2 of these cases there was major morbidity with serious risk to life caused by TACO. In 2 additional cases excessive volumes (in excess of what was prescribed) were given to patients by nursing staff. These are not included in the totals here and are discussed on pages 42 and 43, as they are administration errors not decision making or prescription errors.

Table 11
Excessive transfusion of components n = 13 [+2]

Inappropriate/unnecessary transfusion with correct results available	Cases
Excessive red cells prescribed Hb not checked	5
Excessive red cells prescribed for small patient	5
Excessive volume of FFP prescribed	1
Excessive volume of cryoprecipitate given	1
Excessive volume of platelets transfused	1
[Excessive volume red cells given (not prescribed) see administration errors]	*[2]*

Case 11

Involvement of too many personnel in decision to transfuse

A 20-month-old girl on regular dialysis for end stage renal failure attended for routine haemodialysis and her father reported that she had been unwell. A consultant commenced dialysis urgently and, as the Hb was 5.0 g/dL, requested 2 units of blood to be given during dialysis. The dialysis was completed before the blood was ready so a decision was made by a second consultant to give 250 mL of blood slowly over 6 hours. This message was conveyed between the dialysis unit nurse and the ward nurse by the patient's father. The notes were later collected and a third and fourth nurse set up the transfusion. Observations were done by the fourth nurse. No pre-transfusion observations were done. At 5, 20 and 35 minutes into the transfusion the patient was hypertensive, tachypnoeic and irritable; her oxygen saturations were unrecordable. The nurse thought this was normal for the patient. The transfusion was completed in 1 hour (not 6) and a fifth nurse then realised that the patient's extremities were blue. A sixth nurse administered oxygen while an anaesthetist was called who performed emergency intubation. The patient was transferred to paediatric ITU where she underwent sedation, high-frequency oscillatory ventilation and haemofiltration. The patient made a full recovery.

The transfusion of this child involved two consultants, the father of the patient and 6 nurses. Owing to changes of plan and no single person taking charge of the management of the patient, the child was transfused too late, when she was already off dialysis, and much too fast, causing life threatening TACO. The transfusion had also initially been prescribed over 6 hours, which is outside guidelines (which state a maximum of 4 hours). Nurses need to be assigned to specific patients and maintain responsibility for and control over all nursing tasks associated with that patient's care. Handover must be effective and structured, and a patient's care should not be taken over by new staff on an *ad hoc* basis. Lack of continuity of care has been an increasing problem in medical care in recent years, as the European working time directive has required shorter days and the implementation of shift systems for junior doctors. As a result, detailed handover between doctors as they change shift is essential, as well as full documentation in the medical notes regarding treatment decisions and including instructions for planned interventions.

Case 12

Misunderstanding and lack of knowledge leads to excessive preoperative platelet transfusion

An 81-year-old man was preoperatively transfused with 4 units of platelets within a 4 hour period. The patient developed cardiac failure, the operation was cancelled, and medical intervention was necessary. In fact the orthopaedic specialist trainee doctor had written in the notes 'Arrange 4 units of platelets'. The junior non-specialist doctor assumed this meant to order and transfuse 4 units of platelets prior to surgery. When ordering, the junior non-specialist doctor was advised by a BMS to seek a haematology opinion as the order appeared inappropriate. This advice was not sought.

This case is somewhat akin to Case 8 (above) in that a junior doctor, unfamiliar with the transfusion process and the jargon that goes with it, had not grasped the fact that blood components ordered to cover surgery are not necessarily transfused beforehand. The senior doctors (consultant and specialist trainee doctor) assumed a level of knowledge which the junior non-specialist doctor just did not have.

In the following case a patient with chronic iron deficiency anaemia was massively over transfused over a period of 3 months. The cause of his iron deficiency was not given in the report.

Case 13

Repeated transfusions for iron deficiency resulting in Hb of 22 g/dL

Four units were requested for an 85-year-old male patient with chronic iron deficiency anaemia. Between 29/01, when his Hb was 6.3 g/dL, and 23/04, 24 units of packed cells were transfused on 8 separate occasions, 2 or 4 at a time, with no Hb check. On 09/05 the Hb was 22 g/dL. In addition platelets were 98 x 10^9/L, INR 1.5, APTR 1.4 and fibrinogen > 8 g/L. The patient was subsequently venesected and by 24/05 Hb was 15.3 g/dL and platelets 307 x 10^9/L.

This patient subsequently required venesection. This case shows once again a lack of understanding by successive junior doctors seeing the patient: they did not realise that the Hb should be monitored before prescribing further transfusion. The decision to transfuse was not reviewed, and the junior doctors seeing the patient regularly on the day ward or in outpatients did not sufficiently understand the nature of the condition, or the purpose of the treatment, to question the appropriateness of continuing regular transfusion. Once again this raises issues of continuity of care, documentation of decisions and instructions for handover.

In the following 2 cases the size of the patient was not taken into account when the transfusion was prescribed. One was a very small adult and the other a 2-year-old child.

Case 14

Small anaemic patient over transfused

A 79-year-old female patient with CMV colitis weighing 41.5kg had a Hb of 6.7 g/dL. She was given a 4 unit red cell transfusion resulting in a post-transfusion Hb of 18.1 g/dL.

Case 15

Junior doctor unfamiliar with paediatric prescribing protocols

A 2-year-old girl was admitted with peritonism, possibly due to ruptured appendix (later found to be a ruptured kidney tumour). Hb was 6.7 g/dL and the surgical team decided to transfuse, writing a dose of 15 mL/kg in the notes. The junior non-specialist doctor wrote up 2 units and the child was given 2 adult bags over 6 hours. Hb was 18.6 g/dL post transfusion.

In the case below there was a combination of a possibly erroneously low haemoglobin result combined with a small patient, and an excessive volume of red cells was prescribed and transfused without any further checking. Junior doctors need to be aware of transfusion algorithms based on a mL/kg calculation for smaller patients. They also need to realise that there are very few instances, except where there is active haemorrhage, in which 4 units of red cells need to be given so rapidly. The patient below, with a Hb of 7.3 g/dL, only required a single unit.

Case 16

Small adult patient with low Hb

An 18-year-old male patient weighing 35kg, with a probable chest infection, received a 4 unit red cell transfusion based on an Hb result of 7.3 g/dL. The doctor prescribed 2 units of red cells. The patient was then referred to a medical team and another junior doctor prescribed a further 2 units of red cells making a total of 4 units. Post transfusion the Hb was 18.4 g/dL. Both samples were rechecked and correct. Investigation revealed that the initial sample was taken by a junior doctor in ED using a syringe during a difficult cannulation. The red cells may have settled in the syringe before the sample tubes were filled, giving an inaccurate result. No IV fluids were in progress at the time. No adverse reaction or ill effects were noted from the transfusion.

The final case reveals not only a lack of awareness of national guidelines on reversal of warfarin[4] but also poor clinical acumen leading to high volume fluid transfusion, which is clearly in itself potentially dangerous.

Case 17

A case of TACO after use of FFP to reverse warfarinisation

A 61-year-old male patient with an INR of 6.0 required warfarin reversal prior to elective surgery. He was given Vitamin K 5 mg and 4 units of FFP over 160 minutes. Without any further INR being performed he then received another 3 units over 45 minutes, at which point he became unwell with rigors, chills, wheeze and a temperature of 38.3°C. His oxygen saturation on air was 80%. He was managed with diuretics and oxygen. The planned surgery was performed the following day.

HANDLING AND STORAGE ERRORS N = 118
[Previously reported as 'unsafe' transfusions]

Technical administration errors n = 15
There were 15 cases in which there were technical administration errors.

Table 12
Types of technical error in administering transfusion

Type of error	Number of cases
Leaking component bag sealed with surgical tape and transfusion continued	4
Blood given through solution giving set	5
Frusemide added directly to blood in bag	1
Completely unlabelled platelets transfused	1
Transfusion in community given by patient's mother	1
Inappropriate prescription of cryoprecipitate administered by a syringe	1
Volume of red cells administered in excess of what was prescribed	2

These cases highlight a need for personnel involved in blood administration to understand fully the reasons behind the various steps of the blood administration protocol. These are the kind of mistakes that are made when personnel do not fully appreciate the potential dangers to patients, for instance of unfiltered blood being transfused, of blood being contaminated by a penetration of the sterile bag, or by inadequate monitoring being carried by an untrained person. It therefore underscores the need for education of nursing staff in transfusion, going beyond training and competency.

Case 1
Leaking FFP bag fixed with sticky tape
A 43-year-old male patient was undergoing emergency laparotomy for internal bleeding. During administration of FFP, an operating department practitioner observed leakage from pack. The cause was unclear, possibly a faulty port or a spiked bag. He applied surgical 'Sleek' tape to the pack to prevent further leakage, and the transfusion continued.

The above example is one of 4 cases where surgical tape was used to stem leakage of a component bag. In no cases was there any appreciation of the possible consequences of contamination of the component.

The next case below is one of 5 in which a solution giving set was used to administer a red cell transfusion instead of a blood giving set with an integral in-line filter.

Case 2
Erroneous use of solution giving set
An experienced agency nurse used a normal solution giving set instead of a blood giving set with an in-line filter for transfusion of packed red cells.

There were 2 cases in which nursing staff administered a greater volume of red cells than had been prescribed: in 1 case this was in part owing to the transfusion instructions being verbal, in an emergency. In the other a lack of continuity of care between shifts contributed to but did not fully explain the error.

Case 3
Excessive transfusion follows misinterpretation of verbal instructions
A 48-year-old male patient was in resuscitation with a major gastrointestinal (GI) haemorrhage. Five units of blood arrived and a verbal order for 2 units was given by the doctor, who then wrote them up on a prescription chart. The senior nurse asked the doctor if he wanted the blood given through the rapid transfuser, and he confirmed that 'all the blood can go though it'. Five units were transfused instead of the intended 2 units.

Case 4

Excess red cells are administered to an infant despite correct dose calculation and prescription

A 3-month-old baby with a rhabdomyosarcoma received 171 mL of red cells over 7 hours. The child had been prescribed only 80 mL over 3 hours, and her Hb consequently rose from 7.4 to 15.3 g/dL. The error was caused partly by a failure to include the 71 mL given during the night shift to the volume given during the morning. However, the day staff still transfused yet another additional 20 mL for which no rationalisation could be made.

In a final case the component (cryoprecipitate) was administered in an inappropriate fashion, via a syringe, but fortunately there were no complications. The reporter commented that it was also likely that the cryo was given without any valid clinical indication as it was 'the only component which the patient would accept', all other components being refused.

Transfusion of expired red cells n = 12

There were 12 cases in which expired blood was given to patients. This raises issues regarding who is responsible for making sure that this does not happen. The various reports place the responsibility with different personnel in different hospitals. The final checking at the bedside should confirm that blood is within date for transfusion and therefore it is the ultimate responsibility of personnel trained in blood administration to be certain that blood is safe for transfusion. In some hospitals there appears to be an increased assignment of responsibility to the blood bank or hospital transfusion team to ensure that no expired blood is available in any issue fridges or satellite fridges. However it is very difficult in practice for hospital blood banks to clear expired blood from fridges as blood expiry time of the majority of red cell units is midnight. Many of these cases occur between midnight and 9 a.m. before the daily round of satellite fridges by the laboratory MLA or BMS to remove all expired units. It is reasonable that the hospital transfusion laboratory should be responsible for checking satellite fridges each working day morning, to remove unused and expired blood. However the onus is on the clinical staff administering the component to perform the final check at the bedside.

Case 5

Expired red cells transfused

Two units of blood were issued in response to a request for urgent crossmatch for an anaemic 87-year-old female patient. One of the units was due to expire that day at midnight. It was decided to defer transfusion until the following day. The expiry date was not checked either at collection or at the bedside and the patient received over 100 mL of expired blood before the error was noticed. The unit had not been removed from the issue fridge by the lab at 09.00.

Excessive time taken to complete administration of blood component n = 57

There were 57 cases in this category all of which relate to nursing and midwifery staff except for 3. Of these 3 cases there were 2 in which a junior doctor wrote up the blood to be given at the rate of each unit over 6 hours, and there was 1 case in which a consultant wrote up 4 units of blood over 8 hours each. In both these cases the prescription was clearly outside of guidance which states that red cell transfusion should be completed within 4 hours of leaving controlled temperature storage (CTS)[6].

Of the 57 cases, 1 case was of a transfusion taking place in the community, 2 were taking place in ICU, 1 in ED and 1 in an operating theatre. The vast majority therefore were taking place in inpatient wards.

Thirty-eight cases were routine transfusions and 8 were stated to be emergency transfusions. In 11 cases this information was not available. Thirty-eight of the 57 patients were women and 15 were men, whereas in 4 cases their gender was not stated. There were no children under 4 weeks, but there were 3 children under 1 year and 2 children under 16.

In the majority of cases there was no special reason why the blood component was given over a long period of time. Sixteen of the 57 cases were of red cell transfusions that took more than 6 hours to be completely transfused to the patient from the time that they left CTS. In 7 cases there were 2 units transfused to the same patient, which were each given over more than 6 hours.

There were 3 cases in which additional reasons were quoted as to why the blood took a long time to be administered. In 3 of these cases there were problems with the cannula not being fully patent, and the blood ran slowly. One of these was the only case involving platelets. In addition there was 1 case in which the blood inside both the giving set and the bag was found to be clotted. This bag was cultured and was found to be negative for micro-organisms.

However, in all these cases full adherence to protocols for blood component administration, including monitoring of the patient and performing observations, as well as checking the transfusion rate and any problems with the cannula, would have meant that all of these slow transfusions could have been avoided. It was noted in the National Comparative Audit[7] that the monitoring of the patient undergoing transfusion was poor in many hospitals.

It is interesting to note that of these 57 cases, 27 took place out of hours, which is clearly disproportionate compared with the number of transfusions overall which take place out of hours[8].

Table 13
Breakdown of times of transfusions that took excessive time to run

Time period	Number of cases
8 a.m. to 8 p.m.	27
8 p.m. to midnight	16
Midnight to 8 a.m.	11
Not recorded	3

Forty-two of these cases were reported as 'SHOT only' reports, which is appropriate. Fifteen were also reported to MHRA via SABRE, which is unnecessary as these are entirely clinical blood administration problems.

Cold chain errors n = 34

[20 of these 34 cases involve lab errors and are discussed again in the lab section on page 51]

There are 34 cases in this group, 10 of which were reported to SHOT only, of which 5 may have had relevance for MHRA as there was a laboratory responsibility involved. Of the 22 that were reported to MHRA only 8 possibly had laboratory relevance.

Table 14
Cold chain errors n = 34

Type of error	Number of cases
Alarm related	7
Delivery or transfer of components	7
Inappropriate storage of component	20
Returned to stock when should have been discarded	*8*
Returned to satellite fridge when should have been discarded	*5*
Storage in inappropriate fridge (e.g. drug fridge)	*3*
Storage of inappropriate material in blood fridge	*1*
Inappropriate storage of FFP and platelets	*3*
TOTAL	**34**

Problems related to alarms at CTS sites n = 7

There are 7 cases relating to alarms: 3 of these were alarm failures on a platelet agitator, 1 related to a satellite fridge with no alarm fitted, 1 related to a main Blood Bank stock refrigerator where the door was left open and there was no response to the alarm when it was activated, and 2 related to overheating of refrigerators in the rooms which were very small and therefore prone to elevations of temperature. Once again the alarms were not correctly set and the patients were transfused with units which had been out of temperature.

Case 6

No alarm on refrigerator at satellite site

Three units of red cells stored at a satellite site prior to transfusion were transfused over 2 days. Subsequently the temperature data were downloaded for the satellite fridge and showed that the storage temperature was above 6°C for 1 hour during the period that 2 of the units transfused were in situ. On investigation it was discovered that the satellite fridge did not have an alarm.

Case 7

Alarms activated by door being left open were ignored

FFP that had not been stored in appropriate conditions was administered to a patient. The FFP had been defrosted according to guidelines and placed into the out-of-hours blood bank fridge for possible use within 24 hours of thawing. During this period the temperature in the blood bank fridge rose to 9°C due to the door not being closed properly between 01.00 and 06.00. Temperature alarms were activated and switchboard contacted the BMS in blood bank to report the alarms. However, due to the recent move to a new laboratory building, the member of staff in blood bank was not aware that the alarms were from the blood bank refrigerator, and did not check the cause.

Problems with delivery and transfer of blood components n = 7

Seven cases related to delivery and transfer standard operating procedures (SOPs) for blood stocks arriving at hospitals. In 2 cases platelets were delivered by a Blood Service courier directly to a clinical area, without going being received in the blood transfusion laboratory for entry into stock. In 1 case red cells were left in an inappropriate area by a courier resulting in a prolonged period out of temperature control. There were another 4 cases in which red cells transported with a patient between two hospital sites were out of temperature for an excessive period in a transport box prior to transfusion to the patient.

Inappropriate storage of component n = 20

There were 8 cases in which blood was returned to stock having been out of temperature control for more than 30 minutes. It was then re-released from stock and transfused to either the same patient or another patient.

There were 5 cases where clinical staff returned units of red cells to a satellite refrigerator after it had been out of controlled temperature storage for more than 30 minutes. These units were then stored in a satellite refrigerator for variable lengths of time before being used for patients later the same day or in ensuing days.

Case 8

Blood out of CTS for prolonged periods, returned to issue fridge and later transfused

A unit of red cells was removed from the fridge and returned twice prior to transfusion. On the first occasion it was out of controlled temperature storage for 20 minutes, and on the second occasion for 50 minutes. On each occasion the unit was signed back into the issue fridge but not placed in the quarantine box, nor was the laboratory informed of its return as per the local policy. On the third occasion the blood was removed and transfused to the patient.

There were 3 cases in which blood units were stored in an inappropriate ward refrigerator intended for the storage of drugs rather than in the controlled temperature satellite blood refrigerator. This blood was later transfused. There was also 1 case in which microbiological samples (swabs, etc.) were stored alongside components in a satellite blood refrigerator. Blood from this refrigerator was then transfused to a patient.

One case concerned platelets which a porter returned to a refrigerator rather than the platelet agitator. He was then asked to collect them again for the same patient when they were finally required. He collected them from the stock refrigerator in Blood Bank and they were transfused to the patient.

There were 2 cases in which thawed FFP was stored at room temperature for several hours before being transfused.

SPECIAL REQUIREMENTS NOT MET – CMV and IRRADIATION n = 76

There were 76 cases in which the special requirements relating to CMV negative blood and irradiated blood were not met. Of these, 49 cases related to failure of the clinicians to inform the laboratory of the necessary requirement for irradiated or CMV negative components. Another 25 cases were where irradiated and CMV negative blood components were not issued appropriately for a patient as a result of laboratory errors and omissions. There were 2 additional single cases.

Special requirements not met – Clinical errors and omissions n = 49

Of the 49 cases in this group, in 43 the report stated this was a medical (doctor) error or omission and in 1 case it implied that the oncology nurse was responsible for issuing the correct order for blood component requirements. In 5 cases the responsibility was unclear. In 3 cases there was also a system in place for the pharmacy to inform the hospital blood bank about prescriptions for fludarabine and other purine analogues, and this system was also implicated as having failed to inform the blood bank in these 3 cases. Forty-six of the 49 cases relate to irradiated products and 3 relate to CMV negative products.

Case 1

Nurses, doctor and patient all omit to inform laboratory of special requirements

A request form for blood components for a patient with CLL on fludarabine was completed by a haematology nurse, and checked and signed by a junior doctor who also prescribed the components. The need for irradiated blood was not indicated on the request form or the prescription. The patient did not present their alert card at the time of sampling or prior to the transfusion. The medical staff are responsible for informing the transfusion lab when a patient is first prescribed fludarabine.

Of the 46 clinical omissions to request irradiated blood the indications for irradiation were as follows:

- 12 Hodgkin's disease
- 19 Prescription of fludarabine or other purine analogues
- 9 Stem cell transplant (or conditioning prior to stem cell transplant)
- 3 Neonate post-intrauterine transfusion (IUT)
- 1 Neonate with possible DiGeorge syndrome
- 1 Neonate for truncus arteriosus surgery
- 1 Unknown/unstated indication

Case 2

Lack of information regarding neonate following IUT

An on-call request for a 1 unit crossmatch on a 4-week-old male infant stated 'Rh incompatibility Anaemia Hb 5.5' as the indication for transfusion. The sample grouped as O D negative and the BMS on duty rang the requesting hospital, but no further history was available, though there was a record of the blood group as O D negative, with maternal antibodies. Red cells were crossmatched and issued. The following day the local blood centre called to inform the hospital transfusion laboratory that the child had received IUT for maternal anti-D and required irradiated components. The patient's blood group was later confirmed as O D positive by the International Blood Group Reference Laboratory (IBGRL). The blood grouped as O D negative due to the previous IUT. No clinical information had been passed on to laboratory at either site, and therefore special requirements were not met.

In 9 of these reports there was a clinical situation involving shared care with another hospital, and the need for special requirements was not communicated by the treating hospital to the supporting hospital. In 1 of these 9 cases the patient and their family spoke no English, making it very difficult to obtain a clear history of the condition and its treatment. A proforma discharge letter should be used in these situations, which would help to ensure that transfusion requirements are communicated.

Case 3

Discharge letter from tertiary referral centre omitted vital transfusion information

A 3-year-old boy was undergoing treatment for medulloblastoma on a shared care basis between the tertiary referral centre and a local paediatric department. Initial requests made for the patient by doctors at the local hospital did not specify the need for irradiated CMV negative cellular blood components. Later conflicting requests prompted a telephone call to the tertiary centre when the need for irradiated CMV negative components was confirmed. The discharge letter from the tertiary centre did not contain information concerning transfusion support and local medical staff did not seek advice.

Case 4

'Hodgkin's Disease' is insufficient information to ensure issue of irradiated components

Red cells were requested for a 75-year-old man stating 'sepsis, low Hb' on the initial request form and 'Hodgkin's Disease' on a subsequent one. A unit of non-irradiated cells was transfused initially. No request for irradiated components had been received and the diagnosis of Hodgkin's was not picked up by the BMS on duty. The laboratory manager noticed the omission by chance the following morning.

In most hospitals it is a well defined responsibility of the clinicians to communicate the special transfusion requirements of their patients to the transfusion laboratory. Some hospitals have also developed a system in which prescription of purine analogues results in an automatic communication from the pharmacy to the laboratory regarding the need for irradiated products. Hospital transfusion laboratory staff will be aware of many of the indications for special requirements, but cannot be expected to discern the need from handwritten requests that may use acronyms, be illegible or not be filled in at all.

Special requirements not met – laboratory errors and omissions n = 25

There were 25 cases in this group, of which 21 related to a special requirement for irradiation, 3 to CMV negative requirements and 1 to both.

These will be discussed in detail in the separate laboratory chapter on page 51.

Special requirements not met – blood service errors and omissions n = 1

There was 1 case in which the blood service was requested to send CMV negative blood for a patient but sent blood untested for CMV in error.

Case 5

Incorrect information from blood service

CMV negative platelets were ordered from the blood service for a 61-year-old female patient with acute myelocytic leukaemia (AML). When they arrived there was no label stating the CMV status, so the hospital laboratory telephoned the Blood Centre requesting verbal and written confirmation that the platelets were CMV negative. This was received by fax and the platelets were then issued and transfused. The matter was subsequently investigated by a hospital liaison manager who discovered that in fact the unit had not been CMV tested.

Special requirements not met – miscellaneous n = 1

There was 1 unclassifiable case in this section in which a number of factors relating to a consultant's decision and the IT system resulted in a patient receiving non-irradiated blood.

Case 6

Clinical decision regarding IT implementation impairs accessibility to key data

A 70-year-old female patient had been treated with autologous peripheral blood stem cells (PBSC) for breast cancer and had required irradiated products since 1997. The hospital changed IT systems in 2005, and all special requirement flags were transferred. Owing to the complexity of this process, the consultant haematologists made a decision to transfer to the new system only irradiation flags since 2000. When this patient returned for blood, there was no legacy data on the new IT system, so the lab did not issue irradiated blood. The requestor did not ask for irradiated components. The error was noticed by a nurse who knew the patient had had a PBSC and made the connection, but by then 1 unit had been transfused.

SPECIAL REQUIREMENTS NOT MET – OTHER n = 17

There are 17 cases in this group, of which 15 were laboratory related and 2 clinical related. The laboratory-related cases will be discussed in more detail in the laboratory section of this chapter.

Clinical cases n = 2

The 2 cases which related to clinical errors or omissions were as follows:

A stem cell transplant patient had moved from one hospital to another, and the new laboratory was not informed of the blood group status following the stem cell transplant.

Case 1

Patient's mother alerts clinicians to changed ABO group

A 6-year-old boy who was A D positive had an ABO mismatched stem cell transplant (SCT) from an O D positive donor. One month later he was transfused with A D positive red cells as no information had been communicated to the hospital transfusion laboratory. When group A D positive red cells were again issued the next month, the child's mother informed the nursing staff that he should have O D positive blood. There was no adverse reaction.

The second case relates to a patient with anti-U antibody.

Case 2

Unnecessary transfusion of incompatible blood

A maternity patient (para 13) was known to have anti-U and was anaemic prior to caesarean section. U negative units were ordered from the frozen blood bank, but in the interim the clinicians requested that incompatible units be made available in the labour ward fridge in case of emergency. These incompatible units were recalled when U negative units arrived and were issued, but were not returned. The patient was transfused following delivery by CS and an incompatible unit still in the labour ward blood fridge was used despite the compatibility form clearly stating that the blood was incompatible. She received < 100 mL of red cells and suffered rigors and flushing, and the transfusion was stopped.

Owing to a plethora of problems relating to understanding, communication and logistics, incompatible blood was given to the patient even after U negative blood was made available. The report did not state the pre-CS haemoglobin, nor the degree of blood loss, so it is not possible to make a comment about the appropriateness of this transfusion. It is possible that the presence of a rare antibody and the difficulty in obtaining red cells for this patient paradoxically resulted in an increased likelihood of a decision to transfuse.

Local review by staff involved and HTC members revealed the following causes of error:

- Failure of labour ward staff to return recalled units on request by transfusion laboratory
- Poor handover in BT department – staff were not aware that incompatible units had been issued, recalled and not yet returned
- Labour ward staff did not check fridge and return units routinely next day, as per their agreement
- Failure of ward staff to use compatibility slip in the checking process as per transfusion procedure

The last bullet point is of interest. The compatibility slip was the only document on which the fact that the blood was incompatible was clearly stated. Many hospitals have now removed the compatibility slip from the blood administration process as a measure to enforce effective patient ID checking. In this case the compatibility slip may have been the one possible barrier to the error.

Autologous transfusion n = 1

There was 1 case involving autologous transfusion – where a patient was over transfused with autologous blood. This is also discussed on page 110 together with other cases related to autologous transfusion.

COMMENTARY

The number of IBCT reports (excluding anti-D reports, dealt with elsewhere) has remained static this year. It remains of concern that there may have been a fall off in reporting since the implementation of the Blood Safety and Quality Regulations in 2005.

There has been no further fall in the number of ABO-incompatible red cell transfusions, although it is encouraging that there were no fatalities this year. Cases are still occurring in which a transfusion reaction is not recognised as such when a patient becomes unwell. Further reductions in morbidity and mortality arising from ABO incompatibility will correlate with levels of education and awareness in front line clinical staff. After 10 years of reporting there are still very basic collection, identification and monitoring errors. Although technical solutions may help to overcome this, and competency assessments clearly have an important role to play, these interventions must not be seen as an alternative to appropriate knowledge and educational levels for staff performing critical tasks. Twenty-three of 24 cases of administration of wrong blood to patients in the clinical setting were carried out by nursing and midwifery staff, reflecting the fact that usually blood component administration is performed by this group of staff. However, Case 6 of the ABO-incompatible transfusions was the result of error by two doctors in theatre (see page 31).

This year, as in previous years, there are a large number of incidents arising because junior doctors who may have received no specific training or education in blood transfusion are performing tasks they do not understand, neither on a physiological basis, nor in terms of the reasons for the required steps involved. Four or 5 of the 7 cases leading to mis-transfusion of a patient because of 'wrong blood in tube' related to phlebotomy error by junior doctors – a disproportionate number given that this is not a core task. Inappropriate and unnecessary transfusion involved junior doctors in 46 of the 49 reported cases, and involved errors at all stages of the patient evaluation, including result interpretation, decision making and the prescribing process.

There has been a decrease in some of the handling and storage errors this year, which may be the result of increasing awareness because of the focus of BSQR on this area. While many more cases are being reported of red cells taking more than 4 hours to be transfused from the point of leaving CTS, there has been a decrease in reports of components out of temperature control and expired units transfused.

The number of reports of patients not receiving blood with the appropriate special requirements has remained static. Irradiation continues to be the most commonly missed special requirement, the majority of cases relating to haematology and oncology patients (40/46 clinical omissions of special requirements). The failure to request irradiated components in patients receiving purine analogues is the most common single category (19/46 clinical cases). New BCSH guidelines are currently in preparation.

RECOMMENDATIONS

New recommendations from this year

- Participation in SHOT and MHRA reporting should be scrutinised carefully, as there is evidence from both databases that reporting is patchy, with some Trusts that are high component users still not reporting. Reporting rates in the UK are still relatively low compared with some comparable countries, and the different reporting patterns may be rewarding to study.

  Action: SHOT, MHRA, DH

- Education of doctors and nurses involved in transfusion must continue beyond basic training and competency to a level where the reasoning and rationale behind protocols and practices is understood. Transfusion medicine needs to be a mandatory part of the curriculum to achieve CCST in all hospital specialties, and should be incorporated into the nursing and midwifery curriculum.

  Action: NBTC, Royal Colleges, Specialist Training Committees, GMC

- Only staff who are qualified to make a decision to transfuse, to prescribe, and to administer and monitor transfusions should be performing these tasks.

  Action: Hospital Trust CEOs, HTCs and HTTs, NPSA, NBTC, Royal Colleges, Specialist Training Committees

- Staff involved in blood component issue and administration must be aware of their professional accountability and responsibility, and should not carry out tasks unless they consider themselves competent to do so. Effective and comprehensive handover between different staff shifts or teams is part of this professional responsibility.

  Action: GMC, Medical Professional's insurance schemes, e.g. the Medical Defence Union (MDU) and Medical Protection Scheme (MPS), Nursing and Midwifery Council (NMC), IBMS

- The importance of irradiation, and the rationale behind it should be emphasised during teaching of junior haematology and oncology doctors. This education is part of the curriculum for specialist trainees, but the junior pre-specialist doctors in these areas may remain ignorant despite being frequently called upon to order components.

  Action: Hospital Trust CEOs, Medical Schools, Deanery

- Systems are in place in some Trusts for pharmacy to inform the hospital transfusion laboratory of prescriptions for purine analogues. Such systems work well and best practice can be shared. Assessment and feasibility studies of such arrangements should be carried out in hospitals with high usage of these agents.

  Action: Hospital Trusts, Hospital liaison networks, Better Blood Transfusion (BBT) network, SHOT Transfusion Practitioner network, BCSH