7. 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 that was intended for another patient or which was incorrect in terms of its specification.

DATA SUMMARY

Total number of cases	**282**	*Implicated components*		*Mortality/morbidity*	
		Red cells	**220**	Deaths due to transfusion	**0**
		FFP	**17**	Deaths in which reaction possibly contributed	**3**
		Platelets	**26**	Major morbidity	**4**
		Other *(specify)*			
		Unknown	**19**		

Gender		*Age*		*Emergency vs. routine and core hours vs. out of core hours*		*Where transfusion took place*	
Male	**132**	18 years+	**242**	Emergency	**60**	ED	**4**
Female	**145**	16 years+ to 18 years	**3**	Routine	**189**	Theatre	**9**
Unknown	**5**	1 year+ to 16 years	**21**	Not known	**33**	ITU/NNU/HDU/Recovery	**14**
		28 days+ to 1 year	**9**				
		Birth to 28 days	**7**	In core hours	**82**	Wards	**76**
		unknown		Out of core hours	**45**	Community	**1**
		Total	**282**	Not known/applicable	**155**	Outpatient/day unit	**10**
						Not known	**168**

As in the 2008 report, this chapter comprises reports on 4 main types of errors which result in the transfusion of an incorrect blood component (plus 2 miscellaneous cases):

- Bedside blood administration errors
- Laboratory errors, testing and process errors
- Phlebotomy errors resulting in 'wrong blood in tube' (WBIT)
- Transfusion of components not meeting the patient's special requirements (SRNM).

The SRNM cases are divided according to whether they are clinical errors, largely of knowledge and/or communication (so that the transfusion laboratory did not know of the special requirement), and those which originated in the laboratory (in which the necessary information was available but not acted upon).

In 2009 a total of 282 IBCT reports were received, which is a 7.6% increase compared with 2008, when 262 cases were included. The rate of reports of IBCT for 2009 was 9.7 per 100,000 components issued by the UK blood transfusion services compared with 9.2 in 2008.

The data summary above shows that the data on cases in core hours and out of hours, and for the location of the patient when the error occurred, were poorly completed on the questionnaires. There were a total of 40 cases of IBCT occurring in patients under 18 years of age and these are discussed in more detail in the paediatrics chapter on page 140. The age range among adults was 18–97 years of age.

Table 11

Numbers of true IBCT cases and rate per 100,000 blood components issued 2003–2010

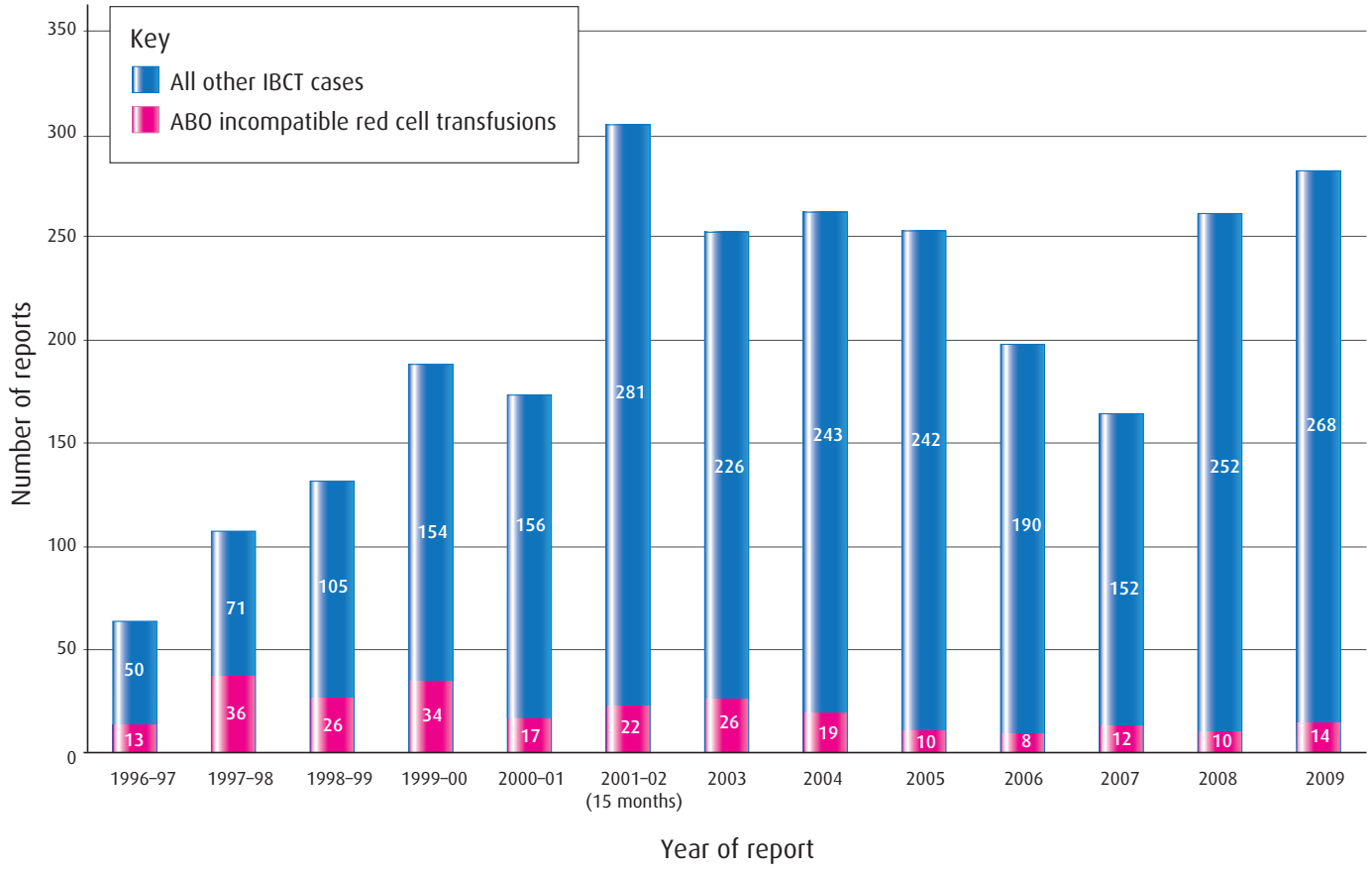
NB These figures exclude HSE and I&U; they are not categorised as IBCT and are reported in separate chapters.

Year	Number of cases reported on IBCT questionnaires	Reports per 100,000 components
2003	252	7.4
2004	262	7.8
2005	252	8.1
2006	198	6.6
2007	164	5.6
2008	262	9.2
2009	282	9.7

Figure 7

IBCT cases 1996–2009 showing ABO-incompatible transfusion

NB HSE and I&U cases are no longer included in the IBCT total (see 2008 Report) and are removed from the IBCT totals in this chart from 2003 onwards.



The histogram above shows the total number of reports in the IBCT category each year since SHOT reporting commenced in 1996. Until 2008, cases of *inappropriate and unnecessary transfusion* and *handling and storage errors* were included in this total. For the first time last year these were removed from IBCT and reported in separate chapters, as they do not involve transfusion of an incorrect component. This results in an apparent drop in IBCT cases. In reality the number of reports in all categories has continued to rise, as participation in haemovigilance has increased and reporters are becoming familiar with the reporting mechanisms and the benefits of contributing cases.

Table 12
Summary of IBCT cases

Type of event	No. of cases 2008		No. of cases 2009	
Administration of wrong blood component		**47**		**40**
■ ABO-incompatible red cells	4		10	
■ D-incompatible red cells	3		1	
■ Compatible wrong blood components	32		21	
■ Incorrect component type	3		1	
■ Other	5		7	
Wrong blood in tube		**5**		**4**
■ ABO-incompatible red cells	4		2	
■ D-incompatible red cells	0		1	
■ Incorrect Hb	1		0	
■ Compatible	0		1	
Special requirements not met – Clinical		**76**		**87**
■ Irradiation and CMV	70		79	
■ Other special requirements (including those arising from SCT)	6		8	
Special requirements not met – Laboratory		**41**		**67**
■ Irradiation and CMV	30		36	
■ Other special requirements	11		31	
■ Blood Service errors and omissions	0		0	
Laboratory errors (excluding SRNM)		**91**		**82**
■ Wrong blood issued	39		21	
■ Wrong ABO/D type for SCT patient	4		13	
■ Pre Tx errors – testing	8		9	
■ Pre Tx errors – procedural	40		39	
Miscellaneous IBCT		**2**		**2**
TOTAL		**262**		**282**

SUMMARY OF KEY DATA FOR ALL IBCT CASES *n* = 282

Mortality entirely related to IBCT event *n* = 0

There were no cases this year in which a patient died directly and solely as a result of an incorrect blood component transfused.

Mortality in which IBCT event contributed *n* = 3

There were 3 cases this year in which a patient died following a reaction to ABO-incompatible blood, where this may have contributed to the death. Two arose from administration errors (see Case 1 and Case 2, below) and 1 resulted from a phlebotomy error in the ED (Case 1, page 38). In these cases it is very difficult to define a causal link, but equally it is impossible to categorically state that an incompatible transfusion did not have an additional impact in an already critically ill patient.

Major morbidity *n* = 4

There were 2 cases of major morbidity resulting from administration errors, 1 from a phlebotomy error at the bedside involving misuse of an electronic aid to patient identification and 1 relating to a laboratory error. These are discussed in the relevant sections.

ABO-incompatible red cell transfusions *n* = 14

A total of 14 ABO-incompatible red cell transfusions were given, 10 resulting from bedside administration errors, 2 from wrong blood in tube phlebotomy errors and 2 due to laboratory errors in which the wrong sample was used for crossmatch. Two were also D incompatible. (Incorrect ABO groups given post SCT are not included here.)

D-incompatible red cell transfusion *n* = 5

There were 5 cases in which RhD-incompatible red cells were given (not including the 2 that were also ABO incompatible). One was the result of a bedside administration error, 1 a phlebotomy error and 3 were laboratory errors (2 RhD typing errors, 1 component selection error). (RhD-incompatible transfusions post stem-cell transplantation (SCT) are not included here.)

ADMINISTRATION OF WRONG BLOOD *n* = 40

Overview

In this subcategory 39 questionnaires were received and 1 case was transferred in from RBRP. Of these 40 cases, 13 occurred in male patients and 25 in female patients. Gender was not documented in 2 cases.

As in previous years a relatively high proportion of cases occurred either out of hours or in emergency situations, both of which have been shown to be associated with a greater rate of errors.

- 20 cases occurred during core hours and 16 out of hours: in 4 cases information on the time of transfusion was not available.
- 21 cases occurred in a routine setting and 13 were emergency transfusions: in 6 cases this information was not given.

A total of 5 reports involved patients under 18 years old. Of these, 4 were aged under 28 days and 1 patient was aged between 28 days to 1 year.

Mortality

There were no fatalities reported to be directly due to administration of wrong blood. However, there were 2 cases in which patients with severe underlying conditions died following an ABO-incompatible transfusion greater than 150 mL. The deaths were not unexpected given the clinical condition of the patients involved, so the final outcomes were inevitable and unchanged, but it is difficult to state with certainty that the transfusion reactions were totally unrelated to the timing of the death.

Case 1

ABO-incompatible transfusion during hip surgery of a patient with cardiac disease

An elderly patient with an underlying heart condition was transfused, during hip arthroplasty, with approx 200 mL of red cells intended for another patient. The transfusion was ABO incompatible: group B D positive blood was given to the group A D positive patient. The transfusion took place out of hours and no bedside checking took place. The patient was transferred to ITU and later died from cardiac problems. Postmortem investigations concluded that the cause of death was the underlying cardiac condition.

Case 2

Patient with severe anaemia, CCF and chest infection receives ABO-incompatible transfusion

An elderly patient was admitted as an emergency during the night with chest pain, ECG changes, chest infection and iron deficiency anaemia, and was deteriorating. A decision was taken to transfuse her but the incorrect unit was collected from the issue fridge of the blood transfusion laboratory. The patients shared a forename, had a similar surname and date of birth and were on the same ward. The recipient, who was group A D positive, had recently become unconscious at the time of transfusion and did not have a wristband. She received approximately 150 mL of group AB D positive red cells. She continued to deteriorate and died a few hours later. The report stated that it was not thought that the transfusion contributed to her death.

Major morbidity

There were 2 cases in which patients suffered severe reactions. One was stated to be 'an immediate reaction with risk to life' and the other, although categorised as 'mild immediate reaction without risk to life' resulted in the patient being transferred to HDU as a precautionary measure, so was perhaps borderline for major morbidity.

Case 3

ITU patient receives ABO-incompatible transfusion despite electronic bedside device

An agency nurse on ITU was caring for 2 patients. The Hb on the first patient showed as 6.6 g/dL from a blood gas machine reading. (A subsequent result on an FBC taken at the same time was 9.7 g/dL.) The nurse opened the electronic bedside documentation for a second patient while in the first patient's bed space. She asked another member of staff to print off a blood collection form for her, but the form printed out, and the unit subsequently collected, were for that second patient. With the unit, the nurse went to the first patient, but could not find a wristband (it was on the ankle) so checked the unit against the electronic details opened at the bedside, still for the second patient, and commenced transfusion. There was no written prescription for the blood. The recipient was group O D positive and the red cells were group AB D positive. The patient developed an acute severe reaction with respiratory distress, and became cold and clammy, and the transfusion was stopped after approximately 50 mL had been transfused.

This case also involved some additional errors. A calculated Hb value from a blood gas machine should not be used to inform a decision to transfuse, as they are inaccurate, with the Hb results not subject to external quality assessment and not intended for this purpose. Additionally, the presence of a handheld electronic device for patient ID did not prevent the error, and seemed to cause additional confusion. The agency nurse had not attended the hospital's transfusion training session.

Case 4

Incorrect unit collected and transfused despite training, competency-assessment and fridge locking system

A man who was group B D positive required a routine top-up post chemotherapy. An HCA who had been trained and competency-assessed collected the red cell unit from the locked issue fridge after hours without the formal checking of documentation. The patient was alert and conscious but was not involved in the checking procedure which was carried out at the nurses' station by 2 registered nurses against a compatibility form, not the patient's wristband. The patient received nearly 100 mL of ABO-incompatible red cells and developed pyrexia and rigors. He was transferred to HDU as a precautionary measure.

In this example all the staff involved were trained, and a lockable issue fridge had been installed to prevent unauthorised access, yet still the incorrect unit was collected and there was no bedside check. It is of concern that, more than 2 years after implementation of NPSA SPN 14[4] in which it was recommended that the compatibility form be phased out, there are still misunderstandings regarding what the bedside check is there to achieve, and 'checking' against the form, instead of the patient, is still taking place.

Erroneous administration of ABO-incompatible red cells *n* = 10 (of which 2 cases were also RhD incompatible)

In 7 of the cases the primary error was the collection of the incorrect unit from the controlled temperature storage (CTS) site. As 1 case occurred in ITU and 2 in theatres, the units involved may have been in satellite fridges in these cases. In the remaining 4 cases the incorrect unit was collected from the transfusion laboratory issue fridge.

Staff involved in collection errors are discussed below (page 36). A properly conducted bedside check would have prevented the IBCT in all cases. Two patients, 1 on a haematology/oncology day ward, did not have ID wristbands in situ, and 1 of these patients was unconscious (Case 2, above).

Case 5

Verbal ID carried out incorrectly on day ward patient with no wristband or photo ID

A patient required a top-up red cell transfusion following chemotherapy for carcinoma and attended the haematology/oncology day ward. The patient was not wearing a wristband and did not have photo ID. The registered nurse who administered the blood asked closed questions to which the patient responded 'yes' – the forename asked was the same, the surname had the same initial letter, but the date of birth was different. The blood, which was intended for a different (group A D negative) patient, was given to this group B D positive patient. Less than 50 mL were given and there was no adverse reaction.

Comments are made in some cases about poor levels of staffing in the clinical area, and staff being distracted by events occurring in relation to other patients. Bedside checking is discussed in more detail below.

Of the 10 cases, 4 were during core hours, and 6 were out of hours – clearly this is a high proportion. Three of the ABO-incompatible red cell transfusions were given in emergency situations, 2 of these out of hours. Although numbers are low, this tends to endorse previous findings that such errors are more likely both out of hours and in emergencies.

Two cases of ABO-incompatible red cell transfusion were also RhD incompatible. The case below is another example in which, despite training, checking procedures both at the time of blood collection, and again in theatres, were carried out wrongly.

Case 6

Man receives emergency transfusion which is both ABO and D incompatible with no ill effects

An elderly man with a lower GI haemorrhage was undergoing angiography and required emergency transfusion. A nurse took the correct documentation with her to collect the blood but did not check it formally and collected a unit for another patient with the same surname. This incorrect unit was handed to the nurse in theatre who checked the unit only against the accompanying compatibility form, not against the patient wristband. The patient, who was group B D negative, received 150 mL of group A D positive blood but did not suffer any adverse reaction. He proceeded to surgery the same day with no problems.

Two of the patients receiving ABO-incompatible red cell transfusions died following the episode, from underlying medical conditions; the transfusion was not considered to be contributory (see above).

Erroneous administration of RhD-incompatible red cells (which were ABO compatible) *n* = 1

RhD positive red cells were given erroneously to 1 further patient who was RhD negative, in addition to the 2 included with the ABO-incompatible group above. In all 3 cases no ID checks were performed; in 2 of the cases the incorrect blood had been collected from the transfusion laboratory fridge.

Case 7

Patient's son notices transfusion of incorrect D-incompatible unit of red cells

Blood was collected from the issue fridge for 2 patients on the same ward who required transfusion. One unit was taken to the bedside of one of the intended patients and two nurses completed the bedside check. None of the correct items, including the patient's wristband, was checked. After commencement of the transfusion the patient's son noticed that the details on the bag, stating the group as O D positive, were not those of his mother, who was group A D negative.

Of all cases of erroneous administration of red cells, 10 were ABO-incompatible and 19 compatible, which is the ratio (1:2) that would be expected by chance.

Wrong blood components transfused that happened to be compatible *n* = 21

There were 21 cases of blood being transfused which was not for the patient who received it, but where by chance the group administered was compatible with the ABO and D group of the patient. Of these cases 19 related to red cells and 2 to platelets.

The errors involved in these cases consisted of:

- Collection of a unit intended for a different patient from controlled temperature storage (CTS)
- Incorrect collection of adult instead of neonatal 'flying squad' blood, see below
- 'Checking' the unit remotely from the patient and then administering it to the incorrect patient
- Interchanging 2 units (after 'checking') intended for 2 different patients in the same clinical area (1 of these cases resulted in an ABO-incompatible transfusion, included above)
- Transfusion to a patient wearing a wristband with another person's details on it.

Case 8

Patient wearing the ID wristband intended for another patient

A woman with a haematoma had a low Hb and required transfusion, stated to be routine although it took place between midnight and 08.00. The wrong wristband had been put on the patient in the medical assessment unit. A group O D positive unit was transfused for which the patient details matched the ID wristband but which did not match the patient herself (who was group A D positive). Another nurse spotted the erroneous wristband on a later drug round.

The incorrect use of documentation when collecting components from the laboratory storage site, the absence of true bedside patient ID checks, and the checking of incorrect items or documents at the bedside or remote from the bedside are recurrent problems in this group of cases (see below).

The following case concerns collection of the incorrect unit, which occurred despite the presence of an electronically protected fridge. An alarm, which was flagging up that it was the incorrect unit for the documents being presented, was ignored or overridden.

Case 9

Wrong unit collected from electronic fridge despite alarm activation

An unqualified nurse collected a unit of blood from an electronically protected fridge. The unit she withdrew did not match the paperwork she presented (only the surname was the same) and the system alerted. However, the alarm was ignored or overridden. The red cells were handed to 2 registered nurses on the ward who conducted the bedside check. Although they were holding the unit of blood, one nurse read out the patient wristband details while the other checked these details against the patient's chart. The unit itself was not checked. The blood group matched the patient: both were group A D positive.

It is implied in the report that the staff involved had not been formally trained and competency-assessed, as achieving this was part of the corrective and preventive action.

Incorrect component type given to the patient *n* = 1

In this case the wrong component was administered against a prescription that clearly stated the correct component, highlighting a lack of knowledge of component types and their appearance among staff involved in the collection and transfusion of blood components.

Case 10

Lack of understanding and training leads to incorrect component selection

A newly qualified nurse was sent to collect platelets for a patient going to theatre. The nurse had been booked onto the Trust's competency-assessed blood transfusion training but had been withdrawn at the last minute because of staffing levels. The nurse did not know what platelets looked like and was not aware that they were not stored in

the fridge. After searching in the fridge, the nurse selected red blood cells for this patient. Red blood cells had not been prescribed but were available for use in theatre if required. The nurse returned to the clinical area, performed a compatibility check with a more senior nurse and commenced the transfusion. The error was not detected at this point because the ward was extremely busy and they were the only 2 qualified nurses on duty. The error was detected when the transfusion laboratory phoned the ward to remind them that the platelets were ready.

It is clear that the error could have been prevented if complete and thorough checks of unit type and number had taken place at the time of collection or at the bedside prior to administration of the units. Once again short staffing and a busy working environment are cited as contributing to this error.

Transfusion of component to correct patient but without a prescription *n* = 2

In these cases a component was transfused which had been neither prescribed nor authorised by the clinicians in charge of the patient's care. The issue here is not the recognition of different components but omitting to check that the component had been prescribed before administering it.

Case 11

Administration of unit without valid prescription

A junior doctor on call out of hours decided that a postoperative patient needed 2 units of RBC and a crossmatch sample was taken. Following discussion with a senior colleague it was agreed not to transfuse, but to re-check the Hb in the morning. This decision was documented in the patient's medical notes but not verbally communicated to the nursing staff. The 2 units of red cells were later requested for the patient by the nursing staff. A unit was commenced using an old prescription chart with 1 unit written up: this had been for possible transfusion in theatre the previous week but had not been necessary. The doctor identified the incident the next morning on the ward round when the patient told him he had received a unit of blood which the doctor knew he hadn't prescribed.

Unlabelled units delivered direct to clinical area *n* = 3

In all of these cases unlabelled components arrived from outside the treating hospital and had not been booked into, or issued by, the hospital transfusion laboratory, nor undergone any compatibility testing. Clinical staff cannot have completed any kind of bedside check as the units bore no patient identifiers.

Case 12

Unlabelled products transfused to wrong patient in error

Platelets for a patient in ITU were delivered to the ED by taxi from the BTS. The ED had also requested platelets for a patient. The ED took delivery of the platelets, which were for a different patient, and transfused them despite there being no documentation or label with any patient details.

Case 13

Emergency red cell delivery went straight to theatre and was immediately transfused

Blood and products delivered blue light from the BTS arrived in the ED but the multiple-trauma patient had gone to theatre. The NBS driver had been instructed to take the blood to the laboratory, and asked the way there. Because of the urgency, the nurse on duty in the ED directed him straight to theatre. The blood was not labelled for the patient but in the emergency the doctors decided to transfuse it. The blood was correct for the patient and there were no complications from the transfusion, although the patient died from trauma.

A third case involved a transfer from another hospital of a patient accompanied by some unlabelled red cell units, with no paperwork or transfer document. The units went with the patient to the clinical area, from where she was to go to theatre for an exploratory laparotomy. The blood was given in theatre despite the lack of a patient ID label or any documents.

Learning points

- All components arriving in a hospital with a transfusion laboratory should go to the laboratory first, to be booked into the inventory and issued using the hospital system to maintain traceability. This applies to emergency deliveries as well as transfers of units for individual patients.
- Hospitals should have SOPs for inter-hospital transfer of blood components.
- No clinical staff should transfuse components that are unlabelled or without a patient ID tag, unless specifically marked as 'flying squad' blood.

Paediatric cases *n* = 5

(discussed in more detail on page 140)

Four of the 5 administration errors reported were in newborn babies, and the fifth case involved a 3-month-old infant. Of the 4 neonates, 3 received adult 'flying squad' blood rather than blood suitable for neonates, and 1 – who was born to a mother known to have high levels of anti-c during the pregnancy – was given 'flying squad' rr red cells in error. In the fifth case, 'flying squad' blood was required for an infant who had arrested, but instead, blood crossmatched for another patient was collected and administered. There was no bedside check, but the infant was group A D positive whereas the blood given was group O D positive.

Lack of visual inspection of unit *n* = 2

In 2 cases the nursing staff administering red cells did not carry out a visual inspection of the unit before commencing the transfusion. In these 2 reports the red cell unit contained extensive blood clots and was unsuitable for transfusion. In neither case did any harm come to the patient. Visual inspection of blood components is an essential part of the pre-transfusion check, as haemolysis, clots or bacterial contamination of platelets may sometimes cause visible changes.

Details of administration errors

Volume of incorrect blood component transfused

As shown in Table 13 below, in 14 cases it appears that the error was noticed almost immediately after the transfusion started, as < 50 mL of blood was transfused.

Table 13
Volume of wrong component administered

Volume given	Number of cases
< 50 mL	**14**
50–99 mL	**3**
> 100 mL	**8**
Whole unit	**11**
> 1 unit	**0**
TOTAL	**36**

There were 11 cases in which the whole unit was transfused. This is not unexpected, since after the initial patient ID check pre-transfusion ID is unlikely to be reviewed. A number of reports include comments on short staffing and excessive workload.

Blood component collection

Of the 40 cases of wrong blood component administered (Table 12), 16 involved the collection of an incorrect unit from the hospital laboratory issues fridge, followed by the failure of all subsequent barriers to administration of wrong blood components – in particular the bedside check of component against patient ID.

Table 14
Staff responsible for the collection of the incorrect unit from the blood storage site

Registered nurse/midwife	**7**
Porter	**1**
Student Nurse	**2**
Health Care Assistant	**2**
Operating Department Assistant	**1**
Doctors	**2**
Unknown	**1**

Personnel who collect components from the blood issue site must be fully trained, competent, aware of the critical nature of the tasks involved, and able to take personal and professional responsibility. Only 10 staff involved in the collection process were documented as being trained, and 5 had received no training.

Errors included:

- Not checking details of all patient identifiers against unit being collected
- Staff using adult 'flying squad' blood that is not appropriate for neonatal use
- Selection of the incorrect component type
- Staff overriding/allowing other staff access to electronically locked issue fridges.

The improper use of IT solutions to reduce transfusion error is discussed in detail from page 57.

Bedside checking

Bedside patient ID checking could have prevented at least 28 of these 40 cases if properly carried out using the ID wristband against the component. The ID check was absent in 21 cases (i.e. either omitted completely or some erroneous form of check was carried out away from the patient). In 7 cases the check was completed at the bedside using various items of paperwork plus the unit of blood, but without any checks of the patient themselves (either verbally, or by the wristband attached to the patient). Of 40 cases, 3 patient ID wristbands were missing and 1 had incorrect details. All other cases in this group had correct ID wristbands although not always on their wrist.[18] In 3 cases no wristband details were recorded.

A cause for concern is the continued use of the compatibility form to 'check' the unit remotely from the patient. This contravenes the action points identified in the NPSA SPN 14.[4] This document clearly states that the reliance on using compatibility forms and checking these against the patient components has been a notable contributory factor to ABO-incompatible transfusions, advising that the compatibility form should be withdrawn. This was also a recommendation in the 2008 SHOT report and it is reiterated in the recently updated BCSH Guideline on the Administration of Blood Components 2009.[19]

The repeated theme of incorrect or no bedside check implies that there are still widespread misconceptions, in spite of training and competency-assessment, about what pre-transfusion checking, signing and documentation processes are actually there to achieve.

Table 15
Number of staff involved in final check

Single-person check	**12**
Two-person check	**21**
No detail	**7**
TOTAL	**40**

The data do not allow for any inference to be made regarding the relative effectiveness of a 1 or 2 person check. As previously reported, there were cases in which the reporter documented that the staff had been trained and competency-assessed but had still not followed the Trust protocols relating to blood transfusion.

COMMENTARY on component administration errors

There are fewer cases of bedside administration errors leading to IBCT than last year (40 versus 47) but more ABO-incompatible transfusions resulted (10 versus 4). However, the low number in 2008 was fewer than would be expected by chance if giving 47 wrong units to the incorrect recipient, and was purely serendipitous. Once again the protocols for positively establishing patient identity were not followed, in some cases despite training and competency-assessment. Patients are still being transfused with no wristband in place, and compatibility forms are still being used as a way of 'checking' ID. Explanations given included agency and locum staff, pressure of work and short staffing.

Learning points – patient identification

- No wristband – no transfusion.
- The compatibility form must not be used as part of a patient ID check.
- The patient must be physically present when the ID check is carried out. Any other check is not a patient ID check.
- Electronic devices are an aid to correctly reading and matching long barcodes, but staff using them must understand that the IT in itself cannot prevent errors.
- Patient ID is an absolutely fundamental part of the delivery of healthcare in any discipline, and should be second nature to all staff.
- It is crucial that the content and principles contained in any training and competency package are fully appreciated and understood if errors are to be avoided.

The following learning point remains relevant from last year:

- It is essential to have positive patient identification using the patient's wristband to label the sample tube at the bedside, however familiar the patient. Doctors are responsible for a disproportionate number of sample errors (see SHOT report 2008) and must be educated in the critical importance of patient ID for every medical intervention.

WRONG BLOOD IN TUBE (WBIT) *n* = 4

These cases occur when the sample tube is labelled correctly for a particular patient, but contains a sample from a different patient. This may affect samples either for a group and crossmatch, or for haemoglobin (FBC) or both.

Of the 4 cases, 2 were ABO incompatible (but RhD compatible), 1 was RhD incompatible (but ABO compatible) and 1 was fully ABO and RhD compatible. Of the transfusions 3 were routine and 1 was an emergency. One took place in normal working hours (routine) and for the others time was not stated. All 4 patients were adult males.

The 2 cases of ABO-incompatible transfusion resulted in severe reactions, and in 1 case the patient died with the ABO-incompatible transfusion probably contributing to the death.

Case 1

Patient dies following acute HTR after phlebotomy error

An elderly man with chronic renal failure, anaemia and a history of falls attended the ED. He was crossmatched using a sample taken in the ED and on admission to ITU he was transfused as he was symptomatically anaemic with Hb 6.8 g/dL. After < 100 mL had been transfused he suffered fever, hypotension and bronchospasm and died a few hours later. The wrong patient, who was group A D negative, had been bled in the ED resulting in the wrong blood in a tube correctly hand-labelled for the intended patient, who was group O D negative. There had been no checking of the patient's ID at the bedside, either with the patient himself or with the wristband. The transfusion sample protocol had not been followed by a locum medical member of staff.

Case 2

Patient suffers respiratory arrest due to ABO-incompatible transfusion

A patient with anaemia due to malignancy was receiving a red cell transfusion as an outpatient. After < 50 mL had been transfused, he developed fever, rigors and bronchospasm followed by a respiratory arrest 20 minutes after commencement. The transfusion was stopped and he was admitted to the ward and stabilised successfully. Upon investigation it has been discovered that the original G&S sample had been mislabelled by a trained phlebotomist using a bedside computer-generated label, and it belonged to another patient who was group A D positive. The recipient was group O D positive. This was the patient's first transfusion so there was no previous transfusion history.

A further case involved a doctor who realised he had bled the wrong patient for the crossmatch when he saw a different patient receiving the transfusion. He had not followed the transfusion protocol and had labelled the sample away from the bedside with the details from the notes of the intended patient. He had bled a different patient, who fortunately had the same ABO and RhD group.

The fourth case detected a previous phlebotomy error 2 years previously resulting in a patient receiving 4 units of RhD positive blood when he was RhD negative. The error was discovered due to discrepant results on a subsequent admission requiring urgent transfusion for active haemorrhage.

COMMENTARY on wrong blood in tube

In all 4 cases the protocol for transfusion sample labelling was not followed correctly and this led to preventable errors being made.[19] In only 1 of the 3 cases was the member of staff involved documented as having been trained (the phlebotomist, see Case 2).

The errors and problems identified in these cases include:

- Not checking patient ID verbally or by wristband
- Labelling filled tube away from the bedside
- Using a computer-generated sticky ID label on a (pre-labelled) tube
- Deployment of locum staff not trained or familiar with standard procedures
- Reliance on bedside technology without full understanding.

All of the errors in this group were preventable if the person taking the sample had adhered to NPSA guidelines and local Trust policy for taking transfusion samples. The absence of this adherence led to 3 patients being given incompatible components, resulting in 1 fatality and 1 life-threatening reaction. Despite staff completing their blood transfusion competencies, work pressures can lead to staff 'cutting corners' and losing sight of the reasons for completing a comprehensive ID check.[19]

SPECIAL REQUIREMENTS NOT MET (SRNM) *n* = 154

The total number of cases in this section (clinical and laboratory) has increased this year to 154 compared with 117 last year. There are 87 cases with a primary clinical cause of the omission and 67 cases in which the responsibility lay within the hospital transfusion laboratory.

This year 81 male and 70 female patients did not have their special requirements met. In 3 reports the gender of the patient was not documented. A total of 25 patients were < 18 years old. There were 2 < 4 weeks old, 4 aged 4 weeks to 1 year, 17 aged between 1 and < 16 years, and 2 aged 16 to < 18 years. The remaining 129 patients were adults with an age range of 18 to 87 years.

Table 16
Special requirements not met, showing proportion of primary clinical and primary laboratory errors

Category of error (SRNM)	No. of clinical cases	No. of laboratory cases
Failure to consult patient notes (clinical or laboratory), or failure of communication from clinicians to laboratory, or poor knowledge of clinician	84	40
Irradiated component	69	22
CMV negative component	5	10
CMV negative and irradiated	5	4
HLA matched platelets		4
HLA matched and CMV negative	1	
BMT group change and irradiated	4	
Poor knowledge and/or failure to recognise the special needs of a specific patient group (clinical and laboratory)	3	27
Phenotyped component		17
MB treated FFP		7
Apheresis platelets not given to a patient < 16		3
Not using blood warmer	2	
Latex allergy missed	1	
TOTAL	**87**	**67**

SRNM following clinical errors or omissions *n* = 87

As in previous years the majority of cases where special requirements were not met related to requests for patients who required irradiated components, but this requirement was not made clear to the laboratory by the clinical staff at the time of requesting the component. A smaller number of cases related to the non-communication of a requirement for CMV negative components or requiring both specifications. Generally, it appears from the information supplied to SHOT that the doctor ordering the components either did not know of the criteria for irradiated or CMV negative products or was not familiar enough with the patient to realise that this was necessary.

Of the 69 clinical-based omissions to request irradiated blood, the indications for irradiation were as follows:

- 26 fludarabine or other purine analogue
- 16 Hodgkin's disease
- 7 BMT or SCT
- 2 hairy cell leukaemia
- 2 AML
- 4 NHL
- 1 Waldenstrom's macroglobulinaemia
- 3 lymphoma (unspecified)
- 1 myeloma
- 3 CLL
- 2 IUT
- 1 Campath therapy
- 1 unknown.

Case 1

Non-irradiated red cells given to baby with previous IUT

A baby who had been the recipient of intrauterine red cell transfusions (IUTs) was given 4 non-irradiated paedipaks of red cells on 2 separate occasions. The request form did state that the mother had antibodies and that there had been 3 IUTs, but the special requirements were not specified. The prescription form did not specify irradiated blood.

Although a BMS might, on seeing the history of IUT, contact the clinicians for clarification, or decide to issue irradiated components, this is not core knowledge for laboratory staff. The requesting of special requirements for individual patients is a clinical responsibility.

Case 2

Consultant assumes that need for irradiation is already documented from several years earlier

An elderly patient had been on fludarabine for NHL since 2002 but no one had informed the laboratory that irradiated units would be indicated if any blood was required. The patient became anaemic and non-irradiated blood was issued and transfused. The consultant assumed that an alert was in the notes and on the pathology system and did not write the special requirement on the request form.

Of the 5 clinical omissions to give a product both CMV negative and irradiated, the indications were as follows:

- 1 post stem-cell transplant for B cell lymphoma
- 1 myeloma
- 1 NHL
- 1 post treatment cerebellar medulloblastoma
- 1 anaemia post treatment for malignancy (paediatric).

There were 5 cases in which CMV negative blood was indicated but not given. The indications were:

- 1 ECMO prior to heart-lung transplant
- 1 pregnancy (unrelated illness while pregnant)
- 1 pre-SCT
- 1 HIV with complications
- 1 unknown.

Other clinical omissions to make a request for special requirements probably also related to lack of transfusion medicine knowledge in non-specialised staff admitting patients through the emergency department. In a number of these cases the need for special requirements was clearly documented as part of the patient medical history.

In 15 of the 87 cases linked with the clinical omission to provide special requirements, the root cause of the problem related to the fact that the patient was undergoing shared care between 2 hospital sites, sometimes within the same

Trust and sometimes in separate Trusts. Information not communicated included:

- irradiated products required due to treatment with purine analogues
- a diagnosis of Hodgkin's disease
- requirement for HLA matched platelets
- previous SCT.

Five of these 15 cases were documented as emergency admission via the ED.

Case 3

Patient transferred to another ITU, special requirement details for SCT omitted

A patient was transferred from his primary hospital, where he had undergone a stem-cell transplant, to another hospital within the same Trust in order to access an ITU bed. Each site has a blood transfusion laboratory. Platelets were requested by ITU and issued by the hospital transfusion laboratory. Irradiated components were not requested due to a lack of communication between the clinicians, and the laboratory records were separate from those at the originating hospital.

Case 4

Special requirements for ECMO patient not communicated between hospitals

A teenager requiring ECMO support prior to a heart-lung transplant was transferred from another Trust. The ECMO team did not notify the hospital transfusion laboratory of the requirement for CMV negative components. This request should also have been followed up by written confirmation on the form for special transfusion requirements.

Special requirements may be second nature to the clinicians dealing with particular patient groups day to day, but may be very unfamiliar to more general staff, e.g. on ITU or in a surgical unit.

Case 5

Error in transcription of patient details leads to special requirement not being met

A patient was admitted via the ED and a sample sent for group and crossmatch. Although the details on the sample and request matched, the patient was incorrectly identified, the name was transposed and misspelt, and the date of birth was wrong. A new hospital number was therefore created, so historical details of special requirements were not accessed. The patient received a non-irradiated unit of blood.

Case 6

Patient history not accessible due to change of address

A patient admitted through the ED required multiple units of blood and received 2 units initially. The following morning a nurse looking after the patient informed the laboratory that the patient had previously received an SCT and required irradiated blood components. The patient had moved house and this was their first admission since relocating. The remaining units were returned to the laboratory and replaced with suitable irradiated red cells.

There were a total of 4 cases in which clinicians did not inform the laboratory that an SCT had taken place in the past.

Case 7

Vital information regarding a recent BMT not communicated to the transfusion laboratory

A patient known to the Trust had FFP requested which was issued according to the historical blood group – O. However the patient had received a BMT (for CLL) at another hospital and the blood group had changed from group O to group B. None of the request forms indicated that the patient had had a recent BMT.

Two new special requirement categories were identified by reporters including 1 latex allergy case and 2 cases of patients who required blood warmers due to cold agglutinin disease.

In 56/87 cases the reporter stated that the BCSH guidelines relating to special requirements were not adhered to.[20]

COMMENTARY on clinical cases of SRNM

The number of cases in this subgroup SRNM has continued to rise and is still probably only a small proportion of the true number of these events. The majority of cases relate to patients for whom irradiated blood is indicated, who do not receive it. The prevention of TA-GvHD in susceptible patients is vital, and irradiation is effective in its prevention. The lack of clinical cases of TA-GvHD in recent years should be seen as the outcome of successful implementation of policies from the blood services and national professional guidance, not as an indication that the condition is obsolete.

Doctors not usually working in haematology and oncology may be required to request blood components for these patients despite unfamiliarity with special requirements – a problem that arises from shift working and extensive cross-covering, especially since the EWTD.

Doctors working in non-haematology specialities, especially the ED and critical care, must also be educated sufficiently in transfusion medicine to know that certain patient groups, such as pregnant women and sickle cell patients, as well as past SCT recipients, have important special requirements for safe transfusion.

The request form is there to facilitate this, requiring a diagnosis or reason for transfusion, and it specifically asks about pregnancy. It should be an absolute requirement, enforced through the Risk Committee and Clinical Governance framework, that the transfusion request forms are fully completed. Transfusion laboratory staff should be required to ask for missing details.

Shared care inevitably results in a situation where the communication of essential information is required and there is a risk of communication breakdown. This appears to be the result of a lack of knowledge, especially among clinicians, of critical transfusion requirements that may arise from the diagnosis and treatment of a shared patient. Detailed information changes hands, but transfusion details may be omitted, or the transfusion laboratory or practitioner may be left out of the communication loop.

SRNM following laboratory errors or omissions *n* = 67

These are discussed in the laboratory section beginning on page 51.

MISCELLANEOUS IBCT *n* = 2

Documentation of traceability of blood components, and of pre-transfusion storage conditions and duration of storage, along with a record of monitoring the patient during and after transfusion, are all essential – even if a home transfusion is being administered. Hospitals should have a protocol for transfusion at home.

Case 1

Home platelet transfusion administered without proper protocol or documentation

Two units of apheresis platelets were released from the hospital transfusion laboratory on the instruction of the haematology consultant for a colleague to administer to her mother at home. There was no hospital policy for this: no patient ID or compatibility paperwork was completed, nor were any observations documented.

Case 2

Incorrect selection of patient details at booking in to ED

A patient attended the ED, but when being booked in an incorrect patient with the same first and second names – though a different spelling of the first name – was selected from the computer system by the reception clerk. The DOB did not match what the patient stated, so the clerk altered the DOB on the computer system. The patient had an Hb of 6.8 g/dL and, with a different patient hospital number and first name and the altered DOB, was transfused. The error was retrospectively detected by the transfusion laboratory.

Patient identification procedures should be followed carefully at every stage of a patient's attendance at a hospital. Clerical and reception workers understand the possible consequences of patient ID errors and must know how to use the address as an additional identifier and be aware that there may be patients with similar names.

IBCT EVENTS ORIGINATING IN THE HOSPITAL TRANSFUSION LABORATORY *n* = 149

2009 has seen a total of 149 IBCT cases in which the primary error occurred in the laboratory, which represents 53% of the total 282 IBCT cases. All IBCT cases have been summarised in Table 12 (page 29) and are discussed in more detail below. Laboratory errors resulting in special requirements not met (SRNM, 67 cases) are discussed towards the end of this chapter.

Overall laboratory errors account for 230 of the total 1279 cases included in the 2009 SHOT Report (18% of all reports). This consists of 149 IBCT events, including 67 cases of special requirements not met (see Table 17, below), 38 anti-D related events (see page 81) and 43 handling and storage errors (see page 75).

In 2008 there were 200 cases involving laboratory errors consisting of 132 IBCT events, including 41 cases of special requirements not met, 47 anti-D related events and 21 handling and storage errors. This represented 19% of the total 1040 SHOT reports in 2008.

However, the increase in the overall reporting to SHOT this year (from 1040 to 1279 reports) stands at 23% while the absolute increase in laboratory-based reports, from 200 to 230, is 15%.

Table 17
Summary of Laboratory-related errors *n* = 230

Type of error	Number of cases from this chapter
Wrong blood	**21**
Wrong sample selected	2
ABO grouping error	5
D grouping error	4
Incorrect component selected	9
Incorrect labelling	1
Wrong group selected for SCT patient	**13**
Wrong ABO group selected	7
Wrong D Group selected	2
Procedural errors	4
Other pre-transfusion testing errors	**48**
Testing errors	9
Procedural errors	39
Special requirements not met	**67**
Due to poor serological knowledge/ failure to recognise the special needs of a specific patient group	27
Owing to failure to consult patient records thoroughly	40
SUBTOTAL	**149**
Anti-D related laboratory errors	**38**
Handling and storage related laboratory errors	**43**
TOTAL LABORATORY ERRORS	**230**

Mortality

There were no cases of mortality definitely related to laboratory IBCT events, nor any in which a lab IBCT event probably or possibly contributed to a patient's death.

Morbidity

One patient showed symptoms (severe pain in the back, abdomen, pelvis and legs, nausea, and tingling in the hands and feet) of an ATR during an ABO-incompatible transfusion of group A D negative blood to a group O D positive patient. There were 3 cases of minor morbidity which occurred as a consequence of errors; these are highlighted in the text. Three other minor acute transfusion reactions were reported but were not a consequence of the error that was made.

ABO and D incompatibility

Errors have resulted in 2 ABO-incompatible red cell transfusions: the case highlighted above which gave rise to an AHTR and a second case where group A D negative blood was transfused to a group B D positive patient. There were a further 5 cases where group A red cells were transfused to group A patients who were recipients of group O BMT/SCT and therefore should have received group O red cells. RhD positive red cells have been given to RhD negative individuals in 6 cases: once because RhD positive red cells were selected in error, twice due to D typing errors, and on three occasions D positive components were selected when the BMT/SCT transplant protocol demanded selection of RhD negative components. No adverse sequelae were reported as a result of these ABO and D typing errors other than the acute haemolytic transfusion reaction described.

Wrong Blood Incidents *n* = 21

This year 21 out of the 230 cases (9.1%) of laboratory errors accounted for 'wrong blood' incidents. This is in comparison with 39 out of 200 cases (19.5%) last year.

Four cases involved paediatric patients – a neonate, a 1-month-old baby, a 15-month-old baby and a 17-year-old. In 2 cases the age was not given. All other cases were in adults over 18 years old. Table 18 illustrates the time and circumstances under which these wrong blood incidents took place.

Table 18
Summary representing when incidents occurred

	Out of hours	In core hours	Unknown
Emergency	7	1	0
Routine	5	3	2
Unknown	0	1	2

As reported in previous years, more errors occurred out of hours. The staff involved out of hours included 8 BMSs who normally work in transfusion and 4 who do not.

The 21 errors were:

- Two cases in which blood was grouped and crossmatched for a patient using the wrong sample. In the first case this resulted in group A D negative blood being transfused to an O D positive individual; and in the second case group A D negative blood was transfused to a group B D positive patient. The transfusion was stopped after only 30 mL had been transfused and the patient experienced no adverse reaction.

Case 1

A malfunctioning analyser forced a manual group and crossmatch – and human error

A crossmatch sample was run on the grouping analyser, but the results failed to transmit to the LIMS due to non-identification of the results by the analyser. A manual group and crossmatch was started but the BMS was interrupted and on return to blood transfusion picked up the wrong sample and tested it.

- There were 5 ABO grouping errors, all of which occurred during emergencies. Three cases involved errors in manual, tube groups resulting in 1 group A D positive patient being grouped as O D positive and receiving

multiple group O components; 1 group B D positive patient being grouped as O D positive and receiving group O red cells and FFP; and 1 group O D positive patient being grouped as A D positive but fortuitously only requiring FFP. A further case involved a neonate being grouped manually as O D positive, and subsequently transfused group O D positive components. However, during a validation process the sample was selected at random and analysed using an automated system, and was grouped as AB D positive. This was later confirmed to be correct. The final case involved a 1-month-old baby that was transferred between 2 hospitals. This case is given below because it highlights the importance of good communication both in shared care situations and between 'shifts' in laboratories.

- There were 4 errors in D-typing that resulted in IBCT cases, all occurring during on-call emergency situations and using manual techniques. In no case was the reporter able fully to ascertain what had gone wrong. All the errors were detected during subsequent routine testing. There were 3 female patients (2 > 60 years old, 1 age unknown) and 1 male patient. The errors resulted in RhD negative blood being given to an RhD positive individual in 1 case and RhD positive blood being given to RhD negative patients in 2 cases. In the final case, despite being mistyped as RhD positive, RhD negative blood was selected and transfused to the patient. There were no cases of anti-D being formed at the time of reporting.

  A further 5 D typing errors resulted in anti-D being given unnecessarily; these are reported in the anti-D chapter, see page 81.

- In 9 cases the incorrect component was selected.
  - Two cases involved red cells. One of these cases occurred when 2 units of red cells, received from a reference laboratory for a named patient, were incorrectly issued to another patient of the same blood group. The error was detected by the BMS and the second unit was withdrawn. The patient experienced pyrexia and rigors 12 hours post transfusion but these symptoms were attributed to a septic episode. The other case involved a male patient whose blood group was O D negative being issued 1 unit of group O D Positive red cells in error. The patient had not produced anti-D at the time of reporting.

  - In 4 cases cryoprecipitate was issued when FFP was requested.

  - Three cases involved platelets. In 1 case RhD positive platelets were issued to an RhD negative patient with anti-D. In another case RhD positive platelets were issued to a female of childbearing potential necessitating the issue of anti-D immunoglobulin. In the final case a group A D positive unit was issued to a group O D positive patient; it appears that the wrong group was sent by the BTS and issued by the laboratory. The ward queried the different blood groups and the decision was made, not unreasonably, to transfuse the platelets.

- Only 1 case was reported as a result of incorrect labelling. A laboratory staff member was partway through the labelling procedure when they were called away: on returning they attached the label to the wrong pack. A patient was subsequently transfused platelets which were not HLA matched. Although the error originated in the laboratory, the discrepancy between the laboratory label and the donor number on the pack was not detected by the nurses collecting and transfusing the unit.

Case 2

Effective transfer of data is essential

A baby was transferred to another hospital and subsequently grouped as O D negative. The BMS contacted the first clinical team and was informed that the baby had recently been transfused. However, the second team were desperate for blood and 8 group O D negative paedipaks were issued. There was concern over the blood group so the case was handed over to the morning staff. The transfusion laboratory tried but failed to contact the referring hospital. The problem was not passed on the next day and group O D negative MB-FFP was issued. The patient was later found to be group A D positive, having been transfused with group O D negative blood at the first hospital.

COMMENTARY on wrong blood incidents

The number of laboratory errors contributing to 'wrong blood' events has decreased this year. This number is small, but ABO and D typing errors continue to be a problem when using manual techniques, generally in urgent situations. Consideration should be given to adding a second check if manual groups are to be performed.

Table 19
Trends in laboratory-based ABO grouping errors, with causes

Year	ABO errors	Wrong sample tested	Interpretation/ transcription errors	Other	ABO-incompatible transfusion (all components)	Sequelae
2009	6	2	5	0	4	1 AHTR
2008	8	3	5	0	4	1 AHTR
2007	7	3	4	0	2	No morbidity
2006	6	2	3	1	0	No morbidity
2005	22	9	12	1	9	1 AHTR
2004	18	5	12	1	6	1 death 1 major morbidity
2003	17	8	9	0	7	2 major morbidity

The trend shows a decrease in the number of reports over time, despite an overall increase in reporting to SHOT – this is a positive finding, and may be seen as a sign of improvement.

Table 20
Trends in laboratory-based D grouping errors, resulting in IBCT, with causes

Year	D errors	Wrong sample tested	Interpretation/ transcription errors	Tx of D+ to D- individual	Other	Sequelae
2009	5	1	4	2	0	No morbidity
2008	11	0	11	10	0	3 patients formed anti-D but none were of childbearing potential
2007	4	1	3	3 (I x 33-yr-old female)	0	No morbidity

Errors in component selection continue to occur, with 4 more cases of cryoprecipitate being issued when FFP was required. Laboratories should ensure clear separation of components which look similar and the LIMS should support prevention of this type of error.

In 8 cases it was believed that the final bedside check could have picked up these primary laboratory errors and prevented mistransfusion.

Learning points

- Where feasible all samples tested by manual methods should be tested using an automated system as soon as possible. Consideration should be given to:
    - adding a second check if manual groups are performed;
    - reassessing the use/availability of automation/IT to add security to manual methods, e.g. automated readers.
- A full RCA should be performed on all errors that led to a SHOT reportable incident and appropriate CAPA instigated.

The following learning points from previous SHOT reports remain pertinent:

- Training and competency-assessment in the laboratory must cover basic manual checking procedures to ensure that these are second nature at a time when automation and computerisation will have lessened experience and practice in these basic skills.
- When new components are introduced, training must be given to all staff to allow thorough familiarisation with the component appearance, label and specification.
- NHSBT should review the packaging of components that look similar, to assess whether they could be more easily identified, particularly when those components are often used in emergency situations.
- The IT system should be configured to flag a component discrepancy between that ordered and that issued, and this should be fully validated. If this is not possible locally then these development requirements must be raised with LIMS suppliers.

Wrong ABO or D type blood components issued for SCT/BMT recipients *n* = 13

All cases were routine transfusions: 1 case was in a 13-year-old patient and all the rest were in adults. Eleven of the cases occurred during normal working hours and 2 were outside normal working hours.

In previous years only errors in selection of ABO and RhD type have been seen for this group of patients. However, this year other errors have occurred necessitating a new subcategory, 'procedural errors'. Five procedural errors occurred this year: 2 cases in which BMSs failed to perform antibody screening prior to transfusion and 3 cases where information regarding the transplant had not been entered clearly or completely into the LIMS. The latter 3 errors resulted in 1 case in which a patient who had an ABO mismatched BMT had blood issued using electronic issue rather than a serological crossmatch, 1 case where red cells of the incorrect RhD group were selected and 1 case where blood of the wrong ABO group was selected.

In total, 7 out of the 13 cases resulted in the issue of components (5 red cells and 2 platelets) of the wrong ABO group. Six of these cases were a result of the BMS's failure to notice or heed warning flags or to read notes belonging to the patient.

In the final 2 cases RhD positive components were selected when the transplant protocol demanded selection of RhD negative components. Both patients were male and anti-D had not formed in either case at the time of reporting.

Learning points

The following learning points from previous reports remain pertinent:

- Simple yet robust procedures must be in place for recording transplant details. Use of a 'shared care' document is helpful but the information from this document must be clearly recorded in the LIMS.
- Selection of blood and blood components post transplant, including thorough consultation of the patient's history/warning flags/notepad entries, must be included in competency-assessments.
- New BCSH guidelines on compatibility procedures in blood transfusion laboratories are in progress. These guidelines will simplify blood group requirements post PBSCT/BMT in line with EMBT (European Group for Blood and Marrow Transplantation) guidelines.[21]

Other pre-transfusion errors *n* = 48

The number of cases in this category is the same as last year. Two of the cases involved babies under 4 months old. In 1 case the age was not stated and the remainder occurred in adults. Table 21 illustrates the time and circumstances under which these pre-transfusion errors took place.

Table 21
Summary representing when incidents occurred

	Out of hours	In core hours	Unknown
Emergency	10	5	0
Routine	12	16	1
Unknown	1	2	1

The staff involved out of hours included 10 BMSs who normally work in transfusion, 9 who do not routinely work in transfusion and 4 cases where the status of the BMS was not known.

The 48 errors have been divided into:

- Testing errors, i.e. the correct tests were performed but incorrect results obtained owing to poor performance of the test, transcription error, or incorrect interpretation.
- Procedural errors, e.g. incorrect test selection, failure to follow procedure.

Testing errors *n* = 9

Two transcription errors resulted in patients receiving antigen positive blood. In one case 2 days after a transfusion, bilirubin results were mildly elevated and the DAT weakly positive. The patient died but this was not related to the transfusion.

Case 3

Confusion during an emergency situation

A sample for a patient in critical care was placed on the transfusion analyser for processing. Two units of uncrossmatched blood were issued as soon as the blood group was known. A manual group and antibody screen was requested but not performed, and then the positive antibody screen results produced by the analyser were 'missed' and recorded as negative. A positive antibody screen was discovered 2 days later, and an anti-E identified. On look back it was ascertained that of 16 units transfused, 1 of the uncrossmatched units and 3 of the other units had been E positive.

Three interpretation errors occurred: in 1 case antibody identification was misinterpreted as anti-Kp^a. The procedure for a 2-person check on all samples where antibodies were detected failed. In a second case the presence of anti-Kp^a was overlooked in a patient with autoantibodies. In the final case a laboratory interpreted the antibody as 'non-specific' but when sent to NHSBT was found to be anti-Jk^a.

One case involved an error during a 6-unit crossmatch where the BMS typed the units for Lu^a at the same time as crossmatching, found 1 unit Lu^a positive, but issued that unit in error.

One case involved a patient with known cold agglutinins. Laboratory staff were aware of this and should have put a note on the paperwork to indicate that a blood warmer was required. They failed to do this. Nursing staff were not aware of the cold agglutinins so the patient was transfused with cold blood and had a minor reaction.

It is debatable whether to call the final 2 cases errors as both involved very weak antibodies (an anti-Fy^a and an anti-Jk^b) at the limit of detection, that gave negative results when tested manually but reacted weakly when tested the next day using automation. Neither patient suffered any adverse reaction.

Procedural errors *n* = 39

There were many different types of procedural errors:

Testing unsuitable samples n = 12

There were 12 cases where the sample was too old. Some errors were due to the BMS failing to check previous transfusion history whereas others were felt to be failures to follow protocol, knowing the transfusion history.

Failure to find historic records n = 10

Two of these cases involved neonates: in one case the mother had two records as her details had not been successfully merged. One record showed anti-D and the other no antibodies. Blood was issued by electronic issue due to the second record being accessed. In the other case a neonate grouped as A D negative and was issued with 2 group A D negative paediatric packs without consulting the maternal record which would have indicated transfusion of group O D negative units.

Of the remaining cases, historic records were not found by the laboratory owing to the following factors:

- an ED number used rather than a hospital number
- a surname change since the last record
- 6 cases where 2 separate databases were held in the laboratory – either current and legacy systems or 2 current systems (1 of these cases is also referred to in the testing section).

Case 4

The importance of accessing all available information when interpreting results

A BMS on duty was unable to identify an antibody specificity and issued crossmatch compatible blood. A senior BMS reviewed the antibody identification results prior to authorisation of the antibody report. The BMS thought that the results were indicative of anti-Fy^a and performed additional testing with Fy^a homozygous cells. Results indicated likelihood of anti-Fy^a. The BMS then looked back at historical data for the patient on a separate database. The patient had a previously detected anti-Fy^a but this data was not available on the current computer system.

Blood issued with incomplete pre-transfusion testing or without following the correct procedure n = 14

- One case in which the BMS failed to read the crossmatch before the results were entered on the IT system. The gel card was found in the centrifuge.
- One case where blood was issued, without investigation, despite the presence of a pan-reacting autoantibody.
- Two cases of failure to look up antibody screen results, therefore missing a positive antibody screen, and issuing blood by electronic issue.
- Blood crossmatched and issued without the antibody screen results being recorded.
- Blood issued despite an incomplete antibody screen and crossmatch.

- Failure to follow protocol resulted in the issue of incompatible blood, resulting in a mild reaction: rigors and pyrexia. This error could have been prevented if the clinician had passed on to the laboratory the vital antibody information given by the patient.
- One case involved an interruption during crossmatching, which contributed to blood being electronically issued rather than issued following an immediate spin technique.
- Two cases involved NHSBT. In 1 case the BMS assumed NHSBT had completed all pre-transfusion testing, and issued the units, when they had not. In a second case NHSBT sent phenotyped units rather than crossmatched units and the BMS assumed they had been crossmatched and issued them.
- One case where an MLA failed to obtain full patient identification when taking a telephone request.
- One case in which a unit of FFP was incorrectly put into the laboratory database as group O D negative when it was group O D positive. It was then transfused to a group O D positive patient. Although the sequelae in this case was of no clinical significance the use of 'copy' facilities on LIMS when inputting critical component information must be disabled.
- One case in which a BMS edited the results to negative, twice; when warning messages of 'wrong liquid level', which invalidates the test, were clearly displayed on an automated analyser.
- One case where a DTR was caused by a missed anti-Jk^b; laboratory protocol did not follow BCSH guidelines on pre-transfusion testing.[22] (See Case 5, below.)

Case 5

Different procedures might have prevented reaction

A pre-transfusion sample from a patient with known anti-K gave weak reactions with the K negative screening cells by an automated technique. The screen was repeated on the second analyser, which gave negative results, and testing against a panel of red cells was not undertaken. Four days later the patient showed signs of a severe DHTR including deteriorating renal function, and anti-Jk^b was detected in the post-transfusion sample. Retrospective testing on the pre-transfusion sample did not reveal anti-Jk^b; however, no different or additional techniques were used, and the sample was not referred for confirmation. The laboratory has since changed its policy, and a full antibody identification panel is undertaken on patients with known antibodies.

Errors during crossmatching n = 3

- 1 case where an incompatible unit was issued to a patient.
- 2 cases in which units were issued that expired before the day they were required.

There were a number of cases of inappropriate electronic issue this year: 1 due to the patient's historic record not being found, and 1 due to 'interruption' during crossmatch. There may have been others due to errors earlier in the pre-transfusion testing process, e.g. sample age, but these have been reported under the appropriate sections and whether they then led to inappropriate EI is unclear.

Case 6

Overriding warning signals

A request was received for 6 units of blood for a patient with anti-D+C. Antigen negative blood was selected and an IAT crossmatch set up. On reading the crossmatch 1 unit was weakly incompatible (+) by IAT. This result was correctly entered into the LIMS but the unit was not physically quarantined from the compatible units. The units were then issued to the patient: a warning message was displayed for the incompatible unit but this was overridden and the emergency issue option used. The unit was transfused before the error was identified.

COMMENTARY on pre-transfusion testing

Numbers of procedural errors remain constant with 40 in 2008 and 38 this year. Although not as marked as in the 'wrong blood incident' section, it appears that there are a disproportionately high number of errors occurring out of hours, even after taking workload into consideration. Local investigation into these errors must be carried out and a full RCA performed to ascertain why they occurred. SHOT endorses the recommendations of the UK Transfusion Laboratory Collaborative with regard to staffing levels, technology, training and competencies both in and outside core working hours.[10,11]

IT must be used to its full potential. It is difficult to understand why the following are not set up on LIMS:

- Preventing the issue of units that expire before the 'time required'.
- Reflex requesting of an antibody identification based on a positive result in the antibody screen so that there is clear, outstanding work still to perform before a crossmatch.

These points are also highlighted in the IT chapter.

Learning point

- Use of automation and IT can increase the security of testing but only if the messages/flags given are heeded and acted on appropriately. It is disappointing to report a number of examples this year that involve qualified staff overriding information, leading to the transfusion of what could be unsuitable units of blood. It is important that staff understand all warning messages and the necessary, appropriate actions to take following warnings.

The following learning points from previous reports remain pertinent:

- Errors are still being made in using inappropriate samples. Computer warning flags are a useful tool but must be backed up with strong theoretical knowledge. New BCSH Guidelines on compatibility procedures in blood transfusion laboratories are in progress. These guidelines will simplify sample age requirements.
- Competency-assessment must comprehensively cover the areas of phenotype selection, antibody history and appropriate use of EI.
- Competency-assessment must comprehensively cover all warning messages from analysers and the LIMS and staff must be able to demonstrate appropriate actions.
- Transfusion laboratories must have thorough search strategies when looking for patient histories in order to find and reconcile multiple entries for a patient.[23]

Laboratory-based cases of SRNM *n = 67*

The 67 SRNM errors have been divided into SRNM based on the following:

- poor serological knowledge/failure to recognise the special needs of a specific patient group
- failure to consult patient records thoroughly.

This section mirrors that of previous years in which the majority of errors were associated with either failing to notice/heed warning flags or absence of warning flags, either because they have not been added or because they have been incorrectly deleted.

SRNM due to poor serological knowledge/failure to recognise the need for special requirements *n* = 27

Failure due to poor serological knowledge/carelessness in selection n = 11

- An incorrect order for blood was made for a neonate. Anti-D+Fy^{a}+Jk^{b} antibodies were identified in the mother, who initially refused to have a sample taken, so blood was crossmatched against the baby's sample in which only anti-D was detectable. The first BMS failed to order Jk^{b} negative units and the second BMS did not pick up on the error when crossmatching the blood.

- One case which resulted in failure to provide antigen negative units for a patient with anti-Jk^a plus anti-C^w.
- Failure to select a CDE negative unit for the 'flying squad' blood: 1 unit was C positive and was transfused to a patient with anti-C+D.
- A second case where the emergency group O D negative 'flying squad' blood that should have been CDE negative was found to be C positive, after an anti-C was found in a patient who had received the 'flying squad' blood.
- Four cases in which blood that was crossmatch compatible, but not Jk^a typed, was transfused to patients with known anti-Jk^a.
- Failure to issue appropriately phenotyped units to a patient with thalassaemia due to misinterpretation of nomenclature: i.e. the BMS had written 'R1R1 required', which was correct for the patient, followed by, 'i.e. e neg, K neg', which was wrong: the patient received R2R2 K neg blood instead of R1R1 K neg.
- e negative units were not selected for a patient with anti-C+e. The crossmatch was then performed incorrectly (Case 7).
- Failure to provide blood of the correct age, following a request to ensure that all units were < 7 days old. NHSBT only sent 4 units that met this requirement; the other 4 were older units and the laboratory did not notice the error.

Case 7

BMS staff must understand the clinical significance of warning flags on analysers

The patient was known to have an IAT reacting anti-C and enzyme only anti-e. As there was no R2R2 blood in stock the BMS selecting the blood decided that, as the anti-e was only reacting with enzyme treated cells, e positive blood could be selected. On the automated crossmatch 'too few cells' were indicated on the analyser. The BMS edited these results to compatible as she thought that this warning had occurred because the patient was anaemic. It was pointed out that the cells were from the donors, not the patient.

Failure to recognise the needs of specific patient groups n = 16

- Giving a female of childbearing age, who was phenotyped as c negative, c positive blood, against local protocol
- Five cases in which K positive units were issued to female patients under the age of 60
- Three cases of failure to provide apheresis platelets to children under 16 years of age
- Seven cases of failure to supply MB-FFP to children under 16 years of age.

SRNM due to failure to consult the patient records thoroughly *n* = 40

Table 22
SRNM due to failure to consult patient records thoroughly *n* = 40

Failure to	No. of cases
Failure to provide irradiated components	22
Failure to provide CMV negative components	10
Failure to provide CMV negative and irradiated components	4
Failure to provide HLA matched platelets	4

The next two cases have been selected to highlight that SHOT reportable incidents often occur because of a number of errors in the transfusion process.

Case 8

When the laboratory knows of a special requirement it should not have to be reiterated on request

A request was made for platelets. The BMS noted the requirement for HLA matched platelets and ordered them to arrive to cover overnight and for use the next day. The on-call BMS booked in and issued the HLA matched platelets. The platelets were not used overnight and the pack was returned to stock the following morning. A different BMS on specimen reception received a request for a unit of platelets for the patient. The need for HLA matched platelets was not mentioned. The BMS failed to notice the comment regarding the need for HLA matched platelets, entered on the laboratory system and on the laboratory whiteboard, and a pool of non-HLA matched platelets was issued and transfused. On discovering the error the ward was contacted and reminded that the patient needed HLA matched platelets and that this needed to be stated on the request. The HLA matched platelet was then reissued to the patient and transfused.

Case 9

Checking the need for a special requirement is the responsibility of all staff groups

A patient had received fludarabine and required irradiated components. While being transfused irradiated components, the patient stated that the blood he had received on a previous occasion had not been irradiated. An investigation ensued.

In the clinical area:

- *the patient's notes did not have an 'irradiated blood' alert sticker on them*
- *the prescription did not state irradiated blood – the relevant field on the prescription was blank.*

In the laboratory:

- *the patient's notes on LIMS contained a large amount of information including that irradiated blood components were required.*

Clearly a number of problems led to this error: omissions at ward level and an error on the part of the BMS. Was this simply a lapse by the BMS or could the notes on the LIMS have been clearer?

COMMENTARY on SRNM laboratory cases

This year has seen an increase in the number of paediatric cases: 7 cases where MB-treated FFP should have been issued to patients under 16 years of age and 3 cases where apheresis platelets should have been issued to the same patient group.[24] Two cases resulted from patients having more than 1 record in which data was not successfully merged or reconciled and as a result warning flags were deleted/missed during the transfer process.

Failure to provide irradiated components when required was the biggest group (22/67 cases). Some hospitals are relying on a ticked box on a request form to highlight the need for irradiation. This can be missed in the laboratory. As recommended in 2008, a more robust mechanism should be in place for informing the laboratory that irradiated components are required. The laboratory must then ensure that these requirements are consistently met without the need for further prompts.

Once again the failure of laboratory staff to select appropriate components when warnings flags are present is hard to understand, especially as the majority of the cases reported were during normal working hours. There does seem to be a particular problem when there are multiple special requirements. IT should be used to its full potential to prompt staff about special requirements either through algorithms based on date of birth and/or gender, or via warning flags. Warnings need to be clear and unambiguous and must be linked to the patient record, not one sample. Staff must then be competency-assessed to ensure that they fully understand all prompts/warnings/flags.

Case 8 above shows, again, that multiple errors, both clinical and laboratory, often contribute to cases of mistransfusion.

Learning points

- Simple yet robust procedures must be in place for recording special requirements. Use of a 'shared care' document is helpful but the information from this document must be clearly recorded in the LIMS.
- Once informed of the need for a special requirement the laboratory must ensure that the requirement is consistently met without the need for further prompts.
- Mistransfusion is often a result of multiple errors. It is important to investigate these incidents thoroughly by performing a full RCA so that all appropriate CAPA can be instigated.

The following learning points from previous reports remain pertinent:

- Assessment of staff working in the transfusion department must cover competency in the provision of blood components for specific groups of patients, and understanding the importance and use of 'special requirements' flags.
- Laboratories must give thought to the nomenclature used to describe phenotype requirements. It may be prudent to simply state the antigens that the red cells should lack, rather than use Weiner terminology, for example, which requires interpretation.

Errors involving NHSBT

These are discussed in the text but grouped here for clarity. There were 2 cases where the primary error was made by NHSBT and then not noticed by the hospital laboratory:

- platelets of the wrong ABO group were sent
- blood that was older than requested was sent.

There were 2 further errors where it is unclear whether there were mistakes or simply miscommunication between the hospital laboratories and NHSBT:

- In 1 case the BMS assumed NHSBT had completed all pre-transfusion testing, and issued the units, when they had not. In a second case NHSBT sent phenotyped units rather than crossmatched units. The BMS assumed they had been crossmatched and issued them.

RECOMMENDATIONS

RECOMMENDATIONS for clinical IBCT cases

- A transfusion checklist should be developed, ideally with an accompanying transfusion record section, in a similar style to the WHO surgical checklist (http://whqlibdoc.who.int/publications/2009/9789241598590_eng_checklist.pdf). This approach is a proven aid to patient safety and could prevent omission of critical steps in the process.

  Action: NBTC and counterparts in Scotland, Wales and Northern Ireland

- All point of care testing devices for Hb estimation must be fully validated and internal quality control and participation in external quality assurance schemes must be ensured. (See also recommendation on page 74.) Currently this is not the case for calculated Hb estimates from blood gas analysers. A study to evaluate the utility of these devices for Hb measurement should be undertaken and guidance and recommendations issued.

  Action: NBTCs, NEQAS, SHOT

- All staff must take full professional responsibility for their part in the transfusion process. Personnel involved at the point of component administration must understand that this is the final opportunity to check for errors earlier in the chain, and the sole remaining opportunity to be certain of the recipient's identity.

  Action: CEOs of Trusts/hospitals, HTCs and HTTs

- The existence, and the importance, of special transfusion requirements must be taught to junior doctors in all hospital specialities. Local mechanisms for ordering and prescribing components need to facilitate correct ordering, and remind clinical and laboratory personnel where possible.

  Action: CEOs of Trusts/hospitals, HTCs

- Hospitals must ensure that they have protocols and documentation systems for:
  - transportation of blood components accompanying patients transferring to other sites
  - administration to patients who may be permitted to receive blood components at home
  - ongoing information transfer between hospitals when patients have shared care at 2 or more sites.

  Action: HTCs, HTTs

RECOMMENDATIONS for laboratory IBCT cases

- Many hopes of error reduction have been pinned on extending automation and IT. An emerging theme from this year's report is that frequently it is still up to well trained staff, with underpinning knowledge, to interpret and heed warnings and flags and, unless appropriate actions are taken, errors will continue to occur.

  Action: Lead BMS for hospital transfusion laboratories, transfusion laboratory managers

- There is a requirement for manufacturers to provide affordable, secure automation for smaller laboratories that bridges the gap between manual methods and large 'walk away' analysers.

  Action: Manufacturers of blood grouping equipment, IT working group of the NBTC

- The number of errors in the SRNM category has remained high for a number of years. Laboratories must make a concerted effort to tackle this problem. This should be done at a local level as there will be different root causes in different Trusts.

  Action: HTTs

- Blood services should review the packaging of components that look similar, to assess whether they could be more easily identified, particularly when those components are often used in emergency situations.

  Action: UK Blood services

- The IT system should be configured to flag a component discrepancy between that ordered and that issued, and this should be fully validated. If this is not possible locally then these development requirements must be raised with LIMS suppliers.

  Action: HTTs, manufacturers of blood grouping equipment, IT working group of the NBTC

IBCT RECOMMENDATIONS FROM PREVIOUS YEARS (ALL SECTIONS)

Year first made	Recommendation	Target	Progress
2008	Competency-assessment of staff involved in the transfusion process must be relevant to the person's core role and knowledge requirements. This must be carried out in accordance with NPSA SPN 14.	**Clinical risk managers, HTTs**	MHRA annual compliance reports ask whether competency-assessment is carried out. MHRA and CPA (UK) Ltd inspectors will look for evidence of competency-assessment.
2008	All staff must be trained (and competency-assessed) in recognising the different blood components and their labels.	**Clinical risk managers, HTTs**	NPSA has issued new guidance and deadlines for completion.
2008	Laboratory procedures should be validated in line with the BSQR and should be revisited following an error as part of Corrective and Preventative Actions.	**Transfusion laboratory managers**	
2008	Competency-assessment in laboratories must be linked to process. BMS staff must be competent in performing the test but must also have a thorough understanding of the context in which the test is being performed, i.e. the test in relation to a specific patient and the clinical information. Basing competency-assessment on National Occupational Standards (NOSs) will enable this, as NOSs have both 'Performance' criteria and 'Knowledge and Understanding' criteria.	**Transfusion laboratory managers**	
2008	The UK Transfusion Laboratory Collaborative has recommended minimum standards for hospital transfusion laboratories in terms of staffing, technology, training and competence. This document has been widely disseminated and should form the basis for future laboratory planning.	**CEOs, Pathology managers**	Report published in *Transfusion Medicine* and *The Biomedical Scientist*, September 2009.[10,11] Report circulated to all CEOs in England, Wales and Northern Ireland. SCTAC considering.
2008	Shared care discharge notification, giving tick-box options for special requirements, with reasons, should be completed by the referring clinicians and forwarded to the receiving hospital through the laboratory network.	**NBTC, RTCs**	
2007	Education of doctors and nurses involved in transfusion must continue beyond basic competency to a level where the rationale behind protocols and practices is understood. Transfusion medicine needs to be a core part of the curriculum.	**NBTC, Royal Colleges, GMC**	Royal Colleges and Specialist Societies Committee working with NBTC.
2007	Staff involved in blood component transfusion must be aware of their professional accountability and responsibility.	**GMC, NMC, IBMS, professional insurance schemes**	