5. Incorrect Blood Component Transfused

Definition

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.

Four hundred and eighteen completed IBCT questionnaires were received. An additional case was transferred from the HTR section. Nineteen reports were withdrawn by the analysts, of which 13 did not meet the criteria for IBCT, and 6 were 'right blood to right patient' incidents, in which the patient received the intended component despite a serious breach of protocol. These are discussed separately at the end of this section. There were no reports of adverse events relating to autologous transfusion.

This section describes the findings from 400 analysed cases, a 17.5% decrease from 2005.

A striking feature this year is that for the first time there has been a reduction in the total number of reported cases of IBCT, even allowing for the decline in blood use over the past 4 years (see table 6). The reason for this reduction is not clear, and there are concerns that reporting may have been inhibited by early difficulties with the SABRE electronic reporting system, and by anxieties around the implementation of the Blood Safety and Quality Regulations.

It should be emphasised that the contents of SHOT questionnaires remain confidential to SHOT alone and also that adverse events in clinical areas not resulting in a reaction are not within the scope of the BSQR, and are therefore reportable only to SHOT.

It is essential that all events continue to be reported to SHOT if a comprehensive and ongoing understanding of transfusion risks in the UK is to be maintained.

Table 6
Rate of reporting 2003–2006 (excluding 77 anti-D Ig) per 100,000 components issued

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

The ratio of ABO incompatible transfusions to total IBCTs is unchanged from last year. Nevertheless, the continued reduction in numbers of ABO incompatible red cell transfusions (figure 4) observed this year, together with the marked reduction in the highest risk errors, where a patient received a blood component intended for a different patient or of the incorrect group, is encouraging. Providing reporting is complete, this may provide evidence that practice is improving, particularly in clinical areas.

The work of transfusion practitioners in improving standards is acknowledged and must be supported in Trusts.

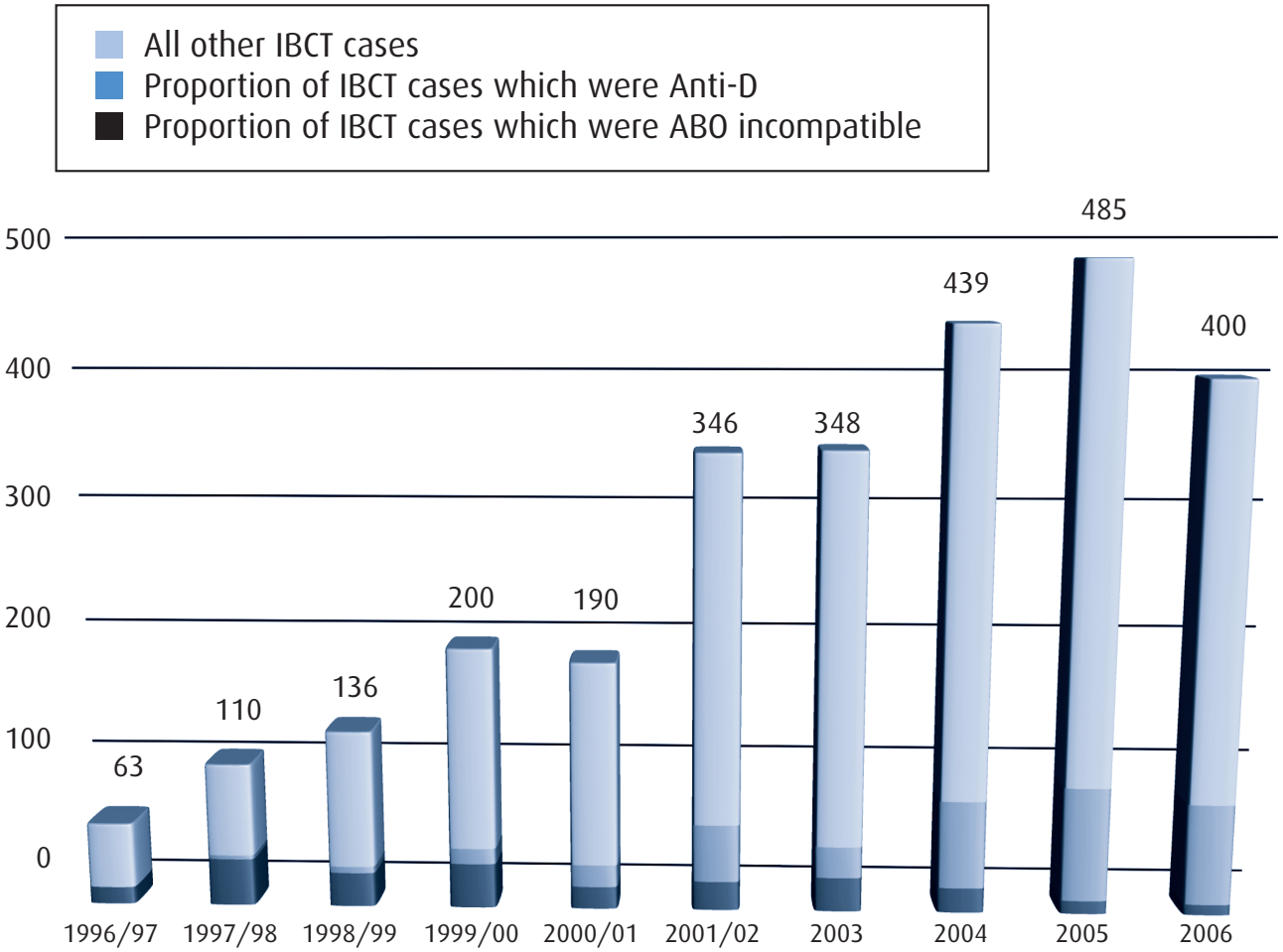
There is no cause for complacency, as 'wrong blood' events continue to occur where there has been failure to positively identify patients, either prior to blood sampling or prior to administration of blood. The practice of 'checking' blood away from the bedside, without a final patient identification check, often against a compatibility form, has not yet been eliminated. Implementation of the NPSA Safer Practice Notice 14[1] and NHS QIS Standards for Blood Transfusion[7] should remove this source of error.

SPN 14 has 3 action points:

- implement an action plan for competency-based training and assessment for blood transfusion staff;
- eliminate the use of compatibility forms as part of the final bedside check;
- examine the feasibility of using bar codes or other electronic identification systems, photo identification and a labelling system to match samples and blood.

It is of note that the 2 fatal IBCT cases this year were not caused by errors in blood administration, but were due to incorrect prescribing, in both cases involving junior doctors. Case 1 highlights the importance of careful prescribing in paediatric transfusion, and case 2 emphasises the need to match abnormal laboratory results to careful assessment of the clinical picture. Both cases reinforce the recommendation that blood should only be prescribed by a doctor who has undergone training in blood transfusion and has been assessed as competent [8,9].

Figure 4
ABO incompatible red cell transfusions



Patients

253 Females
146 Males
1 Not stated

Ages ranged from <1day to 99 years

Forty-seven reports (12%) related to patients under 18 years of whom 31 (8% of total IBCT reports, or 66% of cases in patients under 18) were infants under 12 months.

Mortality and morbidity

There were no deaths related to ABO incompatible transfusion, but 2 patients suffered serious morbidity following ABO incompatible red cells (cases 3 and 9 below, both imputability 3).

An infant aged 12 months died after rapid transfusion of an excessively large volume of platelets (Case 1 imputability 2).

An 80-year-old female patient died of cardiac failure following an unnecessary transfusion based on an incorrect haemoglobin level (Case 2 imputability 1).

Case 1 – lack of care and accuracy in paediatric prescribing results in overtransfusion

A very sick preterm infant, aged 12 months, with multiple congenital abnormalities, had been in hospital since birth and was scheduled for elective surgery. The platelet count was 48x10^9/L. The drug chart stated '1 pool of platelets' and did not specify the volume to be transfused. The nursing staff telephoned a junior doctor to request clarification of the platelet dose. The doctor stated that the verbal instruction was '15mL per kg'. The nurses misheard the prescription as '50mL per kg' and administered 300mL of platelets over 30 minutes. The infant suffered a cardio-respiratory arrest and was transferred to PICU where she died 2 days later.

Case 2 – faulty blood sampling technique and a wrong decision to transfuse

An 80-year-old female patient with a fractured neck of femur and expressive dysphasia from a previous stroke had a post-operative haemoglobin level reported as 3.9g/dL. The pre-operation Hb was 9.5g/dL and there had been little intra-operative blood loss. Eight hours following surgery the patient was noted to be restless, hypotensive and tachycardic. A junior doctor diagnosed hypovolaemia and prescribed 6 units red cells, all of which were administered over a 16 hour period. The post-transfusion Hb was 18.2g/dL, the patient subsequently died from cardiac failure. It was later realised that the blood sample with a Hb of 3.9g/dL was diluted by an iv infusion.

Learning points

- Prescriptions must be written by a doctor, and volume and rate of infusion must be clearly stated.
- Nursing staff must not accept verbal prescriptions or instructions, and should demand that prescribing protocols are followed.
- Medical and nursing staff should not work beyond their competence or expertise.
- All results, especially if highly abnormal, must be reviewed in the context of the patients recent history and current clinical condition.
- Large volumes of blood components must not be given without ongoing clinical and laboratory review.

Analysis of cases

IBCT case reports have again been analysed by category as follows:

Table 7

Type of event	Number (%)
'Wrong blood' events where a patient received a blood component intended for a different patient or of an incorrect group	54 (14%)
Other pre-transfusion testing errors (excluding erroneous Hb)	28 (7%)
Blood of the incorrect group given to recipients of ABO or D mismatched PBSC, bone marrow or solid organ transplant	8 (2%)
Transfusion of blood of inappropriate specification or that did not meet the patient's special requirements	108 (27%)
Inappropriate or unnecessary transfusions	51 (13%)
'Unsafe' transfusion where there were handling or storage errors	74 (19%)
Events relating to administration of anti-D immunoglobulin	77 (19%)
Total	**400**

In each subgroup, an attempt has been made to assess the contribution of errors in clinical areas and in laboratories.

1. 'Wrong blood' events (n=54)

These patients received a blood component intended for a different patient or of an incorrect group, and were put at risk of life-threatening haemolytic transfusion reactions.

- Eight patients received ABO incompatible red cell transfusions, 1 of whom was also D incompatible. Two suffered serious morbidity (both imputability 3) but survived.
- Three patients received ABO incompatible FFP (group O components given in error to patients of other groups). None suffered any adverse reaction, though 1 patient developed a positive DAT and agglutination on the blood film.
- Fifteen D negative patients inadvertently received D positive components (13 red cells, 2 platelets); 2 were female neonates, 1 a 4-year-old girl and 1 a 46-year-old female with a ruptured ectopic pregnancy. Eleven were males or elderly females. Three elderly females were subsequently found to have developed anti-D.
- The remaining 28 patients received components that were fortuitously compatible.

Causes of 'wrong blood' events

Table 8 shows the site of the primary error and also illustrates those cases where the primary error could have been detected at a later stage in the chain, but was not.

In 25/54 (46%) of cases the primary error was in the laboratory (*c.f. 42.5% last year*).

In 28/54 (52%) of cases the primary error was in a clinical area (*c.f. 57.3% last year*).

In 1/54 (1.9%) of cases the primary error was in the blood establishment (*c.f. 0 last year*).

Table 8
Site of the primary error that led to mis-transfusion

Site of Primary Error	No. of cases (%)
Sample from wrong patient	3 (6%)
Not detected by lab (previous group not noted)	*1*
Blood establishment	1 (2%)
Hospital laboratory failed to notice error	*1*
Not detected at bedside check	*1*
Laboratory error	25 (46%)
Not detected at bedside check	*7*
Wrong blood delivered to clinical area	15 (28%)
Not detected at bedside check	*15*
Blood administered to wrong patient	10 (19%)
Total cases	**54**
Total errors	**79**
Total errors in clinical areas	51 (65%)
Total hospital laboratory errors	27 (34%)
Total Blood Establishment errors	1 (1%)

Sample errors

Three cases were reported, 2/3 patients received ABO incompatible transfusions, of whom one suffered major morbidity.

Case 3 – Missed opportunities to avert a catastrophe

A 69-year-old female patient had a blood sample taken for a full blood count; the Hb was 8.9g/dL. As she was breathless a decision was made to transfuse her, and later the same day a 'doctors' assistant' was asked to take a further sample for repeat full blood count and a 2 unit crossmatch. The transfusion laboratory had no previous record of the patient. The Hb on this second sample was 9.9g/dL and the on-call BMS queried the need for transfusion, but was told that the patient was symptomatic and required the blood. The blood group of the sample was A D positive and 2 units were crossmatched and issued. Within 10 minutes of starting the first unit, the patient had a cardiac arrest. She was successfully resuscitated, the transfusion was halted and she was transferred to ITU. A further sample was sent to the laboratory for investigation of a possible transfusion reaction, but the on-call BMS was not alerted and did not carry out the investigation. The whole of the second unit was transfused in ITU early the following morning, surprisingly with no further apparent untoward effects. It appears that there was some discussion with the BMS prior to giving the second unit, but the possibility of an ABO incompatible transfusion was not considered.

Later that day the repeat sample was tested and grouped as O D positive. It was then realised that the sample taken by the 'doctors' assistant' for pre-transfusion testing was from another patient, who was not wearing a wristband and did not respond when asked to confirm her identity.

Learning points from this case

- Positive patient identification is an absolute prerequisite of blood sampling.
- Blood transfusion should only be undertaken at night if clinically essential.
- Unexpected discrepancies in laboratory results, such as occurred in this case, should be investigated and possible error considered.
- Clinical staff must be able to recognise a transfusion reaction and know how to proceed.
- A catastrophic transfusion reaction must be investigated urgently, with involvement of a consultant haematologist.
- The most senior doctor available should be involved in the decision to transfuse.

Laboratory errors

In 25 out of 54 (46%) 'wrong blood' reports the primary source of error was the laboratory. In another 2 cases previous mistakes, made in sampling and at the local blood establishment respectively, were not picked up by the laboratory when they should have been.

Fifteen of the errors occurred 'out of hours', 8 within normal working hours and 2 reports did not state the time of the error. Staff involved in the errors included 14 BMS staff who were transfusion specialists and 8 who did not work routinely in transfusion but were covering transfusion 'out of hours'. Two cases involved locum staff and in one report no information about the staff was given.

In 2 cases the wrong sample was selected for testing resulting in a wrong ABO group determination. Fortuitously neither error resulted in an ABO incompatible transfusion.

Case 4 – a basic error that might have been disastrous

When grouping the patient's sample, the duty BMS picked up the sample from another patient, consequently the group was incorrectly determined as A D neg instead of O D pos. Luckily, as the laboratory was short of A D neg red cells, O D neg was crossmatched and was compatible.

Eleven reports of grouping errors were received, 4 ABO and 7 D typing errors. 7 reports involved manual ABO/D techniques. In 6 of these cases the method used was the laboratory's manual, 'urgent' method and in one case the laboratory's manual, routine microplate method. In most cases the source of the error could not be clearly identified – reporters have queried either misreads or transcription errors. Only one report could prove a transcription error as the correct D type was written on a worksheet but then incorrectly entered onto the blood bank computer system.

In 3 cases automated systems were used for blood grouping but incorrect manual interventions resulted in the wrong D types being reported. In 2 of these cases false positive weak reactions were obtained with the anti-D reagent in use on the analyser and laboratory protocols to repeat the D type with a second anti-D were not followed. In a third case an incorrect blood group was manually entered into the blood bank computer following an edit of a weak reaction. All 3 patients produced anti-D. In the final case a group $A_{weak}B$ with anti-A1 was mistyped as a group B on an automated system. This was discovered some time later when a repeat sample came into the laboratory. The anti-A_1 had disappeared, causing a grouping discrepancy between the forward and reverse group; a manual tube group was performed and a reaction with anti-A obtained.

Seven reports involved component selection errors. These were divided between those in which there did not appear to be any computer warnings that may have helped prevent the error and those in which computer warnings were overridden or not properly read. For example:

Case 5 – computer warning overridden

Two units of red cells were requested for a 79-year-old female patient on ITU. The patient's blood group was AB D neg but the BMS selected group A D pos blood and issued 2 units. The 2 units were transfused and the error was discovered when a sample taken for a group, and saved the following day grouped as A D neg. The laboratory system had flagged that the group was incorrect when the A pos blood was reserved but the BMS did not heed the warning. As the patient was AB D Neg the computer system flagged to say that blood of another ABO group was being issued. The BMS saw this warning but did not take into account the D group.

Labelling errors occurred in 5 cases. In 3 cases labels for 2 patients where blood components were being issued simultaneously, were transposed. In one case a unit of red cells that had not been crossmatched for that particular patient was labelled and in the final case, during an emergency situation, FFP left the laboratory without any labels attached to the packs. A report form with the numbers of the packs was issued.

Case 6 – failure to label correctly

The BMS crossmatching blood put a compatibility label on a unit of blood that was not matched for this patient (it was the same blood group) and issued the blood without completing the required checks. The ward staff then transfused this unit to the patient without completing the required checks.

In a number of the above cases it appears that basic, manual checks are being omitted or performed inaccurately, often during emergency situations.

This year has shown a reduction in the number of laboratory errors leading to 'wrong blood' events, although laboratory errors, as a percentage of errors made, has increased.

The following table shows the marked decrease in ABO typing errors this year:

Table 9

Year	Total No of Cases	Wrong Sample Tested	Interpretation /Transcription Errors	Other	ABO Incompatible Transfusions	Sequelae
2003	17	8	9		7	2 major morbidity
2004	18	5	12	1	6	1 death 1major morbidity
2005	22	9	12	1	9	1 AHTR
2006	6	2	3	1	0	No morbidity

Five of the 6 cases of ABO errors this year involved mistakes in manual testing, or mistakes in a manual step during automated testing, as did all the errors in D typing. In previous years the majority of ABO and D typing errors also occurred during manual testing.

The reduction in ABO typing errors seen this year is encouraging and there is some anecdotal evidence that laboratories have taken on board the messages of previous SHOT reports and have moved further away from manual testing. For example, automation is being used more often in emergency situations and greater numbers of out-of-hours staff have been trained in the use of available automation. However, there is also some concern that reporting may be incomplete as the decrease in errors has coincided with the commencement of MHRA inspections and, again anecdotally, there is a perception amongst reporters that an ABO typing error may initiate an MHRA inspection.

Learning points

- 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.

The following learning points from last year's report remain pertinent:

- Competency-based training for laboratory staff must include those working out of hours.
- A laboratory quality system, as required by the Blood Safety and Quality Regulations, must include internal incident reporting mechanisms and appropriate, documented, corrective actions.

Root cause analysis should be performed where there are adequate resources when a 'wrong blood' incident occurs, as these incidents potentially have the most serious outcomes. For example, in the 3 cases above, where a manual intervention was required on an automated system, questions must be asked about the reagents that gave the weak, false positive results as well as the process of manual intervention that failed.

Collection and administration errors

In 15 cases, the wrong blood was collected from the issue location and an inadequate pre-transfusion check failed to prevent its administration to the patient. Three resulted in ABO incompatible red cell transfusion.

In 7 of these cases, blood for a different patient was taken to the clinical area and in 6/7 cases was 'checked' against a compatibility form, with no final bedside identification check.

Five cases involved incorrect use of 'emergency O negative' blood.

In 3 cases, blood was delivered directly from a blood centre to a clinical area and transfused, bypassing the transfusion laboratory and in a further case highlighted earlier, unlabelled FFP was taken from the blood bank and transfused.

In a further 10 cases, the correct component was delivered to the clinical area but was given to the wrong patient.

In 7 of these cases the blood was checked away from the bedside against a compatibility form, and then taken to the wrong patient.

Of particular concern were 2 cases in which, when the error was discovered, the unit was taken down, the giving set changed and the remainder of the unit transfused to the intended patient. These cases, together with 2 reported in the 'unsafe' section in which the blood pack was accidentally punctured then resealed and the transfusion continued, illustrate a worrying lack of understanding of the potential risks of bacterial contamination of blood components.

In 1 case the wrong twin neonate was transfused. Two cases related to 2 patients in adjacent beds on a gastro-intestinal unit, both with obstructive jaundice and requiring invasive procedures, for whom FFP was prescribed. Eight units of FFP, 4 for each patient, were placed on a table between the 2 beds but were transposed. One patient received ABO incompatible FFP.

Case 7 – same name pitfall, colleagues trying to be helpful, and compatibility form used to check

A porter arrived in blood bank to collect 6 units of blood urgently required in ITU for a 76-year-old male patient, but did not take the required documentation with the patient details. He collected blood for another patient with the same surname.

The blood was received by the ITU Sister who informed the patient's named staff nurse that it had arrived, and placed it by the patient's bed, as the named staff nurse was occupied. Another nurse offered to put it up, and asked a student nurse to assist with the pre-transfusion check. Together they checked the unit of blood against the compatibility form and started the transfusion. The nurse then checked the ID number on the prescription sheet against the unit bag, realised it was the wrong blood and immediately stopped the transfusion. The blood was group A, the patient group O.

Case 8 – failure of checking procedures in a night-time transfusion

An 84-year-old female patient (alias Ellen Johnson) was admitted to a medical ward for elective blood transfusion. As the ward was full, she was moved to a surgical ward, which received a total of 10 'boarding' patients that day. Another patient with a similar forename and surname (alias Ella Johnston), with crossmatched blood still assigned to her in the surgical satellite refrigerator, had been discharged from the surgical ward that morning.

Sometime between midnight and 0800 hours, the surgical ward nursing staff telephoned the porters to request collection of the blood for Ellen Johnson, but gave the forename and surname only. The porter went to the surgical satellite refrigerator, without taking the standard documentation for blood collection, and collected a unit of blood labelled for Ella Johnston. The blood for Ellen Johnson was in a different location, as it had been requested from the medical ward. The blood was 'checked' by 2 nurses against the patient's notes and wrist band, but the discrepancy was not noticed until the second incorrect unit was delivered to the ward by porter. Fortunately both patients were group O D negative, with no clinically significant alloantibodies.

Case 9 – multiple errors in an emergency transfusion

A 51-year-old male was admitted to A&E with a haemopneumothorax. A chest drain was inserted, the drainage was heavily bloodstained, and a venous sample was sent to the laboratory requesting 4 units of blood urgently. The patient's blood group was O D positive and 4 units of crossmatched blood were placed in the issue refrigerator, located in a small room off the main hospital corridor. The A&E department was notified that the blood was ready, and a porter was sent to collect it. There was a power cut in the hospital and the porter could not see to sign out the blood, so summoned a colleague to bring a torch. Using faint light, the 2 porters removed all 4 units of blood, but did not check the patient details against the issue sheet.

In the A&E department, 2 nurses 'checked' the patient details and component ID numbers against the compatibility form, but did not check the patient's wristband or ask him to identify himself. No observations were carried out during transfusion of the first unit of blood. When the second unit was commenced the patient complained of feeling unwell and was found to be hypotensive. At this point it was realised that the wrong blood had been collected and administered, and this group O patient had received 1.5 units of group B blood intended for another patient. The patient was admitted to ITU for management of an acute haemolytic reaction and made a complete recovery.

Other errors noted in the process were; that the blood was not prescribed until the first unit was in progress and the wrong surname was written on the transfusion chart. All 4 crossmatched units were removed from the blood bank and, even had the transfusion gone according to plan, 2 would have been out of temperature control.

Case 10 – night time transfusion, lack of wrist band, understaffing and lack of training made this a high-risk situation

Two elderly females were admitted to an orthopaedic ward at night, both with a fractured neck of femur. The ward was understaffed because of sickness and the nurses on duty had not recently received transfusion training. Patient A required transfusion, the urgency of which is not clear. Blood was crossmatched, issued and delivered to the ward, but was given to patient B, a 95-year-old female with dementia who was not wearing a wristband (the nursing staff were waiting until a printed ID band was sent to the ward from the central bed bureau and were unable to confirm her identity). The blood was compatible.

Learning points from these cases

- In all of these examples, staff were working under pressure and against difficulties, e.g. understaffing, power cut, excess workload, and were giving of their best efforts under adverse circumstances, but not realising that 'helping out' by doing someone else's job may increase risk.
- Staff should be educated to adhere to established safe procedures at all times, except in cases of extreme clinical urgency, which may justify the increased risk of deviation.
- High risk situations (such as simultaneous transfusion of patients in adjacent beds) should be recognised and, if unavoidable, special care taken with identification.
- Compatibility forms and patient notes MUST NOT be used as part of the final check at the patient's side[1].
- As recommended last year, blood administration outside of core hours should be avoided unless clinically essential.

2. Laboratory pre-transfusion testing errors (n=28)

Cases where antigen negative blood should have been selected for a patient with a previously known antibody but was not, are included in the 'Special requirements not met' section.

Of the 28 cases reported, 14 occurred 'out of hours', 13 in normal working hours and in 1 report the time was not stated. Twenty-one of the errors involved BMS staff who regularly work in transfusion and 7 involved BMS staff covering transfusion 'out of hours'.

The errors can be divided into testing/interpretation errors, i.e. where a test was not performed/interpreted correctly (6 errors) and procedural errors i.e. SOPs were not followed (22 errors). In one case two procedural errors occurred.

Testing errors included missing weak antibodies (4 cases). Three of these were antibody screens that gave negative results when performed manually but were then found weakly positive when repeated by automated methods. Two reporters cited extending automation to 'out of hours' as a corrective action that presented a training issue. Other problems occurred in antibody interpretation and phenotyping.

There were miscellaneous procedural errors. In 5 reports electronic issue had been used inappropriately when antibodies were present on the historic file or when an antibody identification was still outstanding. Other errors included using samples that were too old (7 cases), failing to consult maternal results when supplying blood to neonates and failing to link historic and current records, thus missing important antibody information.

In a number of cases robust lines of communication did not appear to be in place within the laboratory so that information available to one BMS was not picked up by the next BMS dealing with the case.

Case 11 – failure to check the age of sample

Two units of red cells were electronically issued on a specimen number that was over a-year-old. No formal compatibility testing was performed. The patient suffered a mild transfusion reaction (rise in temperature). A current sample was then located from the haematology laboratory and tested. The sample contained no atypical antibodies and the red cells were compatible retrospectively.

Case 12 – inappropriate use of electronic issue

Blood was accidentally issued electronically for a patient with a positive antibody screen. The error was detected the following morning during routine hours when the BMS on the antibody bench noticed that blood had already been issued on the sample that she was performing an antibody identification panel on. The antibody was identified as anti-E. By this time, the patient had been transfused 2 of 4 units, one of which was E positive. At the time the report was submitted to SHOT, the patient was being monitored by the consultant haematologist.

Case 13 – use of multiple patient identification numbers creates a hazard

A sample for group and save was entered into the computer with a Trust number. The BMS booking in the request failed to notice a previous record indicating the presence of anti-K. The antibody screen was negative. During the on-call period a crossmatch was added to the request and 6 units of blood were issued urgently, before the BMS on call realised that there was another record for the patient showing the anti-K. All 6 units were K negative. The two records were waiting to be merged.

Case 14 – failure to record an antibody specificity and use of a sample that was too old may have contributed to a death

Blood was originally transfused on the 9th and 10th of the month when the patient underwent CABG with subsequent complications. The patient had a known, single antibody at this stage (anti-Fy^{a}). A further blood sample was taken on the 13th and used to crossmatch blood for transfusion on the 16th. A new request for crossmatch was received on the 21st as the patient was anaemic. This sample revealed a new antibody (anti-Jk^{b}) and it was shown that the patient was undergoing a delayed haemolytic transfusion reaction. On laboratory investigation into the case 2 errors were uncovered: the sample used for transfusion of blood on the 16th was too old; as the patient had been recently transfused the sample used should have been taken within 24 hours of the next transfusion. When the antibody identification panels from the 13th were checked it was found that an anti-Jk^{b} had been detected but had not been entered onto the transfusion computer. The patient subsequently died as a result of the post-CABG complications, although the DHTR may possibly have been a contributory factor.

Learning points

- Laboratories must ensure that robust systems are in place for highlighting 'outstanding' work on a patient, for example patient records awaiting merging, incomplete antibody identification.
- Laboratories should follow the comprehensive guidance on the electronic selection and issue of units given in the BCSH guideline: 'The specification and use of IT systems in Blood Transfusion Practice'. Some pertinent points from this document are:
  - Robust procedures and strict adherence to protocols is essential to ensure safe working practices.
  - All electronic issue procedures should be controlled by computer algorithms to validate appropriateness of actions.
  - For previously transfused patients, the timing of the sample must comply with BCSH guideline 'Compatibility Procedures in Blood Transfusion Laboratories'[10].
  - The patient's serum/plasma does not contain, and has not been known to contain, clinically significant red cell alloantibodies reactive at 37°C.

3. Blood of wrong group given to recipients of ABO or D mismatched haemopoetic stem cell and solid organ transplants (n=8)

- 5 ABO mismatched haemopoetic stem cell transplants
- 2 D mismatched haemopoetic stem cell transplants
- 1 ABO mismatched liver transplant

The liver transplant patient suffered severe haemolysis resulting in acute renal failure, but this was not considered to be caused by the transfusion (imputability 0). The remaining 7 patients had no adverse reactions to transfusion.

In 5 of these cases the requestor did not inform the laboratory that the patient had received a mismatched transplant. One of these should have been detected by the laboratory finding a discrepant reverse group.

In 3 cases the primary error was in the laboratory, including 2 where the BMS failed to take note of a computer 'flag'.

Three of the 4 cases in which there was a laboratory error were tested outside normal working hours by a BMS who did not normally work in transfusion. The degree of urgency is not clear.

Learning points

- Clinical staff must ensure that the transfusion laboratory is fully aware of these complex cases, and unless there is extreme urgency, pre-transfusion testing should be done by experienced staff during normal working hours.
- A mechanism for communication of transplant details between clinicians and laboratories must be in place.

4. Transfusion of components of inappropriate specification or that did not meet special requirements (n=108)

The number of these cases is reduced from last year, particularly those requiring irradiated or antigen negative blood. Irradiation is now carried out exclusively by Blood Establishments but it is unclear what effect this might have on adverse event reporting rates. Nevertheless, 82 patients were placed at risk of TA-GvHD. There were no adverse outcomes in this category.

Table 10
Special requirements not met

Special requirement	No. of cases
Irradiated components	77
CMV negative components	9
Irradiated and CMV negative	5
Antigen negative red cells for patient with known antibody	7
Phenotyped or K-neg red cells	2
Neonatal/paediatric red cell transfusion,	4
Viral inactivated single donor non-UK FFP for children <16	4
Total	**108**

Table 11
Sites of the errors that led to failure to provide special requirements

Site of Primary Error	No. of cases (%)
Request errors	79 (73%)
Also laboratory error	18
Also bedside error	24
Blood establishment errors	4 (4%)
Also hospital laboratory error	1
Hospital laboratory errors	23 (21%)
Also bedside error	10
Unsuitable component collected	2 (2%)
Also bedside error	2
Total cases	**108**
Total errors	***163***

In 38 cases there was failure to request special requirements and no means of detecting these requirements at a later stage (in the laboratory or at the bedside). In 19 of these cases patient care was shared between 2 healthcare organisations and the need for the special requirement was not communicated to the organisation where the patient was being transfused.

Learning point

- A formal mechanism needs to be introduced for informing other hospitals of patients' special requirements.

Table 12
Indications for irradiated products (n=82)

Indication for irradiated components	No. of cases
Purine analogue therapy	29
Stem cell transplantation	8
Hodgkin's Disease	19
Di George syndrome (confirmed or suspected)	5
SCID	2
Severe aplastic anaemia/ALG	1
Neonate, previous *in utero* transfusion	2
Miscellaneous *	16
Total cases	**82**

* Includes cases in which the indication for irradiation is unclear, or appears to be in excess of current BCSH guidelines

Case 15 – use of multiple patient identification numbers creates a hazard (again)

A 34-year-old female patient with Hodgkin's Disease was admitted to the local hospice for top-up transfusion. The request was made using a hospice admission number, not the Hospital number, and the previous transfusion laboratory history was therefore not found. The request form stated 'Hodgkin's Lymphoma' but the box requesting irradiated components had not been ticked. The BMS 1 doing the crossmatch did not recognise the need for irradiated blood.

Cases 16, 17, 18, 19, 20

These 5 infants aged between 10 days and 4 months and with a confirmed or suspected diagnosis of Di George Syndrome, received non-irradiated blood components during cardiac surgery. In 4 cases, the blood request did not specify irradiated components, though the diagnosis was written on the request form. In the fifth, the diagnosis was made during the operation and irradiated components were requested, but the previously ordered, non-irradiated blood was used.

CMV negative components (n=14)

The balance of evidence from clinical studies suggests that acceptable CMV safety can be achieved by pre-storage leucodepletion[11], however CMV seronegative cellular components continue to be requested and provided for CMV antibody-negative pregnant women, CMV antibody-negative recipients of allogeneic stem cell transplants, intrauterine and exchange transfusions and patients with HIV disease[12]. No case of transfusion-transmitted CMV has been reported to SHOT.

Antigen negative red cells for patient with known antibody (n=7)

All but 1 of these cases were laboratory errors, including 1 error by a reference laboratory

One case was reported where the patient was known to have anti-e, but emergency group O D negative blood was taken from a satellite refrigerator in an emergency. Anti-e had been found on the pre-op sample & reported. The patient was taken to theatre without checking the blood group and antibody results, thus not requesting appropriate blood in advance. When uncontrolled bleeding occurred emergency O negative (rr and thus e positive) was used without contacting and consulting with the laboratory. The laboratory did have type-specific blood available in stock that could have been issued as type specific immediately had they been asked to do so.

Phenotyped or K-neg (n=2)

One was a patient with sickle cell disease, and one a young female, where hospital policy was to provide K negative blood.

Neonatal transfusions (excluding irradiation) (n=4)

In 2 cases 'adult' group O D neg blood was taken from a satellite refrigerator for a neonate in extremis.

One case was of red cells in SAG-M provided for a neonatal exchange transfusion because the reason for transfusion was not stated in the verbal request.

One case was of 'adult' red cells provided by blood bank staff for a 9-month-old infant because the volume requested was greater than 1 paedipack.

Failure to issue viral-inactivated non-UK FFP for a child less than 16 years (n=4)

Four cases were reported. In two the FFP was required urgently and MB was not readily available.

In a further two cases a computer flag might have ensured selection of correct component.

Learning points

There are opportunities throughout the transfusion chain where special requirements can and should be documented and communicated. There should be formally established communication channels, supported as far as possible by information technology.

- Bone marrow transplant units must have a robust mechanism in place for communication of special transfusion requirements, and responsibilities must be clearly defined.
- Arrangements for shared care must specifically include communication of special transfusion requirements.
- Identifying the need for special transfusion requirements is ultimately a clinical responsibility and the requirement must be clearly indicated on the request form and the blood prescription. The design of such documents should facilitate this and prescriber education is required. The use of an e-form may improve accuracy and facilitate the process.
- There should be local protocols empowering blood transfusion laboratory staff to ensure that appropriate clinical information is provided with requests for blood transfusion. It is not the responsibility of the laboratory staff to recognise clinical conditions indicating special requirements, but they can provide an additional safeguard and should check the clinical and demographic details on the request form.
- IT 'flags' should be used wherever possible, e.g. date of birth warnings, transplant patient.
- The pre-transfusion check at the bedside must include checking of special requirements against the prescription.
- When purine analogues are prescribed for a patient this should be immediately communicated to the transfusion laboratory so that the patient record can be appropriately 'flagged'. This can be effectively achieved by automatic download from the pharmacy to the laboratory computer.
- A histological diagnosis of Hodgkin's Disease should trigger a communication to the transfusion laboratory. Again, this can be supported by a link between the histopathology and the transfusion laboratory computer systems.
- Cardiac surgical units undertaking correction of congenital heart defects must be aware of the requirements for irradiated blood for patients with confirmed or suspected Di George Syndrome.
- The need for irradiated components must be clearly indicated in the patient's case notes and on blood component prescription chart.
- The patient must be educated regarding the requirement for irradiated components and provided with written information and a card.

5. Inappropriate or unnecessary transfusions (n=51)

These cases are important as they carry a high risk of mortality and morbidity, this year accounting for 2 deaths (see cases 1 and 2 above).

In 37/51 of these cases the decision to transfuse was made on the basis of incorrect information.

- In 21 cases this was due to an FBC result from an unsuitable sample, e.g. taken from the same arm as an i.v. infusion, or allowed to settle in a syringe, or containing clots.
- In 1 reported case the sample for FBC was taken from the wrong patient.
- Four cases were due to wrong analytical results, 2 from the haematology laboratory and two near patient testing, one of which was a derived Hb result from a blood gas analyser.
- In 7 cases the full blood count result was misinterpreted or wrongly entered into the patient's notes.
- In 4 cases the cause of the error was not clear.

In all of these cases it could be argued that there was also a requesting/prescribing error, in that the decision to transfuse was made on the basis of a laboratory result, without sufficient attention to the clinical picture. This is discussed in more detail in the Key Message (p. 17).

Nine cases, including one fatality, involved a prescribing error, and in 5 the wrong component (e.g. platelets instead of FFP) was collected from the blood bank and transfused.

The errors leading to inappropriate or unnecessary transfusions are summarised in table 13.

Table 13
Sites/stages of errors leading to inappropriate transfusion

Primary error	Number
Unsuitable sample for FBC, e.g. from 'drip arm' or from wrong patient	22
Also laboratory failed to note unsuitable sample	*4*
Analytical error (haematology laboratory)	2
Analytical error (near-patient testing)	2
Reason for wrong result not known	4
FBC misinterpreted or wrongly transcribed	7
Prescription error (incorrect volume or rate, failure to check FBC)	9
Wrong component collected from blood bank	5
Total cases	**51**
Total errors	**55**

Case 21 – faulty sampling technique, poor clinical decision making and lack of formal handover result in unnecessary transfusion

An 88-year-old female patient was recovering from elective surgery. Blood samples for full blood count and biochemistry were taken by a junior doctor from the same arm as a saline infusion, resulting in a falsely low Hb (6g/dL). The junior doctor ordered and prescribed 4 units of red cells. The registrar on duty recognised that the results did not fit in with the clinical condition of the patient and asked for the investigations to be repeated. A further sample was sent to the laboratory, but was not requested as urgent and was labelled with a different hospital number. The sample was received in the laboratory following a shift change, and because of the different hospital number the BMS did not recognise the discrepancy in the results. The repeat Hb was 12g/dL, the result was not telephoned to the ward but was sent electronically. The junior doctors had also changed shifts, the doctor coming on duty was not aware of the repeat sample and the 4 units were transfused. The post-transfusion Hb was 18g/dL. No ill effects were reported.

Case 22 – incorrect telephone transcription triggers unnecessary hospital admission and transfusion

A 62-year-old female attended her GP complaining of headache; a full blood count and ESR sample were sent to the hospital for testing. The ESR was elevated and the clinical details prompted the laboratory to telephone the GP surgery with the results, which included Hb 12.4g/dL. The results were written on a scrap of paper by the receptionist and later transcribed into the doctor's log. The original paper was destroyed. The Hb was recorded in the log as 4.4g/dL. The GP saw the patient again the following day and arranged for her urgent admission for transfusion and investigation of anaemia. The admitting doctor noted that she had no symptoms of anaemia but nevertheless proceeded with transfusion. Further blood samples were taken but the transfusion was commenced before the results were available. The repeat Hb of 12.3g/dL was telephoned to the ward, the transfusion was stopped and the patient discharged.

Case 23 – consultant fails to keep up to date with transfusion practice

A consultant verbally instructed a junior doctor to prescribe '5 packs' of platelets (intending 1 ATD) for a 68-year-old male patient with leukaemia. The BMS queried the request, but was overruled as it had been a consultant instruction.

Learning points from these cases – some still pertinent from last year

- All staff undertaking phlebotomy must understand the importance of correct patient identification and correct sampling technique and must be assessed as competent.
- Blood should only be prescribed by a doctor who has undertaken training in blood transfusion and has been assessed as competent.
- Laboratory results must be evaluated in the context of careful clinical assessment of the patient.
- Implementation of shift systems requires an arrangement for formal handover.
- Formal protocols are needed for telephoning of laboratory results, including 'read-back'.
- There should be local protocols empowering blood transfusion laboratory staff to query clinicians about the appropriateness of requests for transfusion against local guidelines for blood use.
- Analytical errors involving point of care testing (e.g. erroneous Hb results obtained from blood gas analysers) should be reported to the MHRA Medical Devices division so that they can be investigated with the manufacturer of the device, and any problems disseminated to all users. Reports can be submitted electronically or forms downloaded from the MHRA website www.mhra.gov.uk.
- Consultant staff should ensure that they keep up to date with current transfusion practice.

6. 'Unsafe' transfusions (n=74)

These cases might be regarded as relatively low risk, but many give cause for concern, particularly the handling errors in clinical areas.

Table 14

Type of error	Number
Blood out of temperature control	33[a]
Blood component given was past its expiry or suitability date	25[b]
Blood components transfused over an excessive time period	11
Other handling errors	5[c]
Total	**74**

[a] There were 7 cases where blood was out of temperature control during transfer between hospitals (2 were community hospitals) or to off-site units.

In 13 cases blood was out of the refrigerator for >30 minutes, then returned to stock and later transfused.

In 8 cases blood was out of temperature control in a clinical area (e.g. in a ward drugs refrigerator).

There were 5 blood refrigerator failures.

[b] Thirteen patients received expired components (5 where component expired at midnight and was transfused before it could be cleared from stock the next morning). There were cases of recently transfused patients where the period of suitability of the blood had expired.

There was 1 case of FFP given after its post-thaw expiry.

[c] In 2 cases the blood pack was punctured by the giving set spike and sealed with tape.

In 1 case where a blood warmer was not available and a red cell unit was immersed in a bowl of warm water.

In 1 case FFP was thawed by a locum BMS in a bucket of water as the correct equipment was broken. In these circumstances a thermometer should have been used to monitor the temperature but this was not done.

In 1 case a large clot was found in a unit of red cells during transfusion.

There were 4 cases that occurred outside an acute hospital setting (2 in community hospitals, 1 GP unit, 1 in a hospice). These numbers are small, but highlight the importance of correct handling. Denominator data is not currently available for the number of transfusions taking place in the community, but it must be made clear that transfusion guidelines and policies apply to all settings in which blood is given.

7. 'Right blood to right patient' (RBRP) (n=55)

As in previous years, we have given reporters the opportunity to separately submit incidents where the right blood was transfused to the right patient despite one or more errors, which should have led to the unit being rejected. These incidents do not fit the definition for IBCT but are, nevertheless, instructive. They are not included in the overall numbers of IBCT cases. Six cases originally sent as IBCT by reporters were transferred to this section.

The 55 cases are summarised in table 15

Table 15
Right blood to right patient episodes

Elements that were wrong on blood packs, documentation, identity bands, etc	Number of incidents
Name alone or with other elements	17
DOB alone or with other elements	15
Transposed labels on 2 units	9
Hospital or NHS number	8
Incorrect unit signed for in transfusion lab records	2
Units unlabelled	1
Miscellaneous:	
Incorrect address used on sample and form	1
Old compatibility form used to check units in theatre	1
Laboratory data entry error for component blood group	1

Regardless of what the error was, where it was made or by whom, the vast majority of these transfusions (98%) should have been prevented by one or more checking procedures.

Table 16 shows where the error(s) should have been picked up but were not or were ignored.

Table 16
The checking procedure(s) that failed to detect the error(s)

Checking procedure	Number of incidents
Laboratory + bedside checking	20
Sampling + bedside checking	17
Sampling + laboratory + bedside checking	6
Collection + bedside checking	3
Patient registration + bedside checking	3
Sampling + laboratory	2
Blood centre + laboratory + bedside checking	1
Laboratory + collection + bedside checking	1
Bedside checking	1
Clinical decision to proceed	1

In IBCT cases, except in very unusual circumstances, if there was a clinical decision to transfuse despite the component being in some way unsuitable, the incident would not be included in the analysis. However, in the case of 'right blood to right patient', clinical decisions are often taken because the clinician is unable to see the potential for error and such decisions are made in routine situations as often as in emergencies.

RBRP case 3

A patient was admitted to ITU, from where a request for platelets was received with an incorrect DOB on the sample and form.

The BMS on duty altered the laboratory computer record to fit with the incorrect information and issued the platelets.

Several days later, another request was made, this time with the correct DOB, and the error in the laboratory was corrected.

RBRP case 6

Two units of blood were crossmatched for a patient, and one was transfused pre-operatively on a ward.

The second unit was required in theatre, but the compatibility form had not been sent to theatre with the patient's notes. A consultant anaesthetist carried out the checking procedure using a compatibility form from a previous transfusion, which was in the notes.

RBRP case 39

A patient was admitted using details from an old prescription sheet in the notes, which contained an incorrect hospital number. This number was then transcribed onto a new prescription sheet, nursing notes, care pathway and wristband.

Patient ID labels containing the correct details were printed from the electronic patient record, then used on the sample and request form for transfusion.

The discrepancy was discovered during the bedside check on the third unit of blood for this patient.

5.1 Errors related to IT systems

As noted in last year's report, problems with IT systems (or their incorrect use) continue to cause IBCT incidents. In 2006, there were 27 cases (28 errors) that led to the transfusion of an incorrect component (see Table 17).

Table 17

Error	No. of reports	Non-irradiated unit transfused	Antigen positive unit transfused	Non-CMV Neg unit transfused	Other	BMS works routinely in Lab
Records not merged	6	2	4	0	0	3/6
Computer system 'down'	6	3	1	1	1 (transcription error)	6/6
Historical record not consulted	3	2	1	0	0	2/3
Protocols for searching previous records insufficiently flexible	3	3	0	0	0	2/3
Ignored warning flag	2	1	1	0	0	1/2
Data not transferred from old system	1	0	0	0	1 (ABO mismatch)	1/1
Failure to update warning flags	1	0	0	0	1 (MB-FFP for a child)	0/1
Inappropriate electronic issue	6	0	4	0	2 Protocol violations	5/6

Patients often acquire multiple hospital numbers (4 in one instance) and case records. It is essential to merge records regularly so that warning flags are not missed by accessing the 'wrong' computer record. Implementation of the NHS number, as recommended by NPSA[13] , will reduce this risk.

'Down time' on the laboratory computer system, making the transfusion record inaccessible, was responsible for 6 incidents. In 1, mis-transcription of a phoned Hb result led to an inappropriate red cell transfusion. During scheduled down time, non-essential transfusions should be avoided and it is important to have robust back-up and recovery procedures.

In 3 cases the BMS did not consult the historical record and, in a further 3 cases, an inappropriate search strategy failed to locate previous records with a warning flag. In 2 cases the warning flag was ignored or overridden for unclear reasons. In more than half of these cases (5/8) the BMS worked regularly in the transfusion laboratory.

Warning flags indicating requirement for newly available components were not updated and, as a consequence, a child under 16 years did not receive non-UK sourced, virus-inactivated FFP.

An ABO mismatch transfusion could have been prevented by transferring data from the old to the new laboratory computer system as the blood group discrepancy would have been noticed.

The development of IT links between blood transfusion laboratories in different hospitals would significantly reduce the number of cases of IBCT (mainly failure to administer irradiated products) when patients with special requirements are transferred between institutions. In 2006, 12 of the 77 (15.6%) cases of failure to supply irradiated products could have been prevented in this way. (This is unchanged since 2005 when 16% of 'preventable' cases were reported.)

There were 6 cases where red cells were issued inappropriately by electronic selection in contravention of national guidelines and local policies. Four of these led to the issue of red cells incompatible with a known alloantibody. In all

4 cases electronic selection was performed despite a positive antibody screen result. In 1 of these cases the laboratory computer system cannot automatically prevent issue if a positive antibody screen is detected but relies on manual entry of 'not for computer compliant issue'. The other 2 violations involved electronic issue despite inadequate clinical details and issue based on results from a specimen number more than one-year-old (allowed by the computer system). Five of the 6 laboratory staff involved in these cases worked routinely in the laboratory.

Learning points

- Merging of computer records is essential for safe practice. Laboratories should review their procedures and ensure that they have robust procedures for merging of records by appropriately trained and competency-assessed staff. Ultimately, the problem of multiple hospital numbers and case records should be reduced by routine use of the unique NHS Number as a primary patient identifier in line with the recent recommendation from the National Patient Safety Agency[13].
- When laboratory IT systems are 'off-line', non-essential transfusions should be avoided. Robust manual back-up procedures and recovery plans must be in place and tested.
- Laboratory IT systems should be designed to ensure that 'warning flags' are prominently displayed, preferably on the opening screen, and cannot be overridden or bypassed.
- Staff must be trained in appropriate search strategies to ensure that all relevant records are accessed.
- Transfusion laboratories should have direct access to the hospital Patient Administration System and / or pathology results and the ability to review haematology results online (ideally on the same screen).
- When new laboratory IT systems are installed, patient data from the old system should be transferred as a matter of urgency to the new system. Wherever possible this should be done electronically to minimise the risk of transcription errors (see SHOT Annual Report 2005).
- Where historical records were not checked or inappropriate search strategies used, more than 50% involved biomedical scientists who work regularly in the transfusion laboratory. This problem is clearly not confined to 'on call' or rotating staff. Laboratories must ensure that all staff using the IT systems have appropriate training, updates and documented competency assessment.
- Poor communication around the transfer of patients between hospitals remains a significant cause of error. As noted in previous SHOT Annual Reports, the development of IT links between transfusion laboratories, or access to an electronic patient record (EPR) containing accurate and up-to-date transfusion data, would significantly reduce the number of IBCT due to special requirements not being met. This would also impact on delayed haemolytic transfusion reactions caused by blood group alloantibodies that have fallen to undetectable levels. The UK Connecting for Health project has the potential to meet these needs but the question of how and when transfusion data is entered on the EPR must be resolved.
- All laboratories using electronic selection to issue red cells must ensure that their operating procedures are consistent with national guidelines and followed by laboratory staff[14]. The computer algorithms in use must prevent issue outside the guidelines.
- IT systems that support transfusion safety, monitoring and traceability outside the laboratory (e.g. blood-tracking systems and bedside ID systems) should be integrated with laboratory systems and processes. Laboratory staff must be fully trained in relation to these systems and be able to provide support and advice to clinical areas on a 24/7 basis.

Further details of requirements for IT standards and specifications for transfusion can be found in the relevant BCSH and NPSA guidance[15,16].

5.2 Adverse events relating to anti-D immunoglobulin (Ig) (n=77)

Seventy-seven events were related to anti-D immunoglobulin administration and are summarised in table 18 below.

The cases of most concern were those in which administration of anti-D Ig following delivery was delayed or omitted, and those where misunderstanding of antenatal serology resulted in failure to monitor the antibody level appropriately during pregnancy (e.g. case 24 below).

The use of routine antenatal anti-D prophylaxis (RAADP) is increasing as the recommendations of the National Institute for Clinical Excellence (NICE) are being adopted[17]. There is therefore an increase in the number of antenatal samples with low levels of anti-D, presenting laboratories with the problem of determining whether this is passively acquired or immune. The BCSH guidelines for blood grouping and antibody testing in pregnancy provide guidance on appropriate follow-up and further investigation[18].

It should also be noted that administration of anti-D prior to taking the second blood sample at 28 weeks gestation (as recommended by NICE) carries the risk of inappropriate administration if the D group determination at booking was incorrect or a weak D unresolved. Implementation of routine fetal genotyping will mitigate these risks.

Table 18
Cases involving anti-D Ig administration with the site(s) of contributing errors
77 cases, 79 errors

Type of event	Number
Omission or late administration of anti-D Ig *Laboratory errors* *Midwife/nurse errors*	26 7 19
Anti-D Ig given to D pos patient *Laboratory errors (including 8 weak D groups)* *Midwife/nurse errors*	19 12 7
Anti-D Ig given to patient with immune anti-D *Laboratory errors* *Midwife errors*	13 6 8
Anti-D Ig given to mother of D neg infant *Midwife error (anti-D given before cord group done)* *Laboratory error (4 wrong D group determinations, 2 wrong result manually entered onto computer, 2 infants grouped as D neg but anti-D issued in error)*	9 1 8
Anti-D given to wrong patient (all were midwife/nurse errors)	4
Wrong dose given (1 lab error, 1 doctor error)	2
Anti-D Ig expired or out of temperature control *Laboratory error* *Also midwife error* *Clinical error in community*	2 1 1 1
Other (laboratory errors)	2
Total cases ***Total errors***	**77** ***79***

Omission or late administration of anti-D

This was a heterogeneous group of cases. Seven resulted from laboratory errors, including incorrect transcription of the D group of an infant, selection of an incorrect 'standard comment', failure to issue anti-D, failure to recognise the requirement for anti-D in a patient at 19/40 gestation admitted with an antepartum haemorrhage, and 1 difficult case in which the D group was determined as weak D and the patient treated as D positive, including transfusion of D positive blood, but subsequently developed anti-C+D.

In 19 cases the primary error was by a midwife or nurse, 7 occurred in the community and 12 in a hospital setting. In many cases the reason for late or non-administration was not clear. Lack of communication and poor documentation were common features.

These cases highlighted the need for clear protocols and definition of responsibilities within care pathways.

Anti-D Ig given to D positive patients

These cases resulted from errors in D group determination, documentation or communication, or reflected misunderstanding of the laboratory report. Ten involved patients with weak D antigen, and, as commented in previous reports, may be unavoidable, as technologies differ in their sensitivity.

Eight cases of weak D were reported as laboratory errors, but in 2, a change of D status was recorded in the notes but not noticed by the midwife.

In 4 cases, the D group was incorrectly determined by the laboratory as D negative, with 2 being due to problems with laboratory analysers.

Five patients documented as D positive were given anti-D in error, 2 by a community midwife without checking the group, 2 by hospital midwives (in 1 case the wrong patient's grouping result was stuck in the notes), and 1 by a theatre staff nurse following evacuation of retained products of conception.

Anti-D Ig given to patients with immune anti-D

These 13 cases revealed a worrying inability of laboratory staff and midwives, to interpret the finding of anti-D in routine antenatal serological testing. They are of major concern, as misinterpretation can result (as in case 24) in failure to monitor the antibody level during pregnancy, with the risk of missing the development of haemolytic disease of the fetus and newborn. In a further case, classified as 'other', an anti-D found at 28 weeks was assumed to be passively acquired and no further investigation was done.

Laboratory errors

Laboratory errors accounted for 37 (47%) of the reported errors in this section. In total there were 10 D typing errors, of which 2 involved manual tube tests that were incorrectly performed, 3 were errors in manual recording of results from automated / semi-automated analysers and 5 errors were reported due to analyser problems. Three of these cases were from one site that had a software problem on an automated analyser. Such failures should be reported to the manufacturer and to MHRA Medical Devices division so that all users are alerted.

Four laboratory errors, in particular, raise issues of appropriate staffing levels and experience: in 1 case an MLA was responsible for issuing anti-D to a woman who had immune anti-D. Another report stated that there were insufficient experienced staff to interpret a Kleihauer film, hence the Kleihauer was not reported within 72 hours and anti-D administration was delayed. In 2 cases, misinterpretation of antibody identification results by BMS staff meant that appropriate fetal monitoring was not carried out, with possible dire consequences, as discussed above.

Case 24 – misinterpretation of an antibody panel had serious consequences

A D negative pregnant woman suffered an antepartum haemorrhage at 16 weeks gestation and received anti-D Ig. At 28 weeks a strongly positive antibody screen was misinterpreted by the laboratory as being due to prophylactic anti-D, quantification was not done and she received a further prophylactic dose. She went into spontaneous labour at 33 weeks. A full antibody identification panel revealed anti-C+D, with a level of anti-D of 75.4iu/mL. The infant required phototherapy for 5/52 and 3 top-up transfusions. Investigation in the laboratory found that there was no SOP for laboratory testing following administration of prophylactic anti-D, and the laboratory report at 28 weeks had been inappropriately authorised.

Case 25 – anti-D Ig given unnecessarily

A D negative patient known to have alloimmune anti-D since 2003 delivered a D positive infant and was given 500iu of anti-D Ig. This was given by the midwife from stock held on the delivery ward, on receipt of the cord blood group result and without checking the patient's notes. An identical incident involving the same patient had occurred 2 years previously.

It appeared that the standard practice on the unit was to give anti-D Ig to all D negative mothers following delivery of a D positive infant, unless advised to the contrary by the laboratory. This policy has now been changed; stocks of anti-D Ig were withdrawn from all postnatal wards and are now issued from the transfusion laboratory for individual patients, after interrogation of electronic records to ascertain suitability.

Midwife education was also carried out.

Learning points

- Laboratories undertaking antenatal serological testing should have clear protocols based on BCSH guidelines including algorithms for repeat testing in cases where there is uncertainty whether anti-D is passive or immune[18].
- Laboratory reports should provide clear and unambiguous advice on the need for repeat testing and prophylactic anti-D administration.
- Senior, experienced laboratory staff should take responsibility for interpretation of results and issue of anti-D.
- The introduction of RAADP should be supported by education of doctors and midwives (in hospital and primary care) regarding the significance of antenatal antibodies.
- Agreed protocols, compliant with current legislation, should be implemented for the issue and prescription of anti-D Ig.
- Problems with reagents or laboratory equipment should be reported to the manufacturer and to MHRA Medical Devices division so that other users may be alerted. www.mhra.gov.org.

5.3 Summary of laboratory errors

Table 19
Summary of blood transfusion laboratory errors – all cases (where known)

	Total Errors	Wrong sample	Transcription	Interpretation	Component Selection/ issue errors	Labelling	Procedural errors	Testing
Wrong blood – ABO group	7	3	3					1
Wrong blood – Others	20		4		8	5	3	
ABO mismatched transplant	3						3	
Special requirements not met	42				42			
Inappropriate transfusion	0							
Anti-D errors	42		2	10	5		10	15
Unsafe transfusion	13						13	
Other pre-tx testing errors	28 cases 29 errors			1			22 cases 23 errors	5
Total cases (where known)	**155**	**3**	**9**	**11**	**55**	**5**	**51**	**21**
Total errors	**156**	**3**	**9**	**11**	**55**	**5**	**52**	**21**

COMMENTARY

- The 17.5% reduction in reports in 2006, coinciding with the implementation of SABRE and the Blood Safety and Quality Regulations, is of concern, and suggests that there has been under-reporting this year.
- There were 125 cases this year, including 2 with a fatal outcome, in which there was a junior doctor error in requesting and/or prescribing blood (79 cases where special requirements were not met, and 46 where transfusion was inappropriate). See SHOT Recommendations of the Year (p.19), recommendation 1.
- An increasing proportion of IBCT errors arise in hospital laboratories, with a disproportionate number occurring outside of traditional core hours [DA, personal communication]. Some errors are due to basic slips and lapses, and some to lack of knowledge and competence.
- Failure to check the 3 unique patient identifiers on the patient wristband against the blood component label at the patient's side remains a source of error, and contravenes NPSA SPN 14 and NHS QIS Standards [1,7]. In 6/7 cases where the wrong component was taken to the clinical area, and 7/10 cases where the component was given to the wrong patient, the blood was 'checked' away from the bedside against a compatibility form. Many hospitals have successfully eliminated the compatibility form altogether from the bedside check[19]. This is strongly encouraged and is a recommendation of NPSA SPN 14.
- Implementation of an integrated care pathway or care bundle for blood transfusion can support good decision making, facilitate communication and documentation of special requirements and improve the safety of the process.

RECOMMENDATIONS

- As required by the CMOs' Better Blood Transfusion, NHS Clinical Governance framework and NHSLA, hospitals must ensure that all IBCT events are reported to SHOT.

  Action: Trust CEOs

- Blood should only be prescribed by a doctor who has undertaken training in blood transfusion and has been assessed as competent.

  Action: Trust CEOs

- The National Transfusion Laboratory Collaborative aims to improve standards, staffing levels, knowledge, competency and skills in hospital laboratories, and should be supported.

  Action: National Transfusion Laboratory Collaborative, stakeholder professional bodies, Trust CEOs

- Hospitals must comply with the requirements of NPSA SPN 14 or NHS QIS Standards for Blood Transfusion. HTTs should investigate and evaluate options for eliminating the compatibility form.

  Action: Trust CEOs, HTTs, HTCs

- HTTs should investigate and evaluate options for introduction of integrated care pathways or care bundles for transfusion. The NBTCs should facilitate this process.

  Action: HTTs, NBTCs