7. INCORRECT BLOOD COMPONENT TRANSFUSED

Definition
This section describes all reported episodes where a patient was transfused with a blood component or plasma product which did not meet the appropriate requirements or which was intended for another patient.

As in all three previous years this category represents the highest number of reports (201 or 69.1% of 292 new reports) and an increase of 39.6% over the previous year. This chapter analyses 184 new questionnaires and 4 explanatory letters plus 12 questionnaires brought forward from last year. Completed questionnaires are still outstanding on 13 new initial reports and will be analysed next year. As in previous years there were a number of incidents where, despite serious errors in the transfusion chain, the right blood did end up in the right patient by good fortune. These incidents do not constitute near miss events as defined in chapter 14 as a transfusion was administered so they are reported here as IBCT incidents. This classification will be reviewed in time for the next (5th) annual report in 2001.

Analysis of reported errors

The questionnaires sought further information about the circumstances and factors which may have contributed to errors and adverse outcomes. The findings are presented in some detail with the use of case studies where appropriate. The aim is to illustrate weak points in the transfusion process in order to help those responsible for training staff or for the review and implementation of transfusion procedures so that areas for improvement may be identified to ensure that the right blood is given to the right patient at the right time, every time.

The data from 200 completed questionnaires are presented.

The following 3 tables give information on the gender and age of recipients and the blood components implicated in the incident.

Table 12
Sex of IBCT patients

Females	=	110
Males	=	88
Unknown	=	2
Total	=	**200**

Table 13
Age of IBCT patients

Age of recipients	
Age range	0 days to 95 years
Median Age	58 years

Table 14
Components implicated in IBCT (207 components in 200 cases)

Components Implicated	Number of cases
Red cells	162
Platelets	24
Fresh Frozen Plasma	6
Anti-D immunoglobulin [1]	12
Other [2]	3
Total [3]	**207**

[1] Adverse events to this plasma product are usually reported through the MCA yellow card system, but they are reported here because they fall into the category of either blood derivative to the wrong patient or as a result of RhD typing errors

[2] Two reports of albumin administered incorrectly. One was an outdated product and the other a wrong dosage. The third case involved the administration by a blood centre of unirradiated buffy coats for neutropenic sepsis and from which there were no adverse sequelae.

[3] There were 6 cases in which it was not possible to identify a single component. Five of them involved the use of two products (red cells and platelets) another which included 3 products (red cells, platelets, and fresh frozen plasma). The latter was the result of a grouping error in the hospital blood bank.

The outcome of 200 fully reportable incidents is shown in Table 15

Table 15
Outcome of 200 fully reported incidents

OUTCOME	NO. OF INCIDENTS
Death definitely related to transfusion	1
Death probably related to transfusion	1
Death unrelated to transfusion	18
Major morbidity *	13
Minor or no morbidity	167

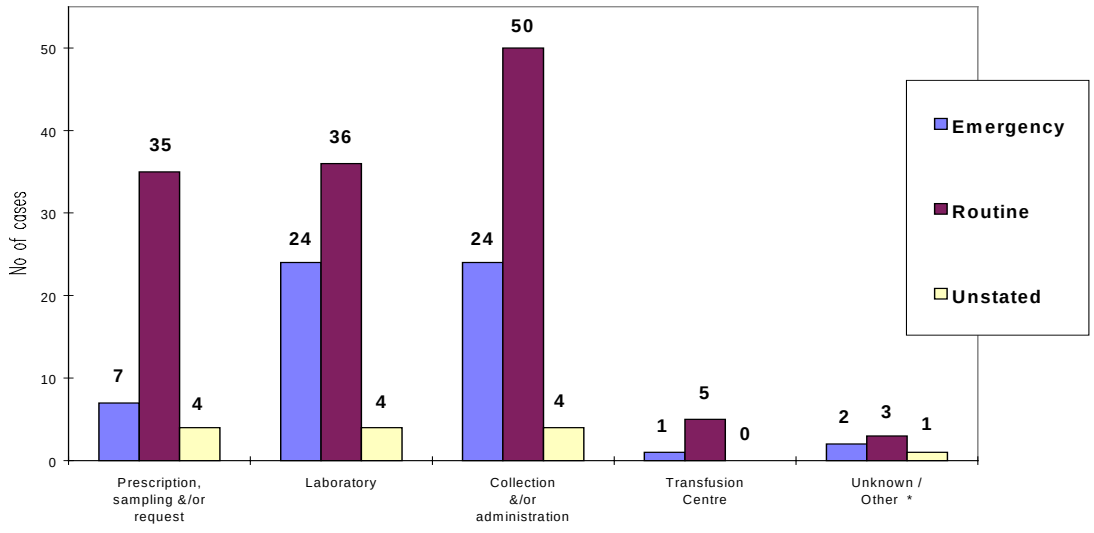
* Major morbidity was classified as the presence of one or more of the following:

- Intensive care admission and/or ventilation
- Dialysis and/or renal dysfunction
- Major haemorrhage from transfusion-induced coagulopathy
- Intravascular haemolysis
- Potential risk of RhD sensitisation in a female of child-bearing potential

Emergency and elective transfusions

Of the 200 completed questionnaires, 129 related to elective and 58 to emergency transfusion. 13 questionnaires did not state whether the transfusion was elective or emergency. Figure 15 shows the distribution of errors relating to emergency and elective transfusions.

Figure 15



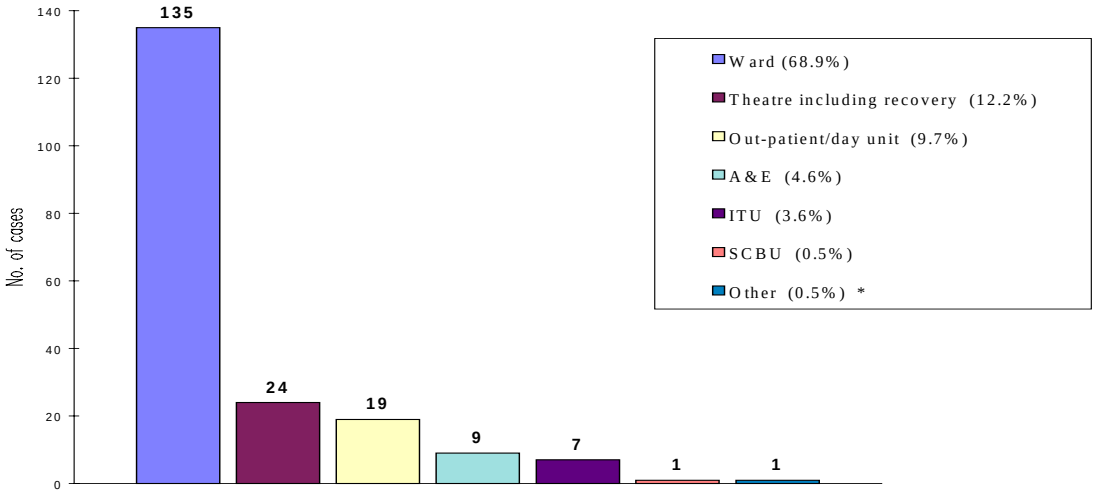
Incidence of errors at the various stages of the process of emergency and elective transfusion (n=200)

* Unknown = 4 cases where it was not possible to determine the source of the error
Other = 2 cases of units being transported from 1 hospital to another out of temperature control

Site of transfusion

The questionnaire asked for information about where the transfusion took place. 194 reports gave information on the site of the transfusion (Figure16). This information is of limited value, however, as no denominator data are available.

Figure 16
Site of transfusion (n=196) [1]

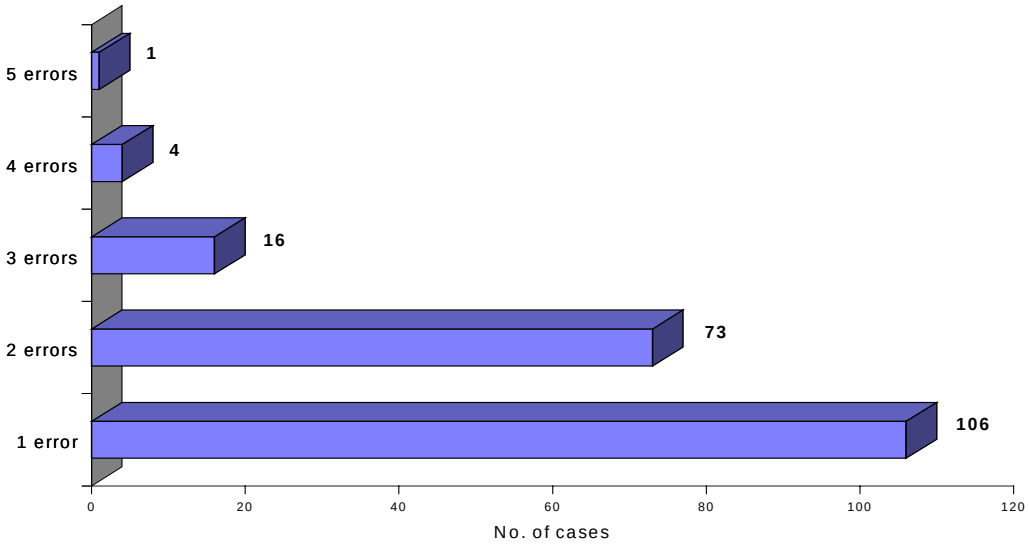


***** Other = 1 Anti-D given in a G.P. surgery
[1] 2 cases involved transfusions on 2 separate sites

Multiple errors continue to contribute to many "wrong blood" transfusions

In all 3 previous years it has been consistently noted that multiple errors have been implicated in many "wrong blood" incidents. This year is no exception and detailed analysis of 200 completed questionnaires has demonstrated their value in highlighting 94 cases (47%) where multiple errors in the transfusion chain culminated in a "wrong blood" transfusion. This year a total of 321 errors was noted in 200 cases and further detail is shown in Figure 17

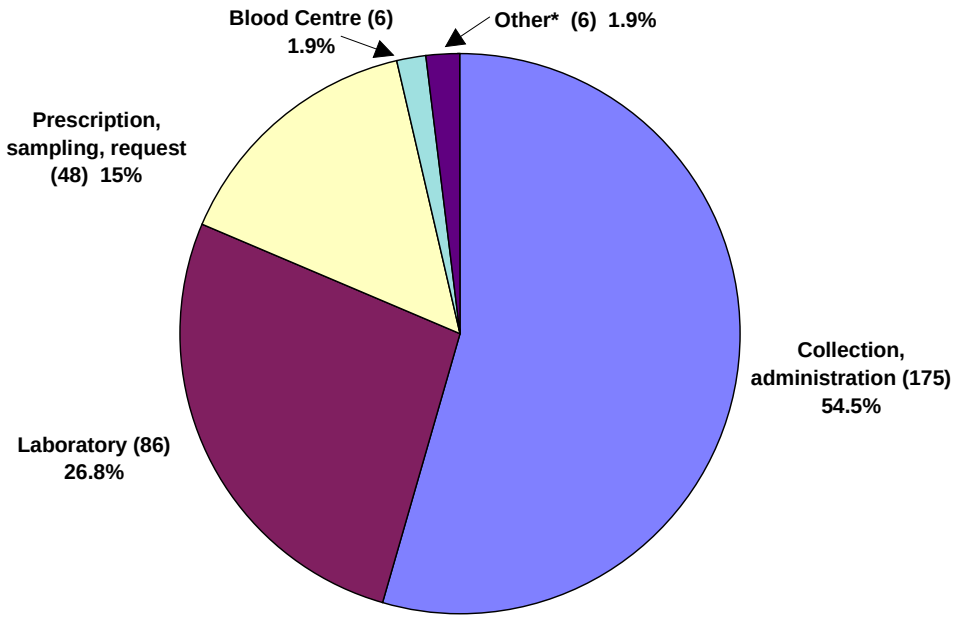
Figure 17
Total number of errors per case (total cases = 200; total errors = 321)



Distribution of errors

The following Pie chart (Figure 18) shows the distribution, according to the main reporting categories, of a total of 321 errors from the analysis of 200 completed reports. A more detailed analysis of the distribution of total errors can be seen in Table16

Figure 18
Distribution of total errors according to the main reporting categories (n=321)



***** 6 errors did not fit into existing categories. 2 errors involved transport between hospitals and 4 errors could not be traced to their source.

Table 16
Distribution of procedural failures in terms of total errors (n=321)

Location	Number of errors
Prescription, sampling and request	
Sample taken from wrong patient	7
Details on request form incorrect	3
Details on sample incorrect	4
Prescription of inappropriate and / or incompatible components(s)	2
Inappropriate request	32
Total	**48**
Hospital Blood Bank	
Transcription error	1
Failure to consult / heed historical record	5
Grouping error	19
Missed antibody(ies)	5
Missed incompatibility	1
Selection / issue of inappropriate component	12
Labelling error	5
Failure to irradiate	4
Crossmatch error	6
Crossmatch wrong sample	4
Failure to follow protocol	12
Incorrect serological reasoning	1
Clerical error	4
Technical error	3
Failure to clear satellite refrigerator	1
Failure to detect error made by Blood Centre	2
Other [1]	1
Total	**86**
Collection and Administration	
Collection of wrong component	46
Failure to detect error earlier in the chain	16
Failure of bedside checking procedure	87
Wristband missing or incorrect	14
Inappropriate component selected by clinician	2
General administration error	5
Failure to follow protocol	1
Other [2]	4
Total	**175**
Supplying blood centre	
Inappropriate component supplied	5
Other [3]	1
Total	**6**
Other	
Unable to trace source of error	4
Unit transfused out of temperature control	2
Total	**6**

[1] Computer system not properly evaluated for use
[2] 1 punctured bag, 2 units out of temperature control, 1 Incorrect clinical decision
[3] Breakdown in communication lead to supply of component which was not irradiated and not CMV Neg

The pitfalls of a complex multi-step, multidisciplinary process

Once again we make no apology for pointing out the complexity of the transfusion process the aim of which must always be to ensure that the right patient receives the right transfusion at the right time. Involving, as it does, many individuals and crossing several professional boundaries with different line management accountability, it is hardly surprising, although not excusable, that errors occur from time to time unless the process is very tightly controlled. The following analysis of 321 errors occurring in 200 cases illustrates how events may combine to result in a "wrong blood" incident.

Errors in prescription, requesting of blood components and patient sampling

There were 48 errors in this category occurring in 47 case reports.

Prescription errors

There were 2 errors relating to mis-prescribing which occurred in 2 cases. The first (case study 1), which fortunately had no immediate clinical consequences, clearly illustrates a number of human errors arising in the context of unclear or unsuitable hospital procedures and over-stretched locum medical staff. This case was very thoroughly investigated by a hospital review panel and specific recommendations made to correct deficiencies. The second (case study 2) is possibly a less commonly recognised cause of unnecessary blood transfusion arising as a result of a falsely low haemoglobin (Hb) result.

Case study 1

A catalogue of errors which resulted in the administration of anti-D immunoglobulin to the wrong patient or "Extraordinary coincidences do occur"

2 obstetric patients with the same surname were admitted to different wards within a few days of each other. The first woman required anti-D immunoglobulin to cover an invasive investigation. This was prescribed by a locum doctor. Later that day the same doctor assessed the second woman and pronounced her fit for discharge. In the meantime the request for anti-D was processed in the laboratory from an inadequately completed request form (the ward name, which resembled the patients' surname, had been abbreviated and the name of the consultant in charge of one of the patients was poorly written and thus resembled the name of the other ward!) The anti-D was issued to the wrong patient and the attending nurse, noting the absence of a prescription, asked the original doctor to attend to write it up. The doctor did not query the request and was too busy to attend the ward so asked a colleague to help by writing the prescription, as a result of which the blood product was administered. The error was discovered when a nurse on the other ward telephoned the blood bank to enquire why the requested anti-D had not been delivered.

Case study 2

Failure to detect an erroneous haemoglobin estimation and to act on the correct result leads to unnecessary blood transfusion

A small volume sample taken from a patient was reported as haemoglobin (Hb) 62 g/dl. A second sample was tested and the Hb found to be 145 g/dl. Laboratory error was considered to have contributed to the reporting of an incorrect result. Despite issuing the second (correct) result in time 4 units of red cells were requested by the clinician who had not looked at the latest result and an unnecessary transfusion of one unit of red cells was given.

Failure to request the appropriate product

In 32 cases there was failure to request the appropriate product. As was shown in last year's report, once again the most common error was failure to request irradiated components for patients at risk, as defined in BCSH guidelines [6] notably 16 patients being treated with purine analogues (15 fludarabine, 1 deoxycoformycin), 4 patients with Hodgkin's disease, 3 patients who had received a bone marrow transplant and 3 due for stem cell harvests. No instances of proven TA-GVHD resulted from these omissions but 1 patient developed skin rash, fever, diarrhoea, and deranged liver function in association with autologous bone marrow failure. A skin biopsy was compatible with TA-GVHD and the patient responded promptly to steroids. The clinician was reluctant to attribute a firm diagnosis of TA-GVHD.

In 2 cases, patients with previous known red cell antibodies, were transfused with red cells unselected for avoidance of the relevant antigen The first of these cases was a patient with previous anti-E and anti-cellano, usually abbreviated to anti-k. The requesting clinician wrote anti-K on the request form. At the time the laboratory computer was down so the historical record could not be checked. On the antibody screening test one cell was weakly positive but the screen and compatibility tests were reported as negative. Wrongly selected (i.e. cellano positive) red cells were transfused without ill effect. The second case was of a patient with previous (but now undetectable) anti-Jka identified and issued with an antibody card at another hospital. The receiving hospital on this occasion detected anti-c and acted appropriately but, as information from the antibody card was not passed on, failed to request Jka negative red cells.

In 1 case anti D immunoglobulin was inappropriately requested. The blood bank reported that a cord sample was RhD negative. Maternity staff made an assumption, presumably from lack of understanding of the significance of the report, that the mother must also, therefore, be RhD negative and requested anti-D. In fact the mother was group A RhD positive.

There was 1 report of a request for homologous blood where autologous was available and 1 failure to request red cells of the appropriate age (< 5 days old) for a neonatal exchange transfusion because ward staff appeared to have been unaware of the guidelines for neonatal exchange transfusion[10] Finally, 1 telephone request made without giving the date of birth and unique patient identity number led to the transfusion of a compatible red cell unit crossmatched from a sample taken from another patient with the same name (see case study 3 below).

Case study 3

Insufficient information on telephoning a request for blood led to the transfusion of a compatible unit crossmatched from a sample from another patient with the same name.

Patient 1 was admitted, crossmatched and transfused without incident. Five days later patient 2, who had exactly the same forename and surname as patient 1 was admitted with a head injury. A sample was taken from patient 2 for group and screen only. The same day patient 1 had a massive G.I. bleed. A telephone request was made to the blood bank for 4 units to be crossmatched for patient 1. The doctor requesting the blood gave only the patient's name but not date of birth or hospital number. The BMS who took the call had just completed the group and screen for patient 2 and, because the name was identical, assumed it was the same person and did not ask the doctor to confirm date of birth or hospital number. At the time the request was made nursing staff expressed surprise among themselves that a further sample was not requested for this patient whose first transfusion had been 5 days earlier but they did not raise the matter with medical staff nor with the blood bank. Two units were then collected from the blood bank by a porter. No formal check was made at this stage. The unit was labelled with details for patient 2 but this was not detected either at collection or at the bedside. Patient 1 received one unit of ABO / RhD compatible blood which had been crossmatched and labelled using another patient's sample. The error was discovered when nurses on the following shift went to the patient to hang the second unit. The patient suffered no ill effects as both patients were group A RhD positive.

Sampling errors

Seven cases involving the taking of samples from the wrong patient.

5 cases involved mis-identification at the time of sampling. In 4 cases the wrong patient was approached for the sample which was subsequently labelled with the intended patient's details. One of these cases in fact resulted from sampling the wrong placenta in a delivery suite (see case study 4). In the fifth case the correct sample was labelled with another patient's details. In the sixth incident the only logical conclusion for the cause of an ABO incompatible red cell transfusion was a sampling error at the bedside but this could not be proven. As a result of these 6 errors there were 3 major ABO incompatible transfusions resulting in 2 acute reactions but no other adverse sequelae, 1 case of erroneous administration of anti D, 1 ABO compatible but non-identical red cell transfusion and 1 case where a group O patient was given group B FFP, an acceptable course of action under certain circumstances. The seventh incident was also an example of sampling from the wrong patient, in this case giving rise to a wrong Hb result (case study 5 below).

Case study 4

An unnecessary administration of Anti-D immunoglobulin following RhD typing from the wrong placenta.

A 28 year old woman who was correctly RhD typed as RhD Negative was given Anti-D immunoglobulin when her baby was found to be RhD Positive. The baby's sample, however, had been taken from the wrong placenta. The error was discovered when a fresh sample was sent from the infant (now on the neonatal unit) and was found to be RhD Negative.

Case study 5

An unnecessary transfusion given because the sample for haemoglobin estimation had been taken from the wrong patient.

A young male patient with serious injuries had samples taken for crossmatching and haematology and biochemistry tests. The sample for crossmatching was labelled correctly but the haematology and biochemistry samples were transposed with those of another patient. When the results were received they indicated that the injured patient's Hb was 6.8 g/dl and an immediate transfusion was ordered. The patient was transfused with 1.5 units of red blood cells crossmatched from the correct sample before the phlebotomy error was discovered. The patient's actual pre-transfusion Hb was 10.8 g/dl which increased following the transfusion to 11.9 g/dl.

Labelling errors

There were 7 errors of labelling which involved incorrect details on sample and/or request in 6 cases. 2 errors of mis-spelling of surnames were considered not to have contributed to the eventual "wrong blood transfusions". 2 more errors resulted in "right blood to right patient" despite repeated mis-spelling of a surname in 1 case and entirely the wrong name on the sample in the other. In a further incident where the date of birth was omitted from sample and request form, the correct computer record, which would have shown up a previous anti-c, was not accessed and the patient was given c positive red cells without adverse effect. The 7th case involved a complex series of four errors resulting in a major ABO incompatible transfusion and is also referred to in the previous section (case study 6).

Case study 6

A sampling error, not detected in the laboratory or at the time of administration, which resulted in a major ABO incompatible transfusion

The first error was the taking of a transfusion sample from the wrong patient and labelling with the intended patient's details. No transfusion history was given on the request form and although the patient had been grouped before, the implementation of a new computer system meant that the old record had not been merged with the new. Correct bedside administration procedure was not followed resulting in the transfusion of <50 ml of group B red cells to a group A patient. An acute reaction (no details available) ensued but no other adverse effects were recorded.

Hospital blood bank errors

Of the 86 laboratory errors noted in 73 case reports, 35 occurred during routine working hours and involved 32 state registered BMSs, 1 supervised MLA and 1 trainee. The 41 errors made out of hours involved 17 BMSs who worked regularly in the blood bank and 24 who did not. In 10 other cases involving 11 errors the grade of staff was not stated. This information is summarised in Figure 19**.** It can be seen that, as in previous years, errors are neither restricted to inexperienced/unfamiliar staff nor to "out-of-hours" situations. Table 17 gives more detail about the errors and grades of staff involved. Approximately 48% of errors occurred in the "out-of-hours" situation but it is not possible to comment on the significance of this information in the absence of relevant denominator data. This information is currently not sought in questionnaires.

Figure 19
Circumstances under which laboratory errors occurred (n=86)

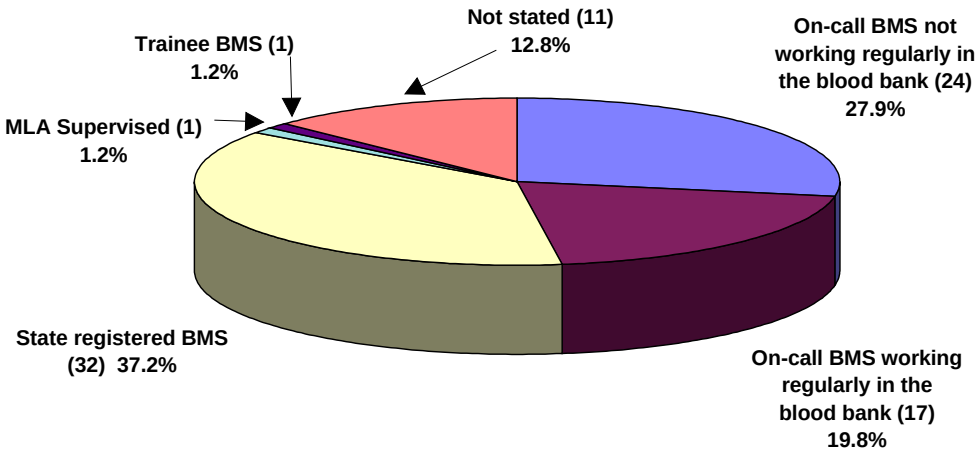


Table 17
Laboratory errors and grade of staff involved (n=86)

Error	Total number of errors	State registered BMS, routine, regularly working in blood bank	State registered BMS, on call, regularly in blood bank	State registered BMS, on call, not regularly in blood bank	Other staff	Unstated
Sample transposition	**4**	3	1	0	0	0
Failure to consult / heed historical record	**5**	2	1	1	0	1
Incorrect group	**19**	6	4	5	1	3
Missed antibody screen	**5**	2	0	2	0	1
Missed incompatibility / crossmatch error	**7**	2	2	3	0	0
Incorrect labelling of component	**5**	5	0	0	0	0
Selection / issue of inappropriate component	**12**	2	3	5	1	1
Failure to clear satellite refrigerator	**1**	1	0	0	0	0
Failure to irradiate	**4**	2	2	0	0	0
Clerical error	**5**	1	1	1	0	2
Other procedural error	**18**	5	3	7	0	3
Other [1]	**1**	1	0	0	0	0
Total	**86**	**32**	**17**	**24**	**2**	**11**

[1] Computer system not properly evaluated for use.

Sample transposition

4 errors fell into this category. 3 resulted in group O RhD positive patients receiving O RhD positive red cells crossmatched using a wrong sample, one of which was serum from a group AB patient. The fourth error, involving two patients with the same name, resulted in major ABO incompatibility with the patient dying from unrelated causes

Failure to consult/act on the historical record

5 errors fell into this category and the details are shown briefly below

- Patient request stated anti K (instead of anti k or anti cellano and anti E). The error was not spotted in the laboratory. There were no adverse sequelae (see earlier)
- A wrong RhD group and failure to check the historical group resulted in unnecessary administration of anti D immunoglobulin
- A sample taken from the wrong patient with failure to check the record resulted in a group A patient receiving group B red cells, fortunately with no ill effects (case study 6)
- A warning on the computer system was ignored and a patient who required irradiated components received unirradiated platelets
- An error in RhD typing resulted in administration of RhD negative red cells to a RhD positive patient and is illustrated below (case study 7).

Case study 7

Mis-grouping, compounded by failure to check the historical record and a wrong unique identifier which was not detected at the bedside

A patient requiring an elective transfusion was sampled correctly. The patient had been grouped before but the transfusion history was not checked in the laboratory. Pre-transfusion testing was reported as group O RhD negative, when in fact the correct group was O RhD positive, with a negative antibody screen. A pre-existing error in the laboratory computer meant that the hospital number was wrong and therefore the wrong hospital number was printed on the pack and issue voucher. This error was not detected at the bedside although the patient's wristband carried the correct identification number. Fortunately this series of errors resulted in the transfusion of compatible red cells.

Grouping, screening and crossmatch errors (n=31)

In this category there were 31 errors occurring in 31 cases.

Grouping errors: Rhesus D

There were 19 errors of grouping. 7 RhD negative patients were grouped as RhD positive and received RhD positive red cells in error. 2 patients died of unrelated causes and 2 were females of child-bearing potential, placed at risk of RhD sensitisation and one of these cases is illustrated below (case study 8):

Case study 8

RhD mis-grouping results in treatment with multiple injections of anti-D immunoglobulin

A young female with traumatic amputation of both legs was rapid-grouped as A RhD positive and 2 units of A RhD positive red cells were issued. In the meantime, confirmatory grouping found her to be A RhD negative but mis-read and entered into the computer as A RhD positive. A further 4 units of A RhD positive red cells was selected using the computer record but on testing a grouping discrepancy was noted. Re-grouping confirmed that the patient was in fact RhD negative, thus preventing the issue of more incompatible red cells. Unfortunately the first 2 units had already been transfused resulting in the need to administer a large amount of anti D immunoglobulin over the next three days. Follow-up to check whether RhD sensitisation has occurred has not yet been completed.

6 RhD positive patients were mis-grouped as RhD negative, resulting in the administration of compatible but incorrect red cells to 2 and unnecessary anti D immunoglobulin to 4.

Grouping errors: ABO

The remaining 6 errors involved ABO mis-grouping, of which 5 resulted in major ABO incompatibility although none suffered any serious sequelae. The sixth case was a group B patient with cold haemagglutinin disease who was erroneously grouped as AB (a well-known pitfall of this condition) and was then transfused with group A red cells. The patient survived an episode of intravascular haemolysis.

Screening errors

5 screening errors resulted in one case of missed anti c and 2 of missed anti E. There was one case of missed anti Fya, masked by a known anti C and the fifth case, in a patient with known anti E+c, a further antibody was suspected but transfusion preceded identification of anti Jka. None of the patients experienced adverse effects.

Crossmatching errors

Finally there were 7 errors of crossmatching, 5 of which combined with other laboratory errors to result in the transfusion of E positive red cells to a patient with anti E, group AB red cells to a group A patient, K positive red cells to a patient with anti K (see case study 9 below), group A red cells to a group O patient and unselected red cells to a patient with anti C+e. With the exception of the fourth patient who experienced intravascular haemolysis, there were no adverse effects. A further patient was given RhD negative red cells instead of RhD positive and the seventh case involved the inappropriate use of electronic issue for a group A patient who had received a group O renal transplant.

Case study 9

Several breaches in laboratory protocol led to the transfusion of K positive red cells to a patient with anti K

An emergency request was made "out of hours" for red cells for a group O RhD Negative patient with a GI bleed. The on-call BMS crossmatched the sample and found it to be antibody positive. He assumed that the patient had developed anti-D, for reasons that were not made clear, and requested that the positive antibody screen be investigated the following day. In fact the patient had developed anti-D + K, and one of the units transfused was Kell positive. The BMS, who did not work regularly in the blood bank, failed to discuss the urgency and possible delay for this patient, did not refer the sample to the local transfusion centre and did not inform the consultant haematologist. Furthermore he/she did not perform the crossmatch correctly and therefore did not detect the incompatibility due to anti-K nor did he enter the results properly. This elderly patient died due to her underlying condition.

Labelling errors (n=5)

4 of these involved placing the label for the intended patient on to the wrong unit. In all 4 cases the error was made by a BMS working during normal working hours and none of the transfusions were in an emergency. Fortunately all these units were ABO and RhD compatible with the patients who received them. The last case was one of "right blood to right patient". The BMS mis-read the patient's name and typed a wrongly spelled version of the name into the computer so that issue labels were incorrect.

Selection / issue errors (n=12)

On 3 occasions date expired units were issued by the blood bank, all of which were issued out of hours, 2 of them in an emergency. 2 cases involved the issue of non-irradiated platelets where irradiated products were required. 1 of these errors was made by a supervised MLA and the other by a BMS working out of hours who issued them despite a computer warning to the contrary. Similarly there were 2 cases in which laboratory staff failed to issue CMV negative products despite computer warnings. Both these transfusions were routine and the products were issued by a BMS working out of hours who did not work regularly in the laboratory. The remaining cases were 1 unit issued out of temperature control because staff had not noticed a fault on the refrigerator, 1 case of albumin issued as 4.5% concentration when it was, in fact, 20%, 1 unit which was irradiated when the unit was over 14 days old, 1 where a group O RhD positive unit was selected for crossmatch for a group A RhD positive patient,

and 1 in which an inexperienced member of the laboratory staff issued a unit crossmatched for another patient mistakenly believing it to be replacement emergency stock.

Failure to clear satellite refrigerator (1)

This error resulted in the transfusion of a unit of red cells with an expiry date 3 days earlier. Prior to this incident the hospital policy was to check satellite refrigerators twice weekly but this has since been changed to daily.

Failure to irradiate (4)

All these cases were failure to irradiate a blood component despite the need for this being detailed on request form and/or there being a warning flag set in the laboratory computer.

Clerical errors (6)

5 of these cases involved incorrect details being entered either onto the laboratory computer or onto issue labels and, in the remaining case, confusion over two patients with the same name led to multiple errors one of which was that the BMS mis-read the name of the ward on a request form and notified the wrong ward that anti-D immunoglobulin was available for their patient (see case study 1 earlier)

Other procedural errors (18)

These were too diverse to cite individually but can be loosely broken down into 4 areas:
1. Failure to follow protocol (12)
2. Technical errors (3)
3. Failure by laboratory staff to detect an earlier error made by the local transfusion centre (2)
4. Incorrect serological reasoning (1).

Errors in the collection and administration of blood components

There were 175 errors in this category occurring in 113 case reports, comprising 54.5% of all errors.

Collection of incorrect component (46)

As in previous years, collection of an incorrect component from its storage site in the hospital remains a significant cause of error. There were 46 incidents in this category and, as in the past, errors were not restricted to specific groups or grades of staff and occurred irrespective of formal checking procedures at the time of collection (Table 18). Failures at this important intermediate stage of the transfusion process continue to set the scene for later failure of the bedside checking procedure. Of note and contrary to recently published BCSH guidelines [5] in 31/46 (67.4 %) of these incidents it was reported that no formal checking procedure was carried out, at the point of collection, by the person responsible for collecting the blood component (Table18).

Table 18
Collection errors according to grade of staff involved and whether or not a formal check was made at this stage (n=46)

GRADE OF STAFF	FORMAL ID CHECK		
	Yes	**No**	**Unknown**
Registered nurse	3	11	3
Unregistered nurse	3	4	
Porter	1	10	2
Theatre staff		3	1
Other *		2	
Unknown		1	2
Totals	**7**	**31**	**8**

***** 1 midwife, 1 night staff, grade unknown

Failure of bedside checking procedure

The 87 incidents in this category occurring in 86 case reports contributed 27% of errors reported in all categories. 46* preceding errors of collection (45 cases) and laboratory errors (11 cases) were not detected by the bedside check and in 10 cases missing patient identification wristbands contributed to the error. There were 68 bedside mis-identification episodes. Contributory factors included confusion over two patients with the same or similar names (including newborn twins), failure to adequately distinguish between "unknown" trauma victims, checking remote from the patient's bedside and swapping of units of red cells left on bedside lockers even although correct checks had been carried out.

In addition, 18 other bedside administrative errors occurred, including confusion over emergency group O RhD positive and group O RhD negative red cells, transfusion of expired blood components, failure to detect haemolysed red cells, failure to detect a discrepancy between the compatibility label and blood centre donation details as a result of laboratory labelling error and "right blood to right patient" episodes, despite wrong identification details such as unique patient ID and surname. The common factor in all cases was inadequate checking at the bedside.

These "wrong blood" incidents resulted in 25 cases of major ABO incompatibility in which there was 1 death definitely related, 1 death possibly related to the transfusion and 6 cases of major morbidity, 2 of which also involved RhD incompatibility. 1 case of major ABO incompatibility which involved the transfusion of group A platelets to a group O recipient is acceptable under some circumstances but, in this case, involved mis-identity at the bedside.

* In one case a porter was given a unit of red cells crossmatched for another patient in mistake for emergency group O RhD positive red cells. This wrong unit was then stored in an A+E satellite refrigerator from where it was again incorrectly collected by a different member of staff and transfused to the patient despite bearing completely wrong patient ID details i.e. there were 2 separate collection errors involving the same unit.

These incidents are summarised in Table 19

Table 19
Outcome of bedside errors (n=87 in 86 cases)

Category	Survived/ no ill effects	Major morbidity	Died unrelated to tx.	Died possibly related to tx.	Died probably related to tx.	Died definitely related to tx.	Unknown	TOTAL
Major ABO incompatibility[1]	12	**6**[2]	4		1	1		**24**
RhD incompatible	5	1[3]	1					**7**
ABO / RhD compatible[4]	40		4					**44**
Inappropriate transfusion[5]	7							**7**
Anti D	5							**5**
Total	**69**	**7**	**9**		**1**	**1**		**87**

1 Includes 2 cases which were also RhD incompatible
2 Recovered from intravascular haemolysis
3 Potential RhD sensitisation in females of child bearing potential
4 Includes 4 cases of "Right blood to right patient"
5 3 expired units, 1 platelets given instead of cryoprecipitate, 1 platelets not prescribed, 1 expired albumin

Interestingly, in the majority of instances (66/86, 77%) two persons, usually registered nurses, were stated to have performed the check but, as in previous years, errors nevertheless occurred (see Table 20). Recent BCSH guidelines recommend that one member of staff (a doctor or registered nurse) should be responsible for carrying out the identity check of the patient and the unit of blood at the patient's bedside [5]. Since no denominator data is available for procedures not resulting in a mis-transfusion, our data does not allow firm conclusions to be drawn about the relative safety of single or double checking procedures.

Table 20
Grades of staff involved in bedside incidents (n=87)

Grade of staff	Number of cases

Registered nurse & registered nurse	48
Registered nurse & unregistered nurse	8
Registered nurse & doctor	5
Registered nurse and other [1]	3
Registered nurse & unknown	2
Registered nurse only	2
Doctor & doctor	1
Doctor & medical student	1
Doctor & other [2]	3
Doctor & unknown	2
Other only [3]	2
Unstated	10

[1] midwife, theatre orderly, newly qualified nurse awaiting PIN
[2] Operating Department Assistant (O.D.A.)
[3] O.D.A., community midwife

The following selection of case reports illustrate some of the circumstances surrounding collection/ administration errors

Case study 10

The dangers of staff becoming distracted

Two patients on an orthopaedic ward required routine transfusions. Nurse 1 went to collect blood for patient 1 from a satellite refrigerator but was unable to find the prescription form. While this problem was being investigated, nurse 2 decided to proceed with the transfusion for patient 2. Meanwhile patient 1's prescription form was located and brought by nurse 1 along with the unit for patient 1. Nurse 2 checked the unit details against the prescription form but checked no details with the patient. Patient 1's unit was then transfused to patient 2. This B RhD Positive patient received over 100 mls. of A RhD Positive red cells. The error was discovered when the patient developed fever and hypotension and the transfusion was stopped. Fortunately he recovered from the complications of intra-vascular haemolysis. In the investigation which followed this incident nurse 2 said "While I was checking I was thinking about the first patient we had intended to transfuse".

Case study 11

A bed swapping prank results in two "wrong blood" transfusions.

Three thalassaemic brothers were admitted to the same ward. The two younger brothers were prescribed transfusions at the same time. When the blood arrived on the ward the correct protocols were followed for checking the units. Unfortunately the nurses putting up the units then became distracted and, during this time, all three brothers exchanged beds. Two of the boys received blood intended for the other. They were, fortuitously, ABO / RhD compatible and neither patient suffered any ill effects. The error was discovered by the older boy who informed staff that his younger brothers had their bags hung "the wrong way round".

Case study 12

A further demonstration of how incorrect transfusions can still occur even after correct checking procedures.

A unit was collected from the blood bank for transfusion to an in-patient. All checking procedures were performed correctly following which the unit was placed on top of a locker together with another unit for a different patient while pre-transfusion observations were carried out. The incorrect unit was then picked up from the locker and transfused without further checking. This 80 year old man who was group O RhD positive

received < 50 mls of A RhD positive blood. He quickly developed fever and rigors and was transferred to the High Dependency Unit for further monitoring. He made a full recovery from the effects of intra-vascular haemolysis.

Case study 13

A fatality as a result of a major ABO mismatch

The patient was a 40 year old woman undergoing elective spinal decompression. An operating department assistant collected a unit of red cells from a satellite refrigerator for use during a routine operation in theatre. The pack was incorrect in all respects; date of birth, name, hospital number, and blood group. The transfusion was then administered by an anaesthetist with the O.D.A. assisting neither of whom checked the unit against the patient. Consequently a whole unit of B RhD Positive blood was transfused to this O RhD Positive patient. She suffered hypotension and other complications. She was transferred to the Intensive Therapy Unit where she later died as a direct result of a major ABO mismatched transfusion

Case study 14

The dangers associated with relying on verbal results

A 31 year old woman suffered a vaginal bleed in early pregnancy (exact gestation not stated). A sample was taken for grouping and the result phoned through to the ward. The patient's group was O RhD Positive but this was mis-heard by the ward staff and interpreted as O RhD negative. As a result anti-D immunoglobulin was administered unnecessarily.

Problems with identification wristbands

In 14 cases wristbands were missing although in 4 cases this omission was not considered to have contributed to the mis-transfusion. Analysis of the circumstances revealed that 5 involved outpatients of which 3 were associated with bedside errors and 4 occurred in theatre (3) or the A+E (1) department together comprising 64% of instances. In the 10 cases associated with bedside errors there were 7 ABO/RhD compatible, 1 ABO incompatible and 1 RhD incompatible transfusions.

Inappropriate transfusion episodes

There were 7 of these which can be summarised as follows:

3 expired units
1 expired albumin
1 case of platelets given instead of cryoprecipitate
1 case of platelets not prescribed
1 case of haemolysed red cells following incorrect storage next to card-ice

Errors originating at the supplying blood centre

6 errors originated at the supplying blood centre

- Breakdown in communication led to product not being irradiated and not supplied CMV Neg
- Failure to irradiate. Blood centre unable to say why.
- Unit supplied not irradiated although blood centre paperwork showed, in error, that it had been.
- Issued 8 pedipacks instead of one adult unit for a 4 year old male
- Incorrect verbal message lead to confusion over requirements for 2 patients

- Supplied group O platelets which had not been checked for absence of high titre anti-A,B for a group B child with resultant severe intravascular haemolysis from which the patient recovered.

Errors which did not fit into existing categories

6 errors in 6 cases were difficult to place in the existing error categories.

2 cases involved the transfusion of units which were out of temperature control. In the first of these ward staff at one hospital arranged for a unit of blood to be transported with the patient to another hospital. They did not inform the hospital blood bank and made no appropriate arrangements for the unit to be carried in an insulated box. The second incident was similar insofar as a unit was transported between hospitals without proper temperature control. In this case, however, it was not clear who was responsible for the error.

In 4 cases although it was clear that an error had been made it was not possible to determine how or where the error took place. The first incident resulted in major ABO incompatibility. A group A RhD negative patient received a group AB RhD positive unit in error. There were no errors in collection or administration of the product but clearly an error had been made earlier in the chain. The hospital was unable to determine whether this had been a "sample from the wrong patient" or a grouping error in the laboratory. In a similar case, a group A RhD negative woman received a group A RhD positive unit. She suffered no adverse reactions and, in fact, the error was not discovered until 5 months after the transfusion. For that reason it was not possible to trace the source of the error. The third error occurred when a patient received an unnecessary transfusion as a result of an incorrect Hb level being reported. The presumed cause was that the sample for testing had been diluted during phlebotomy but this was impossible to prove. The last of these cases involved the transfusion in an emergency of 31 units of whole blood. It became apparent during post transfusion testing that one of the units had been ABO incompatible but the cause of this error was never traced.

Outcome

Of the 200 fully analysed cases there were 39 cases of major ABO incompatibility, including 2 cases which were also RhD incompatible. There were 15 cases of RhD incompatibility, 16 cases where other red cell antigen incompatible transfusions were given, and 57 incidents which resulted in ABO and RhD compatible transfusions of which 4 were cases of "right blood to right patient" despite procedural errors.

The remaining cases comprised 38 cases of failure to provide for special requirements (32, non-irradiated, 4 not irradiated and not CMV negative and, 2 not CMV negative), 12 cases of anti-D immunoglobulin given in error and 23 cases of an inappropriate or wrong component transfused.

- One patient died as a result of major ABO incompatibility
- One further death was probably related to major ABO incompatibility
- 18 patients died of causes unrelated to the transfusion incident
- 8 patients recovered from the effects of intravascular haemolysis
- 4 RhD negative females of child-bearing potential were exposed to RhD positive red cells
- One patient suffered an autologous bone marrow transplant failure following transfusion of non-irradiated platelets. TA-GVHD could not be excluded.
- 167 patients survived with no lasting effects

The outcome of all IBCT cases is summarised in Table 21

Table 21
Outcome of cases of incorrect blood component transfused (n=200)

Category	Survived/ no ill effects	Major morbidity	Died unrelated to tx.	Died possibly related to tx.	Died probably related to tx.	Died definitely related to tx.	Unknown	TOTAL
Major ABO incompatibility[1]	25	8[2]	4		1	1		**39**

RhD incompatible	8	4[3]	3					**15**
ABO / RhD compatible[4]	52		5					**57**
Other red cell incompatibility	15		1					**16**
Inappropriate transfusion	22		1					**23**
Special requirements not met[5]	33	1	4					**38**
Anti D	12							**12**
Total	**167**	**13**	**18**		**1**	**1**		**200**

[1] Includes two cases which were also RhD incompatible
[2] Recovered from intravascular haemolysis
[3] Potential RhD sensitisation in females of child bearing potential
[4] Includes 4 cases of procedural failure but "right blood to right patient"
[5] CMV negative / irradiation

Procedural review

Reporters were once again asked to state whether the incident had been reported to the Hospital Transfusion Committee. Table 22 summarises the responses

Table 22
Hospital Transfusion Committees

Number of responses	Response
12[1]	No response
120	No, but will be discussed at a future meeting
66	Yes
2	No Transfusion Committee in place

[1] Includes 4 cases reported by letter only.

It is not possible to analyse these data by numbers of hospitals reporting because of the anonymous nature of the scheme. We cannot, therefore, infer how many Hospital Transfusion Committees are in place. It is interesting to note, however, that this year only 2 reporters stated that their hospital(s) did not have Transfusion Committees. This represents only 1.1% of all those who responded compared with an average of 19.2% in previous years.

We also asked whether the incident had resulted in any changes to policies / procedures. 50 reporters did not respond to this question (but this includes 4 cases reported by letter only), 64 said that no changes had been made and 86 responded positively. A summary of the responses from these 86 reports is given in Table 23 However, of the 114 who said that no changes had been implemented or who did not reply, 56 made other comments which are summarised in Table 24

Table 23

Summary of changes made to policies / procedures (101 changes from 86 incidents)

Number of changes	Summary of change
59	Changes implemented to documentation; collecting; handling; laboratory techniques / procedures; ward procedures / protocols; administration
7	Implementation of new / additional training
13	Review of existing policies / procedures / protocols
2	Recommendation to appoint new / additional staff
4	Upgrade or renewal of equipment
14	Reiteration of existing procedures
1	Hospital Transfusion Committee to be established
1	Committee formed to address problems of patient identification

Table 24
Summary of comments made by reporters who said that no changes had been made or who did not respond to the question (59 comments from 56 reporters)

Number of comments	Summary of comments
12	No changes but re-training / education of staff involved
11	Existing policies / procedure / protocols are adequate
9	Investigation ongoing: changes may result
7	Review pending
5	No changes but ongoing training
5	Reiteration of existing procedures
4	No changes but incident has been / will be reviewed by the Hospital Transfusion Committee
2	No changes but guidelines under review
1	Changes pending
1	Recognise the need for improved communication
1	Software error corrected
1	Changes made to existing procedures

COMMENTARY

- This is the fourth consecutive year in which the single most important cause resulting in mis-transfusion was failure of some aspect of the bedside checking procedure immediately prior to administering the transfusion. (87/321 or 27% of errors). Contributory factors were similar to those reported previously, for example confusion over patients with the same or similar names, checking remote from the patient's bedside, interruption between completion of the checking procedure and administration of the transfusion and failure to note discrepancies between compatibility and donation labels where a preceding laboratory labelling error had occurred. Unusual circumstances (brothers swapping beds after the checking procedure and extraordinary coincidence of wards, patients and consultants with the same or similar names) clearly contributed but in the majority of cases, no clear explanation for the failures was apparent.

- The continued practice of requiring two trained persons to perform the bedside check does not appear to protect against "wrong blood" transfusion although in the absence of denominator data it is not possible to draw firm conclusions about the relative safety of single or double checking procedures.

- Multiple errors continue to contribute to bedside administration errors in 47% of cases indicating that problems still exist at all levels in the transfusion chain.

- As in previous years, the withdrawal of the wrong component from its storage location in the hospital preceded a bedside administration error in a significant proportion of cases (approximately 14% of total errors) and there was a notable absence of formal checking procedures at this point in 67% of these, contravening recently published BCSH guidelines [5].

- Together, collection and bedside administration errors account for 54.5% of causes of IBCT

- It is still not universal practice to use unique patient identification wristbands or other formal means of identification at the bedside. In 14 cases absence of wristbands was noted, 64% of these being in the outpatient, theatre or A+E setting and contributing to bedside errors in 10 instances.

- There were 32 failures to request the appropriate components for transfusion, of which the most common (n=26) was failure to request irradiated components for patients at known risk of TA-GVHD, notably those being treated with purine analogues, patients with Hodgkin's Disease and those who had received or were due to receive stem cell transplants.

- Sampling errors comprise a small (n=7) but important cause of ABO incompatible and other "wrong blood" transfusions. These are impossible to detect at laboratory level if the patient has not been previously grouped or if the laboratory historical record has not been not consulted.

- Laboratory errors contributed to 26.8% of the total and included 31 errors of grouping, antibody screening and compatibility testing, 5 instances of sample transposition and 5 labelling errors, suggesting technical and/or training problems. These together with a variety of other procedural errors and selection/issue of inappropriate components suggest a need for further training or review of procedures. 48% of laboratory errors occurred out of hours but the available data cannot be used to interpret the significance of this finding. Basic "epidemiological" research into the timing and location of transfusions in the hospital setting is clearly needed.

- Unnecessary transfusions were noted on a number of occasions and with blood safety assuming such importance in the eyes of the public, any such instances must be viewed seriously. Anti D immunoglobulin was administered unnecessarily in 12 patients for a variety of reasons which included mis-prescribing because of apparent lack of understanding or mis-interpretation of RhD grouping results, sampling error, mis-grouping in the laboratory, a verbal report not heard correctly or mis-identification at the bedside. Additional examples of unnecessary blood component administration occurred as a result of erroneous haemoglobin results and bedside identification errors

- A number of errors in requesting, selection, issue and administration of a variety blood components suggest some basic lack of knowledge and understanding of transfusion issues amongst individuals responsible for

different steps in the transfusion process. These include criteria for irradiation and anti-D immunoglobulin administration, referred to above, the significance of pre-existing red cell antibodies, the correct use of emergency group O red cells and occasionally the issue of the wrong component altogether.

- It remains the case that a factor in some wrong blood transfusions is confusion over telephone messages.

- Phlebotomy errors are not confined to blood grouping/crossmatch samples. Erroneous haemoglobin levels as a result of wrong blood samples may lead to unnecessary transfusions.

- Since publication of the 3rd Annual SHOT Report in March 2000, a BCSH guideline has been published (reproduced in the 3rd Annual Report) on how to achieve safer transfusion at the bedside [5]. It is clear from the foregoing that many of its recommendations have not yet been put into practice.

RECOMMENDATIONS

Although over a year has passed since publication of the BCSH guideline "The administration of blood and blood components and the management of the transfused patient" [5] the number of reports falling into the category of incorrect blood component transfused has risen by 39.6%. The major increase has been in the area of collection from the hospital storage site/bedside administration but an increase in inappropriate requests was also noted. Whether this increase in reporting represents a true increase in incidence of errors or greater willingness on the part of hospitals to report errors cannot be ascertained in this type of hazard reporting scheme. Not all cases were those of transfusion of a blood component to other than the intended recipient or of the incorrect ABO or RhD group. Many involved failure to provide the correct requirements for a given patient or fortuitous issue of the right blood to the right patient despite breaches in procedures. Nevertheless the figures point to significant problems in ensuring the safety of the blood transfusion process, particularly at the point of administration at the bedside. As was stated in last year's report:

"Wrong blood incidents are without exception avoidable errors and the bedside check is the final opportunity to prevent a mis-transfusion"

It is essential that every hospital becomes familiar with and puts into practice existing guidelines in the field of blood transfusion to minimise the possibility of human error.

The complexity of the transfusion process and the difficulties of ensuring compliance with procedures in a large, multi-disciplinary organisation cannot be underestimated. However, the problem of inadequate patient identification procedures in particular may have serious consequences and as this report has shown, extends beyond the confines of the transfusion process itself to involve other blood samples and potentially drug administration (for example anti D immunoglobulin). It is essential that every hospital becomes familiar with and puts into practice existing guidelines in the field of blood transfusion to minimise the possibility of human error. Existing procedures should be re-examined for flaws which could lead to systems errors. Hospital Transfusion Committees should play a key role in this process and should be managerially empowered to do so. As the same types of errors are occurring each year, many of the following recommendations are the same or very similar to those made in previous SHOT reports.

- **Every hospital must have a formal policy for the bedside check which must be rigidly enforced at all times.**
  This must ensure that blood components are correctly allocated and identified and be capable of detecting preceding compatibility labelling discrepancies and relevant previous transfusion information such as previous group and antibody screening reports. The dangers of staff becoming distracted, even after correct checking, must be borne in mind.

- **Every patient should be uniquely identified using a wristband or equivalent**
  Retaining wristbands or their equivalent in the operating theatre situation is essential and a formal means of identification should be pursued for all patients in theatre and A+E departments. Reliance should not be placed on familiarity with the patient in the outpatient setting.

- **Computerised systems are available to ensure safe transfusion at the bedside. Such systems are in operation in other countries, although not on a large scale, and pilot studies have been conducted at a few sites in the U.K. These systems and others such a radiofrequency labels now merit further study and development.**
  Their potential value beyond the transfusion setting, for example in reducing drug administration errors, should be explored as this will improve their cost effectiveness. Currently serious errors in the use of prescribed drugs account for 20% of all clinical negligence litigation and in a recent Department of Health publication it has been recommended that steps should be taken to reduce these by 40% by 2005 [8].

- **Every hospital should ensure that standards are set for correct collection of blood components from hospital storage sites; this should incorporate formal identification procedures.**
  Staff carrying out this important function must be aware of the key role they play in ensuring the safety of the transfusion process and must receive appropriate training in this procedure. Computerised systems exist to improve the safety of this process and can be linked to bedside identification systems for both blood sampling and administration of blood components. Although such systems are not in widespread use and are still in the process of being developed, as stated above, they merit further evaluation.

- **Blood banks must continue to be vigilant in reviewing procedures, systems and training to prevent sample handling and technical errors.**

- **Individuals responsible for the prescription and request of blood components must be familiar with the special needs of their patients and these requirements must be flagged on the clinical and laboratory records.**
  Recently a card and information leaflet has been developed by the BCSH in collaboration with the NBS for patients requiring irradiated components, particularly those receiving shared care (see Appendix 10). Where appropriate patients should be encouraged to carry these and present them on admission to hospital.

- **Individuals responsible for the prescription and request of blood components must be familiar with their correct use and with the special requirements of their patients.**
  These should conform with BCSH and other guidelines and special requirements should be flagged on the clinical and laboratory records. A new BCSH guideline on the clinical use of red cells is in press.

- **Individuals responsible for taking samples for transfusion testing must at all times follow strict procedures to avoid confusion between patients.**
  The same degree of care should be afforded to the taking of other blood samples as incorrect results from these may lead to unnecessary blood transfusion.

- **Telephoned requests for blood components must be formally recorded and incorporate all relevant information including special requirements. Great care must be exercised when acting on verbal results.**

- **Basic "epidemiological" research into the timing and location of transfusions in the hospital setting is needed.**
  The confidential and anonymised nature of the SHOT scheme makes it difficult to place errors in the overall context of transfusion activity in the UK, apart from very broad estimates of the incidence of hazards as a proportion of total blood components issued. The lack of denominator data makes meaningful interpretation of, for example, out-of-hours errors impossible. With the increasing sophistication of blood bank information technology, it is now possible to collect such data and this could be of value in designing improved systems to increase the safety of the blood transfusion process

Note:

Readers may be interested to note the recent publication of new BCSH guidelines on blood bank computing[13].