4 Incorrect Blood Component Transfused

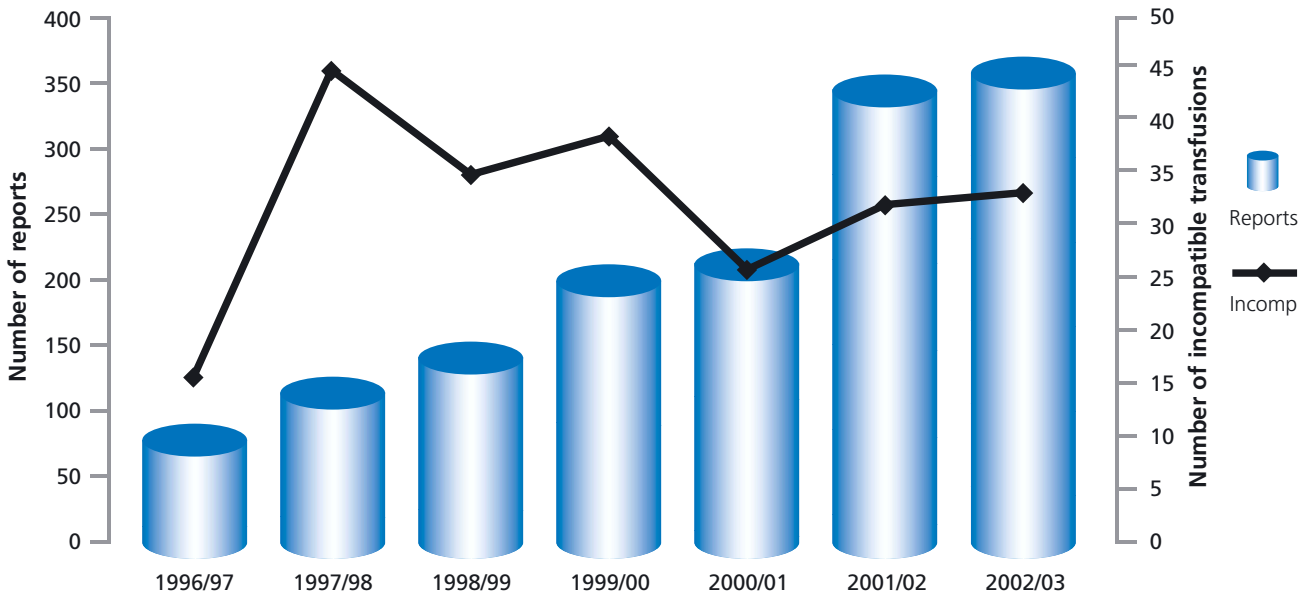
Definition

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.

In the 12 month period Jan to Dec 2003, 358 new initial reports were received. This is a 25% increase over the previous equivalent 12 month period and IBCT reports comprised 75% of all reports received this year. It is likely that the establishment in hospitals of transfusion teams and SPOTS is resulting in greater vigilance and hence reporting of errors which may have previously gone unrecognised. Although the total number of adverse events reported continues to increase, there is an overall downward trend in the number of ABO incompatible transfusions reported (Fig 3), suggesting that we may be starting to see the improvement in the proportion of 'serious' events compared to overall events which characterises a developing safety culture.[15]

Figure 3

ABO incompatible transfusions since 1996



This chapter analyses 348 completed questionnaires, including 22 which were outstanding from the previous year. Completed questionnaires are outstanding on 32 initial reports and will be analysed next year. In addition, 61 reports were withdrawn as not meeting the criteria for IBCT and 1 has been "written off" due to failure to submit a completed questionnaire within an appropriate timescale.

All names in the vignettes are fictitious.

Analysis of reported errors

Analysis of the gender, age of recipients and blood components implicated in the incident can be found on the SHOT website.

The IBCT questionnaire requests much detail regarding the circumstances of events and adverse outcomes and this information is used to analyse each case individually and draw conclusions regarding the distribution and types of errors. Much of the raw data obtained from the questionnaires is available on the website. This chapter seeks to highlight and illustrate some of the important issues identified from reported incidents.

Errors occur in the transfusion of patients of all ages and in the administration of all types of components. It is notable that this year 28/348 (8%) of IBCT incidents related to patients under the age of 12 months. In a recent study on the epidemiology of blood transfusion[8] the proportion of red cells transfused to this age group was 1.2%, so it would appear that there is a disproportionately high incidence of errors involving these patients. This finding is discussed in more detail in Chapter 12.

Outcomes

Of the 348 fully analysed cases there were 33 ABO incompatible transfusions of which 4 were also RhD incompatible, (26 incompatible red cell transfusions and 7 incidents in which patients received incompatible FFP, cryoprecipitate or platelets). In addition there were 22 cases of unintended RhD incompatible transfusions and 22 cases where other red cell antigen incompatible transfusions were given.

Mortality and morbidity

This year there were no definite or probable transfusion related deaths due to incorrect blood component transfused and only one possible case. The outcome of all IBCT cases is summarised in Table 1 below.

Major morbidity is defined as one or more of:

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

Table 1

Outcome of cases of incorrect blood component transfused (n=348)

Category	Survived / no ill effects	Major morbidity	Died unrelated to transfusion	Died possibly related to transfusion	Died probably related to transfusion	Died definitely related to transfusion	Outcome unknown	TOTAL
ABO incompatibility	19	8	5	1	0	0	0	**33**
RhD incompatible	18	4	0	0	0	0	0	**22**
ABO/RhD compatible	45	0	4	0	0	0	0	**49**
Other red cell incompatibility	20	1	1	0	0	0	0	**22**
Inappropriate transfusion	32	2	2	0	0	0	0	**36**
Special requirements not met	103	1	3	0	0	0	0	**107**
Anti-D	24	0	0	0	0	0	0	**24**
Other	54	0	1	0	0	0	0	**55**
Total	**315**	**16**	**16**	**1**	**0**	**0**	**0**	**348**

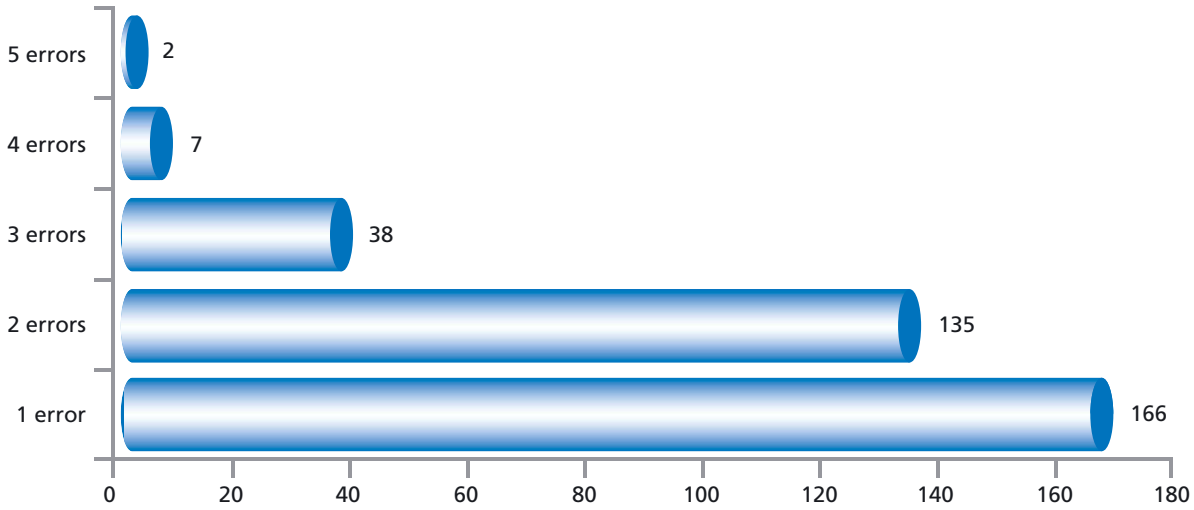
Multiple errors

Again this year multiple errors have in many cases contributed to 'wrong blood' events as shown in Fig 4. There were a total of 588 errors occurring in 348 analysed cases, with multiple errors in 52%. In some cases these have been separate but contributory errors, but in the majority a primary error has occurred which subsequent checks have failed to detect. The final opportunity to detect an earlier error is the bedside check, which, as last year, was the most common site of failure.

Events due to single errors are fewer than last year but are of particular concern, as these, such as patient misidentification at the sampling stage or transposition of samples in the laboratory, indicate critical stages in a process where errors cannot subsequently be detected. Review of systems is required if such errors are to be prevented in the future.

Figure 4

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

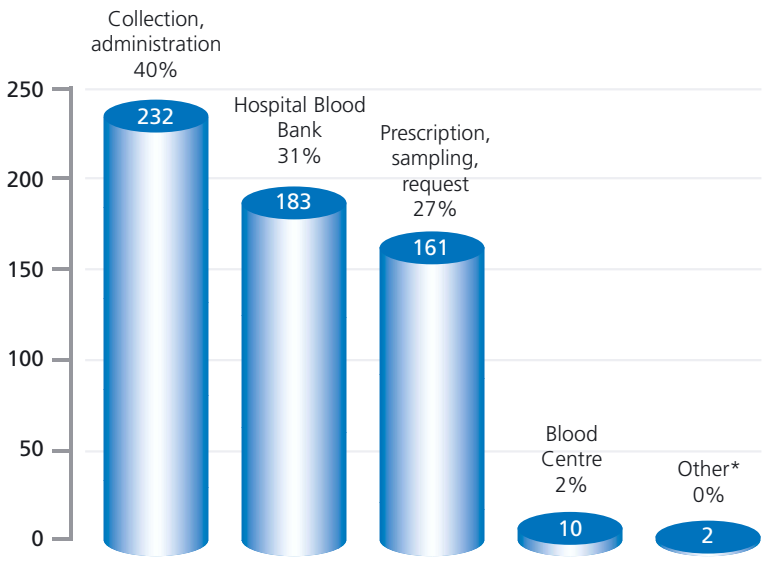


Distribution of errors

Figure 5 shows the distribution, according to the main reporting categories, of a total of 588 errors from the analysis of 348 completed reports. A more detailed analysis of the distribution of total errors is available on the SHOT website.

Figure 5

Distribution of total errors according to the main reporting categories



*Other = errors in software made by IT department

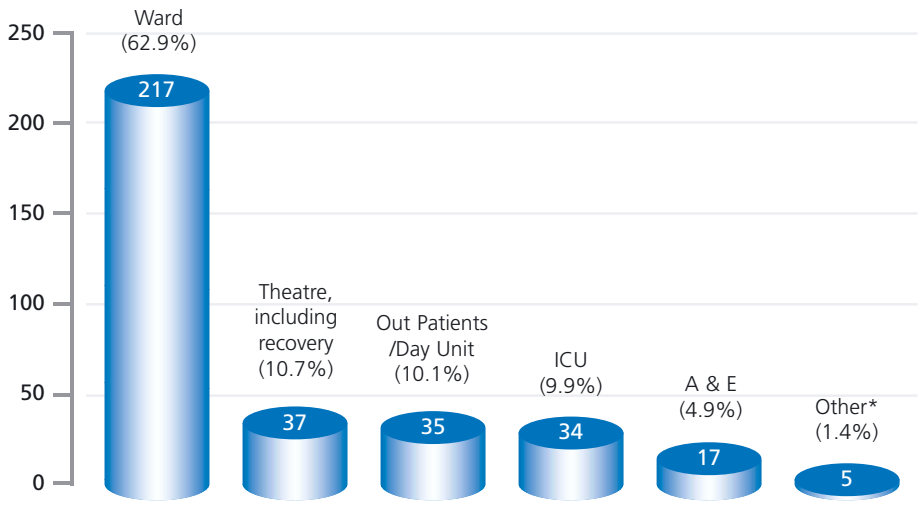
The distribution of errors in IBCT cases is remarkably similar to last year, with approximately 67% of errors occurring in clinical areas and 31% in laboratories. This year there has been a slight increase in the proportion of laboratory errors (28% last year) and a reduction in the proportion of collection and administration errors (43% last year). A detailed breakdown of types of error can be found on the SHOT website.

Site of transfusion

Three hundred and thirty-three reports gave information regarding the site of transfusion. In the absence of denominator data on blood transfusion activity, it can only be noted that clinical areas where there is a high ratio of nursing staff to patients are by no means exempt from errors. In all of these environments, factors likely to contribute to errors include inability of the patient to confirm their identity, identification wristband hidden or removed for venous access, and staff under stress because of clinical urgency.

Figure 6

Site of transfusion when error occurred in a clinical area



*Other = 3 x GP surgery, 1 x Community, 1 x Ambulance

Errors in prescription, requesting of blood components and patient sampling n=161

This year there were 161 errors in 154 cases at the prescription, request, and sampling stage. In 44% of cases the primary error occurred at this stage of the process. Approximately half of all errors at this stage (88/161) related to failure to indicate special transfusion requirements. This section also includes errors in blood sampling and labelling, potentially leading to ABO incompatible transfusion. SHOT analysis of 'near-misses' and clinical audit of samples rejected by laboratories[16] have also highlighted the importance of errors at this stage.

Samples from wrong patient

On 10 reported occasions, the sample used for pre-transfusion testing had been taken from the wrong patient, and, because the patient had not been previously grouped, the error could not be detected. One of these errors was not detected until 6 months later when the laboratory received a further sample. Five patients received ABO incompatible blood as a result of sample errors, 4/5 suffered major morbidity; one patient (case 1) was already terminally ill and died 3 weeks later.

Case 1 Misguided teamwork leads to incompatible transfusion

A terminally ill patient was admitted as an emergency through A & E with a haemoglobin level of 74g/L. A nurse offered to take a sample for group and crossmatch, but took the sample from the wrong patient and handed it unlabelled to the Senior House Officer (SHO), who labelled it away from the bedside. The patient, who was group O, received 4 units of group A red cells. Over the next 4 days his haemoglobin fell to 40g/L and he became jaundiced. He died 3 weeks later from metastatic malignancy.

Case 2 Reluctance to take a further sample puts patient at risk

An on-call BMS received an urgent telephone request for 2 units of red cells, and was informed that there was a sample already in the laboratory. In this small hospital the on-call BMS was also responsible for phlebotomy out-of-hours and was reluctant to take a further sample from the patient. He was unable to find a transfusion sample, but instead located a full blood count sample taken the previous day and labelled with the patient's details. In contravention of laboratory procedures he used this sample for pre-transfusion testing; crossmatching and issuing 2 units of group A blood. An acute haemolytic transfusion reaction occurred after the first 30ml of blood were transfused. A further sample was taken from the patient and the correct group was found to be O. The sample had been taken from the wrong patient. The wrongly transfused patient survived the episode. The BMS was dismissed.

Wrongly labelled samples

In 2 cases the sample was taken from the correct patient but labelled with the wrong details, resulting in mis-transfusion.

Case 3 Benefit of historical record lost by incorrect labelling

This patient had been previously found to have auto-antibodies and a reference laboratory had recommended R_1R_1 blood. The wrong surname was written on both the sample and request form and an emergency admission number was given instead of a hospital number. The only correct reference points were the first name and the date of birth. The laboratory was therefore unable to find any previous record of the patient that would have alerted them to provide phenotyped blood. The patient suffered no ill effects.

Case 4 Confusion on SCBU results in wrong transfusion

Two infants on a neonatal unit, Baby Bloggs and Baby Soap, had the same date of birth. Baby Bloggs required transfusion. The SHO labelled the request form and the sample with Baby Soap's details and verbally requested blood for Baby Soap. Mrs Soap's sample was used for pretransfusion testing. Group O RhD negative blood was selected. The baby suffered no ill effects.

See also Case 10, Chapter 12.

Learning points

- Misidentification of patient samples can result in potentially fatal ABO incompatible transfusion; there may be no means of detecting the error further down the chain.
- Discrepancies of labelling may result in duplication of patient records and loss of valuable information.

Inappropriate transfusions due to sample errors, analytical errors, communication failures and prescription errors

In 29 cases this year, patients were unnecessarily transfused or over-transfused as a result of errors in blood sampling or testing, mis-communication or mis-documentation of haematology results. Eleven of these were dilute samples taken from 'drip arms' or allowed to settle in syringes. In two cases the laboratory suggested the possibility of a dilute sample but clinical staff nevertheless proceeded with transfusion.

There were six errors by haematology laboratories; two of which were wrong haemoglobin determinations, one a wrong fibrinogen estimation leading to unnecessary transfusion of cryoprecipitate and three were spuriously low platelet counts due to clots or clumping as a result of which patients received platelet transfusions. Again this year, a haemoglobin level in one case was wrongly determined from a blood gas analyser; four other wrong haemoglobin results were unexplained.

In 7 cases, haematology results were wrongly documented or misinterpreted; in three of these the white cell count was taken to be the haemoglobin level.

One patient with sickle cell disease was transfused on the basis of wrong clinical advice from a specialist nurse at another hospital. In one case FFP was requested for and transfused to the wrong patient.

Three paediatric patients were over-transfused because of wrongly calculated prescriptions; these cases are discussed in chapter 12. One of these was also a laboratory error as adult red cell units were selected for an 18 month old child.

One adult patient (case 8) suffered major morbidity and required venesection as a result of overtransfusion.

Case 5 Laboratories should not accept unsuitable samples

An elderly male was admitted for investigation of chronic diarrhoea. A blood sample was sent to the haematology laboratory for a full blood count; the laboratory reported the result but queried whether the sample was dilute and requested a repeat. No repeat sample was sent; 6 units of blood were crossmatched and transfused. Post transfusion the patient was polycythaemic, but suffered no clinical ill effects.

Case 6 Poor sampling technique starts a series of errors

A post-operative blood sample was sent from a patient following repair of a fractured neck of femur. The haematology laboratory reported a Hb of 39g/L. The ward sent a nurse to the blood bank with instructions to collect uncrossmatched 'emergency O negative' blood. Because of an earlier refrigerator breakdown, the hospital blood stock was kept in the same refrigerator as blood for issue; the nurse removed 2 units of group O RhD negative blood from stock instead of taking blood designated and labelled for emergency issue. It was later realised that the low Hb level was incorrect due to poor sampling technique and the patient had not required the transfusion.

Case 7 Do the results match the clinical picture?

A male patient (age not given) was transfused with 8 units of red cells on the basis of a Hb of 23g/L. The patient was not bleeding and his clinical condition is not recorded. Post transfusion his Hb level was 188g/L. The cause of the spurious Hb result could not be determined. The patient survived with no ill effects.

Case 8 Post-transfusion increment should be monitored

A female adult patient of small stature was admitted with haematuria and Hb estimation was 63g/L. Four units of red cells were transfused, following which the Hb was 166g/L. A doctor failed to note the post transfusion Hb and prescribed a further 4 unit transfusion. Following this the Hb was 205g/L and the patient was noted to be hypertensive. Venesection was carried out daily for 3 days. The patient survived.

Case 9 Wrong Hb leads to unnecessary surgery

A young woman was admitted as an emergency with acute abdominal pain. A full blood count was done and a low Hb (level not given) was noted. As a result, a provisional diagnosis of ruptured ectopic pregnancy was made; the patient was transfused with 2 units of blood and a laparotomy was carried out. When no evidence of bleeding was found, a repeat sample was sent for full blood count and found to be normal. It was then realised that the first sample had been taken from the 'drip arm'.

Learning points

- Procedures for blood sampling must state that samples must not be taken from a 'drip arm'.
- A decision to transfuse must take account of clinical findings as well as laboratory results.
- Unexpected laboratory results should be reviewed and confirmed by a repeat sample. Haematology laboratories should not issue unvalidated results.
- Robust procedures must be in place in all clinical areas for recording telephoned results.
- Blood gas analysers are not suitable for haemoglobin estimation.

Failure to meet special requirements (107 cases). Better communication is urgently needed

One hundred and seven patients received blood components that did not meet special requirements, accounting for 31% of IBCT cases. The majority (88/107) involved errors at the request stage, though in 14 of these cases the requester was not aware of the special requirement as the patient's care was shared with another hospital who had not communicated the necessary information. In 39 cases the laboratory failed to select the appropriate component – these are further discussed in the section on laboratory errors.

Of these 107 events, 81 involved a patient at risk of TA-GVHD, for whom there was a failure to provide irradiated components. Fortunately there was no case of TA-GVHD and it is likely that leucodepletion of cellular components offers some protection, though gamma-irradiation remains the only reliable means of preventing this universally fatal complication.[17] The commonest indication for irradiation (46/81) was treatment with a purine analogue.

Other 'special requirements' which were not met included CMV negative components (19, including 10 which should also have been irradiated), methylene blue (MB) FFP for children (6), components suitable for neonates (4), antigen negative blood for patients with known antibodies (2), components for patients post-ABO mismatched marrow transplant (2) and K-negative blood for young females where this is hospital policy (3).

One patient who had predeposited autologous blood for elective surgery was transfused with allogeneic blood because of multiple communication failures.

Case 10 Lack of awareness of guidelines puts patient at risk

A 66 year old male patient received fludarabine for chronic lymphatic leukaemia. The ward staff were unaware of the indication for irradiated blood components and so the laboratory was not informed. Over a 5 month period the patient received 13 units of unirradiated red cells.

Case 11 Failure of communication in shared care

A 14 year old male was admitted for an open lung biopsy following which he bled and required transfusion. He had previously received a stem cell transplant in another hospital in the same Trust, but there was no facility to link the two transfusion laboratory computer systems and the requester was not aware of the previous history. Non-irradiated red cells were given.

Case 12 No notice taken of an informed patient

An elderly male patient was admitted to hospital A with an ischaemic foot. He informed the ward staff that he required regular transfusion with 'special blood' at hospital B. The ward confirmed with the transfusion laboratory at hospital B that he had an anti-ANWJ but this information was not passed on to the laboratory at hospital A who were undertaking pre-transfusion testing. The antibody screen was negative and 3 units of red cells were issued electronically and transfused. The patient had a rise in temperature and a raised bilirubin, and died 8 days later from bronchopneumonia.

Case 13 Lack of effective IT 'flagging'

A young woman received an out-of-hours transfusion for iron deficiency anaemia. The clinical indication for urgency is not apparent from the report. The hospital had a policy of providing K-negative blood for women of child-bearing age, but the on-call BMS selected 4 units of red cells, one of which was K-positive. There was no 'flag' on the laboratory IT system to alert the BMS to the requirement for K-negative blood. The patient later became pregnant and on routine antenatal screening was found to have developed anti-K. Fortunately her partner was K-negative.

Learning points

- Robust systems are needed to ensure that patients at risk of TA-GVHD receive irradiated cellular components. The pharmaceutical industry and hospital pharmacists have important roles to play.
- There must be effective communication when patient care is shared between hospitals, to ensure that relevant information is available to all concerned.
- There is a need for education regarding guidelines and policies on special transfusion requirements.
- Patients should, wherever possible, be educated and empowered regarding their special requirements and staff should take note of information from patients.

Hospital Transfusion Laboratory Errors n=183

There were a total of 183 errors in this category occurring in 155 case reports. These are a diverse and complex group of problems; a breakdown of types of errors is on the SHOT website.

In 122/348 (35%) of all IBCT cases the primary error occurred in the hospital transfusion laboratory.

There were 118 reports of laboratory errors in which information was provided on the time the error took place.

69/118 (58%) were during normal 'core' working hours

49/118 (41%) were outside of core hours, either on-call or on a shift system

Preliminary analysis of a workload survey undertaken by SHOT in 2004 indicates that only 21% of all transfusion laboratory work is undertaken outside of 'core hours'. Further scrutiny of these data is required but there appears to be evidence to support the impression gained from this and previous SHOT reports that errors are more likely to occur outside core hours.

Wrong ABO group determination – a major danger area and staff under pressure

These 17 cases, in which patients were put at risk of potentially fatal ABO haemolytic transfusion reactions, resulted from selection of the wrong sample for testing (8 cases), interpretation or transcription errors (9 cases). As a result, 6 patients received ABO incompatible red cells and one incompatible FFP. Two patients suffered major morbidity, both survived. One patient died from injuries.

Wrong sample for ABO grouping

In these 8 cases (including 2 'paired' cases involving 4 patients) wrong ABO group determinations resulted from blood grouping using the wrong patient's sample. Four patients received ABO incompatible transfusions; 2/4 suffered major morbidity, but both survived.

A further sample transposition (involving 2 patients) was reported in which both patients were fortuitously Group O RhD positive.

Cases 14 and 15

Bert Fry required an elective transfusion but blood was requested out of hours. Emma Carter was admitted as an emergency following a miscarriage and required urgent transfusion. Neither patient was known to the laboratory. The on-call BMS inadvertently transposed the two samples on the bench. Fortunately, because of stock levels, he allocated group O RhD negative blood to Bert Fry, whom he had grouped as A RhD negative but was in fact B RhD positive. Emma Carter, whose correct group was A RhD negative, was grouped as B RhD positive and given 2 units of B RhD positive red cells. She suffered a haemolytic transfusion reaction and required anti-D immunoglobulin (Ig) and exchange transfusion.

Cases 16 and 17

Two patients required elective transfusion following cardiac surgery. The BMS labelled gel cards for both patients but transposed the samples and added the wrong patient serum and cells to the reagents. As one patient was group A RhD positive and one group B RhD negative, both received an ABO incompatible transfusion which in one case was also Rh incompatible. In addition, the patient who was B RhD negative also had an anti-E but did not receive antigen negative red cells. Although a whole unit of incompatible blood was transfused to both patients, neither suffered serious morbidity. The laboratory has since changed its procedures.

Right sample but wrong ABO group – manual methods are inherently unsafe

The cases in which the right sample was tested but the wrong ABO group was obtained are striking in that all involved a manual method and the result was either misread or incorrectly entered into the computer system. Only 5/9 cases appeared to be clinically urgent. In 5/9 cases the BMS did not work regularly in the transfusion laboratory or was relatively inexperienced in transfusion work. Because of the importance of these cases, all are summarised in table 2 below.

Table 2

Manual methods leading to wrong ABO groups

Case 18	RTA, Massive tx during day but a BMS not normally working in transfusion. Misread manual ABO group. 2 units ABO incompatible blood given before error realised. Patient died from injuries.
Case 19	RTA, uncrossmatched group specific blood requested. An inexperienced BMS misread manual group, checked by senior BMS but error not recognised. ABO incompatible blood given. Patient survived.
Case 20	Elective transfusion but testing undertaken outside core hours by BMS not working regularly in transfusion laboratory (shift system). Manual input of results. AB recorded as A.
Case 21	Premature infant, blood requested out of hours. Grouped as A using a manual technique, later found to be AB.
Case 22	Routine request but testing done by BMS not normally working in transfusion laboratory. An incorrect batch number had been entered on a plate reader so results could not be transferred electronically and were being entered manually. Patient's results entered as O RhD negative, instead of A RhD positive.
Case 23	RTA, blood required urgently out of hours. Testing done by on-call BMS regularly working in blood bank. Rapid manual method used, reactions misinterpreted. Patient group B, grouped as O.
Case 24	FFP requested to cover an elective procedure. Group done out of hours by on-call BMS who regularly worked in transfusion. Manual technique used - wrong group recorded (A instead of B). ABO incompatible FFP given. No adverse effect.
Case 25	Urgent request out of hours. On-call BMS not normally working in transfusion laboratory. Manual tube technique – results incorrectly documented and hence misinterpreted. Patient grouped as O instead of A.
Case 26	Urgent request for patient in theatre. Patient manually grouped as O, later found to be A. Details of error not clear.

Rh D group difficulties

Twenty-six errors in determination of RhD groups were reported. Of these, 16 resulted in administration of unnecessary anti-D Ig (see below). Six of these cases related to weak RhD groups, highlighting the pitfalls of RhD group determination. It is debatable whether these should be regarded as errors as appropriate reagents were used and it must be accepted that, due to the limitations of the technology, some laboratories will group weak RhD groups as positive and some as negative.

Eleven errors (RhD negative patients grouped as RhD positive) resulted in inadvertent transfusion of RhD positive red cells to RhD negative patients, 4 of whom were young females of potential child-bearing age, at risk of haemolytic disease in future pregnancies. One 12 year old female transfused following head injury underwent an exchange transfusion.

An additional wrong RhD group resulted from the wrong patient's sample being selected in the laboratory for grouping. (case 32 below)

Case 27 Patient protests ignored

A 42 year old female patient underwent reconstructive surgery following mastectomy, following which she required urgent transfusion. No previous sample had been sent for grouping. Pre-transfusion testing was carried out urgently by a BMS not normally working in transfusion. Manual ABO and RhD groups were carried out and results manually recorded. No reverse group was performed. The patient's RhD group was incorrectly determined as positive and Group O RhD positive blood was crossmatched and issued. The patient was aware that she was RhD negative and queried the group of the transfused blood, but was reassured by a nurse.

Case 28 Wrong RhD group on cord sample from direct antiglobulin test (DAT) positive infant

Following delivery by a RhD negative woman, a cord sample was sent to the laboratory for RhD typing. The infant was DAT positive and the BMS had difficulty in interpreting the cord RhD group. To 'be safe' he issued anti-D Ig. There was no clinical urgency and the results could have been reviewed be a more senior member of staff the following day. The infant was in fact RhD negative.

Case 29 Historic RhD group unavailable because of numbering discrepancy

A male patient was admitted through A&E with gastrointestinal bleeding. An on-call BMS undertook blood grouping but grouped the patient as RhD positive, when in fact he was RhD negative. The patient had been grouped previously but because he was allocated an A&E number the historical group was not available.

The proposed corrective action by the laboratory did not appear to include changing the patient 'look-up' procedures.

Antibody screen or ID errors and crossmatch errors – experienced support is needed to resolve complex cases

Fifteen cases were reported in which there were technical or clerical errors in antibody screening, identification or crossmatch. As a result 11 patients received incompatible red cells of whom 2 suffered haemolytic reactions. Six cases involved multiple errors. Again it is of note that 7/15 of these instances occurred out of core hours and 5/15 were urgent transfusions. Four of the cases involved a BMS not normally working in the transfusion laboratory. Seven cases were missed antibodies, in another three full pretransfusion testing was wrongly omitted. In 2 instances, blood was labelled as compatible and placed in an issue location pending resolution of serological problems - not surprisingly the blood was collected and transfused. Two BMSs were disciplined as a result of errors.

An additional 2 cases were reported in which pre-transfusion testing was carried out using a sample which had been stored for longer than recommended by guidelines.

Case 30 A complex serological problem out of hours

Blood was requested out of hours for a 'routine' transfusion. The on-call BMS did not normally work in the transfusion laboratory. The antibody screen was positive, however the BMS wrongly interpreted it as due to 'non-specific IAT antibodies' despite a negative IAT control. He crossmatched and issued apparently compatible blood. The following day further investigations showed an anti-S and anti-Kp^a. Two of the transfused units were S positive. The patient had a poor haemoglobin increment. The BMS was suspended from on-call duties.

In a similar case the BMS contacted the ward and agreed to delay the transfusion until the next day so that the positive antibody screen could be resolved. However he crossmatched and labelled the blood and placed it in an issue location – it was collected and transfused.

There are lessons to be learned from all the individual cases reported under these headings, - short vignettes can be found on the SHOT website.

Special requirements not met or inappropriate blood component selected – many preventable by better IT

Laboratory errors in 39 cases related to failure to meet special requirements. Of these, 22/39 patients were put at risk of TA-GVHD by failure to provide irradiated components. One patient's stem cell harvest was delayed as a consequence.

In 29/39 cases, the failure could have been prevented by an effective 'flag' on the laboratory IT system. One laboratory had lost its 'flags' when a new IT system was installed, resulting in 2 cases of failure to irradiate, and computer breakdown caused a further 3. In 9 cases laboratory staff had not updated the computer system. In one case the BMS ignored a computer 'flag' and in 5 the wrong component was selected by the BMS.

An additional seven cases were reported in which the patient's previous transfusion history was unavailable resulting in failure to provide suitable antigen negative blood. One laboratory had a paper record system; in the other 5, use of a different patient number meant that the historic record was not retrieved. Two of these patients suffered haemolytic transfusion reactions due to anti-Fy^a .

These cases highlight the need for laboratory IT systems to be able to search on a limited dataset and to provide effective 'flags' for patients with special transfusion requirements. There must be robust back-up systems in place for computer down-time, both planned and unplanned.

Case 31 Previous history not available from paper record system

A patient with thalassaemia major required elective transfusion. The laboratory was not computerised and no previous records were found in the paper filing system. Antibody screen was negative and the transfusion was uneventful. It was subsequently discovered that the patient had anti-K, undetectable for the past 3 years. When next investigated a strong anti-K was found.

Eight additional cases were reported in which laboratory staff selected components which were unsuitable for a variety of other reasons; 3/8 were for paediatric patients; 5/8 patients suffered some morbidity.

Telephone requests must be fully documented

Two almost identical reports were received in which telephone requests were incompletely documented in the laboratory, resulting in the wrong patient's sample being selected for pre-transfusion testing. In neither case was the transfusion urgent. In both cases there were 2 patients on the same ward with similar names, and both the laboratory and the ward failed to check the full details. Fortunately in both cases the blood given was ABO compatible. One of these cases is described in detail below.

Case 32 Don't rely on name alone for identification of samples or patients

Edith Watt and Edith Watts were on the same orthopaedic ward. Neither had been grouped previously. Their serum samples were adjacent in the laboratory storage rack. The laboratory received a telephoned request for blood for Edith Watt who was going to theatre for repair of her fractured neck of femur. The request was not documented in the laboratory. The BMS picked out Edith Watts' sample and used it to crossmatch blood which he labelled with Edith Watts' name, date of birth and hospital number. The nurse collecting blood for Edith Watt did not notice the discrepancy, nor did the 2 nurses who administered the blood. Edith Watt was not wearing a wristband and her notes were not available. She was group O RhD negative and received blood which was group O RhD positive.

In the following remarkable case no fewer than 5 individuals failed to spot the discrepancy between patient details on the pack and on the patient wristband.

Case 33 'Same name' coincidences must be expected

A patient was admitted to St Elsewhere's with a ruptured abdominal aortic aneurysm. The ward telephoned the laboratory requesting Group O uncrossmatched blood. The laboratory had previously received a sample for grouping from another patient with exactly the same name, who was Group A. The BMS, recognising the name but without checking the date of birth or hospital number, issued 4 units of uncrossmatched group A blood labelled with the date of birth and hospital number from the previous request. Two nurses gave the first unit without noticing the discrepancies. The patient was transferred to Large University Hospital (LUH) with a nurse escort taking with her the remaining 3 units of blood. On arrival in A&E, the nurse from St Elsewhere's together with a nurse from LUH gave the second unit without checking against the wristband. The patient was taken immediately to theatre where the anaesthetist gave the third unit, again without checking. Only when the fourth unit was given was the discrepancy noticed. The patient was found to be group O. He died on the operating table; the incompatible transfusion was not thought to have contributed to his death.

Stock control failures

In 27 cases failure of laboratory stock control procedures contributed to transfusion of a blood component which had expired (21 units of red cells and 1 FFP) or had been out of temperature control. IT systems are available to aid stock control and prevent issue of expired units from blood banks and satellite refrigerators.

Learning points from laboratory errors

- Laboratory staff working out of hours and/or under pressure are prone to make errors and must be supported by robust procedures and technology.
- Staff must not be required to work beyond their level of competence or experience.
- Procedures for rapid testing are more error prone than routine automated procedures and should only be used when there is clinical urgency.
- Patient name coincidences will happen and systems must be in place to protect against the consequences.
- Verbal communications are a potential source of errors and must require the same points of identity as written requests.
- Transfusion laboratory stock control procedures should ensure that expired units are cleared from issue locations. Laboratory IT systems must not allow expired units to be issued.
- Transfusion laboratory IT systems should provide effective 'flagging' of special requirements and alert staff to select appropriate components.

Errors in the collection and administration of blood components (n=232)

There were 232 errors in collection and administration of blood components in 187 cases.

In 36% of reported cases the primary error occurred at this stage of the transfusion process.

Of the 176 cases in which the time of the transfusion was reported, 65/176 (37%) took place between 8pm and 8am. It is of note that of the 33/176 (19%) transfusions started between midnight and 8am, 16/33 were stated to be 'routine'.

There were 156 instances of failure of the bedside checking procedure, which was again the most common error in the transfusion process. In 21/156 cases, this was the primary error, resulting in wrong transfusions being given. In 10 of these cases there were 2 patients being transfused simultaneously on the ward; four 'paired' reports were received.

In 45 cases a wrong blood component was collected from the hospital storage site and the error was not detected at the bedside. It is notable that 10 of these cases related to acutely bleeding patients undergoing urgent or massive transfusions in critical care situations (operating theatres, recovery suites, A & E departments, intensive care units or delivery suites).

In 135 cases, the bedside check failed to detect an error earlier in the transfusion chain; in 24 of these an expired unit was transfused. System failures included checking blood against documentation away from the bedside, absence of identification wristbands and in some cases complete omission of the bedside identification check.

Cases relating to children are also discussed in chapter 12.

In one case blood was delivered directly to A&E by the blood service and transfused without reference to the transfusion laboratory. In another a label became detached from a platelet pack and was re-attached to the wrong unit.

Outcomes of collection and administration errors

Twelve patients received ABO incompatible transfusions. Two of these patients died from massive bleeding, the incompatible transfusion was not thought to have contributed to their deaths. A further 2 patients suffered major morbidity as a result of acute haemolytic transfusion reactions.

Collection of incorrect component (n=45)

Table 3

Collection errors according to grade of staff involved and whether or not a formal check was made at this stage

GRADE OF STAFF	FORMAL ID CHECK		
	Yes	No	Unknown
Qualified nurse / midwife	5	6	5
Unqualified nurse / midwife	2	0	1
Porter	5	5	0
Locum / agency	1	2	0
Qualified ODA	0	3	0
Unknown	2	2	1
Other*	1	3	1

*1 x Auxiliary nurse, 1 x Unqualified ODA, 1 x Anaesthetist, 1 x Ward clerk, 1 x SHO

The recent National Comparative Audit of Transfusion[3] has demonstrated poor practice in the administration of blood at the bedside. The cases described here are a direct result of unsafe practices such as those identified in the audit, and initiatives to improve this area of practice are urgently needed.

Case 34 Two patients, same surname – a well known pitfall and 2 similar cases

Joe Soap, who was O RhD negative, required an urgent transfusion for bleeding oesophageal varices. There was another patient (Fred Soap) with the same surname on the ward for whom blood had also been crossmatched. Fred Soap was O RhD positive. Fred Soap's compatibility form had been stuck in Joe Soap's notes. An agency nurse was sent to the blood bank to collect blood for Joe. She collected a unit of Fred's blood which was then checked against Joe's notes but with reference to Fred's compatibility form. No bedside check was carried out.

A nurse noticed the discrepant name when taking down the empty bag.

Case 35

David Archer and Tony Archer were patients on the same ward and blood was crossmatched for both. David was O RhD positive and Tony was A RhD positive. The porter collecting blood for David removed a unit of Tony's blood and Tony's compatibility form. Nursing staff checked the details on the bag label against the (wrong) form, which was signed and placed in David's notes. David was not wearing a wristband and no identity check was done. The transfusion was stopped when he developed a fever, but only when the laboratory came to investigate the reaction was the ABO incompatibility realised. He survived the event.

Case 36 No light shed on wrong blood

A patient (group B RhD positive) was undergoing endoscopy in theatre for acute upper gastro-intestinal bleeding. A unit of group O RhD positive blood intended for another patient was collected from the theatre satellite refrigerator. Because the theatre was in semi-darkness for the endoscopy, the anaesthetist was unable to read the label and administered the blood without checking.

Case 37 Wrong blood given to patient in the intensive care unit (ICU) and delay in recognising an acute reaction

This case was particularly well investigated and a number of errors was identified. The patient, who was being treated in an intensive care unit for oesophageal carcinoma, received an ABO incompatible transfusion resulting in major morbidity but he survived. The transfusion was elective but was undertaken in the evening, pre-transfusion testing was done by an on-call BMS. A porter was sent to collect the blood, having been given only a surname (verbally) without any documentation. He collected the wrong unit from the blood bank refrigerator and did not correctly log the unit out. Two qualified nurses checked the unit against a compatibility form but did not check it at the bedside. Moreover the blood was held at room temperature for over 30 minutes before the start of transfusion. The patient developed fever, chest pain and haemoglobinuria but observations were not recorded at appropriate intervals and the transfusion reaction was not recognised until almost a whole unit had been transfused.

Failure of bedside checking procedure (n=156)

Table 4

Grades of staff involved in bedside incidents

Grade of Staff	Number of cases
Qualified nurse & qualified nurse	98
Qualified nurse only	21
Qualified nurse & unqualified nurse	6
Qualified nurse & doctor	5
Qualified nurse & locum / agency	4
Doctor only	3
Doctor & doctor	2
Doctor & qualified ODA	2
Unqualified nurse & Unqualified nurse	1
Locum / agency only	1
No response	13

Cases 38 and 39 Why give non-urgent elective transfusion at night?

Two patients on an oncology unit required elective transfusions. Freda Fry was O RhD positive; Linda Snell was B RhD negative. The two units of blood were collected after midnight from the blood bank and checked on the ward away from the bedside. The units were inadvertently transposed and transfused to the wrong patients. Freda Fry suffered a severe acute haemolytic reaction after the first 50 ml of transfusion and required admission to ICU. She later recovered. Linda Snell's transfusion was stopped; she suffered no ill effects.

Cases 40 and 41 Patients in adjacent beds in A&E given one another's blood

These 2 patients were in adjacent beds in an A&E department at night. Both required transfusion. One was O RhD positive, the other one A RhD positive. It is not known whether they were wearing wristbands. Two units of blood were inadvertently transposed and given to the wrong patients. A nurse noted the discrepancy and the transfusions were stopped, neither patient suffered any ill effect.

Learning points

- Name coincidences are a source of error here as at other stages of the transfusion process and must be guarded against by full positive identification at every stage.
- In emergency situations safety must not be compromised for expediency.
- The final patient identity check must be done at the bedside against an identification wristband or equivalent attached to the patient. No other form of checking is acceptable under any circumstances.
- Transfusion should not take place at night unless clinically indicated.

Transfusion of 'unsafe' units – incorrectly stored or expired

Forty-three reports were received of inappropriate handling of blood components. These included 21 units of red cells transfused past their expiry date. All of these involved a stock control error by the laboratory (2 relating to satellite refrigerators) plus failure to check the expiry date at the bedside. There were 12 instances of red cells out of temperature control in clinical areas. In 4 cases this involved blood which was being transferred between hospitals. Ten miscellaneous handling errors included FFP stored at room temperature on a platelet agitator in a clinical area; platelets stored in a satellite refrigerator; an irradiated neonatal unit returned to the laboratory for discard and taken by an SHO and FFP issued past its expiry date by a BMS.

Learning points

- The pre-transfusion checking procedure must include a check of the expiry date of the component.
- Hospital transfusion teams must collaborate to ensure that procedures are in place for safe transfer of blood between hospitals.

Errors originating at the supplying blood centre

There were 10 errors by 7 blood centres. Errors included;

Failure of screening procedures to detect a strong anti-Fy^{a} in an apheresis platelet donor resulting in passive transfer of antibody sufficient to cause a positive antibody screen.

Failure to detect a high titre haemagglutinin in red cells labelled as suitable for neonatal transfusion resulting in accelerated red cell destruction in a group B infant.

Two instances in which a verbal report by a reference laboratory was inconsistent with the final report. In one case this resulted in failure to select antigen negative red cells; in another anti-D was inappropriately administered to a patient with a weak D.

Provision of RhD positive platelets when RhD negative had been requested for a RhD negative patient - this error was not detected by the hospital laboratory or at the bedside.

An ad hoc delivery of Group O RhD negative blood directly to an A&E department instead of to the transfusion laboratory. A doctor transfused the blood.

Failure to provide CMV negative components.

Errors in anti-D administration

SHOT has not actively encouraged reports of incorrect administration of anti-D Ig, but nevertheless each year reports of such events are received. This year there has been a reduction in the number of anti-D errors reported.

As with other IBCT reports, there are errors at all stages of the process, including patient identification, laboratory errors, incorrect serological reasoning in the laboratory and by clinical staff. The majority of errors are of commission and we receive few reports of errors of omission, which are likely to have more serious clinical consequences.

This year 26 errors were reported in 24 cases, of which 16 related to incorrect or equivocal RhD grouping in laboratories.

Table 5
Anti-D errors

Type of error	Number
Misunderstanding of guidelines by midwife	3
Anti-D given to wrong patient	3
Late administration of anti-D Ig (>72hrs)	2
Patient already sensitised, misinterpreted by laboratory	2
RhD grouping error – cord sample	5 (2 due to reagent problem)
RhD grouping error – maternal sample	5
Weak RhD group (includes 1 reference laboratory)	6

Case 42

The wrong notes accompanied a patient to theatre for a caesarian section. Anti-D Ig was given on basis of historical group in (wrong) notes without sending a confirmatory sample.

Procedural review

Whilst recognition, reporting and investigation of incidents serves to identify flawed systems, full benefit can only be gained from incident reporting if events are carefully analysed to determine root causes and contributory factors. Much has been written on the subject of root cause analysis and a retrospective analysis of three cases reported last year is published on the SHOT website. HTTs and Transfusion Committees have a crucial role in ensuring that the loop is closed following an adverse event and that opportunities are taken to use such incidents as learning opportunities.

In a number of cases the 'corrective action' consisted of the addition of checking steps to processes, thus making them more complex. Staff are more likely to follow correct procedures if they are simple and straightforward and opportunities should be taken to review and revalidate processes when errors have occurred.

Disappointingly, an element of blame was apparent in many of the accounts of events. One BMS was dismissed, two were disciplined and others were removed from on-call rotas. Blame was also apportioned to some nurses, though not to medical staff who made errors. There still needs to be a shift of emphasis away from individual blame if incidents are to be fully shared and lessons learned from them.

COMMENTARY

- The number of inappropriate transfusion reports due to poor blood sampling techniques remains an area of concern. In addition to patient identification errors, these events may result from performing venepuncture on a limb into which an intravenous infusion is being given, inadequate filling of the sample tube or failing to mix the sample in the tube appropriately. These practices can cause spurious or incorrect laboratory results that can result in incorrect or inappropriate requests for blood components. Patient identification errors at this stage are particularly hazardous as they may be undetectable.

- Errors are more likely to occur under exceptional circumstances, particularly in clinically urgent situations when staff are under pressure and there is a high level of stress. Drills and practices of emergency procedures are effective in other environments and can contribute to the development of a 'safety culture' in clinical areas and in laboratories.

- Patients continue to be put at risk due to failure to communicate special transfusion requirements; most commonly the need for irradiated components in patients prescribed purine analogues. The use of this group of drugs is increasing and gamma-irradiation remains the only proven method of preventing TA-GVHD.[17]

- There are numerous examples of laboratory staff working under pressure, either when blood has been requested urgently, or out of hours, or both. It is of concern that, among errors likely to result in incompatible transfusion, 8/9 ABO grouping errors and 7/15 antibody identification or crossmatch errors were related to out-of-hours or urgent work. The increasing moves towards a 24/7 level of hospital activity and the pressures of other NHS initiatives exacerbate these stresses.

- Administration of blood at the bedside remains an important risk area, as demonstrated by events reported to SHOT and by the findings of the National Comparative Audit[3]. A co-ordinated initiative is needed to address this area.

- A disproportionate number of incidents involving infants has been reported this year. These are further considered in chapter 12. There is a need for education of staff in paediatric units and laboratories, in special transfusion requirements of children including volume calculation.

RECOMMENDATIONS

- Hospital risk management committees must ensure that all staff undertaking venepuncture for blood sampling must have received the necessary training and have their practical competency formally assessed and recorded. Blood samples should be taken from a free flowing venepuncture site, and the tube should be filled to capacity and inverted gently several times to adequately mix the sample and any anticoagulant. The person taking the sample must complete the tube label before leaving the patient, checking the details are correct with the patient and against the ID wristband or equivalent.

  Action: Hospital risk management committees

- Hospital risk management procedures should include 'drills' for high risk situations such as massive transfusion, involving all relevant staff.

  Action: Hospital risk management committees

- Prevention of TA-GVHD in patients receiving purine analogues is the responsibility of prescribers, but can and must be supported by the pharmaceutical industry and pharmacists and by suppliers of laboratory IT systems. All patients should receive an information card and leaflet and haematologists must ensure that there is an effective system of flagging special transfusion requirements in the laboratory. Referrals for shared care must include timely communication of all relevant information.

  Action: Clinicians prescribing purine analogues and administering blood transfusion; HTTs; pharmacists, pharmaceutical industry; suppliers of laboratory IT systems

- Hospital blood bank laboratory staffing must be sufficient for safe transfusion practice. Hospitals must ensure that blood transfusion laboratories have adequate numbers of appropriately trained biomedical scientists to cover the 24-hour working day, including a core of permanent blood transfusion laboratory staff. Standards should be established for manpower appropriate to the level of workload and this should be subject to inspection.

  Action: Clinical directors of pathology, professional and accrediting bodies

- Paediatric units undertaking transfusion must ensure that staff are educated in the special transfusion requirements of children. Laboratory IT systems should be regularly updated to support implementation of new guidelines.

  Action: Paediatricians and laboratory staff responsible for transfusion of paediatric patients; HTTs

- The most important contribution which could now be made to the safety of blood transfusion would be an initiative to improve the safety of the bedside pretransfusion checking procedure. This will require investment in education and audit, and also in evaluation and implementation of suitable information technology. The CMO's NBTC has the necessary remit to take this forward.

  Action: CMO's NBTC through regional and hospital transfusion committees: HTTs