6.1 IBCT Errors Relating to IT Systems

Problems with IT systems, their incorrect use or deficiencies continue to cause IBCT incidents. In 2008 there were 44 reported incidents, compared with 25 in 2007 (see Table 30). All incidents originated in the transfusion laboratory. Twenty-nine cases involved red cells, 11 platelet components, 3 FFP and 1 pooled buffy coat. Four of the 44 cases occurred in children.

Table 30
Categorisation of cases in which IT systems caused or contributed to errors

NB Some reports involved more than 1 error (most commonly failure to issue irradiated and CMV negative components)

Error	Reports	Non-irradiated component transfused	Antigen positive unit transfused	Non-CMV neg unit transfused	Wrong group after SCT	Other	
Failure to consult historical record	8	6		3		1	Issued non-HLA matched platelets
Historical record not identified	1		1				
Ignored/missed warning flag	7	3	3			1	Issued inappropriate group FFP
Failure to update warning flags	10	5	1	3	2	0	
Computer system 'down'	3					3	ABO incompatibility due to error in manual transcription Wrong component selected and issued Wrong group issued manually (wrong sample selected)
Data not transferred from old system	2	1	1			0	
Electronic blood tracking system errors/misuse	1					1	Expired platelets issued despite alert
Failure to merge or reconcile records	1		1			0	
Error/deficiency in computer system	11						See Table 31
TOTAL	**44**	**15**	**7**	**6**	**2**	**6**	

Table 31
Incidents caused by errors or deficiencies in the Laboratory Information Management System (LIMS)

Error/Deficiency	No.	Notes
Allowed issue of red cells before completion of crossmatch	3	
Allowed issue of wrong component	1	Cryoprecipitate issued instead of FFP
Allowed issue of buffy coat without compatibility screen	1	Special requirements of this component not entered in LIMS
Allowed issue of Kell positive red cells to pre-menopausal female	1	No alert algorithm on LIMS
Allowed crossmatch on outdated specimen	2	
Allowed component to be issued with wrong label or tag	3	• 1 unit of red cells and 1 pack of platelets issued with wrong traceability tag (2 separate incidents) • compatibility labels transposed on 2 packs of platelets issued simultaneously

Case histories

Case 1

The danger of manual transcription of results when the computer is 'down'

Following an urgent request for blood for a patient with cranial trauma going to surgery, the on-call BMS manually transcribed incorrect blood grouping results when the laboratory computer interface 'stalled'. Two units of group A red cells were transfused to a group O patient who subsequently developed red urine and falling Hb, but otherwise made a complete recovery.

Case 2

Multiple errors lead to transfusion of red cells of the wrong ABO group post BMT

A group A patient received a bone marrow transplant from a group O donor (both were D positive). Despite appropriate prior notification by the clinical team, the LIMS was not updated to warn of the new requirement. Six units of group A red cells were issued during routine working hours over the next 2 months. Following receipt of a further notification, the appropriate note was then made on the LIMS. However, because of failure to check the historical record, a further 4 units of group A red cells were issued over the next 3 months before the error was noted. The patient experienced no adverse effects.

Case 3

Cryoprecipitate issued in mistake for FFP

An urgent request for 2 units of FFP for a bleeding patient was received at a time when the LIMS was 'down'. The single-handed on-call BMS erroneously selected and issued 2 packs of pooled cryoprecipitate. The LIMS normally reconciles the component selected with the request at point of issue, and the laboratory SOP states that 2 members of staff should check an issue in this situation whereas only 1 person was available. The reporter noted that the cryoprecipitate was probably incorrectly stored on the 'FFP shelf' of the issue refrigerator and that the 5 unit pools of cryoprecipitate are now similar in volume and appearance to units of FFP.

Case 4

Computer rule leads to transfusion of non-irradiated and CMV-screened platelets

A group A D negative male patient with non-Hodgkin's lymphoma required irradiated and CMV negative components. This was recorded on the LIMS. Appropriate platelets were ordered from the blood centre. Because of limited availability of group A CMV negative donations, the blood centre issued a group B D positive adult therapeutic dose (second choice

according to national guidelines). However, the hospital LIMS had a rule that prevented issue of this combination of ABO groups. The on-call BMS dealing with the issue was 'distracted' by this occurrence and selected an alternative pack of non-irradiated, non-CMV screened platelets of group A, which were transfused to the patient. The issuing BMS also did not check the special requirements flag.

COMMENTARY

As in previous years, failures to update warning flags on the LIMS, failure to notice (or heed) warning flags and failure to consult the historical record remain common causes of IBCT. This is a significant contributory factor in failure to issue appropriate irradiated, CMV negative or antigen negative components. In 2 cases, failure to update warning flags led to the issue of components of an inappropriate ABO group after allogeneic stem cell transplantation. A number of reports commented that navigating through the laboratory information management system (LIMS) to identify all warning flags is often complex, tedious and involves accessing multiple screens. As recommended last year, the redesign of systems to exhibit all clinically essential warning flags on the opening screen is a priority.

Twenty-five per cent (11) of these IT-related IBCT occurred outside 'core' laboratory working hours, 20% (9) occurred in emergency situations but 84% (37) involved staff working regularly in the laboratory. Of the 6 incidents involving BMSs who do not work routinely in the transfusion laboratory, 5 took place 'on-call'. One case of failure to notice a warning flag was attributed to a clerical worker in the laboratory reception. No case this year was attributed to a locum BMS.

There were18 individual cases involving errors in issuing irradiated or CMV negative components. Although the 'root cause' was in the laboratory, clinical errors in indicating special requirements on request forms (9 cases) or transfusion prescriptions (8 cases) compounded the problem. Non-irradiated components were issued in 2 paediatric surgical cases of patients with Di George syndrome and 1 case of a baby with possible severe combined immunodeficiency (SCID). On each occasion, the administering clinical team did not notice or prevent the error.

Analysis of the reported data indicates that at least 14 of the 44 IBCT (32%) could have been, but were not, prevented at the point of the final bedside check. In 11 of these cases 2 people were checking, and in the other 3 incidents 1 person performed the check.

Component selection and manual transcription errors remain a risk when the LIMS is off-line and IBCT errors continue to occur because historical data on special requirements are not transferred when new laboratory information systems are installed. Again this year, a patient received red cells positive for a blood group to which they were known to have developed alloantibodies in the past, because of failure to reconcile multiple computer records on the same patient.

It remains a priority to improve the capability of laboratory IT systems to incorporate algorithms based on patient demographics and/or data incorporated in the component label by the issuing blood centre (see 2007 Annual SHOT Report), e.g. using the date of birth and gender of the patient to ensure the selection of non-UK virus-inactivated FFP for patients under 16 years old, or the use of Kell negative red cells for premenopausal women. Data on the component label, such as irradiation or CMV status, could be used to generate an additional warning flag at the point at which the component is reserved for a patient with known special requirements. The final electronic check should also prevent components being issued with the wrong compatibility label or traceability tag.

DISCUSSION OF LABORATORY IT STANDARDS

- SHOT, as a member of the UK Transfusion Laboratory Collaborative, fully endorses the coming publication[2] of recommendations with regard to hospital transfusion laboratory staffing, technology, training and competence. SHOT strongly supports the need to determine and maintain appropriate staffing levels and skill mix to ensure safe and effective routine and emergency service provision. Incidents analysed in this and many previous SHOT reports add weight to the Collaborative's recommendations for ongoing training programmes and annual competency assessment for all staff who work at any time in the transfusion laboratory. The document places special emphasis on maintaining the competency, including familiarity with local protocols and systems, of staff working intermittently in the transfusion laboratory. There are particular issues around locum and temporary staff. SHOT data also endorse the recommendations on the

routine use of 'walk away' automation, used 24/7, to eliminate manual errors. Finally, the routine use of 'electronic issue' of red cells, where the LIMS fully meets national guideline standards to support this, and full 'vein to vein' electronic blood tracking where remote issue of blood components is introduced, will make a significant contribution to transfusion safety. Adequate resources need to be made available to allow these improvements to occur.

- Work should continue with suppliers of laboratory information management systems to improve the capability of IT systems to generate warning flags and implement component selection algorithms based on data incorporated in the component label.

- Frequent reconciliation or linking of multiple computer records on the same patient is important for safe practice (a clear historical trail of all amendments to the records must be maintained to comply with BSQR). This should be a laboratory process performed by appropriately trained and competency-assessed senior staff.

- The problem of multiple hospital numbers and case records could be reduced by routine use of the unique NHS number as a primary patient identifier in line with the recommendation from the NPSA SPN 24.[7] However, this requires careful change control as not all current LIMS can use the NHS number as a primary identifier and there is the potential to lose access to historical records with unintended adverse consequences.

- When laboratory IT systems are 'off-line' non-essential transfusions should be avoided. Robust manual back-up procedures and recovery plans must be in place and tested. Manual transcription of results should be held to an essential minimum.

- Laboratory IT systems should be designed to ensure that 'warning flags' are prominently displayed, preferably on the opening screen. Where appropriate (e.g. criteria for electronic selection) it should not be possible to override or bypass flags. At the same time, alert systems should not prevent the issue of clinically appropriate components of a group different to that of the patient.

- Staff must be trained to perform search strategies to ensure that all relevant records are accessed. Work is required to develop appropriate and effective search strategies, perhaps coordinated by the BCSH Transfusion Task Force.

- Transfusion laboratories should have direct access to the hospital Patient Administration System (PAS) and the ability to review haematology results online (ideally on the same screen).

- When new laboratory IT systems are installed, patient data from the old system should be transferred to the new system. Wherever possible this should be done electronically to avoid transcription errors

- Most failures to consult the historical record or identify warning flags were made during normal working hours by BMSs who work regularly in the transfusion laboratory. This problem is clearly not confined to 'on call' or rotating staff. Laboratories must ensure that all staff (including locums) using the IT systems have appropriate training, updates and documented competency assessment.

- The increasing use of routine computer alerts from pharmacies to transfusion laboratories has great potential to ensure that appropriate patients receive irradiated components. However, these systems must be robust, comprehensive and timely.

- The development of IT links between transfusion laboratories, or access to an electronic patient record (EPR) containing accurate and up-to-date transfusion data, would reduce the number of IBCT due to failure to meet special requirements. This would also impact on delayed haemolytic transfusion reactions caused by blood group alloantibodies, previously detected elsewhere, that have fallen to undetectable levels. The UK Connecting for Health project has the potential to meet these needs but the question of how and when transfusion data are entered on the EPR must be resolved.

- All laboratories using electronic selection to issue red cells must ensure that their SOPs are consistent with national guidelines and followed fully by all laboratory staff. [8] The computer algorithms in use must prevent issue outside the guidelines.

- IT systems to support transfusion safety, monitoring and traceability outside the laboratory (e.g. blood-tracking systems and bedside ID systems) should integrate with laboratory systems and processes. Laboratory staff should understand the working of these systems and be able to provide support and advice to clinical areas on a 24/7 basis. All clinical staff using these systems must be trained and competency-assessed. This is crucially important in clinical areas, such as operating theatres and delivery suites, where rapid access to emergency blood stocks is essential.

RECOMMENDATIONS

Recommendations from this year's report

- Chief executive officers of hospitals and trusts, and their hospital transfusion teams, must use the UK Transfusion Laboratory Collaborative report as a basis for achieving the minimum standards recommended for staffing, skill mix, automation, training and competency in their hospital transfusion laboratories.[2]

  Action: Trust CEOs, HTTs

- Standardisation of IT systems is required across the UK, and a national minimum specification for hospital transfusion laboratory IT systems should be developed. This would then be used when working with individual suppliers of LIMS systems.

  Action: NBTC and equivalents in devolved administrations

Recommendations from previous years

Year first made	Recommendation	Target	Progress
1998	IT as an aid to transfusion safety should be assessed and developed at national level.	**NBTC IT WG, NPSA/ NBTC/SHOT initiative, CfH**	Coordination now achieved between NBTC, NPSA, CfH. National standard specification under development. Implementation is dependent on central funding through CfH or by individual Trusts.