Errors Related to Information Technology (IT)

11

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This chapter covers transfusion adverse incidents that relate to laboratory information management systems (LIMS) as well as other information technology (IT) systems and associated equipment, that are used in the delivery of hospital transfusion services.

The cases included are drawn from the other chapters of this report, as shown in Table 11.1. Cases selected include incidents where IT systems may have caused or contributed to the errors reported, where IT systems have been used incorrectly and also includes cases where IT systems could have prevented errors but were not used.

Error	
Incorrect blood component transfused (IBCT)	21
Specific requirements not met (SRNM)	31
Right blood right patient (RBRP)	8
Avoidable, delayed or undertransfusion (ADU)	3
Handling and storage errors (HSE)	15
Haemolytic transfusion reaction (HTR)	2
Total	**80**

Table 11.1: Source of cases included in this chapter

In 2012 there were 80 reported incidents of errors related to IT systems (see Table 11.2) compared with 74 in 2011, 56 in 2010, 61 in 2009 and 44 in 2008.

In 2012, 85% (68/80) of the incidents originated in the transfusion laboratory. A total of 71 cases involved red cells, 5 platelets (1 platelets and plasma) and 4 related to plasma components alone.

Six of the 80 cases occurred in children (1 was below the age of one year).

The majority, 65% (52/80) of the incidents occurred during core working hours. In relation to the requests, 55% (44/80) of the transfusions were considered routine, 22.5% (18/80) urgent and 17.5% (14/80) were emergencies. In 4 cases the urgency of the request was not stated.

Table 11.2: Categories of IT system errors

Error	Reports	Right blood component	Wrong blood component	Component transfused where specific requirements were not met		Wrong group after *HSCT	Unit expired, or out of temp. control	Avoidable, delayed or under-transfused
				Not irradiated	Ag positive unit			
Failure to consult or identify historical record	**9**		1	1	2	4	1	
Failure to link, merge or reconcile computer records	**7**	5			2			
Warning flag in place but not heeded	**16**		2	2	4	2	5	1
Warning flag not updated or disabled	**10**	1	3	2	2	2		
Failure to use flags and/or logic rules	**15**		6	5	4			
Incorrect result entered or accessed manually	**6**	1	3					2
Computer or other IT systems failure	**4**	2			1		1	
Errors related to computer system	**1**			1				
Errors related to electronic blood management system	**12**		4				8	
Total	**80**	**9**	**19**	**11**	**15**	**8**	**15**	**3**

**Haemopoietic stem cell transplant (HSCT).*

Deaths n=0

There were no transfusion-related deaths where IT systems contributed.

Potential for major morbidity n=3

There were three cases where IT systems contributed to a potential for major morbidity.

A patient's antibody history was not flagged correctly and the patient developed a delayed haemolytic transfusion reaction after receiving an exchange transfusion with antigen positive blood.

A major haemorrhage protocol was activated for a patient with a gastrointestinal bleed but the biomedical scientist (BMS) was unable to issue blood immediately because the patient had a red cell antibody and the BMS was not familiar with the mechanism for overriding the alert. This resulted in a delay to emergency transfusion but blood was provided after assistance was sought from another BMS.

In an urgent situation, a warning flag indicating the age of a woman was not heeded and one of the units of blood issued was K-positive. The woman subsequently developed anti-K.

Errors due to non-availability or inaccuracy of the historical record n=16

There were nine cases where failure to identify or consult a historical transfusion record held on the computer led to problems and a further seven cases where errors arose from a situation where transfusion records were not merged, linked or reconciled.

This resulted in five cases where specific requirements were not met; in 4/5 cases antigen negative blood was not provided for patients with red cell antibodies or patients who required extended-phenotyped blood to prevent sensitisation.

There were six examples of the right blood being transfused where a patient's hospital number and/or date of birth did not agree between the patient's ID wristband and compatibility tag attached to the blood component because the records on the patient administration system (PAS) and laboratory information management system (LIMS) were different.

Another consequence of the non-availability or inaccuracy of the historical record is the failure to provide the correct blood components to patients who have had a HSCT. These are complex cases and a complete historical record is very important (see also Chapter 29 – Analysis of Incidents Related to Transplant Cases).

In one case >100 mL RhD positive blood was transfused to a RhD negative woman of childbearing potential because of a laboratory error where the historical record was not consulted and the wrong component was selected. She required anti-D Ig treatment to prevent sensitisation. In another case, a reference laboratory did not check all available historical records which led to the supply of blood that was matched for only three out of the four known red cell antibodies. Consistent use of the National Health Service (NHS) number to link records from different hospitals may have prevented this error.

Trusts/Health Boards where hospitals have merged but retained separate patient numbering systems for individual hospitals, rather than implementing a common numbering system or the NHS number (or equivalent national health numbering systems), have sometimes failed to pick up clinical and transfusion information where patients move around hospital sites to receive treatment from different specialists.

Learning point

In previous reports, it was identified that electronic access to the blood group and antibody information from reference laboratories by hospital transfusion laboratories would be helpful when managing the transfusion support of complex patients, particularly if patients are treated in different hospitals and/or different geographical areas. This system is in the process of being implemented by NHS Blood & Transplant (NHSBT) and is known as Sp-ICE (Specialist Services Electronic Reporting using Sunquest ICE). The success of such a system in delivering safer patient care is dependent on a number of factors:

- That hospitals use common patient identifiers such as NHS number (or equivalent) when sending samples to reference laboratories
- Those hospitals allow their patient data to be entered on the system, which is provided by an NHS organisation and used by other NHS organisations to improve the safety of the transfusion support of individual patients
- That hospitals train all transfusion laboratory staff to use the system, including those providing an out-of-hours service

Errors due to failure of warning flags or logic rules n=41

As in previous reports, the computer ‘warning flags’, ‘alerts’ and ‘logic rules’ that are essential for the safe selection of correct blood components for patient safety provide the largest category of error reports. These flags/alerts should provide a reminder of specific requirements at the very least but preferably they should prevent the issue of wrong blood or blood that is unsuitable for transfusion.

Sixteen cases were reported where alerts or warning flags were not heeded, or were ignored or overridden. There were 10 cases where alerts or warning flags were ineffective because the information had not been updated or the updated information had been inaccurate. In a few cases, alerts or warning flags had been incorrectly disabled or deleted.

A further 15 cases were identified where alerts or warning flags should have been activated but were not – either because there was an oversight on behalf of the laboratory, or because the LIMS did not provide a sufficiently robust system.

Within this category there were 7 cases where electronic issue (EI) was used inappropriately; in 6 cases because the patients were not flagged as unsuitable for EI and in one case the flag was in place but not heeded.

The consequence in all but one case was issue of blood that did not meet specific requirements, most commonly because it was not antigen matched for a red cell antibody although one case should have been excluded from EI because the direct antiglobulin test (DAT) was positive due to a suspected autoimmune haemolytic anaemia.

Case 1: Multiple 'specific requirement' flags result in selection of incorrect blood components for a stem cell transplant patient

A patient was given components of the wrong blood group on three occasions by three different transfusion biomedical scientists (BMS) because the alert that stated 'D negative cellular components' was overlooked. This was in the context of multiple alerts for specific requirements on the patient's transfusion record; the patient needed irradiated blood as well as other specific requirements, all of which had been successfully provided.

Case 2: Incorrect configuration of the specific requirements flag on laboratory information management system (LIMS) fails to prevent remote issue

The transfusion department was notified that a patient needed irradiated components and added the specific requirements flag against the patient's record on the LIMS. The patient attended the following day for a 2-unit blood transfusion but, when the ward staff checked the patient's status, the LIMS appeared to indicate the patient was suitable for 'remote issue'. As a result, non-irradiated blood was transfused to the patient. Investigation of the incident showed that two flags need to be applied in this situation – one for irradiation and one to indicate the ineligibility of the patient for remote electronic issue.

Case 3: Immediate registration of an emergency admission is essential for all interoperable information technology (IT) systems

An infant admitted to the paediatric intensive care unit (PICU) needed cytomegalovirus (CMV) negative and irradiated blood and a specific requirement form was completed. The child had not yet been registered on the patient administration system and this prevented the transfusion record, and associated specific requirement flag, being set up on the laboratory information management system (LIMS). By the time the patient administration system (PAS) registration was complete, the specific requirement flag had been forgotten and the child was transfused blood without the necessary specific requirements.

Learning points

- As stated in the 2011 recommendations, and in the current chapter on laboratory errors (Chapter 10), the use of computer alerts and warning flags is important for safe transfusion laboratory practice
- These alerts and warning flags should be associated with the patient record and should be visible whenever blood components are selected and/or issued. It should also be possible to have multiple alerts or warning flags on an individual patient
- Laboratory staff should recognise the potential pitfall of failing to comply with all of the specific requirements where multiple flags are in place

Errors due to computer downtime or failure of other systems n=5

There were fewer errors in this category in 2012. In 2011 there were 13 cases.

Hospitals reported working with IT providers to resolve software problems and to improve the functionality of IT systems to support safe transfusion practice. Some reported that problems had been successfully highlighted through IT validation rather than clinical errors.

Learning points

- Current UK guidelines[51] for the validation of information technology (IT) systems require the validation process be robust enough to ensure that the laboratory information management system (LIMS) provides the expected safety systems to prevent issue of wrong blood in a range of different scenarios that reflect the clinical practice of the unit
- If corrective and preventative action from an incident or error requires changes to the laboratory information management system (LIMS), the system should be revalidated to ensure it is working correctly

Laboratory errors arising from manual data entry where electronic transfer of data would have been safer n=6

There will always be manual steps required in transfusion laboratories and in clinical areas. Four cases were reported where reliance on manual data entry into a computer or transcription of data from IT systems into notes resulted in the selection of wrong blood components and, in one further case, an unnecessary transfusion.

One case was included because the wrong mode of delivery was selected on the electronic blood ordering system from the NHSBT (OBOS) and this led to a delayed platelet transfusion.

Errors arising from IT systems used outside the laboratory

Electronic blood management systems n=12

In this category 4 of the 12 cases related to wrong blood components collected from blood issue refrigerators bypassing the safety mechanisms in place. These safety features include preventing staff access if they are not assessed as competent to use the system and ensuring blood is collected for the right patient. The use of an emergency access override button is a feature on some blood refrigerators which are otherwise under electronic control. This is seen by some clinicians as an essential feature to prevent blood delays but cases have been reported where blood intended for another patient, rather than the emergency O RhD negative blood, was removed by an untrained clinician using this emergency button.

Eight cases have been reported where blood no longer valid for transfusion has been collected from a refrigerator under electronic control. These blood components were collected despite the fact that they were expired or the validity of the sample used to provide the blood had expired.

Case 4: Wrong blood collected with someone else's identity (ID) card

A patient was admitted with massive upper gastrointestinal bleeding due to an aortic fistula. In an extreme emergency, a nurse collected blood without the patient's ID and accessed the issue refrigerator controlled by an electronic blood management system with an ID card that belonged to another member of staff. The wrong blood was removed from the refrigerator and transfused. The blood collected was group O and the recipient was group A. Despite active resuscitation, the patient died due to the underlying condition, not due to the wrong blood.

Case 5: Emergency access button used to collect the wrong patient's blood

A patient experiencing massive blood loss and numerous life threatening injuries after a road traffic accident was given blood intended for another 'unknown male' because the trauma nurse sent to collect the blood used the emergency button to bypass the blood refrigerator lock. No checks of patient identification were made at the refrigerator or at the bedside. Fortunately, although the wrong blood was transfused, it was compatible with the patient.

Learning point

- The training delivered to healthcare and support staff involved in the blood transfusion process should include relevant SHOT case examples to explain the consequences of bypassing security systems in place to prevent wrong blood collection

Anti-D Ig errors

Table 11.3: IT errors related to administration of prophylactic anti-D Ig n=13

Error	Reports	Unnecessary anti-D Ig administered	Failure to administer anti-D Ig, or excessive delay
Error when manually transcribing data	**4**	1	3
Failure to consult historical record	**6**	4	2
Failure to use flags, logic rules	**2**	2	
Incorrect merging or linking of results	**1**	1	
Total	**13**	**8**	**5**

There were 13 reports in 2012 where laboratory IT-related errors or problems led to unnecessary administration of anti-D Ig (8 cases) or delay in giving anti-D Ig prophylaxis (5 cases).

Two cases were reported where anti-D was given to women with immune anti-D because the information about the antibody was either not input into the LIMS or was not easily accessible and was therefore overlooked.

For the cases where anti-D was given to RhD positive women because the D-group was incorrectly recorded this was more to do with the incorrect group than any failure of the IT system.

Most of these cases occurred within normal working hours.

COMMENTARY

The number of cases where IT systems may have caused or contributed to the errors reported, been used incorrectly or could have been used to prevent errors has remained stable this year. The themes noted are similar to the previous two years.

Laboratory errors where IT systems played a role demonstrate how critically dependent the modern transfusion laboratory is on laboratory information management systems and how the LIMS has to be robust to support safe transfusion laboratory practice.

Hospital mergers (and associated laboratory mergers) have been shown to cause errors in the correct identification of historical transfusion records with the result that information that may inform the correct selection of blood components is lacking. Sometimes the problem has arisen outside the laboratory because of the decisions made about patient numbering systems without understanding the importance of correctly linking or merging to the patient's historical transfusion record.

The use of the NHS number (or equivalent national patient numbering system) has been recommended for many years and was the subject of an National Patient Safety Agency (NPSA) safer practice notice in 2009[52] (SPN 002) but in 2011 only 16% of English NHS Trusts stated that it was being used in transfusion practice[53]. The NHS number (or equivalent) is a very effective way of linking patient records in reference laboratories, particularly as Blood Services are making these reference results available to hospitals so that historical records for patients with complex serological problems who are treated in different hospitals can be consulted in a timely way.

The use of alerts or warning flags on the LIMS, as well as logic rules to link the gender or the age of patients to specific blood component requirements, are extremely important IT measures to support safe transfusion laboratory practice. Errors reported this year, and in previous years, demonstrate how failure of these warning flags and alerts can lead to wrong blood or component specification errors. As

well as ensuring that these alerts or warning flags are robust and are tested to function as intended, it is important that they can still allow blood to be issued in an extreme emergency.

It is also necessary to be able to update and reconfigure the alerts or warning flags on the LIMS if transfusion guidelines change, as they have recently. Examples might include the Advisory Committee on the Safety of Blood, Tissues and Organs (SaBTO) guidance on selection of CMV negative components[47] and the sample validity rules in the updated British Committee for Standards in Haematology (BCSH) guidelines for pre-transfusion compatibility procedures in hospital transfusion laboratories[35].

Outside the transfusion laboratory, interoperable systems (i.e. computer systems which interface with each other and exchange information such as the patient information system with the laboratory pathology system) are increasingly used to support safe transfusion practice. Although largely effective at preventing errors, examples are given where trained and untrained staff use electronic blood management systems incorrectly. These examples can be used to demonstrate the benefits of these systems and the consequences of not using them correctly.

Recommendation

- Hospital transfusion laboratories should be encouraged to participate in the national electronic access scheme for blood group and antibody information which is being developed by National Health Service Blood & Transplant (NHSBT) (called Sp-ICE), and equivalent systems in Wales, Scotland and Northern Ireland for patients with complex transfusion requirements, and as recommended by National Patient Safety Agency (NPSA) safer practice notice, to use the NHS number or equivalent national patient numbering system

Action: Hospital Transfusion Laboratory Managers; Pathology Managers