# 2019 Annual SHOT Report – Supplementary information

# Chapter 15: Errors Related to Information Technology (IT)

This supplementary data contains the categorisation of reports by error, along with a more detailed description of IT-related cases by SHOT-reporting category.

**Table 15.3: Summary of errors related to information technology**

| Error | Total reports | Right blood | Wrong blood | Unit transfused when specific requirements not met | | | | | No blood warmer | Wrong group HSCT/SOT | Handling and storage errors | Avoidable or delayed | Traceability |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Not irradiated | Not CMV/not PAS[1] | Not MB/VIP | Ag positive unit/not phenotyped | HLA-matched | | | | | |
| Failure to consult or identify historical record | **17** | 1 | | 5 | | | 6 | 1 | | 4 | | | |
| Failure to link, merge or reconcile computer records | **4** | 1 | | 3 | | | | | | | | | |
| Warning flag in place but not heeded | **40** | 2 | 3 | | 1 | 2 | 8 | 2 | 1 | 4 | 17 | | |
| Warning flag not updated | **29** | | 1 | 9 | 4 | | 8 | | | 3 | 4 | | |
| Failure to use flags and/or logic rules | **53** | 2 | 3 | 25 | 5 | 5 | 7 | | | 3 | | 3 | |
| Computer or other IT systems failure | **19** | 6 | 2 | 1 | | | 1 | | | | 1 | 7 | 1 |
| Errors related to electronic blood management system | **41** | 8 | 1 | 1 | | | 1 | | | | 7 | 4 | 19 |
| Equipment failure | **38** | 2 | 1 | | | | 1 | | 1 | | 27 | 6 | |
| Incorrect result or data entered or accessed manually | **20** | 12 | 3 | | | | | | | | | 4 | 1 |
| Discrepancy between LIMS and PAS[2] | **7** | 6 | | | | | | | | | | 1 | |
| Blood issued against wrong patient ID (sample or request form) | **2** | 2 | | | | | | | | | | | |
| **Total** | **270** | **42** | **14** | **44** | **10** | **7** | **32** | **3** | **2** | **14** | **56** | **25** | **21** |

*CMV=cytomegalovirus; PAS[1]=platelets in additive solution; MB=methylene-blue; VIP=virally inactivated plasma; HLA=human leucocyte antigen; HEV=hepatitis E virus; HSCT=haemopoietic stem cell transplant; SOT=solid organ transplant; PAS[2]=patient administration system; ID=identification; OBOS=online blood ordering system; EI=electronic issue*

## IT-related Anti-D immunoglobulin (Ig) cases n=13

There were 13 cases where IT errors played a part in incorrect anti-D Ig administration.

### Anti-D Ig given unnecessarily n=9

Anti-D Ig was given to 5 D-positive mothers and on 4/5 occasions this was because the maternal electronic patient record and the laboratory information management system (LIMS) were not linked electronically and the result had to be transferred manually. In another case the analyser incorrectly assigned a D-negative group to a mother with weak D. This was a problem with the analyser that required upgrading and recalibrating.

Anti-D Ig was given where the baby at birth was D-negative or the fetus following cell-free fetal deoxyribonucleic acid (cffDNA) testing was predicted to be D-negative. The 2 cases below exemplify the importance of having a process in place to use the cffDNA result to guide issue of anti-D Ig from the LIMS using a set of flags or logic rules.

**Case 8.2: Flags or logic rules not updated to reflect new processes**

*A woman had a potentially sensitising event after 20 weeks gestation and a Kleihauer was sent to the laboratory. On reporting the Kleihauer an automatic LIMS comment prompted the issue of anti-D Ig. Anti-D Ig was duly issued and administered, although the midwife did query whether this was necessary and was reassured by the laboratory that it was. However, a sample for cffDNA had been analysed and predicted the fetus was D-negative. It was the laboratory policy to check the cffDNA result before issuing anti-D Ig but this was not done. The LIMS had not been configured to link to this result when issuing anti-D Ig so the LIMS did not prevent issue of anti-D Ig in this situation.*

**Case 8.3: Ineffective recording of cffDNA result**

*Anti-D Ig was given to a D-negative woman carrying a D-negative fetus. A woman presented late in pregnancy with reduced fetal movements and it was noted that she had not been given routine antenatal anti-D Ig prophylaxis (RAADP) so after checking with the laboratory it was given late. She had a cffDNA sample sent but the result was not on the LIMS, however it was on Sp-ICE which was accessed the following day and the fetus was predicted to be D-negative. In fact, this had also been accessed by the community midwife which is why RAADP had not been given, but this was not recorded. There was no procedure in place for putting the cffDNA result onto the LIMS and therefore no way of ensuring that anti-D prophylaxis is only given to those who need it.*

### Delayed anti-D Ig administration n=3

On 1 occasion the D group had been deleted in error from the booking bloods by a biomedical scientist (BMS) in another department at the point of inputting a set of microbiology results. This had resulted in delay in identifying a D-negative woman eligible for anti-D Ig.

Another delay post delivery could have been prevented if the cord blood result had been transmitted directly to the maternity electronic patient record. On this occasion the wrong result was received verbally (although there was no record of the conversation) and the woman was discharged without anti-D Ig.

A 3rd case was given anti-D Ig late because there was a discrepancy between the mother's blood groups taken in the current pregnancy and one tested 2 years previously. Investigation showed that the historical blood group had been assigned to a different person but the LIMS records had been incorrectly inked.

## Miscellaneous n=1

A final miscellaneous case resulted in a woman being given anti-D Ig which was assigned in the LIMS to a different patient. The labels had been mixed up at issue of anti-D Ig to an antenatal clinic.

# IT-related incorrect blood component transfused (IBCT) cases n=127

## IBCT-wrong component transfused (WCT) n=25

In 1 case an O D-positive unit had been misplaced in the short-dated drawer in the blood stock refrigerator and was selected and transfused to an O D-negative female patient in her 40s. Although the LIMS warned of the blood group discrepancy, it was not heeded.

In the 2nd case a stem cell transplant protocol was not provided to the transfusion laboratory so was not put on the LIMS in a timely manner and the wrong blood was issued.

**Case 9.8: Wrong blood issued for non-urgent transfusion during IT downtime**

*An elderly female with no red cell antibodies was given two units of O D-positive blood during IT downtime. She was actually O D-negative and this was identified when the manually issued units were retrospectively entered into the LIMS. The error was an incorrect manual interpretation of the blood group, but also failing to have a second checker of the results and the issue of correct components when manual procedures were in place. The scheduled IT downtime lasted for 6 hours, 2 hours longer than expected, and the hospital transfusion laboratory was issuing blood for non-urgent patients during this time which made the laboratory staff very busy.*

**Case 9.9: Incorrect use of electronic blood tracking system**

*A postoperative female patient aged less than 50 years with a haemoglobin (Hb) of 70g/L required an 'urgent' transfusion. A registered nurse did not follow the correct procedure when collecting blood from a remote issue refrigerator. Two units of group O D-positive red cells were removed without entering the patient's details or printing a compatibility label. The blood was then transfused to the patient without any bedside checks. Fortunately, the patient was O D-positive and suffered no adverse effect.*

## Learning points

- Remote electronic issue systems must be set up safely so that non-emergency blood cannot be collected without going through a compatibility procedure. This applies to both routine and urgent transfusions
- Staff should be trained to understand their role in giving compatible blood to patients when using these systems and untrained staff must be prevented from accessing a remote electronic issue refrigerator
- When using emergency access procedures only emergency blood should be available for collection

## IBCT-specific requirements not met (SRNM) n=102

### Case 9.10: LIMS defaults to 18-week sample validity

*A problem with the LIMS configuration was identified during a sample audit. It was recognised that two units of red cells had been collected from a remote issue refrigerator and transfused during an emergency in theatres based on a sample that was invalid (16-week-old). The local policy stated a maximum of 12 weeks for sample validity for remote electronic issue. Investigations during the audit showed that the LIMS defaults to a fixed sample validity of 18 weeks. This highlights the importance of configuring the LIMS to reflect local policies. Initial validation or periodic revalidation should have detected this discrepancy.*

### Case 9.11: An update to report printing has an unexpected effect on electronic issue (EI)

*An upgrade to the LIMS was requested with the purpose of changing how transfusion reports for the general practitioner (GP) were printed. An algorithm intended to be run overnight identifies a GP report, prints the report and removes the flag from the sample. This had an unexpected effect on a completely different and unrelated task – that of identifying sample unsuitable for EI. The new algorithm turned off the flag that states a sample has been manually edited and the case is ineligible for EI. This could potentially result in inappropriate permission for electronic blood issue. The hospital reported to the LIMS provider who have investigated and corrected as well as communicating to all users of their system.*

## Learning point

- It is standard practice to validate critical processes after a software upgrade. This should include all critical processes, even those that are not obviously related to the change or improvement. In addition, any unexpected consequences of a software upgrade should be fully investigated and reported to the software provider

## Failures involving electronic blood management systems

### Case 9.12: Use of remote EI fails to provide irradiated blood components

*Two units of irradiated red cells were requested for a male in his 70s with Hodgkin's Lymphoma. This specific requirement was not flagged on the LIMS, but irradiated blood was crossmatched and placed in the issue refrigerator. The clinical staff by-passed the crossmatched blood and opted for remote-issue blood instead. Because the LIMS flag had not been set, Bloodhound360® then released short-dated non-irradiated blood and one unit plus 100mL of the second unit was transfused before this error was detected.*

## IT-related handling and storage error (HSE) cases n=76

**Case 10.3: Incorrect use of electronic prescribing system fails to verify traceability**

*A new electronic prescribing system for blood was introduced which allowed staff to fate the transfusion at the point of administration and also to record the transfusion observations. The fate of a red cell unit could not be established because the there was no electronic record. The ward confirmed the unit had been transfused, but further investigation revealed that staff had been recording the transfusion and observations on a piece of paper and transcribing at a later date. On this occasion, they had forgotten. This was not the correct procedure for which they had been trained but was 'normal' practice on the ward.*

### Learning point

- This case demonstrates the use of a manual 'workaround' to mitigate ergonomic issues with an information technology (IT) system. The report suggests that contemporaneously inputting the required data electronically was more challenging than recording it on paper for subsequent transcription. Manual workarounds arise because the ergonomics of a process are not aligned with the realities of completing a task in real world scenarios and lead to poor quality data capture. Recognition of the primacy of the ergonomics of a system should inform the design of IT systems

## IT-related avoidable, delayed and under/overtransfusion (ADU) cases n=25

There were 12 delays, 5 cases of overtransfusion and 8 avoidable transfusions where IT systems or other equipment was at fault. Some examples are given below.

### Errors related to electronic blood management systems

**Case 11a.5: Delay due to LIMS interface with remote electronic issue (REI) refrigerators**

*Clinical staff were unable to remove blood REI from the theatre blood refrigerator for a patient who was actively bleeding during liver transplant resulting in a 30-minute delay which was resolved by collecting the red cells for the patient from the transfusion laboratory. On this occasion the interface had to be restarted to enable REI. The problem identified was the capacity of the server which needed replacing because excessive demand on existing capacity slows down messaging between LIMS and REI refrigerators.*

In a complex surgical case there was a 10-minute delay in providing REI blood because the interface with the blood-tracking system failed and had to be reset before blood could be released. There was no contingency planning or advanced communication about the planned implementation of an uninterruptable power supply and surgery in a neonate had to be suspended because the blood refrigerator was re-setting and could not release blood for urgent transfusion.

### Learning point

- Hospital transfusion teams should review their contingency plans for planned and unplanned information technology (IT) downtimes, including ensuring sufficient server capacity and risk-assessing the impact on clinical services

### Errors related to interoperable systems

**Case 11d.2: Delay to administration of prothrombin complex concentrate (PCC) contributes to a patient's death**

*An elderly lady on warfarin fell and broke her arm. She was admitted and later developed a spontaneous intracerebral haemorrhage, possibly as a result of hypertension. The anticoagulation was immediately reversed with vitamin K and PCC was advised. The doctor 'prescribed' PCC using the electronic patient record system but in fact this was an order to the blood bank, not a prescription. The PCC was issued immediately but not collected or administered for another 5 hours. The patient died 5 days after admission. Changes have been made to the IT system to make sure it is clear to clinical staff that an order and a prescription need to be completed separately.*

## Learning points

- Electronic prescribing systems are increasingly used in blood transfusion and have a number of advantages including the provision of a permanent electronic record which is visible to all those eligible to access the patient record. The configuration of these systems is complex as you have to identify a) the order to the laboratory b) the instruction to the clinical area as two separate but interoperable functions

- There is considerable scope for sharing expertise in the area of electronic ordering and prescribing to ensure that safe and effective systems are available to all in the future

## Incorrect use of POCT equipment or bedside tracking

### Case 11b.3: Incorrect use of bedside identification and labelling systems

*A patient was transfused in error based on a Hb from a different patient. Using order comms, a sample was taken from the wrong patient (wrong blood in tube) because the correct procedure was not followed. The procedure for phlebotomists, using a 'computer on wheels' and wireless printer, is to bleed and label one patient's sample at a time, at the bedside. But in practice, medical staff make a request, print off the labels and give to the phlebotomist to do, so this sample probably had a label attached that got left on the trolley and was not checked prior to attaching the label to the sample.*

## IT-related right blood right patient (RBRP) cases n=42

**Case 13.2: Extra care required when using manual systems during downtime**

*The usual printer was not working during LIMS server 'downtime'. The LIMS was working and blood was issued to a patient using the LIMS. Compatibility labels were printed using the back-up printer system. Two ABO-compatible red blood cell units were issued and transfused but the units issued had different donation numbers to the ones allocated by the LIMS. There was no procedure in place to check the units and patient details against the LIMS system when the back-up printer was being used. A new two-person check sheet has been programmed into the back-up printing program, to ensure two independent people check before the blood leaves the laboratory.*

**Case 13.3: Medical staff respond inappropriately to electronic blood management system (EBMS) printer failure**

*A patient bled during surgery and blood was available for immediate remote electronic issue (REI). At the point of collection from the REI refrigerator, the label printer failed, and a blank label was issued. The hub laboratory was consulted and the biomedical scientist correctly advised the theatre team that emergency blood was immediately available or compatible blood could be provided if there was enough time to label and transport it from the hub laboratory. Neither option was acceptable to the surgeon or anaesthetist who went for a third incorrect option of transfusing the unlabelled units that had been released from the REI refrigerator.*

**Case 13.4: Incorrect use of the emergency button on BloodTrack®**

*During a Code Red trauma call 20 components were transfused over 30 minutes to a patient with a different spelling of the trauma name on the units and the identification (ID) wristband. Although a BloodTrack® system was in place and was used for all the components, the operator selected the emergency mode which does not check the ID on the blood against the ID band.*