Handling and Storage Errors (HSE) n=272

10

Authors: Heather Clarke, Nicola Swarbrick and Victoria Tuckley

Definition:

All reported episodes in which a patient was transfused with a blood component or plasma product intended for the patient, but in which, during the transfusion process, the handling and storage may have rendered the component less safe for transfusion.

Abbreviations used in this chapter

HSE	Handling and storage error	**NHS**	National Health Service
BSQR	Blood Safety and Quality Regulations	**NM**	Near miss
ED	Emergency department	**OPEL**	Operational pressures escalation levels
GP	General practitioner	**SOP**	Standard operating procedure

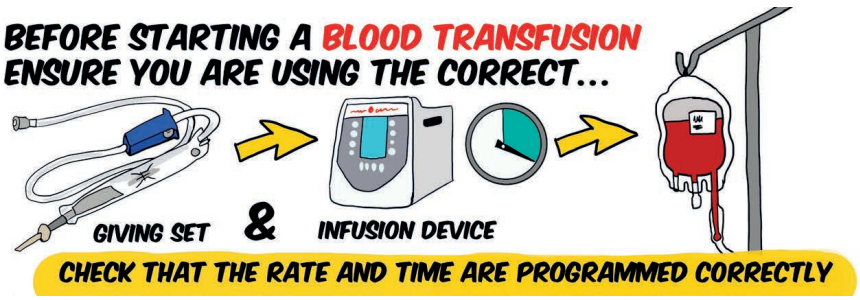
Key SHOT messages

- Clinical errors contribute to more than 80% of HSE errors reported in 2022 with technical administration errors and cold chain errors accounting for most (85.3%) of the clinical HSE errors
- Of the laboratory HSE errors, non-compliance with cold chain and inappropriate return to stock/quarantine were the most common (55.5%) errors reported

Recommendations

- A pre-administration checklist should include checking that the correct giving set is used and that the pump (if used) is set correctly
- To avoid potential patient harm from excessive time to transfuse errors, patients must be monitored during all blood transfusions. Increased education to clinical staff about this must be included in the blood transfusion training and competency-assessments
- Wherever possible cold chain compliance should be controlled by laboratory information management systems and/or electronic blood-tracking systems. Laboratory procedures should be in place for the accurate return of components back into stock and cover quarantine procedures, including information about cold chain compliance

Action: All staff involved in transfusions, laboratory management

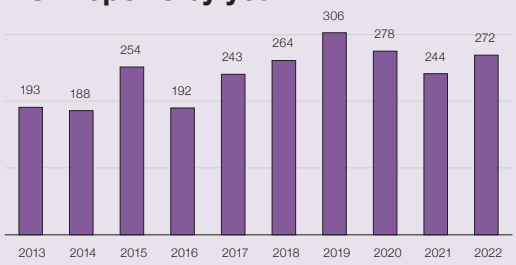


SHOT
Serious Hazards of Transfusion

Headline data 2022

Number of reports n=272
Deaths n=0
Major morbidity n=0

HSE reports by year



Demographic data

Male n=124
Female n=130
Unknown n=18

Adults n=228
Paediatric n=22
Unknown n=22

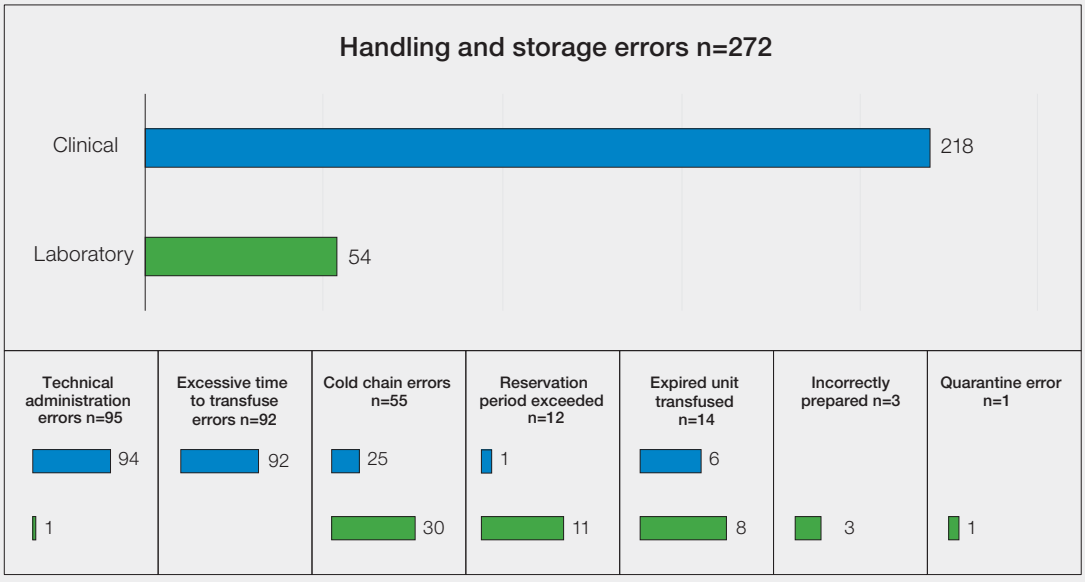
Blood component data

Red cells n=226
Platelets n=25
Plasma n=14
Cryoprecipitate n=1
Multiple components n=6

Introduction

There were 272 cases reported in 2022. HSE errors accounted for 244/3161 (7.7%) reports in 2021 (Narayan et al. 2022) and for 272/3499 (7.8%) in 2022. Clinical errors accounted for 218/272 (80.1%) and laboratory errors for 54/272 (19.9%). The distribution of clinical and laboratory errors are illustrated in Figure 10.1.

Figure 10.1: Breakdown of 2022 handling and storage error (HSE) reports (n=272)



Deaths related to transfusion n=0

There were no deaths reported that were related to errors associated with HSE in 2022.

Major morbidity n=0

There were no HSE cases reported in 2022 that resulted in major morbidity.

Clinical errors

The number of clinical errors has seen a slight rise (from 190 reported in 2021 to 218 in 2022) and

there has been an increase in technical administration errors (94/218 in 2022 and 73/190 in 2021). The percentage of excessive time to transfuse errors is the same as in the last Annual SHOT Report at around 42% (92/218 and 79/190 in 2021). Technical administration errors have been further categorised below in Table 10.1.

Technical administration error	Number of cases
Pump	58
Giving set	28
Same venous access used	2
Staff not trained	1
Miscellaneous	5
Total	**94**

Table 10.1: Clinical technical administration errors (n=94)

Of the 58 administration pump errors, 30 incidents related to the pump being set incorrectly despite a correct prescription. There were 28 errors related to giving sets, of which 26 were wrong giving set used, 1 clamp malfunction and 1 giving set error due to the cannula positioned in the antecubital fossa which resulted in the transfusion being administered over 47 minutes instead of over the 2 hours as prescribed. Those used in these incidents were a combination of fluid and drug giving sets. The trend for these errors continues to be similar to previous years.

Excessive time to transfuse errors mostly occurred during routine hours (08:00-20:00) 57/92 (61.6%) which was consistent with last year's data and the majority (34/57) were routine requests, with 16/57 incidents of urgent/emergency requests.

Case 10.1: Unit of red cells transfused exceeding time allowed after removal from controlled storage

Two units of red cells were removed in a cool box validated for 6 hours at 22:13 for a patient in the ED. The first unit was transfused in the ED over 3 hours and then the patient was moved to a ward. The second unit was transferred with the patient in the cool box to the ward. The second unit was started after being in the cool box for 5.5 hours and transfusion was not completed until 8.5 hours after removal from the blood refrigerator.

On investigation the patient was being transfused in the ED but was not actively bleeding. The blood prescription was for two red cell units each to be transfused over 3 hours. Both units were removed from the refrigerator at the same time by a porter who was used to requests from ED for bleeding patients requiring more than one unit to be transfused quickly and would collect and pack in the 6-hour cool box used for massive haemorrhage activations. There was no documentation to suggest that only one unit was to be collected when two were prescribed.

ED at the time were operating under OPEL 4 conditions (pressure in the local health and social care system continues to escalate leaving organisations unable to deliver comprehensive care). The patient was symptomatic with anaemia caused by severe iron deficiency. There was no facility to transfuse the patient in a more appropriate setting for the next 4 days, so the GP sent the patient to the ED for transfusion.

There was no evidence from the patient's notes of the time when the patient was transferred from the ED to a ward, or that the receiving ward knew how long the blood had been in the 6-hour cool box. The prescription chart should have identified the time the first unit had been commenced and that it was not possible to complete the second unit within the 6 hours from removal from the blood refrigerator, but this was not noticed.

No adverse reaction was reported for the patient.

Case 10.2: Acknowledging continuing excellence case

An NHS organisation has submitted report of an innovation project to address previous red cell transfusions that went over 4 hours, including >5-hour episodes that were reportable to SHOT. Transfusion take-down tags were designed, trialled and produced to increase awareness in the clinical area, to inform all staff in the vicinity and empower the patient, to prompt an appropriately

trained member of staff to take the red cell unit down within 4 hours of removal from the cold chain. The tags increase compliance with the BSQR (BSQR 2005) and reduce the risk of potential bacterial infection. From the feedback received, all patients during the trial period understood the concept and felt this helped them prompt a staff member to complete their transfusion and take the unit down if it is nearing the 'take down time'. The patients reported feeling safer during their transfusion. There were no further incidents of transfusions exceeding 4 hours during the trial usage of the tags.

This is an excellent example of sharing good practice about a process that has been put in place to potentially eradicate excessive time to transfuse errors.

Figure 10.2: Transfusion take-down tag

This registered design is re-produced with permission of Royal Cornwall Hospitals NHS Trust who can be contacted for any further information - Rch-tr.TMGTX@nhs.net

Laboratory errors

The number of laboratory errors were the same in 2022 as the 2021 Annual SHOT Report with 54 errors. Most of the errors were cold chain errors (30/54). Cold chain errors have been further categorised in Table 10.2.

Cold chain error	
Inappropriate return to stock	12
Refrigerator/equipment failure	9
Incomplete cold chain	4
Transport and delivery	3
Inappropriate storage	2
Total	**30**

Table 10.2: Laboratory cold chain errors (n=30)

Of the 9 refrigerator/equipment failure errors, 4 involved the temperature monitoring system and of the 12 inappropriate returns to stock errors, 5 involved the blood-tracking system.

Where units were inappropriately returned to stock these were following temperature excursions due to refrigerator failures, data logger failures, where IT alerts were overridden, or the quarantine process was not followed.

Where units were transfused following a refrigerator failure these were due to IT alarms being ignored, data logger failure or equipment inappropriately returned to use following temperature excursions and/or equipment failure.

Case 10.3: Unit of red cells transfused with no documented cold chain for 36 hours

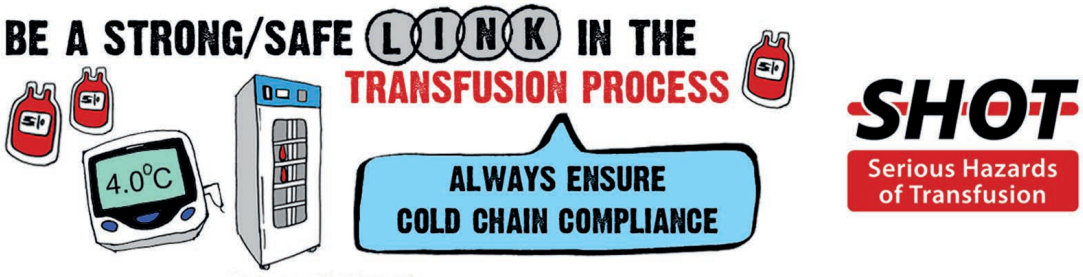
A unit of emergency O D-negative red cells was taken to the ED. It was not used and returned to the laboratory 2 days later. This was returned to stock instead of being put into quarantine as there was no documented cold chain for the 36 hours the red cell unit was out of the laboratory. The unit was then issued to another patient and transfused. The error was only picked up by chance when staff looked for the missing compatibility tag.

On investigation, it was identified that the quarantine SOP and paperwork needed clarification.

No adverse reaction was reported for the patient who received the red cell unit.

Learning points

- Laboratories must have clear SOP for the appropriate and timely return of blood components back into stock and these must include quarantine procedures
- The temperature monitoring systems in use by laboratories should be checked regularly, and should include testing the full functionality of the system to ensure the safe storage of blood components



Near miss HSE cases n=140

There were 140 NM HSE cases reported in 2022, which is the same as reported in 2021. There were 110/140 (78.6%) that originated in the clinical area and 30/140 (21.4%) in the laboratory. The NM HSE cases primarily involved cold chain errors 108/140 (77.1%), followed by 10/140 (7.1%) cases of technical administration errors, 9/140 (6.4%) cases of reservation period exceeded and 7/140 (5.0%) cases where expired units were almost transfused to patients.

Observations from human factors reports

On review of the human factors attached to the administration errors reported this year, there appears to be two common themes. These being a mismatch between workload and staff provision along with issues or gaps with staff skill or knowledge which have worsened post pandemic. Similar themes are also evident in the laboratory workforce from the errors reported. Adequately trained and competent staffing levels are paramount to ensuring patient safety at all points in the transfusion process both clinically and in the laboratory.

Conclusions

By working collaboratively, staff in the laboratory and clinical area can ensure the safety of the blood components that are transfused. Staff need to be aware of the correct rate and duration of transfusions. Other factors, such as staffing levels and appropriate working conditions to ensure safe patient monitoring should be addressed. SHOT reinforces that all staff who participate in the handling and storage of blood components should adhere to correct procedures in accordance with local transfusion policies. Transfusion policies should be easy to access and contain useful information based on the most current published guidance available (BSH Robinson et al. 2018). By embedding these policies in working practice, safer patient care overall can be achieved.

Recommended resource

Patient Blood Management - Blood assist app
Apple (https://apps.apple.com/gb/app/blood-assist/id1550911130)
Google play (https://play.google.com/store/apps/details?id=uk.nhsbt.bloodassist)
Web based (https://www.bloodassist.co.uk/)

References

BSH Robinson S, Harris A, Atkinson S, et al. The administration of blood components: a British Society for Haematology Guideline. *Transfus Med* 2018;**28(1)**:3-21. http://onlinelibrary.wiley.com/doi/10.1111/tme.12481/full [accessed 28 April 2023].

BSQR. The Blood Safety and Quality Regulations ISBN 0110990412 (2005). http://www.legislation.gov.uk/uksi/2005/50/contents/made [accessed 28 April 2023].

Narayan S (Ed), Poles D, et al. on behalf of the Serious Hazards of Transfusion (SHOT) Steering Group. The 2021 Annual SHOT Report (2022). https://www.shotuk.org/shot-reports/ [accessed 27 April 2023].