11 Handling and Storage Errors (HSE) n=342

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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	**NM**	Near miss

Key SHOT messages

- Clinical errors contribute to 259/342 (75.7%) of HSE errors reported in 2023, with excessive time to transfuse, pump and giving set errors accounting for most of these errors, 193/259 (74.5%)
- Of the laboratory errors, cold chain errors including inappropriate return to stock and refrigerator failure accounted for most errors, 54/83 (65.1%)

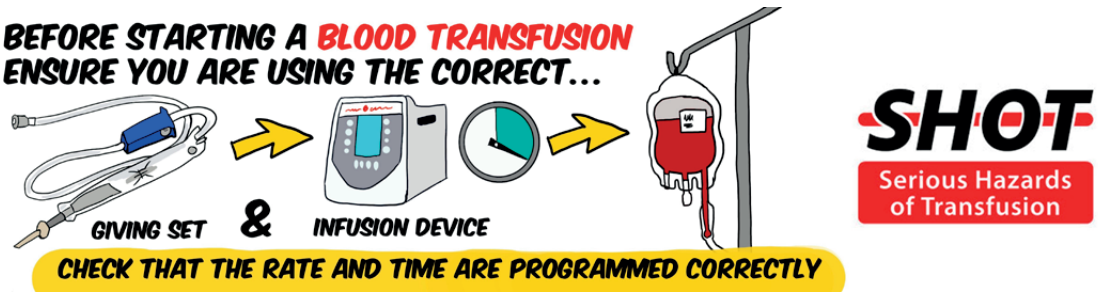
Recommendations

- Laboratories should have an effective procedure in place to periodically test the functionality and alarm settings of their temperature-monitoring systems

Action: Transfusion laboratory managers

- A structured handover in clinical areas is needed when patients are receiving a transfusion that continues into the next shift. This should be audited regularly to inform local improvement actions
- Any gaps in staff knowledge need to be identified and addressed in transfusion training

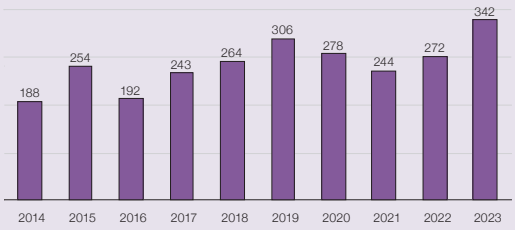
Action: Education leads, ward managers, audit leads



Headline data 2023

Number of reports n=342
Deaths n=0
Major morbidity n=0

HSE reports by year



Demographic data

Male n=170
Female n=147
Unknown n=25

Adults n=282
Paediatric n=32
Unknown n=28

Blood component data

Red cells n=289
Platelets n=29
Plasma n=16
Cryoprecipitate n=4
Granulocytes n=1
Multiple components n=3

Introduction

There was an increase of errors reported from 272 in 2022 to 342 in 2023. HSE errors accounted for 342/3833 (8.9%) errors in 2023 compared with 272/3499 (7.8%) in 2022 (Narayan, et al., 2023). Clinical errors accounted for 259/342 (75.7%), which is a smaller percentage than 2022, 218/272 (80.1%), and laboratory errors for 83/342 (24.3%), which is an increase from 2022, 54/272 (19.9%). The variation between clinical and laboratory errors are illustrated in Figure 11.1.

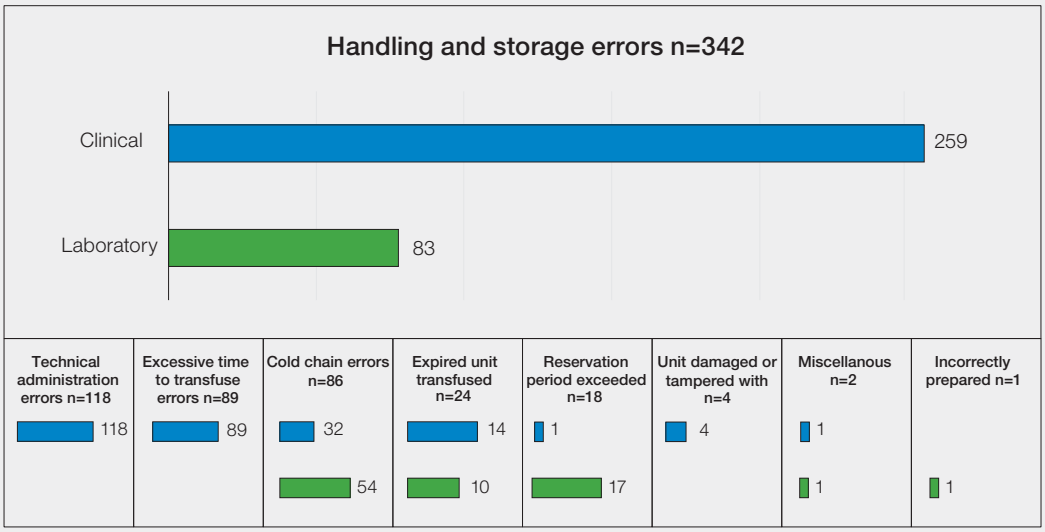


Figure 11.1: Breakdown of 2023 handling and storage error (HSE) reports (n=342)

Deaths related to transfusion n=0

There were no deaths that were related to errors associated with HSE in 2023.

Major morbidity n=0

There was 1 case of major morbidity related to a HSE error in 2023, but as an uncommon reaction, this has been included in the numbers for the UCT category. A patient developed chest pains and desaturation soon after the start of a blood transfusion. The clinical deterioration was due to venous air

embolism following inappropriate preparation of the line prior to transfusion. This highlights the potential complications following HSE errors. Proper handling and storage of blood products are crucial for ensuring patient safety and effectiveness of transfusions. See Chapter 20, Uncommon Complications of Transfusion (UCT), Case 20.3 for more details.

Clinical HSE errors n=259

The number of clinical errors has increased (from 218 reported in 2022 to 259 in 2023) and a similar rise in technical administration errors was noted,118/259 (45.6%) in 2023 and 94/218 (43.1%) in 2022. Technical administration errors have been further categorised in Table 11.1.

Table 11.1: Clinical technical administration errors (n=118)

Technical administration error	Total
Pump programming error	62
Incorrect giving set	39
Same venous access used	7
Manual drip rate incorrect	4
Miscellaneous	3
Prescribed too fast	2
Recalled but given in error	1
Total	**118**

Of the 62 administration pump errors, 51 incidents related to the pump being set incorrectly despite a correct prescription. There were 39 errors related to giving sets, of which 2 also had additional errors (excessive time to transfuse and incorrect preparation).

Excessive time to transfuse errors occur equally within routine hours and out of routine hours. These are reported more frequently following routine requests (46/89) than during emergency/urgent requests (31/89). When asked, 42/89 reporters felt that handover had impacted on the error but only 23/42 had a structured handover in place between shifts and staff changes. Examples of structured handover process were initially outlined by the NHS Institute for Innovation and Improvement (2010) Situation, Background, Assessment and Recommendation (SBAR) implementation and training guide. Laboratory areas can also benefit from good quality structured handovers (Tuckley, et al., 2022).

Case 11.1: Excessive time to transfuse using the wrong giving set

When receiving a non-urgent transfusion, the patient reported that the transfusion they were receiving had run for an extended period (approximately 6 hours). It was found to have been administered through the incorrect giving set. Upon investigation, the documentation was found to be sub-optimal. No stop time and no end observations were recorded. There were no medical or nursing notes pertaining to the transfusion. The patient was in the day surgery unit which after hours was covered by agency staff supervised by a single substantive nurse not familiar with this area.

Non-urgent transfusion should be avoided outside of routine hours, where at all possible and not detrimental to patient safety. Providing comprehensive orientation and support to agency staff can help address challenges they face when working in unfamiliar surroundings. It is important that transfusions are given in settings which support safe practice and have appropriately trained staff.

Laboratory HSE errors n=83

The number of laboratory errors have increased to 83 in 2023 from 54 in 2022, with the majority being cold chain errors, 54/83 (65.1%), which have been further categorised in Table 11.2.

Table 11.2: Laboratory cold chain errors (n=54)

Cold chain error	Number of cases
Inappropriate return to stock	27
Refrigerator/equipment failure	17
Incomplete cold chain	7
Transport and delivery	2
Inappropriate storage	1
Total	**54**

Of the 17 refrigerator/equipment failure errors, 9 involved a temperature-monitoring system and of the 27 inappropriate returns to stock errors, 7 involved a blood-tracking system.

Case 11.2: Temperature-monitoring system alarm limits set incorrectly

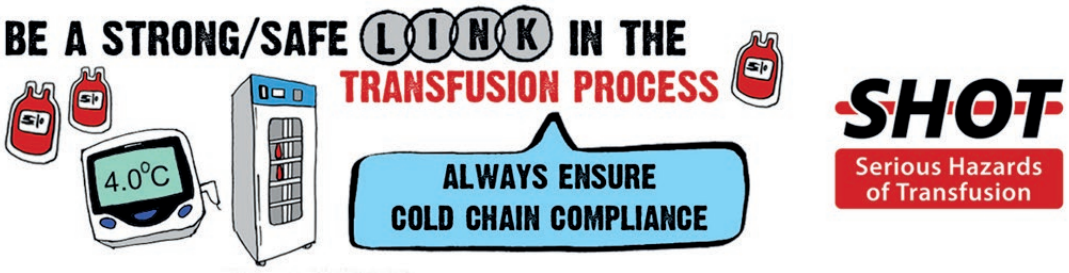
During a training session the transfusion practitioner noted that the issue refrigerator door was slightly ajar, and closed the door, but did not inform the laboratory staff at the time of the event. Later, when laboratory staff reviewed the temperature logs on the temperature-monitoring system and the paper chart on the refrigerator, it was noted that the temperature had been above 6°C for approximately 2 hours. The lead biomedical scientist immediately initiated a recall of all red cell components that had been stored in the refrigerator during the time that it had been outside the acceptable temperature.

It emerged that one patient had been transfused with a unit of red cells implicated in the temperature excursion. The consultant haematologist was made aware and there was no obvious adverse reaction in the patient. Five other red cell units were disposed of. The blood refrigerator temperature-monitoring system usually triggers an audible and visual alarm in the laboratory, but this did not occur. The alarm settings were reviewed, and it was noted that the air temperature alarm was set to trigger at 7.7°C with a 5-minute delay. No justification could be provided for the air alarm setting and so it was immediately adjusted to meet requirements. The blood refrigerator temperature probes were connected to a third-party alarm escalation service, but did not trigger an alarm to switchboard as expected.

The blood refrigerator was also fitted with a door open alarm. The settings for this were checked and found to be on 3-minute delay, this has since been adjusted to a 1-minute delay. It is not clear whether the door alarm did sound on the day of the event but, during testing, it was observed that the alarm was not very loud.

Learning points

- Blood giving sets should be stored in clearly labelled containers and distinguishable from other giving sets to prevent selection of the wrong type
- Staff should be trained to use pumps appropriately, verify pump settings regularly and minimise interruptions to focus on critical tasks
- To prevent excessive time to transfuse incidents, clinical areas need to have a system in place to alert staff and the patient when a transfusion should stop, and the unit be taken down. An example of an innovative solution can be found in Chapter 10, Handling and Storage Errors (HSE) of the 2022 Annual SHOT Report (Narayan, et al., 2023)



Near miss HSE errors n=138

There were 138 handling and storage near miss events in 2023, including 104 clinical errors and 34 laboratory errors. Of the clinical NM-errors, 93 were cold chain errors where blood components were stored in inappropriate conditions in the clinical area, and in 11 cases expired blood components were collected. Of the laboratory NM-errors these were mainly due to 23 expired units issued, and 6 cold chain errors. Insufficient handover impacted upon 37/138 (26.8%) NM-HSE errors, and mostly affected clinical cold chain errors, 25/93 (26.9%).

Conclusion

The overall findings remain consistent with previous Annual SHOT Reports with an increasing trend in reported errors especially in the laboratory. There continues to be a mismatch between workload and staffing in both the clinical and laboratory areas. It also highlights that even though staff are trained and competency-assessed the same errors keep happening. SHOT reiterates that all staff who participate in the handling and storage of blood components throughout the transfusion process should be aware of and adhere to the correct procedures that are outlined in guidelines and their local transfusion policy. Transfusion policies should be easy to access and contain useful information based on the most current published guidance available (Robinson, et al., 2018). By embedding these policies in working practice, safe patient care overall can be achieved.

Recommended resources

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/)

NHS Institute for innovation and improvement Safer care SBAR Situation, Background, Assessment and Recommendation implementation and training guide: https://www.england.nhs.uk/improvement-hub/wp-content/uploads/sites/44/2017/11/SBAR-Implementation-and-Training-Guide.pdf

References

Narayan, S. et al., 2023. *The 2022 Annual SHOT Report*, Manchester: Serious Hazards of Transfusion (SHOT) Steering Group. doi: https://doi.org/10.57911/WZ85-3885.

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Robinson, S. et al., 2018. The administration of blood components: a British Society for Haematology Guideline. *Transfusion Medicine,* 28(1), pp. 3-21. doi: https://doi.org/10.1111/tme.12481.

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