11 Handling and Storage Errors (HSE) n=278

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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.

Key SHOT messages

- In progress or planned transfusions must be included in patient handover procedures to prevent handling and storage errors (HSE). This must include information on the transfusion duration and monitoring required

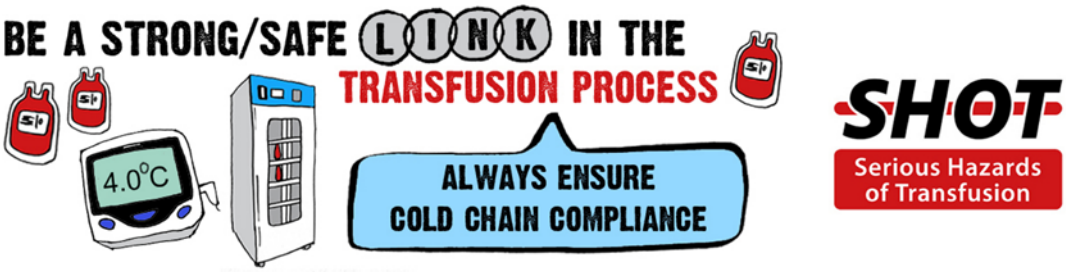
Abbreviations used in this chapter

HSE	Handling and storage error	**NM**	Near Miss

Recommendations

- Education for clinical staff should include information on the appropriate rates of transfusion and should consider variations required for individual patient needs. Where an infusion pump is used, procedures must be in place to ensure the correct rate is achieved
- 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, including information about cold chain compliance

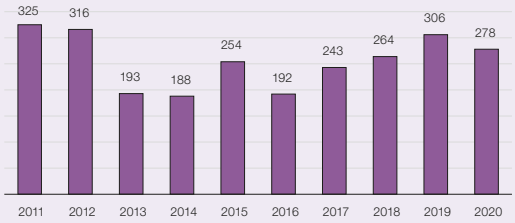
Action: Clinical education teams, laboratory management



Headline data 2020

Number of reports n=278
Deaths n=0
Major morbidity n=0

HSE reports by year



Demographic data

Male n=135
Female n=104
Unknown n=39

Adults n=231
Paediatric n=14
Unknown n=33

Blood component data

Red cells n=233
Platelets n=18
Plasma n=20
Multiple Components n=3
Other n=2
Unknown n=2

Introduction

There were 278 cases reported in 2020. HSE errors accounted for 306/3397 (9.0%) reports in 2019 (Narayan et al. 2020) and for 278/3214 (8.6%) in 2020. The reduction in total number of HSE may be attributed to the reduction in transfusions taking place during the first wave of the COVID-19 pandemic. Clinical errors accounted for 185/278 (66.5%) and laboratory errors for 90/278 (32.4%). The distribution of clinical and laboratory errors is illustrated in Figure 11.1.

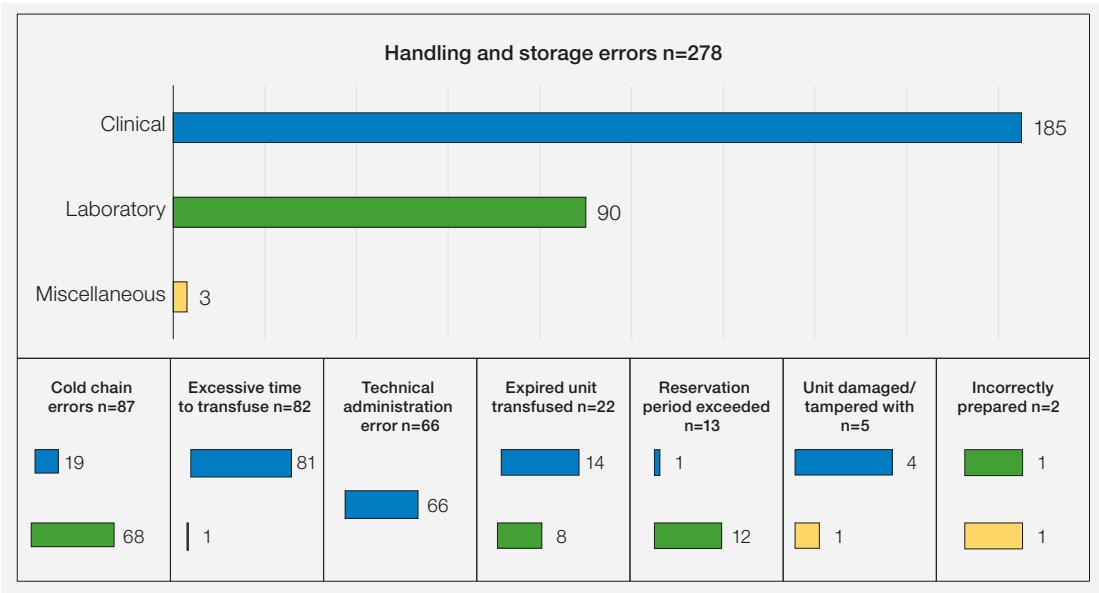


Figure 11.1: Breakdown of 2020 handling and storage error reports (n=278)

The top graph shows an overview of the HSE errors. These are broken down into specific groups of errors in the bottom graph. One case categorised as 'miscellaneous' is not displayed by error in the bottom graphs as it did not fit into any of the categories.

Deaths n=0

There were 19 deaths reported in 2020, but only 1 that related to errors associated with HSE (imputability 1 – possibly related), in which a patient was transfused a unit of red cells over 6 hours and subsequently developed transfusion-associated circulatory overload. This death is not counted in the HSE data but is included in Chapter 18b, Transfusion-Associated Circulatory Overload (TACO).

Major morbidity n=0

There was 1 HSE case reported in 2020 that resulted in major morbidity, but this was unrelated to the transfusion.

Clinical errors

The number of clinical errors remains consistent with previous years, however there has been a 25.8% decrease in technical administration errors (66/185 in 2020 and 89/199 in 2019) and a slight increase (3.8%) in excessive time to transfuse errors (81/185 in 2020 and 78/199 in 2019). Excessive time to transfuse errors include all cases where components have been transfused beyond the recommended time duration. Technical administration errors have been further categorised below in Table 11.1.

Table 11.1: Clinical technical administration errors (n=66)

Technical administration error	Number of cases
Administration pump error	45
Giving set error	15
Inappropriate rate	3
Same venous access used	2
Other	1
Total	**66**

Note: The case included as 'other' contained insufficient information about the technical administration error to categorise.

There were 82 errors relating to excessive time to transfuse, 81 clinical errors and 1 case where the laboratory staff gave inappropriate advice on the transfusion duration. Excessive time to transfuse errors mostly occurred during routine hours (08:00-20:00) 58/82 (70.7%), and surprisingly 22/82 (26.8%) occurred with urgent requests. In both these situations there should be sufficient staff available for patient monitoring. In 32/82 cases (39.0%) no incident investigation was performed, with the most common reason given being that the error was not serious enough to warrant further investigation. This lack of investigation may indicate why the problem is persisting and increasing. Most excessive time to transfuse errors are detected by transfusion practitioners 29/82 (35.4%) or laboratory staff 12/82 (14.6%) showing the error is not always recognised by the clinical staff providing the patients care, and there is likely to be a high level of under-reporting.

There may be a degree of under-reporting in the category of 'expired unit transfused'. SHOT strongly encourage all actions are taken to provide a component which will not expire during the transfusion period. The expiry date represents the latest point in time that the component has been deemed safe for transfusion. A number of systemic factors often contribute to a component being transfused past its expiry, such as staff shortages and gaps in communication. These should be explored and addressed to ensure safe practices.

Case 11.1: Red cells transfused after the units had expired

Two units of red cells due to expire at midnight that day were issued to a patient for a top up transfusion. The units were placed in the issue refrigerator ready for collection. The first unit was collected at 22:00 and the second unit was collected at 06:10 the next day, which was over 6 hours past the midnight expiry. It also transpired that transfusion of the first unit was not completed until after the unit had expired. On investigation the expiration date was highlighted on the blood collection slip and both units were collected by the same healthcare assistant, administered by the same nurse, and both failed to notice the expiry date of the units at collection and pre-administration checks. The laboratory reacted quickly in creating corrective and preventative actions to avoid this happening again and now have a new procedure in place. Any units issued to a patient that expire at midnight on the day of issue are now kept within the laboratory awaiting collection, thus ensuring that they will not be transfused past expiry.

As part of pre-administration checks, components must be inspected to ensure that they have not expired or will not expire during the period of transfusion.

Laboratory errors

In most HSE categories the numbers remain consistent with previous Annual SHOT Reports; however, there has been a decrease in the number of laboratory errors from the 2019 Annual SHOT Report, 90 errors in 2020 compared to 107 in 2019. There was 1 case of excessive time to transfuse which was attributed to laboratory practice. The laboratory gave incorrect advice to the clinical area when asked about continuing a platelet transfusion that had been stopped as the patient needed re-cannulation. This resulted in the unit being transfused nearly 5 hours after collection from the laboratory.

Most laboratory HSE errors involved cold chain errors, 68/90 (75.6%) reports in 2020. The largest cause of cold chain errors identified was refrigerator/equipment failure 33/68 (48.5%) of which 5 involved failures of temperature monitoring processes. Inappropriate return to stock errors accounted for 20/68 (29.4%) of which 5 involved failures in electronic blood tracking systems. Other errors included incomplete cold chain 10/68 (14.7%) and transport and delivery 4/68 (5.9%). In one case cryoprecipitate was inappropriately stored.

Case 11.2: Blood storage refrigerator out of temperature for 2 hours due to failure to respond to temperature monitoring system alerts

A blood storage refrigerator core temperature exceeded its high limit for almost 2 hours. The temperature monitoring service called the laboratory mobile phone as per standard procedure, but the laboratory did not answer as the phone battery was dead and the charger for the phone had gone missing. The caller left a voicemail on the mobile phone and emailed the site lead as per instructions. The site lead missed the email and only found the alarm alert 2 days later whilst clearing another alarm received that day. Three patients were transfused a total of five units of red cells that were out of temperature control for 1.5 hours. Another three units, that were also in the blood refrigerator at that time, had to be wasted. The clinical teams looking after the 3 patients who were transfused were informed and no adverse reactions or harm were reported.

Temperature monitoring systems must have a robust process for escalation of alarms that does not rely on emails and messages left on answering machines. Laboratory management must ensure that reliable communication channels are available at all times. It is important that all staff are aware of the need to act on temperature monitoring alerts in a timely manner to ensure that any equipment problems are picked up and acted upon as quickly as possible. This should prevent wastage and transfusion of potentially unsafe blood components. The laboratory must also have a robust process in place, for staff, so that alerts are picked up as soon as possible and must include clear guidance of what, when and how to escalate.

Emergency preparedness

In 2021, SHOT issued 'SHOT Safety Notice 01: Emergency preparedness in the transfusion laboratory in case of total power outage'. This is based on a handling and storage error reported which occurred during a major power outage and involved thawing of fresh frozen plasma in a non-standard manner. There are many points of merit to be acknowledged in this case, and many learning points about ensuring safety of components during extreme circumstances. This case is included as part of online supplementary material for Chapter 6, Acknowledging Continuing Excellence in Transfusion (ACE). The safety notice can be found in current resources on the SHOT website (see recommended resources at the end of this chapter) and the case has been detailed in the supplementary material (https://www.shotuk.org/shot-reports/report-summary-and-supplement-2020/).

Learning points

- Components must not be transfused past the expiry date. Transfusions should not commence if they cannot be safely completed prior to their expiry
- All staff involved in the transfusion process must be aware of the need for accurate cold chain compliance and the correct storage for blood components

Near miss HSE cases n=129

There were 129 near miss HSE cases which is a 21.3% reduction in the number of cases reported in 2019 (n=164), 105/129 (81.4%) originated in the clinical area and 24/129 (18.6%) in the laboratory. The near miss HSE cases primarily involved cold chain errors 59/129 (45.7%) followed by 39/129 (30.2%) cases of incorrect storage of units and 19/129 (14.7%) cases where expired units were almost transfused to patients. Near miss events outnumber actual errors relating to inappropriate storage (13/278, 4.7%). This suggests that most staff are aware of correct component storage and vigilant clinical staff are returning components to the laboratory when they are outside of appropriate conditions.

Conclusion

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 resources

Blood Assist - a blood administration safety app developed by the Patient Blood Management team at NHS Blood and Transplant.
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 (www.bloodassist.co.uk)

SHOT Safety Notice 01: Emergency preparedness in the transfusion laboratory in case of total power outage
https://www.shotuk.org/resources/current-resources/

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 25 March 2021].

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