26 Haemoglobin Disorders n=117

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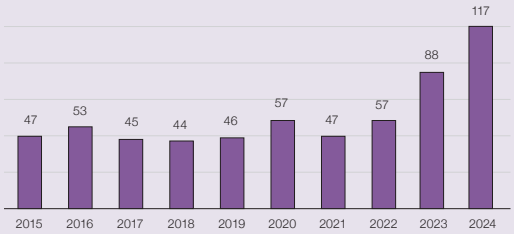
Headline data 2024

Number of reports n=117
Deaths n=3
Major morbidity n=14

Haemoglobinopathy cases by year



Key findings:

- The number of reports related to haemoglobin disorders have increased year-on-year
- Haemolytic transfusion reactions (HTR) are a particular problem in patients with sickle cell disease (SCD) and make up a significant proportion of all HTR reported to SHOT
- There were 3 deaths following HTR, all were in patients with SCD
- Reports of febrile, allergic, and hypotensive reactions (FAHR) more than doubled in 2024
- Cases of specific requirements not met (SRNM) continue to be reported

Gaps identified:

- Lack of awareness among healthcare professionals regarding the significant risks associated with transfusion, particularly in SCD
- Advice from haematologists specialising in SCD is not always sought prior to transfusion decisions
- National guidance is not always adhered to as demonstrated by examples of unnecessary and unclear indications for transfusion

Good practice:

- It is encouraging to see an increasing trend in reports received in this category as under-reporting continues to be an issue

Next steps:

- Haematology teams must be involved in the management of haemoglobinopathy patients presenting to secondary care and be consulted regarding transfusion decisions
- All haemoglobinopathy patients should have a baseline extended red cell phenotype or genotype prior to transfusion
- It is important to gain a full transfusion history from the patient and inform the transfusion laboratory when patients present to an unfamiliar hospital. The national database (Specialist Services Integrated Clinical Environment (Sp-ICE) or equivalent) should be checked, and the patient's base hospital transfusion laboratory asked for previous transfusion records

For all abbreviations and references used, please see the **Glossary** and **Reference list** at the end of the full Annual SHOT Report. Please see the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/annual-shot-report-2024/).

Definition:

This chapter includes all incidents reported in patients with a significant haemoglobinopathy including sickle cell disease and thalassemia.

Introduction

The total number of haemoglobinopathy cases reported for 2024 was 117, which included 76 cases in SCD patients and 41 cases in thalassaemia patients.

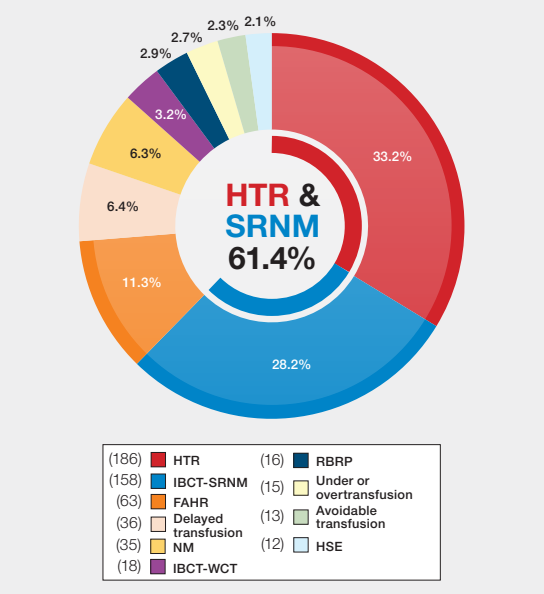
Table 26.1: Cases involving haemoglobin disorders reported in 2024 (n=117)

SHOT category	Sickle cell disease	Thalassaemia	Total
Haemolytic transfusion reactions (HTR)	20	1	**21**
Incorrect blood component transfused-specific requirements not met (IBCT-SRNM)	16	4	**20**
Febrile, allergic, and hypotensive reactions (FAHR)	11	17	**28**
Delayed transfusion	5	3	**8**
Avoidable transfusion	2	1	**3**
Under or overtransfusion	5	3	**8**
Handling and storage errors (HSE)	1	4	**5**
IBCT-wrong component transfused (IBCT-WCT)	2	0	**2**
Right blood right patient (RBRP)	4	1	**5**
Near miss (NM)	8	4	**12**
NM-wrong blood in tube (NM-WBIT)	2	3	**5**
Total	**76**	**41**	**117**

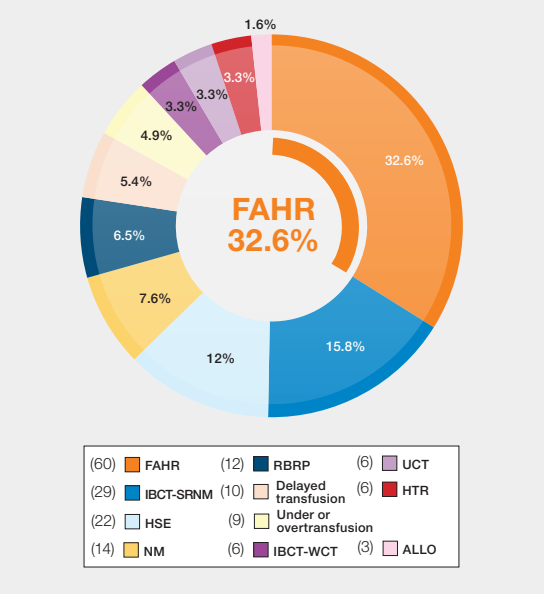
The most frequent reports in SCD were HTR and IBCT-SRNM. The most frequent reports in thalassaemia patients were FAHR.

Figure 26.1: Cumulative data for adverse transfusion events in patients with haemoglobin disorders 2010 to 2024

a. Sickle cell disease (n=560)



b. Thalassaemia (n=184)



ALLO=alloimmunisation; FAHR=febrile, allergic or hypotensive reactions; HSE=handling and storage errors; HTR=haemolytic transfusion reactions; IBCT=incorrect blood component transfused; NM=near miss; RBRP=right blood right patient; SRNM=specific requirements not met; TACO=transfusion-associated circulatory overload; TTI=transfusion-transmitted infection; UCT=uncommon complications of transfusion; WCT=wrong component transfused

Categories with 2 or fewer reports are not included in the figures

Deaths related to transfusion n=3

There were 3 deaths in cases of SCD in the context of a HTR.

Case 26.1: Acute presentation following recent transfusion resulted in patient death (imputability 2 – probable)

A patient with SCD and a history of red cell alloimmunisation received one unit of red cells for concerns over evolving chest syndrome with severe chest pain and hypoxia. The patient was discharged 5 days later but re-presented within 24 hours with severe pain and rapidly progressive multi-organ failure. They were admitted to critical care but died within 48 hours. The working diagnosis was delayed HTR/hyperhaemolysis.

Case 26.2: Death secondary to hyperhaemolysis (imputability 2 – probable)

A patient with SCD and a history of red cell alloimmunisation presented with a sickle cell crisis and was given two units of red cells. The patient was discharged the following day but then re-presented 6 days later with recurrent pain, weakness, dark urine, and a falling haemoglobin (Hb). They were admitted to critical care and died within 48 hours of admission. The working diagnosis was hyperhaemolysis.

The third death has been described in Chapter 21, Haemolytic Transfusion Reactions (HTR), Case 21.1.

Major morbidity n=14

There were 14 cases associated with major morbidity in 2024. These included 10 HTR, all with SCD, and 4 FAHR, 2 with SCD and 2 with thalassaemia.

Febrile, allergic, and hypotensive reactions (FAHR) n=28

There were 28 reports of FAHR, 11 of which were in patients with SCD, and 17 occurred in patients with thalassaemia. All patients made a full recovery. Case 26.3 illustrates a case of FAHR in a patient with thalassemia.

Case 26.3: Febrile reaction in a young child with thalassaemia leading to major morbidity

A young child with thalassaemia was attending an outpatient department for routine red cell transfusion. The first red cell unit was given uneventfully, but during observations to administer a second unit, they became unresponsive. They had chills, rigors, developed a fever of 40.6°C and tachycardia (heart rate 142 beats per minute). The child was treated with paracetamol, antihistamine, and admitted to the paediatric ward for observation overnight. A repeat group and screen sample was tested but did not indicate incompatibility. The red cell unit was sent to the Blood Service for bacterial and fungal culture testing, the results of which were negative. They were discharged the following morning with no further concerns. Local investigation showed that staff dealt with the reaction promptly and appropriately.

Learning points

- All areas administering blood components need to be appropriately equipped, and staff trained, to manage a severe acute reaction. This includes settings where transfusion is given in outpatient settings. Prompt recognition and timely management of reactions is vital to ensure patient safety
- The possibility of a febrile or allergic reaction should be explained to patients/guardians when taking consent for transfusion and relevant patient information leaflets should also be provided

Haemolytic transfusion reactions n=21

The 21 cases reported included 10 cases of hyperhaemolysis, 10 cases of delayed haemolytic transfusion reaction, and 1 acute reaction. Twenty of the cases were in SCD patients which included 3 transfusion-related deaths.

Intravenous immunoglobulin (IVIg) use was reported in 13 cases and intravenous corticosteroids in 11 cases. Eculizumab was reportedly used in 2 cases.

Case 26.4: SCD patient transfused without haematologist advice

A patient with SCD and a history of a previous HTR with multiple red cell antibodies was admitted under the renal team with a Hb of 41g/L. There were clear instructions from the haematology consultant not to transfuse the patient without discussion. A decision to transfuse was made without discussion with haematology which resulted in a further drop in Hb to 37g/L. A new alloantibody (anti-Fy^a) was identified on antibody screen. The patient was treated with IVIg, corticosteroid and further red cell transfusion. The patient died subsequently but the cause of death was not recorded as being related to transfusion.

Case 26.5: Hyperhaemolysis despite IVIg and corticosteroid prophylaxis in thalassaemia

A patient with non-transfusion dependent thalassaemia was admitted with significant anaemia. The patient was transfused one unit of red cells and due to a history of hyperhaemolysis, they also received IVIg and corticosteroid. The patient presented 8 days later with recurrent haemolysis which was managed appropriately, and they recovered fully.

Learning points

- Hyperhaemolysis can recur when a patient with a history is transfused despite the use of prophylactic IVIg and corticosteroid
- Transfusion in patients with red cell antibodies, especially with a history of haemolysis, carries significant risk. This requires early specialist input and risk-benefit assessment prior to transfusion support

IBCT-Specific requirements not met n=20

The specific requirements of blood transfusion for SCD and thalassaemia patients include ABO, extended Rh- and K-matched red cell units. Blood should also be antigen-negative for any clinically significant red cell antibodies and HbS negative for SCD patients. Where possible, blood should be <10 days old for simple transfusion and <7 days old for exchange transfusion but older blood may be given if the presence of red cell antibodies makes the provision of blood difficult (Davis, et al., 2017b).

There were 20 reports of IBCT-SRNM for patients with SCD (n=16) and thalassaemia (n=4).

Case 26.6: Difficulties ascertaining specific requirements of a new patient during a cyber-attack on the hospital electronic patient record system

A patient with SCD presented to a hospital that was not their usual base hospital with a sub-arachnoid haemorrhage and transfusion was requested. Although the laboratory information management system (LIMS) was shared between the new hospital and base hospital, there were different procedures for each system recording specific requirements. The request was made during downtime on the LIMS following a hospital cyber-attack. The patient had a Sp-ICE record; however, this was not accessed due to a discrepancy in the demographic data. The patient was known to be D-variant and should receive D-negative units. The crossmatch sample reacted strongly with anti-D reagent and therefore, the laboratory issued two units of D-positive red cells.

Case 26.7: Poor communication with laboratory

Blood components were requested for a SCD patient, but the only clinical detail provided on the request was 'HbSC'. The laboratory staff did not recognise from the limited information provided that this was a SCD patient and therefore the red cell units issued were not extended phenotype matched or HbS-negative. This was incidentally discovered when laboratory staff looked up the haemoglobinopathy screening results at a later date.

A similar case was reported from another hospital where poor communication from clinical teams to transfusion laboratories about specific transfusion requirements meant that appropriately matched red cells were not transfused.

Case 26.8: No extended phenotype-matched red cells provided for a thalassaemia patient

A patient with thalassaemia was admitted to the stroke unit. Group and antibody screen on admission was sent without indicating the patient had a haemoglobinopathy. Two units of red cells were requested that were not extended phenotype-matched and the patient inappropriately received one E-positive unit.

These cases highlight the importance of clear communication between clinical and laboratory staff when requesting blood for patients with haemoglobinopathies. Some electronic patient record systems specifically ask if a patient has a haemoglobinopathy when requesting blood components, to ensure specific requirements are provided. Confirming that the laboratory staff have received all the key information to ensure patient's specific transfusion requirements are met is vital.

Near miss n=17

There were 5 cases of wrong blood in tube (WBIT) events and 12 reports in other NM categories. Ten of these cases were in patients with SCD and 7 were in thalassaemia patients

Case 26.9: Missed specific requirements for a haemoglobinopathy patient undergoing exchange transfusion

A patient with SCD and multiple red cell antibodies, required a six-unit red cell exchange transfusion. Biomedical scientist (BMS) 1 pre-ordered the red cell units from the Blood Service. Three of the six red cell units ordered did not have the correct antigen-negative requirements. BMS 2 began crossmatching the red cell units during the night shift but realised they did not meet the patient's antigen requirements. BMS 2 found replacement red cells from routine stock which met antigen requirements, but one red cell unit was not HbS-negative. The laboratory information management system (LIMS) did not alert BMS 2 to the missing requirement at issuing.

The nurse conducting the pre-administration check identified that the red cell unit was not HbS-negative and contacted the laboratory. The exchange transfusion was completed with appropriate units.

An effective investigation was carried out locally for this near miss event. Findings included gaps in staff knowledge, incomplete training, and suboptimal LIMS functionality. BMS 1 had recently been signed off as competent for ordering blood components and was yet to complete the competency regarding antigen-negative requirements. Staffing issues meant that appropriately trained and competent staff were not available to carry out this task. The lack of LIMS alert was later investigated by the information technology (IT) supplier and found to be due to a limitation within the software version, preventing the alert appearing with some components.

Robust pre-administration checks and knowledge of patient requirements helped identify the error in this case. Staffing issues must be identified and addressed to ensure appropriately skilled and competent staff are available to perform key tasks. Staff should have sufficient knowledge of specific transfusion requirements including the impact of receiving blood that does not meet these requirements. Both laboratory and clinical areas should maximise the potential of IT systems to support safe issue and administration of blood components.

Conclusion

Blood transfusion in haemoglobinopathy patients remains a vital aspect of care. Transfusion is however not without risk. Decision-making requires specialist input to ensure there is a clear indication for transfusion and clear communication with the laboratory to ensure the appropriate blood components are selected. Patients with complex transfusion requirements should also involve transfusion specialists to discuss the most suitable and available red cells.

The roll out of the National Health Service (NHS) blood group genotyping programme is anticipated to significantly improve care for patients with SCD, thalassaemia, and rare anaemia by providing more accurate phenotypic information and leading to the potential to provide more precisely matched red cells (NHSBT, n.d.). The NHS became the first healthcare system in the world to provide a new blood group genotyping test when this was introduced in January 2022 (NHSE, 2024a).

A position paper on International Collaboration for Transfusion Medicine (ICTM) Guideline 'Red blood cell specifications for patients with hemoglobinopathies: a systematic review and guideline' provides a UK perspective on this guidance (Trompeter, et al., 2020b). The authors of this paper reviewed each of the recommendation from the ICTM guideline and evaluated applicability for transfusion practice in the UK and their relevance to British Society for Haematology and other national guidelines. A recent updated systematic review and clinical practice guideline from the ICTM guidelines recommends that ABO, RhDCcEe, and K-compatible red cells are selected for individuals with SCD and thalassaemia, even in the absence of alloantibodies, and that red cells which are antigen-negative to already existing clinically significant antibodies are chosen (Wolf, et al., 2025). The paper also highlights the need for comparative research to define the benefit, impact, cost-effectiveness, and feasibility of extended red cell matching strategies to prevent alloimmunisation.

Recommended resources

SHOT Bite No. 14: Transfusion Errors and Reactions in Patients with Haemoglobinopathies
https://www.shotuk.org/resources/shot-bite-no-14/

SHOT Bite No. 31: The role of Sp-ICE in preventing Haemolytic Transfusion Reactions (HTR)
https://www.shotuk.org/resources/shot-bite-no-31/

SHOT Video: Haemolytic Transfusion Reactions in patients with Haemoglobinopathies
https://www.shotuk.org/resources/haemolytic-transfusion-reactions-in-patients-with-haemoglobinopathies/

SHOT Safety Notice 02: SRNM 2022
https://www.shotuk.org/resources/safety-alerts-and-safety-notices/safety-notices/