23 Haemoglobin Disorders n=46

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Key SHOT messages

- Alloimmunisation is a significant complication in patients with sickle cell disease (SCD) and can lead to haemolytic transfusion reactions and difficulties with blood provision. Preventing alloimmunisation must be a priority
- Hyperhaemolysis is a unique and potentially fatal complication of transfusion. Identification and reporting of cases is essential and specialist advice should be sought for subsequent transfusion

Abbreviations used in this chapter

CMV	Cytomegalovirus	**IT**	Information technology
FAHR	Febrile, allergic and hypotensive reactions	**IVIg**	Intravenous immunoglobulin
Hb	Haemoglobin	**LDH**	Lactate dehydrogenase
HDU	High dependency unit	**SCD**	Sickle cell disease
HTR	Haemolytic transfusion reactions	**Sp-ICE**	Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment

Recommendations

- All transfusions for sickle cell disease (SCD) should have a clear indication and should be authorised by the haematology team (BSH Davis et al. 2016)
- Patients anticipated to have transfusion should receive units that are CcEe and Kell-matched and antigen-negative for any corresponding clinically significant alloantibodies
- Any historical alloantibodies should be clearly documented in medical and transfusion records including national databases such as Specialist Services electronic reporting using Sunquest's Integrated Clinical Environment (Sp-ICE) in England

Introduction

There were 46 incidents reported this year in patients with SCD or thalassaemia. The most frequently reported incident was specific requirements not met, occurring in 14 cases. There were 8 reported cases of haemolytic transfusion reactions including 3 cases of hyperhaemolysis. There were no reported deaths directly related to complications of transfusion. There were 4 cases classified as right blood right patient and 2 cases relating to handling and storage.

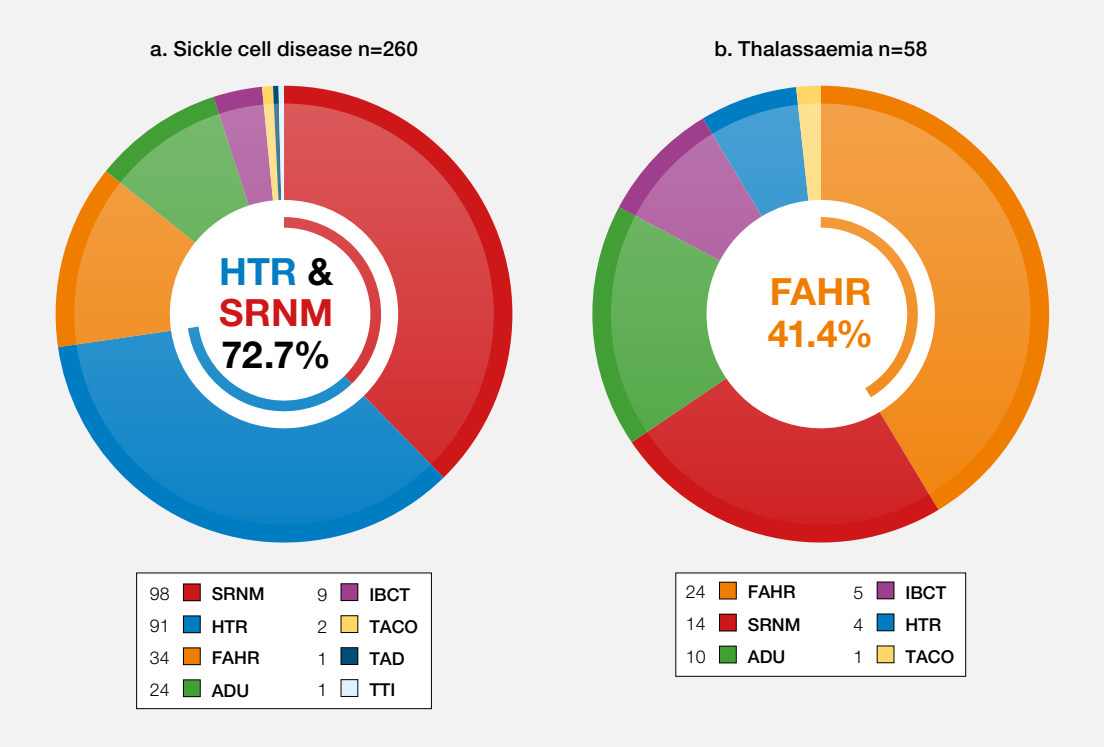


Figure 23.1: Cumulative data for adverse events in transfusion for patients with haemoglobin disorders 2010 to 2019

SRNM=specific requirements not met; HTR=haemolytic transfusion reactions; FAHR=febrile, allergic and hypotensive reactions; ADU=avoidable, delayed or under or overtransfusion; IBCT=incorrect blood component transfused; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea; TTI=transfusion-transmitted infection

Avoidable, delayed and under or overtransfusion (ADU) n=9

There were 2 reports of overtransfusion, both occurring in children with thalassaemia, where an incorrect blood volume was administered due to errors in volume calculation or incorrect patient weight. There were 6 cases of delay in transfusion due to both clinical and laboratory errors. The delays were during elective transfusion in 5 cases with errors including problems or delays in sample processing. There was 1 reported avoidable transfusion.

Case 23.1: Overtransfusion in a child, identified by a parent during transfusion

A young patient with thalassemia attended for an elective transfusion. An incorrect volume was prescribed and administered. The large volume was noticed by the child's father who alerted the nurse. The transfusion was stopped after 45mL over the recommended volume had been transfused.

Case 23.2: Avoidable transfusion due to information technology (IT) failure and lack of awareness of indications for transfusion in SCD

There was an avoidable transfusion in a patient in their 60s with SCD who presented with heart failure. Due to an IT failure the clinical team did not realise that the current haemoglobin (Hb) value of 60g/L was his baseline level. A decision was made in the emergency department to transfuse the patient without seeking advice from haematology. It was later determined to be an unnecessary transfusion.

Case 23.3: Delayed transfusion following perioperative bleed due to decision to proceed with elective surgery

A man in his 50s with SCD was admitted for elective hip surgery. The surgical team requested blood on the day of surgery, but a sample had not been sent to the laboratory. The patient had a history of alloantibodies and the laboratory informed surgeons not to proceed with surgery as there would be a delay in blood availability. Surgery proceeded and was complicated by excess bleeding causing a drop in Hb from 90 to 52g/L. The patient was admitted to the high dependency unit (HDU) and monitored until blood was available later during the night. The patient made a complete recovery.

This case highlights that requirements for blood to be available for routine elective surgery should not be overruled in cases where crossmatched blood will not be possible at short notice.

Specific requirements not met (SRNM) n=14

Clinical causes n=6

There were 4 cases in which the clinical team did not clearly inform the laboratory of a diagnosis of SCD. This resulted in these patients not receiving extended Rh and Kell-matched units and not receiving HbS-negative units. Two pregnant patients with SCD did not receive cytomegalovirus (CMV)-negative units.

Laboratory causes n=8

Specific requirements were not met for SCD in 8 patients. In 5 cases the laboratory was informed of the diagnosis of SCD but did not provide extended Rh and Kell-matched or HbS-negative units. This resulted in 1 patient developing an anti-C alloantibody.

Three patients had historic alloantibodies that were not picked up by the laboratory; these patients received antigen-positive units. No subsequent adverse events were reported.

Case 23.4: Clinical pressure on the laboratory to release components before completing antibody investigations

A patient with SCD attended for an elective exchange transfusion. The laboratory suspected an antibody but required a further sample to complete the investigation. The laboratory stated they were under pressure to issue blood and so issued crossmatch-compatible units before completing antibody investigations. A second sample was collected post transfusion which identified an anti-Jk^b alloantibody.

This case could have resulted in a serious transfusion reaction. Laboratory staff should not be pressured to release blood for transfusion until they are satisfied it is safe to do so and should not deviate from standard operating procedures. Effective communication and co-ordination between clinical and laboratory teams are key to ensure safe and timely transfusions.

Wrong transfusion n=1

Case 23.5: Incorrect patient transfused due to failure to follow patient identification procedures

A young female with SCD attended for a red cell exchange transfusion on the haematology day unit. Due to a failure to correctly identify the patient, blood transfusion was commenced with the blood intended for another patient in the department. The error was noticed after 10mL of blood was transfused. By chance the incorrect transfusion was ABO-compatible and met all specific requirements for the patient. There were several issues which contributed to this error; the healthcare assistant collected multiple transfusions for different patients at the same time, the patient did not have a wrist band on, and patient identification policy was not followed.

Febrile, allergic or hypotensive reactions (FAHR) n=6

There were 4 cases of febrile reactions reported and 2 allergic reactions in patients with SCD and thalassaemia. One of the patients with SCD was treated for anaphylaxis.

Haemolytic transfusion reactions (HTR) n=8

There were 8 reports of haemolytic transfusion reactions all occurring in patients with SCD. At least 6 of the reactions occurred following an urgent or unplanned transfusion. There was 1 report of an acute haemolytic transfusion reaction in a patient reportedly being treated for a sickle cell crisis. (Case 18.3 in Chapter 18, Haemolytic Transfusion Reactions (HTR))

There were 7 cases of delayed haemolytic transfusion reactions of which there were 3 cases of hyperhaemolysis. Further details can be found in Chapter 18, Haemolytic Transfusion Reactions (HTR).

Case 23.6: Recurrent hyperhaemolysis following a series of transfusions in a patient with alloantibodies whose specific requirements were also not met

A patient in their late 20s with SCD and a history of anti-S and previous hyperhaemolysis had 2 transfusion episodes over a 2-month period for recurrent anaemia. The patient received intravenous immunoglobulin (IVIg) and corticosteroid prior to transfusion due to a history of hyperhaemolysis. The patient had a further transfusion episode for anaemia 1 month later without IVIg and corticosteroid cover and developed a further episode of hyperhaemolysis. It also transpired that specific requirements were not met with all transfusion episodes due to a flag being removed from the transfusion record. The patient subsequently developed anti-C alloantibody.

The decision to transfuse a patient with a history of hyperhaemolysis in SCD must be carefully balanced with the risk of recurrence which could be life-threatening. It is vital that all specific requirements for transfusion are met and expert advice should be sought for such complex cases.

Case 23.7: A case of hyperhaemolysis with no new alloantibody identified

A female patient in her 40s with SCD received two units of blood for acute chest syndrome. There was a history of previous alloimmunisation with anti-C and anti-S. One week later she presented with severe all over pain described as 'sickle pain' and dark urine. This was associated with an acute drop in Hb from 95g/L to 50g/L with a relative reticulocytopenia and markedly raised lactate dehydrogenase (LDH). The patient was treated for hyperhaemolysis. No new alloantibody was identified.

Uncommon complications of transfusion n=1

Case 23.8: Severe headache during transfusion

A male patient in his 20s with SCD developed a severe headache during an elective exchange transfusion. The exchange procedure was aborted after the fifth out of eight units planned. The patient was admitted for observation but made a complete recovery.

Near miss n=1

Case 23.9: Specific requirements not met detected at the bedside by a nurse

A teenage male with SCD attended for a red cell exchange transfusion. Units of the incorrect phenotype were ordered from the Blood Service, and the error was not initially identified at authorisation as the special requirement information had not been added to the correct module of the laboratory information management system. The error also went unnoticed during manual label checking, and C-positive units were issued when the patient should have received C-negative units. These errors occurred during a period of particularly high pressure in the laboratory; activation of the major haemorrhage protocol for a paediatric patient, printer failures and reduced staffing. The incorrect phenotype was noticed by the nurse at the bedside and the units were sent back to the laboratory before transfusion.

Conclusion

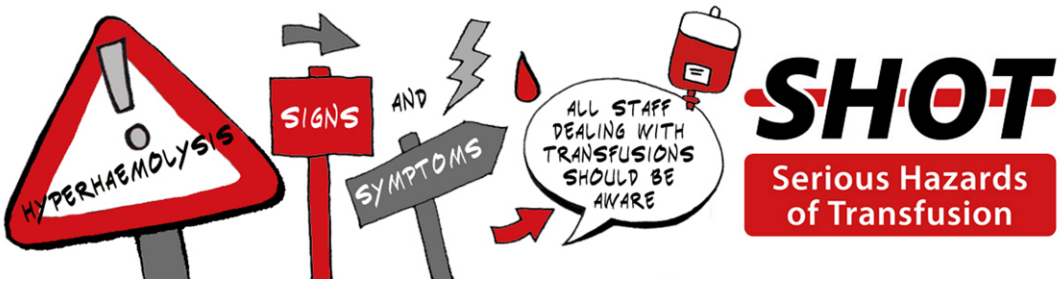
The most frequent adverse event reported was SRNM. Not providing extended Rh and Kell-matched units increases the risk of alloimmunisation. Many cases were due to lack of communication between clinical and laboratory staff as well as problems with IT systems.

A detailed history should be obtained for all haemoglobinopathy patients requiring transfusion including any prior alloimmunisation or transfusion reactions. Clear communication between clinical and laboratory staff is essential to ensure appropriate blood is provided.

All hospitals should have protocols for the management of acute complications of SCD. Specialist haemoglobinopathy teams should be involved in the management of all these patients and provide advice on transfusion.

Recommended resources

Red blood cell specifications for patients with hemoglobinopathies: a systematic review and guideline (Compernolle et al. 2018)
https://pubmed.ncbi.nlm.nih.gov/29697146/



References

BSH Davis B, Allard S, Qureshi A, et al. (2016) Guidelines on red cell transfusion in sickle cell disease. Part I: principles and laboratory aspects. *Br J Haematol* 2016;**176(2)**:179-191.

BSH Davis B, Allard S, Qureshi A, et al. (2016) Guidelines on red cell transfusion in sickle cell disease. Part II: indications for transfusion. *Br J Haematol* 2016;**176(2)**:192-209.

Compernolle V, Chou S, Tanael S, et al. (2018) Red blood cell specifications for patients with hemoglobinopathies: a systematic review and guideline. *Transfusion* 2018;**58(6)**:1555-1566. https://pubmed.ncbi.nlm.nih.gov/29697146/ [accessed 09 June 2020].