

Under or Overtransfusion n=34

11c

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Definition:

A dose/rate inappropriate for the patient's needs, excluding those cases which result in transfusion-associated circulatory overload (TACO). Infusion pump errors leading to under or over transfusion (if it did not lead to under/over transfusion then it is reportable under handling and storage errors (HSE).

Key SHOT messages

- Volume calculation for transfusions in paediatric patients continues to be a concern. Clinical staff involved in prescribing/authorising blood components for children must be familiar with calculating and prescribing correct doses
- Hb increment following transfusions should be checked and used to guide further transfusion support

Recommendations

- Hospitals should ensure their paediatric transfusion guidelines are updated to include calculations in g/L and not g/dL
- Staff who authorise paediatric transfusion should be trained so that they know how to calculate the correct dose of all components

Action: Hospital transfusion teams, Royal College of Paediatrics and Child Health

- Transfusion essentials must be included in the paediatric curriculum and staff should have access to regular and relevant updates. A close liaison with the hospital transfusion committee is vital to ensure that learning is optimised from reported events and trends

Action: Royal College of Paediatrics and Child Health, hospital paediatric clinical leads

Introduction

In this category with a total of 34 reports, 6 were under and 28 were overtransfusions. This is an increase compared with 2020 when 25 cases were reported. Errors in paediatric prescribing or administration resulted in 12 cases of overtransfusion in children.

The following themes emerged:

- Incorrect volume calculation in paediatrics
 - 2 cases where calculations using g/dL were used with Hb result in g/L, so volume was out by a factor of 10
 - Absence of appropriate checks: failure to notice when calculated volume exceeded adult therapeutic dose, and a 15kg child's weight mis-transcribed as 46kg

- Correct volume prescribed for paediatric patients, but complete unit administered
- Overtransfusion in sick/bleeding patients who are hypotensive where other causes for low BP were not considered and no interim Hb checks made

Deaths related to transfusion n=0

There were no deaths reported relating to under or overtransfusion in 2021.

Major morbidity n=3

Case 11c.1: Overtransfusion for GI bleeding

A woman in her 60s, weight 46kg, died following a GI bleed from a duodenal ulcer. Four units of red cells were requested because of a falling Hb (113 to 88g/L over 5 hours). After three units had been transfused over a 3-hour period her Hb was 203g/L. The overtransfusion did not contribute to the patient death.

Staff were not expecting this degree of Hb increment from three units of red cells with a baseline Hb of 88g/L but perhaps the low body weight had not been taken into consideration.

Case 11c.2: Unexpected bleeding during elective surgery

The patient suffered a major haemorrhage due to bleeding from an unidentified source during an elective laparoscopic inguinal hernia repair. The MHP was called 7 hours after the start of surgery. After about 11 hours in theatre the wound was packed, and the patient was transferred to the ICU. The bleeding could not be stopped and the patient died. This was a complex case where slow, insidious bleeding gradually worsened into a state of cardiovascular collapse due to major haemorrhage and DIC.

This was reported as undertransfusion because it was thought that this patient with active bleeding and worsening clinical status received fewer units of FFP (four units) and platelets (one ATD) than indicated for major bleeding (total 17 units of red cells) with evidence of DIC. This relative undertransfusion did not contribute to death.

Case 11c.3: Concealed blood loss after caesarean section

A woman underwent caesarean section and lost 1.3L of blood during the surgery which appeared to have been successfully managed with surgical techniques and two units of red cells. However, 8-9 hours after the delivery, she became very unwell and was taken back to theatre with suspected internal bleeding. A large amount of blood was found in her abdomen, and it was difficult to stop the bleeding and repair its source. She required a hysterectomy. The MHP was activated, and several components transfused. The patient lost 7.3L of blood in total and was transferred to the ICU for ongoing monitoring.

Undertransfusion in this case was due to delay in staff not recognising the extent of the internal bleeding following surgery. The patient had also improved partially following the initial top up transfusion which falsely reassured the treating team.

Paediatric cases

As in previous years errors in prescribing were notable and recorded in 9/12 overtransfusions. In the other 3 cases administration errors resulted in transfusion of more than had been prescribed.

Two children with malignant disease died but this was not related to the transfusion errors.

In 2 cases the wrong formula was used resulting in 10-fold error (calculated in g/dL rather than g/L). Hb has been measured in g/L rather than g/dL for several years. Calculations are available in the paediatric transfusion guidelines (BSH New et al. 2016).

All were transfusions of red cells except 1 infant who received an excess of platelets.

Learning point

- Prescribing errors for blood components in children are common. Hospitals should review their paediatric transfusion guidelines and ensure they contain updated units and calculations



Additional paediatric cases of overtransfusion have been covered in detail in Chapter 22, Paediatric Cases, as well as in the supplementary information on the SHOT website (<https://www.shotuk.org/shot-reports/report-summary-and-supplement-2021/>).

Under or overtransfusion in relation to major haemorrhage n=6

There were 6 cases, 4 of overtransfusion including 2 cases of haemorrhage during surgery for abdominal aortic aneurysm. An obstetric case is discussed above.

In another case with intra-abdominal bleeding following percutaneous coronary intervention there was extreme haemodynamic instability with multiple peri-arrest episodes intraoperatively which necessitated massive transfusion. Multiple (14) red cell units were transfused but relatively fewer plasma and platelet components (four FFP, two platelets). On reflection of the MH incident and in retrospect it seems that a different combination of volume resuscitation may have been more appropriate therefore limiting the number of red cell units given. The patient made a full recovery and was discharged 3 days later. Undertransfusion was reported in the surgical case described above (Case 11c.2).

In a further case the MHP was activated in the absence of any bleeding. The woman in her 60s had known history of anaemia and on admission to the ED was unwell with a reduced level of consciousness and had very low Hb (26g/L). However, eight units of emergency O D-negative red cells were prescribed by a consultant and transfused within an hour, and she received four units of FFP. CT confirmed no active bleeding. The post-transfusion Hb was 139g/L. This was also avoidable use of group O D-negative units. With such a low Hb in an unwell patient, a more controlled red cell transfusion was appropriate with one or two units sufficient to bring Hb to acceptable levels.

Learning points

- Blood loss may be difficult to estimate during major haemorrhage especially in covert bleeding
- It is helpful to obtain regular measurements of Hb to guide transfusion support to help avoid under and overtransfusion
- Blood gas analysers may be used for this if they are quality assured for this purpose and the sample is handled correctly



Near miss cases n=6

Case 11c.4: Misreading the blood count results

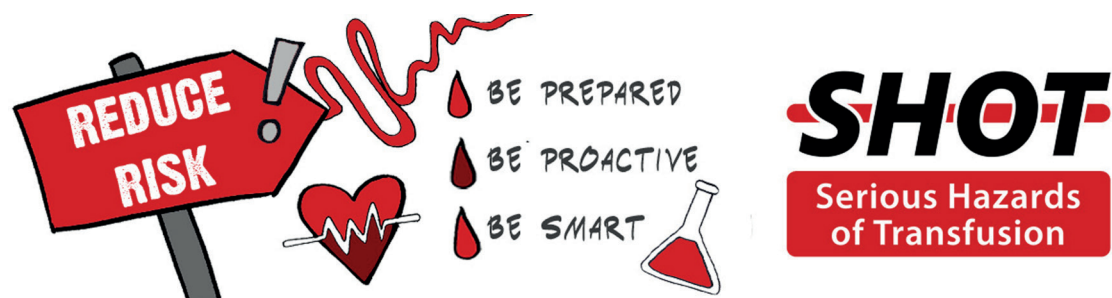
A prescriber erroneously interpreted a patient's platelet count as his Hb (the last three results were 89, 68 and 66) so booked him into for a two-unit red cell transfusion the same day. Blood was taken for a repeat blood count, film and a crossmatch sample was also taken. An IV cannula was inserted, and he waited for his transfusion. The blood was placed in the blood refrigerator on the ward. A nurse asked why the patient was having a blood transfusion when his Hb was 141g/L which was when the prescriber realised their error. The patient did not receive any blood.

Five other cases are described in the supplementary information on the SHOT website (<https://www.shotuk.org/shot-reports/report-summary-and-supplement-2021/>).

Conclusion

Paediatric cases continue to be overrepresented in this category with calculation or administration errors resulting in overtransfusion. Measures are needed to improve transfusion safety in children and neonates. This is a role for paediatricians as well as the hospital transfusion team.

Blood loss in major haemorrhage in adults can be difficult to assess. Regular monitoring of blood parameters is recommended and should be performed. Blood gas analysers may be used for this as long as they are quality assured for this purpose and the sample is handled correctly.



Recommended resources

SHOT Bite No. 4: Paediatrics

<https://www.shotuk.org/resources/current-resources/shot-bites/>

Key information from the BSH paediatric guidelines

<https://www.shotuk.org/resources/current-resources/paediatric/>

Reference

BSH New HV, Berryman J, Bolton-Maggs PHB, et al. Guidelines on transfusion for fetuses, neonates and older children. *Br J Haematol.* 2016;**175**(5):784-828.