11c Under or Overtransfusion n=35

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 overtransfusion (if it did not lead to under/overtransfusion then it is reportable under handling and storage errors (HSE)).

Key SHOT messages

- Volume calculation of blood components in paediatric patients continues to be of concern
- Laboratory scientists should be empowered to question inappropriate requests with support from haematologists
- Point-of-care testing should be set up collaboratively with laboratory support using agreed protocols and standardisation, and hospitals should participate in national quality assurance programmes
- Correct cryoprecipitate dosing is important to avoid under or overtransfusion

Recommendation

- All medical staff, including consultants, who prescribe or authorise blood components must receive transfusion training in order to recognise components, their indications and appropriate volumes

Action: Hospital transfusion teams, hospital medical directors

Introduction

Thirty-five cases were reported in this category of which 30 were overtransfusions. Eleven of these 30 (36.7%) were in children, age range 13 days to 14 years.

Death n=1

An adult died with massive haemorrhage during surgery with inadequate component replacement. Death was considered to be 'possibly related' and is described below.

Case 11c.1: Haemorrhage during surgery with fatal outcome

A woman in her 40s with advanced rectal cancer bled during surgery. The patient started bleeding at varying rates in surgery at 14:00, until this increased at 16:00. There are conflicting reports of when the major haemorrhage protocol (MHP) was activated by the theatre team and the correct procedure was not followed. The biomedical scientist (BMS) reported that the team requested red cells and to withhold the fresh frozen plasma (FFP).

The patient was being monitored with thromboelastography (TEG) so samples were not sent to the laboratory for clotting. FFP was not required because the thromboelastogram was normal. Misinterpretation of Hb levels contributed and there was no documentation of blood loss during surgery. The patient became haemodynamically unstable and the first suggestion of coagulopathy was made at 3 hours from the start of surgery. A request for FFP was then made and haematology contacted for advice. In total she received 26 units of red cells, but only six of plasma, two of platelets, two pools of cryoprecipitate and fibrinogen concentrate once the coagulopathy was evident, but she unfortunately died 3 hours later during the surgery.

This hospital had not followed the recommendations of the National Patient Safety Agency Rapid Response Report (NPSA 2010). Following this case, the MHP was reviewed, and training instituted. New standard operating protocols were established for TEG, for intraoperative blood loss, and quality processes were developed for point-of-care testing.

Learning point

- Hospitals using thromboelastography (TEG) should participate in national quality assurance to increase reliability of their results (https://www.neqascoag.org/point-of-care-poc/point-of-care-programmes/rotem-teg-testing/). Three samples are sent out per year
- The results of bedside testing technologies, such as thromboelastography, should only be interpreted by those with adequate training and knowledge of the specific platform. They should be used in conjunction with patient's clinical symptoms and other testing parameters

Major morbidity n=0

No patients suffered major morbidity. One adult received more red cell units than necessary in the course of elective caesarean section for placenta accreta. A fall in blood pressure during the operation was thought to be due to occult bleeding. Her post-transfusion Hb was 171g/L and she received 10 days of low molecular weight heparin.

It is difficult to criticise transfusion in this case of surgery with a high risk of bleeding. This could be considered a reasonable clinical decision.

Illustrative cases

Paediatric cases n=11

In 11 paediatric cases of overtransfusion (2 of platelets, 9 of red cells) errors were made in calculation of volumes required or pumps were set incorrectly. In 2 instances parents of regularly transfused children (both with haemoglobinopathy) noticed that the transfusion was excessive.

In another case the need for transfusion in a child weighing 3kg was discussed at the multidisciplinary team (MDT) meeting. Although a doctor said '300mL' when the correct dose was 30mL; the rest of the team agreed. Nobody realised this was 10 times the volume required, and the electronic prescribing system had no inbuilt rules to prevent a prescription of such a large volume for a 3kg child. See Case 22.5 in Chapter 22, Paediatric Cases.

Errors in doses of blood components due to lack of knowledge

Case 11c.2: Prescription of five times the correct dose of cryoprecipitate

A young woman was admitted as an emergency with a diagnosis of myeloma with spinal cord compression. During admission she developed marked haemoptysis with evidence of deranged coagulation. Following transfusion of FFP, she was prescribed '10 units' of cryoprecipitate and received seven of these. The correct dose was two units (two pools of five). There was confusion between the locum doctor, who had no experience of prescribing cryoprecipitate, and the haematology

registrar, and this prescription was not challenged either by the laboratory or the nursing staff. It was clear that all staff groups required education about the correct dose of cryoprecipitate.

Case 11c.3: Overdose of platelets

A man in his 80s with a platelet count of 15x10^9/L received four adult therapeutic doses of platelets prescribed by a consultant, where one dose would have been appropriate. The request of 1 'mega' unit was interpreted as being 4 normal therapeutic units and all were transfused. The use of 'non-conventional' terminology by the requesting clinician was compounded by failure to clarify what was required for the patient by several people involved in this incident. The patient made a complete recovery.

Learning points

- All staff involved in transfusion must have mandatory transfusion training which should include identification of all blood components, and instruction about appropriate dosing particularly in paediatrics. The adult cryoprecipitate dose was changed from five single units to pools of five in 2006. A mobile application 'Blood Components' is available to assist blood component dosage (NHS 2018)
- Laboratory staff should be encouraged to challenge inappropriate requests with support from their clinical haematologists

Near miss cases n=2

One of these was a neonate for whom the wrong volume of red cells was prescribed but recognised before transfusion. In the 2nd case red cells were ordered and prescribed for a woman who did not need them.

Conclusion

Paediatric transfusion continues to be a cause for concern. Transfusion training should ensure that clinicians authorising transfusions understand the use of all blood components including indications, monitoring, recognising and managing adverse reactions. Point-of-care testing (POCT) equipment, such as thromboelastography, are proven, powerful technologies that can turn around accurate results in a timely manner. However, their use requires trained staff competent to carry out tests accurately, interpret results correctly and take appropriate action promptly. A quality assurance (QA) programme encompassing training, personnel, equipment, appropriateness of testing, pre-analytical, analytical and post analytical aspects of POCT from sample collection to documenting the final result, is key to the delivery of an accurate and reliable POCT programme (BSH Mooney et al. 2019). Finally, all transfusion decisions must be made after carefully assessing the risks and benefits of transfusion therapy. Clinical and laboratory staff must work collaboratively and in a co-ordinated fashion to be able to deliver individualised, holistic, patient-centred care. This was a key SHOT recommendation in 2018.

References

BSH Mooney C, Byrne M, Kapuva P, et al. (2019) Point of care testing in general haematology. *Br J Haematol* 2019;**187(3)**:296-306. https://onlinelibrary.wiley.com/doi/full/10.1111/bjh.16208#.Xqv87x5c6MI.email [accessed 08 June 2020].

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