11b Avoidable Transfusion n=101

Definition:

Where the intended transfusion is carried out, the blood/blood component is suitable for transfusion and compatible with the patient, but where the decision leading to the transfusion is flawed. This includes transfusions based on poor knowledge, communication failures, incorrect decisions or poor prescribing.

In addition to the total above, 2 delayed transfusions resulted in inappropriate use of O D-negative units and 1 case of undertransfusion was a result of transfusion of a low volume of FFP that was also inappropriate (not indicated for reversal of rivaroxaban). These are counted in their own sections (giving an overall total of 104). Two avoidable infusions of PCC are included in the PCC section.

Overview

No serious harm was known to have occurred as a result of avoidable transfusion, although there was one episode of probable transfusion-associated circulatory overload (TACO) reported in association with an avoidable transfusion and additionally reported in TACO. Four deaths occurred in this group, none of which were related to the transfusion.

Sample errors n=29

Blood component prescriptions based on the wrong blood results accounted for a third of avoidable transfusions.

Table 11b.1: Causes of wrong blood results n=29

Error	Number of cases
Result from another patient used	8
Dilute sample (drip arm)	5
Clotted sample	2
Transcription error	2
Historical results reviewed	3
Erroneous near-patient-testing results	1
Other	6
Laboratory error: platelet clumps	1
Erroneous platelet count from WBIT	1
Total	**29**

WBIT=wrong blood in tube

Case 11b.1: WBIT with failure to verify unexpected results

A nursing home resident in her 70s was reviewed in the community. A blood sample taken by the general practitioner (GP) showed a platelet count of 6x10^9/L with a white cell count of 1.98x10^9/L. She was admitted to hospital later that day for a platelet transfusion. Blood sampling was repeated on arrival to hospital prior to transfusion; the platelet count was 186x10^9/L and white blood count was 11.7x10^9/L. These results were not reviewed by the admitting doctor and a unit of platelets was prescribed and administered. The error was detected by laboratory staff.

This primary error in blood sampling caused unnecessary admission to hospital for an elderly patient and exposure to a blood component that was not indicated. However, a series of events contributed to this outcome. Firstly, the report noted that the sample was taken from another patient in the nursing home. Initial patient identification, if performed correctly, would have prevented this. The results should then have been reviewed by the GP and admitting doctors. If these results were unexpected, based on the patient's symptoms and previous trends (if available), then investigation into the abnormal results is required. This should include consideration of an erroneous result and thorough clinical investigation. This should occur prior to transfusion unless the patient is at high risk due to significant active bleeding. In this case a repeat sample was requested and a normal platelet count demonstrated. There was failure to review the most contemporaneous results prior to authorising a transfusion. There were at least four errors in procedure.

Case 11b.2: Poor management leads to excessive transfusion

An elderly man required a revision hip replacement (40-year-old prosthesis). At preoperative assessment a week before surgery his Hb was 127g/L. He bled during the technically difficult and long procedure (about 5 hours) and received six units of red cells before the Hb was checked and found to be 170g/L.

The review noted reliance on estimated blood loss as an indicator for transfusion, an 'I know best' attitude and a loss of situational awareness. Preoperative preparation was suboptimal. The patient did not have an arterial line nor central venous access and was lying on his side for the surgery which meant that only one arm was accessible for blood sampling.

Inappropriate management of haematinic deficiency n=10

There were 8 cases where patients with iron deficiency anaemia were treated inappropriately with blood transfusion. A further case was identified in the overtransfusion category (Case 11c.4). One patient was transfused for folate deficiency and 1 for B12 deficiency.

Case 11b.3: Inappropriate transfusion in a patient with iron deficiency and failure to check response to transfusion

A woman in her 50s with iron deficiency anaemia and Hb of 57g/L presented with fatigue as her only symptom. She weighed 54kg and was prescribed a five-unit red cell transfusion by a junior doctor. All five units were transfused with a repeat full blood count (FBC) only checked after the fifth unit had been given. The post-transfusion Hb was 131g/L.

This patient was exposed to risks of transfusion, and in particular TACO, due to an unnecessary transfusion that was also inadequately monitored. Given that this patient was relatively asymptomatic with no cardiovascular risk factors, a more considered approach may have been to transfuse one unit of red cells at most, with repeat clinical assessment afterwards. A course of oral or intravenous iron would be appropriate management.

Investigation into to the underlying cause of iron deficiency is also required.

Case 11b.4: Perioperative transfusion of red cells due to failure to manage iron deficiency anaemia preoperatively

A man in his 70s was found to be iron deficient 6 months prior to an elective abdominal aortic aneurysm repair (AAA). The iron deficiency was not managed adequately. Preoperatively, the Hb was 106g/L but it was felt that surgery could not be deferred. The Hb fell to 83g/L following the procedure and four units of red cells were transfused.

Preoperative anaemia is associated with increased postoperative morbidity and mortality, and increased transfusion needs. National Institute for Health and Care Excellence (NICE) guidelines on blood transfusion recommend treating iron deficiency with iron supplements (NICE 2015). Hospitals should design pathways to manage these patients effectively.

Potentially avoidable use of emergency O D-negative units n=17

Seventeen cases have been identified when emergency O D-negative units were issued inappropriately. Five emergency or urgent transfusions were in the ED, 2 in the delivery ward, and 2 in theatre. Other locations included the medical admissions unit and wards. Two additional cases are included where delays resulted in inappropriate use; in both instances there was delayed provision of crossmatched red cells due to an earlier error with pre-transfusion compatibility testing. This is a waste of a precious resource and moreover, O D-negative red cells are unsuitable and potentially unsafe for certain patients, e.g. those with anti-c antibodies.

Table 11b.2: Reasons for use of emergency O D-negative units

Avoidable use of emergency O D-negative units	Number of cases
O D-negative used when crossmatched available	4*
O D-negative used when group-specific available	1
Delayed provision of correct components due to earlier error	9
O D-negative blood used in non-emergency scenario	3
Total	**17**

**In 1 case EI could have been used to issue crossmatched units if historical records had been checked*

In 9 cases, emergency O D-negative red cells were issued because of earlier errors. These included: labelling errors (n=2), failure to notify the laboratory to convert group and screen to a crossmatch request (n=1), samples misplaced in laboratory (n=2), delays sending samples to the laboratory (n=3), failure of laboratory staff to check if EI was appropriate (n=2) resulting in delays due to unnecessary requests for repeat sample testing, and delays in processing samples that were not required. In some cases, more than one error occurred.

Case 11b.5: Delayed provision of red cells for postpartum haemorrhage caused by miscommunication by the clinical team and failure to check sample validity in the laboratory

A young woman had an estimated 3.6L blood loss from a vascular tear following vacuum-assisted vaginal delivery at 07:45. A valid sample was available for EI from the previous day. Two litres of fluid were infused and another transfusion sample was sent to the laboratory at 08:00 with a request for two units of red cells to be crossmatched. The urgency of the request was not conveyed to the laboratory. The laboratory staff then failed to check for sample availability and therefore unnecessarily processed the new sample. This caused additional delay, preventing EI from the existing sample. Crossmatched blood was issued at 09:22 after one unit of emergency O D-negative blood had been transfused at 08:30.

Clear communication is vital. It is essential to inform the laboratory when blood is required urgently. The laboratory should check for availability of a valid sample. In this case group-specific blood could have been issued.

Inappropriate transfusion of FFP n=6; given to reverse anticoagulant effect n=3

FFP was given inappropriately to three patients to reverse anticoagulant effect. One woman in her 70s on warfarin with INR 3.7 developed a rectus sheath haematoma. PCC should be used in emergencies to reverse warfarin together with vitamin K. There is no role for FFP. Two patients were anticoagulated with rivaroxaban, and while there is as yet no licensed reversal agent current guidelines recommend the use of PCC in emergency situations. In one of these cases, the dose of FFP was also inadequate (counted in the undertransfusion category) and would have had little therapeutic benefit even in an appropriate situation.

Case 11b.6: Unexpected severely abnormal results should be checked prior to release by the laboratory

A man with alcoholic liver disease undergoing surgery was reported to have INR >11 with an abnormal fibrinogen result and was transfused FFP and cryoprecipitate on the basis of this result which should have been repeated by the laboratory.

Learning point

- Laboratory staff should not issue results which they know or suspect to be unreliable or incorrect

Case 11b.7: Avoidable transfusion of FFP associated with poor communication and the distance of surgical treatment centre from transfusion laboratory

A patient at a local treatment centre (TC) (12 miles away) was bleeding following emergency evacuation of a haematoma two weeks following a hip replacement. This emergency surgery took place at a weekend. The patient required four units of group O D-negative red cells. There was no group and screen sample at the main hospital as the procedure was considered low risk for bleeding (the TC keeps O D-negative red cells as stock).

At 12:00 a request for FFP was referred to the on-call consultant haematologist who advised that due to the clinical situation and distance two units of plasma should be thawed and sent. He also requested that FBC and clotting samples were taken as soon as possible, but there was a significant delay in taking these samples. At 14:00 the consultant haematologist was contacted by the anaesthetist to inform him that the patient was in recovery, and was now 'haemodynamically stable' although hypotensive with a tachycardia. Four units of red cells had been transfused. The haematologist advised that given this information and in the absence of the clotting results that the previously authorised FFP be transfused. At 15:30 the clotting results (all parameters within normal limits) were telephoned to the haematologist but not conveyed to the TC. Although no further red cells were transfused two units of FFP were transfused, at 17:30 and 18:00, despite the patient being stable and 2 hours after clotting results were available showing normal parameters.

This was the first occasion that staff at the TC had to manage a major bleed (pathology services supplied offsite since 2012) and resulted in review and revision of their major haemorrhage protocols to include management of major haemorrhage at a site which is 12 miles away from the supplying transfusion laboratory. There may be more issues similar to this with the proposed centralisation of pathology services in an expanded number of hub and spoke models.

Inappropriate transfusion of platelets n=15: make a diagnosis before ordering platelets

Platelets were issued on the basis of erroneous results n=6: 2/6 as result of WBIT, 3/6 due to platelet clumping, 1/6 cause unknown.

One patient received platelets for a low platelet count that was later diagnosed to be due to thrombotic thrombocytopenic purpura (TTP). This is a thrombotic condition in which platelet transfusions are contraindicated except for life-threatening bleeding as they may increase the risk of thrombosis. This illustrates the importance of establishing the cause of thrombocytopenia prior to transfusion. Early review of a blood film is essential for assessment of unexpected thrombocytopenia and may have established this diagnosis (fragmented red cells are characteristic) and prevented potentially dangerous transfusion. The diagnosis of TTP is urgent, and patients should be started on plasma exchange as soon as possible, and platelet transfusion avoided.

Platelets were transfused inappropriately when not indicated prior to procedures, in excess quantity for the procedures undertaken, and prior to procedures that were subsequently cancelled.

There were 2 cases in which patients were transfused platelets inappropriately in order to achieve a count of >50x10^9/L prior to insertion of a nasogastric tube. This is not in accordance with British Society for Haematology (BSH) guidelines on the use of platelet transfusions (BSH Estcourt et al. 2017).

Case 11b.8: Excessive platelets requested to cover a procedure that was subsequently cancelled

A patient with myelofibrosis and a chronically low platelet count was due to undergo a liver biopsy. The platelet count was stable at around 40x10^9/L. Six units of platelets were requested to cover the procedure by a consultant haematologist. Two units were transfused prior to the procedure,

which was subsequently cancelled, following concerns raised by a junior doctor and interventional radiologist who had not been consulted in advance and considered the procedure too risky. The laboratory staff had also raised concerns regarding this request. There was a comment made in relation to this event, that due to the culture at the hospital, laboratory staff did not feel empowered to act further.

Platelets are a valuable resource that should be used judiciously and in accordance with national guidelines. It is important that hospitals have policies to guide the use of platelets and that all members of staff, including the laboratory team, are empowered to raise concerns in a culture of openness. An adult treatment dose is a single bag of platelets.

Learning point

- Thrombocytopenia has several causes, many of which are not best managed by platelet transfusions. It is important to make a diagnosis as platelet transfusion may be contraindicated. Unexpected thrombocytopenia should always prompt film examination and, if necessary, confirmation on a repeat sample

IT-related avoidable transfusions n=5

Transfused on the wrong result n=5

Two patients were transfused because of an incorrect Hemocue™ result and one following a series of incorrect Hb levels on a blood gas analyser. In another patient a WBIT led to a platelet transfusion but the previous FBC result could not be checked because of computer downtime. The wrong (old) Hb result was used to initiate transfusion rather than the current (higher) Hb because the electronic patient record (EPR) results screen did not default to the current result.

Commentary

All the examples reported here are similar to previous years. It is important that clinical staff understand the rationale and indications for any blood component transfusion and ensure that there is no alternative. A novel approach has been taken in one district general hospital. The transfusion prescription is a comprehensive folded document which includes prescribing codes for red cells, platelets, FFP and cryoprecipitate. This was introduced in May 2017; nursing staff were trained not to proceed without a code, and if none was applicable to contact a haematologist. Audit demonstrated a 16.2% reduction in red cell use (McGrann 2018).

References

BSH Estcourt L J, Birchall J et al. Guidelines for the use of platelet transfusions. *Br J Haematol* 2017;**176(3)**:365-394.

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