Delayed Transfusions n=112

10a

Definition:

Where a transfusion of blood/blood component was clinically indicated but was not undertaken or was significantly delayed or non-availability of blood components led to a delay with impact on patient care (not restricted to emergency transfusion).

There were 112 reports of delayed transfusions in 2018 versus 95 in 2017. This total includes 6 cases where prothrombin complex concentrate (PCC) infusions were delayed.

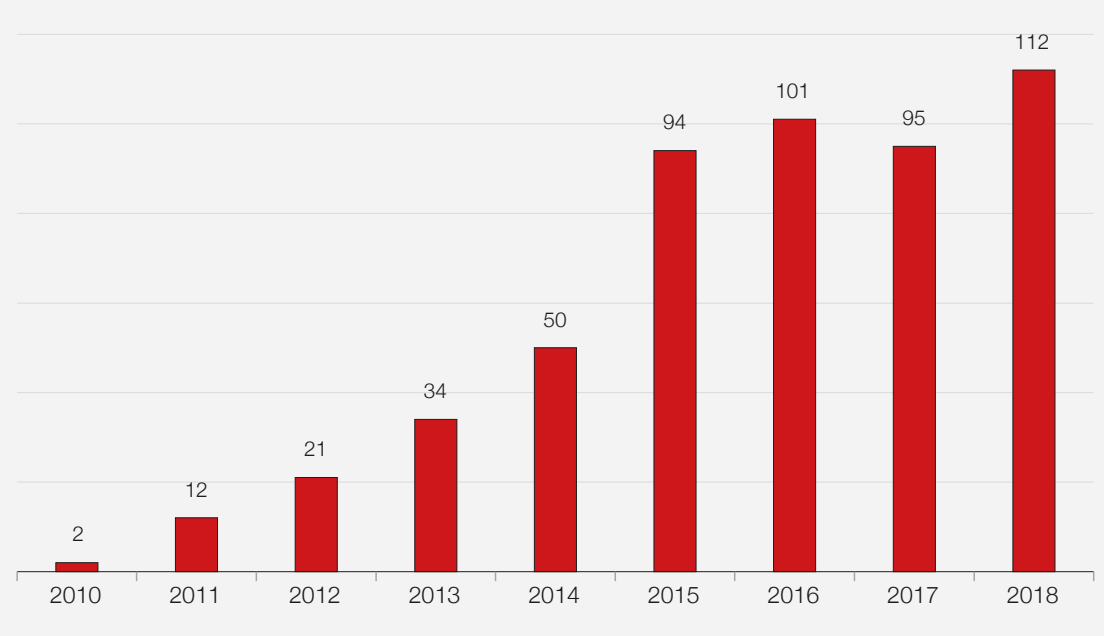


Figure 10a.1: Delayed transfusion reports by year 2010-2018

In 13 cases delays were experienced during MHP activation and in a further 6 cases with major haemorrhage but without MHP activation.

Deaths n=8

Of the 12 deaths reported in this category, 8 were related to the delay in transfusion. Two were 'probably related' and 6 'possibly related' to the delay. In one case, although the reporter noted that the death was 'unrelated' to transfusion delay, the cause of death was 'multiple organ failure secondary to uncontrolled bleeding'. These are described below.

Deaths 'probably related' to delay n=2

Case 10a.1: Delayed transfusion with contribution from multiple assumptions

A man in his 80s was in the high dependency unit (HDU) following elective aortic aneurysm repair and had a haemoglobin (Hb) of 77g/L due to haematuria. He had ischaemic heart disease (IHD). A transfusion was prescribed in the evening but he did not receive the transfusion and suffered cardiac arrest the following morning.

Many assumptions were made and there was poor handover: the prescribing doctor requested that the transfusion take place as soon as possible, but the nurses assumed it was non-urgent; staff assumed there was already blood available, but the units prepared for surgery had been returned to stock. The patient was shortly to be transferred to a ward and there was a policy not to transfuse at night unless essential.

Case 10a.2: Delay treating gastrointestinal (GI) haemorrhage

A man in his 80s was admitted (at 08:55) with a GI bleed (history of blood in stools) and Hb 76g/L. He was unwell, hypotensive (blood pressure 93/42mmHg) dizzy and unable to stand, with a raised early warning score. Two units were requested at 10:16, available at 12:07, but were not prescribed and never transfused. He was on warfarin for atrial fibrillation (AF) and his international normalised ratio (INR) was 7 for which he received timely treatment with PCC and intravenous (IV) vitamin K. He deteriorated and had a cardiac arrest within 5.5 hours (at 14:26) and died due to prolonged untreated hypovolaemic shock. The primary cause of death was recorded as massive upper GI haemorrhage due to gastric ulcers.

The case review noted that the emergency department (ED) staff did not recognise how unwell the patient was at transfer, particularly as there was no overt bleeding, and also that there was no clear plan and a lack of communication about the proposed transfusion on transfer to the ward at 12:50. There was clear evidence of deterioration in the vital signs (increased respiratory rate, tachycardia and continued fall in blood pressure) which was not escalated to the medical team.

Deaths 'possibly related' to delay n=6

Case 10a.3: Death from GI haemorrhage due to failure to recognise and treat this in a timely manner

A man in his 70s was admitted with back pain and shortness of breath and died while receiving a red cell transfusion 2 days later. Multiple co-morbidities included IHD with previous stroke, chronic kidney disease and AF for which he was on warfarin. He had known previous anaemia and received iron injections at home. On admission his Hb was 83g/L so he was prescribed a unit of red cells in the evening of Day 1. His INR was >7 for which he received a suboptimal dose of 1mg vitamin K; during the admission he had several episodes of melaena. He was transferred from the ED to the medical admissions unit (MAU) and then to a ward but the transfusion did not start until the morning of Day 3 when he then had a cardiac arrest.

Several issues were identified in the investigation:

- Failure to look for evidence of GI bleeding. A digital rectal examination was not carried out by the doctor in the ED, the foundation year doctor (who clerked the patient), nor the reviewing consultant. Had the GI bleeding been identified on Day 1 the patient could have had a gastroscopy on Day 2 and this may have prevented his death
- Failure to rapidly reverse his anticoagulation. Vitamin K was administered at 18:20 on Day 1 but only 1mg, which is inadequate for acute bleeding with a prothrombin time (PT) of 101 seconds (s) (normal range usually about 12s). Further PT results on Day 2 confirmed that only partial correction had occurred. Consideration of prothrombin complex concentrate treatment should have taken place when bleeding was overt, at 02:00 on Day 3
- Transfusion was delayed. It was planned on Day 1, and again by the reviewing consultant at 13:45 on Day 2. Transfusion was indicated after 17:00 on Day 2 when a falling Hb of 71g/L was reported
- Poor and confusing medical and nursing documentation

Case 10a.4: Delay in recognising serious GI bleeding

A man in his 70s was admitted with community-acquired pneumonia reporting a 10-day history of productive cough on a background of chronic obstructive pulmonary disease (COPD). During admission his Hb level fell from 151g/L on admission to 128g/L on Day 2. Repeat blood tests and

rectal examination were not done on Day 3, despite the patient complaining of black stools and being on medication which could cause bleeding (aspirin). On Day 5 (a Saturday) he had episodes of melaena - 'a large amount' - and was noted to be hypotensive with a tachycardia; Hb was 89g/L. He was stable so oesophago-gastroduodenoscopy (OGD) was planned for Day 7 (Monday), The patient had a two-unit red cell transfusion due to a further fall in Hb to 61g/L on Day 6 (Sunday) associated with tachycardia and repeated episodes of melaena. In the early hours of Day 7 (Monday) he became agitated and complained of abdominal pain. His Hb was 60g/L and four units of red cells were given. He deteriorated further and suffered cardiorespiratory arrest. Cardiopulmonary resuscitation (CPR) was commenced but was unsuccessful.

The National Institute for Health and Care Excellence (NICE) guidelines recommend that patients with an upper gastrointestinal bleed should have an OGD within 24 hours (of admission) (NICE 2012). Patients with upper GI bleeding should have a Blatchford score recorded to assess the bleeding risk (Banister et al. 2018; Chatten et al. 2018). There was a delay in obtaining senior review on Day 7. There was a further delay in starting the transfusion due to difficulty with venous access.

The case review noted that patients who deteriorate likely due to upper GI bleeding should have urgent senior review and blood transfusion started without delay.

Case 10a.5: Multiple causes for delay with death from hypovolaemic shock due to GI bleeding

A woman in her 80s was seen at home for a chest infection (Day 1) and refused to come to hospital. The following day (Day 2) she was seen again by the general practitioner (GP) and again declined admission although she was noted to be very pale and hypotensive (94/54mmHg, pulse rate 96 beats per minute (bpm)). On Day 3 the ambulance crew were called to her home where she was found collapsed, very short of breath and cyanosed. The working diagnosis was an acute exacerbation of COPD. She was admitted at 11:05 and waited in a chair for 3 hours. Blood results available at 17:20, 6 hours after admission, showed Hb 65g/L. She was then noted to have melaena at 19:00 so a diagnosis of GI bleeding was made, and red cell transfusion authorised. At 8 hours after admission (19:00), a blood sample was taken for crossmatch (which arrived in the laboratory 1.5 hours later). Blood was issued within an hour, however the transfusion was delayed and did not take place at all.

At 01:46 she had a cardiac arrest and died. The cause of death was recorded as cardiac arrest due to hypovolaemic shock and GI bleeding. The report notes communication failures and staff distractions due to the unit being very busy.

Learning point

- Prompt recognition and timely management of gastrointestinal (GI) bleeding, especially in complex elderly patients, is imperative. Delays can contribute to patient death. Every second counts

Patients with evidence of GI haemorrhage require close monitoring, timely investigation and appropriate transfusion; this may be incremental to keep up with bleeding, keeping a close watch on the Hb and clinical signs of bleeding. These patients do not often have sudden massive haemorrhage, and many are at increased risk of TACO (age and comorbidity). (Case 17b.1 in Chapter 17b, Transfusion-Associated Circulatory Overload (TACO), 'Rapid correction of anaemia can precipitate TACO in the absence of other comorbidities and risk factors').

Case 10a.6: Delay related to poor communication

A frail woman in her 80s died from hypovolaemic shock with bleeding from a leg haematoma. When blood was requested the laboratory requested a second sample as clinicians had not communicated the urgency. There was a delay of more than 2 hours.

In an emergency the need for a group-check sample from a previously untransfused patient may be overridden if this would delay urgent transfusion.

Case 10a.7: Intraoperative death from haemorrhage

An elderly patient was admitted with trauma. During planned surgery on Day 7 of admission there was unpredictable and catastrophic bleeding (estimated more than 2.5L within minutes), and the patient arrested and died in theatre.

A serious incident external review was undertaken. There was a changeover of anaesthetist during the procedure. The patient received two units of fresh frozen plasma (FFP) but no red cells. The external reviewer noted that the major haemorrhage protocol was not activated and considered that this degree of bleeding should have resulted in more aggressive action. In severe haemorrhage minutes may matter; there was also concern over internal delays in blood gas analysis. This unfortunate event could not have been foreseen and probably was not preventable. The external reviewer noted the considerable impact of this event on the medical staff involved.

Extract from the external review of this case notes the importance of supporting the staff involved in any serious incident

The reviewer noted the openness of discussion and the open learning culture in the department.

'This has been a great shock to a 4th year consultant anaesthetist; their confidence has been shattered, their self-belief shredded….this colleague has learnt a hard and bitter lesson. It is now time to heal and support them.

The two juniors directly involved show complete and heartfelt discomfort .. I detect, and it is unfair, self-blame and doubt. One junior has doubted their career path and considered a change.

The role of the primary consultant: I was moved by the obvious torture he is still going through…in hindsight he admits his actions were not optimal. Given time again it would all be dealt with differently. I think this shows a very brave and commendable degree of insight .. the role of a consultant can be a lonely and high stress environment. Decisions are often based on incomplete evidence under sub-optimal circumstances. It is all too easy in the comfort of an office to review notes and find glaring inadequacies in others.'

The external reviewer felt that all reasonable actions were taken to maximise this patient's chances of survival for the majority. However, he noted that only a litre of crystalloid was given, the changeover of anaesthetic staff occurred at a critical moment, no group-specific blood was given. The junior doctor requested crossmatched blood, then left. The surgical team thought that 'blood was ordered' so were unaware that this could take up to one hour to provide. Consequently, the MHP was not followed.

Case 10a.8: Potentially unsafe use of O D-negative blood in an emergency in a patient with red cell alloantibodies at a hospital with no overnight transfusion laboratory support

A woman in her 70s on peritoneal dialysis presented to her local hospital with acute bleeding overnight when the laboratory was closed. Anticoagulation with full dose low molecular weight heparin had been started on this day, and she developed a very large subcutaneous haematoma. This was treated as major haemorrhage and she received two units of emergency O D-negative blood while awaiting crossmatched blood from another site. However, neither the laboratory staff (who could have come in) nor haematologist was contacted. The clinical staff did not note that she had atypical antibodies (anti-N and auto anti-e) and therefore that the O D-negative units might be incompatible. She was transferred to the dialysis unit at another hospital where she later died as a result of complications of this bleed. There was no adverse reaction to the O D-negative units and the crossmatch of further units was completed at a distant site. Six compatible units were issued 12 hours after admission and one transfused.

The death from bleeding was initially classified as 'unrelated to transfusion' but due to the presence of many relevant factors, it has been included as possibly related (imputability 1) here.

It is important that patients who are bleeding do not die from haemorrhage so it may be necessary and appropriate to use emergency group O D-negative red cells. However, in the presence of irregular antibodies these may not be compatible and have the potential to result in haemolysis. Group O D-negative red cells will be e-positive. Advice should be sought from the haematologist and transfusion laboratory staff in this situation for both transfusion (how to monitor for and manage potential immune haemolysis) and anticoagulant management.

A case of haemolysis following transfusion of incompatible O D-negative red cells in an emergency (postpartum haemorrhage) is reported in Chapter 18, Haemolytic Transfusion Reactions (HTR). In this instance the patient had known anti-Jk^{a}. The patient was admitted to intensive care with renal impairment and required ventilation. Retrospective typing of the emergency units showed one or more was Jk^{a}-positive.

Additional educational cases

Case 10a.9: Delay caused by misunderstanding of abbreviations

Red cells were requested with the clinical details 'IUT 27+6/40 PROM'. The biomedical scientist (BMS) interpreted IUT as 'intrauterine transfusion' and ordered red cells suitable for this. However, in this instance, IUT meant 'in utero transfer'; the blood was required for the mother, not the baby. There was additional miscommunication during a telephone call resulting in delay to provision of red cells for the mother, and wastage of three units that had been provided as 'suitable for intrauterine transfusion'. On review of this case the haematologist suggested that all requests for intrauterine or exchange transfusion should go through a senior member of the transfusion laboratory staff.

Several medical abbreviations have multiple meanings so should be avoided, particularly in communication across different departments. For example, PID can mean pelvic inflammatory disease or prolapsed intervertebral disc, and there are 75 other meanings. AAA (abdominal aortic aneurysm) has 198 alternatives (source: acronyms.thefreedictionary.com). This may occur even within a specialty (e.g. MI can mean both mitral incompetence and myocardial infarction).

Learning point

- Abbreviations may be misunderstood, so do not assume that others understand without spelling it out. One abbreviation can have more than one meaning

Case 10a.10: Transfusion inappropriately delayed overnight with misinterpretation of guidelines (see also Case 10a.1 above)

An elderly woman (with diabetes) was admitted with a low Hb of 46g/L due to severe iron deficiency. The medical team refused to authorise transfusion overnight despite adequate ward staffing with three very experienced nurses more than capable of managing a transfusion reaction. She was prescribed two units of red cells. The on-call medical team were not happy for the patient to be transfused overnight in view of minimal medical cover to provide support for possible transfusion reaction. Although clinically stable at the time, the patient was at high risk due to her very low Hb. The hospital transfusion policy, while stating that consideration must be given to the safety of the transfusion, notes that the patient's clinical condition must be taken into account. The policy does not prohibit transfusion at night.

In this case there was clearly a difference of opinion between the nursing and medical staff. The nursing numbers and experience in this case were adequate to proceed. SHOT guidance is clear that transfusion must not be delayed where the need is urgent. This elderly woman also had diabetes and likely cardiovascular disease, increasing her risk of ischaemic damage from hypoxia with this degree of anaemia. Transfusion of one unit followed by reassessment would be appropriate to see at what point she could continue with iron rather than red cell transfusion.

Case 10a.11: Delayed transfusion: failure to recognise and respond appropriately to a haematological emergency in an elderly man

The elderly man with chronic lymphatic leukaemia (CLL) and significant co-morbidity complicated by known autoimmune haemolytic anaemia (AIHA) was admitted as an emergency with Hb 44g/L but did not receive transfusion until 15 hours later. Referral to the haematology team (to whom he was known) was not made for nearly 12 hours when treatment was rapidly escalated but there were additional delays; the second unit of blood was delayed as the patient transferred between wards.

The investigation identified lack of a clear transfusion plan, no referral to haematology on admission, no direct communication between the admitting doctor and the laboratory, and despite documented deterioration of the patient, the nurses and doctors failed to recognise or respond to this.

Case 10a.12: Urgent blood release delayed after postpartum haemorrhage (PPH) because of a verbal error in the order

The laboratory issued group-specific A red cells for Patient 1 following a 2L PPH but the blood was required for a different patient, Patient 2, whose group was O. There were two patients with the same first name who delivered at the same time. The midwife ordering the blood heard the wrong name and ordered blood for another woman. The group A red cell unit could not be collected from the electronic kiosk because the identification (ID) on the pick-up slip did not match the ID on the electronic system.

The reporter noted that they were very short of midwives and could not recruit and retain staff. As a result of this incident staff were reminded to always repeat back all verbal requests to ensure the details are correct. This illustrates the importance of correct patient identification and wrong transfusion was prevented by the information technology (IT) system.

Problems related to management of major haemorrhage n=34

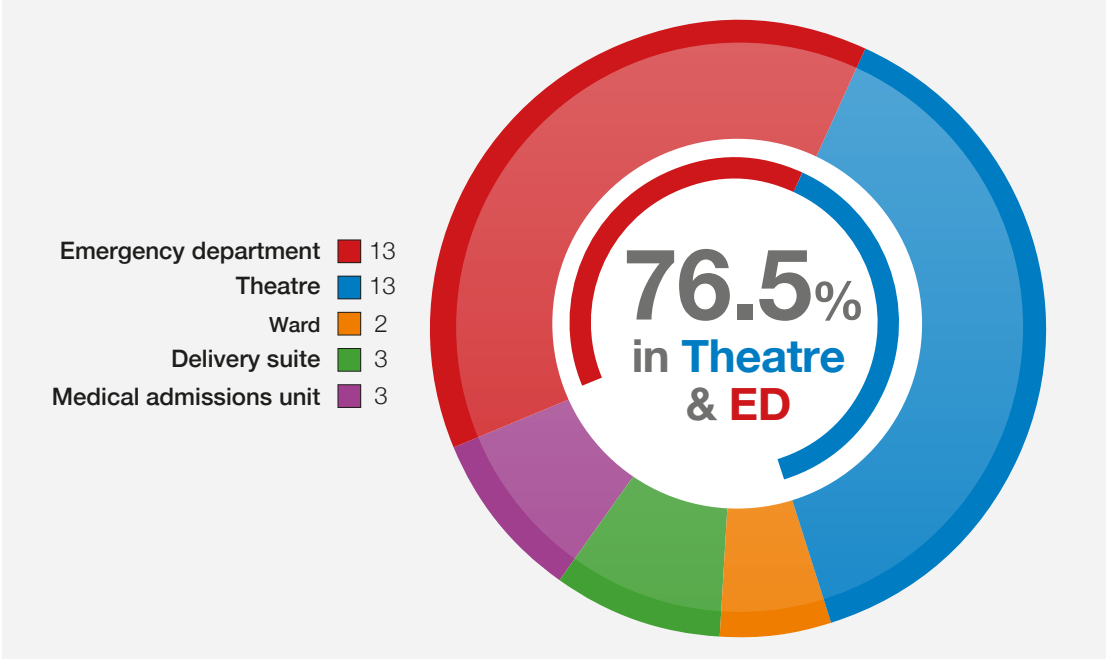
This subsection describes all incidents related to major haemorrhage, and includes 19 delayed transfusions, 12 instances of avoidable transfusion and 3 overtransfusions.

In this group of patients, there were 6 deaths, 5 unrelated to the delay and 1 (Case 10a.7) was 'possibly related' to the delay.

The transfusion priority in 32/34 was 'emergency', 1 was 'urgent', and 1 was not specified. The MHP was activated in 27/34 cases.

The majority, 26/34 (76.5%) of reported incidents in this category occurred in the ED or theatre.

Figure 10a.2: Location of major haemorrhages



There were 12 cases of avoidable transfusion related to major haemorrhage with (11) or without (1) protocol activations; in 9 of these, emergency O D-negative units were transfused unnecessarily.

There were 19 cases of delayed transfusion (in addition one avoidable case where O D-negative blood was transfused unnecessarily was also delayed). In 6 of these there was major haemorrhage without MHP activations.

There were 3 cases of overtransfusion in the context of major haemorrhage, all are detailed below.

Case 10a.13: A young person with significant multisystem injuries

A very seriously injured young person was transferred with multiple trauma: head injury with raised intracranial pressure, major chest injuries, significant intra-abdominal uncontrolled haemorrhage from a high-grade liver laceration and very high-grade splenic injury. Peripheral injuries included stable pelvic fracture, femoral shaft fracture and the patient was haemodynamically unstable. The patient received red cells and plasma in transit. Following admission during complex surgery and resuscitation they received 19 units of red cells, 14 units of FFP, three units of platelets and four of cryoprecipitate. Post-transfusion Hb was 199g/L requiring venesection.

The emergency care resulted in survival from these extensive injuries. However, case review was undertaken to investigate why the patient was overtransfused. Persistent hypotension and poor perfusion had been attributed to blood loss when it was caused by misplacement of the chest drain resulting in a tension pneumothorax. Repeated blood gas and laboratory analyses were available throughout surgery and stabilisation showing adequate Hb levels of about 140g/L but these had not been taken into account.

Case 10a.14: Unexpected bleeding during surgery

An elective nephrectomy for a tumour was converted from a laparoscopic to an open procedure with estimated 2L blood loss from the renal vein. The patient received 15 units of red cells, five of FFP, two of platelets and two of cryoprecipitate. The pre-transfusion Hb was 123g/L and 4 hours later was 156g/L. The patient suffered cardiac arrest and was transferred to ITU postoperatively, but this was not attributed to the transfusion.

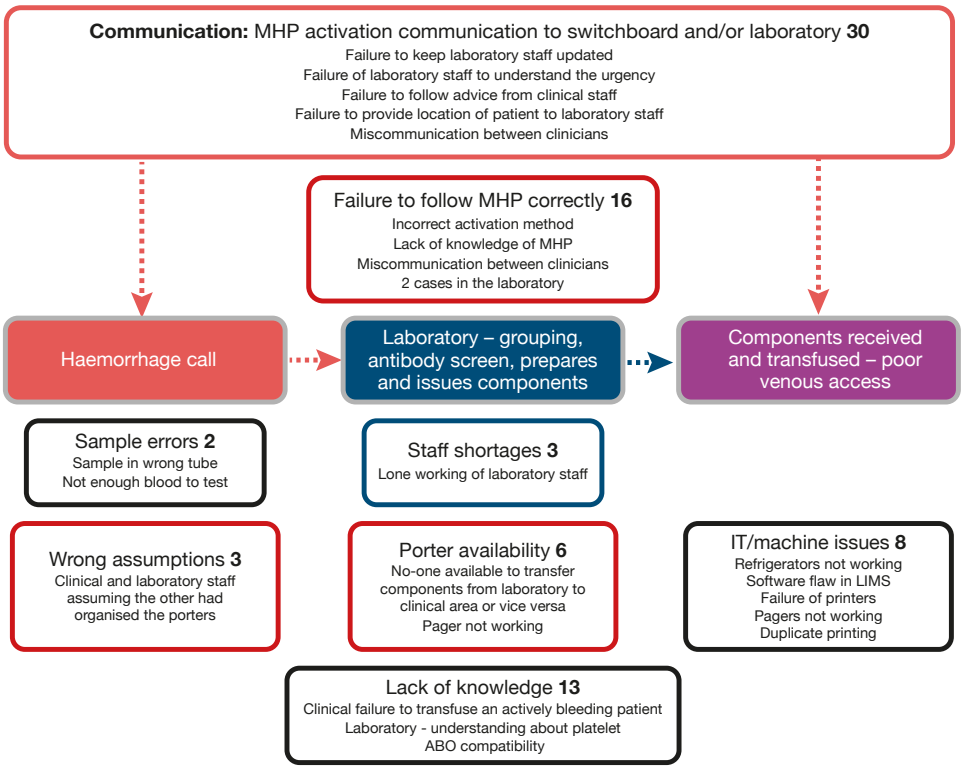
Case 10a.15: Inaccurate estimate of bleeding

Unexpected blood loss into a drain (300mL) following mastectomy resulted in activation of the MHP. This was considered to be an inappropriate activation with an overestimation of the blood loss. The patient received two units of blood and the FFP was wasted. The post-transfusion Hb the next day was 123g/L.

These three cases demonstrate difficulties in assessment of blood loss in an emergency. The first case was particularly difficult for the attending staff owing to the very severe injuries; the case review was important as it noted that in the stressful environment the useful evidence from blood tests was overlooked.

Factors identified in 34 major haemorrhage cases (27 MHP calls) n=81 (often more than one per case)

Figure 10a.3: Holdup points identified in the major haemorrhage transfusion pathway



MHP=major haemorrhage protocol; IT=information technology; LIMS=laboratory information management system

30/34 (88.2%) communication factors

- Miscommunication between clinicians
- Failure of biomedical scientist or porter's pagers
- Misunderstanding of verbal information between clinician and laboratory staff
- Failure to follow advice from haematology staff
- Failure of laboratory staff to understand clinical urgency
- One hospital had different packs depending on whether the MH was associated with trauma (Pack 1 includes FFP) or not associated with trauma (Pack 1 does not include FFP)
- Failure to update laboratory staff following MHP activation. Recurring failure of clinical area to update laboratory staff and confirm stand down
- Failure to check transfusion history in a patient with known alloantibodies followed by transfusion of O D-negative units
- Failure to provide location of the patient to the laboratory staff

16/34 (47.1%) MHP procedure not followed correctly

- Incorrect activation method
- Misunderstanding of correct procedure including failure to use emergency group O D-negative units
- Provision of platelets with MHP Pack 1 in error (should only be in Pack 2)
- Failure to complete patient identification, and prescription in the wrong place
- Failure to ensure the laboratory staff and porters were contacted

- Failure of laboratory staff to start thawing FFP following use of Pack 1 in order that it would be ready for Pack 2
- Laboratory staff lack of knowledge and failure to follow procedures

13/34 (38.2%) lack of knowledge contributing to the two issues above

- Failure to transfuse actively bleeding patients or activate the MHP when advised to

6/34 (17.6%) porter availability e.g. nobody to transport blood units from laboratory to clinical area

5/34 (14.7%) equipment failures

- Blood refrigerator in theatres out of action, porters had been informed but the clinical staff were not aware
- Failure of plasma thawer

3/34 (8.8%) wrong assumptions made

- Laboratory staff received no calls from the ED following admission of a patient with haemorrhage and first provision of emergency units so they assumed the MHP was stood down (there was a special telephone number not used by the clinical area)
- Continued transfusion on the assumption that the patient was bleeding without consulting available results which showed normal Hb results
- Clinical area and laboratory staff each assumed the other was responsible for organising the porters

3/34 (8.8%) staff shortages – lone working of laboratory staff

3/34 (8.8%) IT issues included failure of printers, duplicate printing and inability to release paediatric emergency units due to a software flaw

2/34 (5.9%) sample errors – one sent initially in heparinised tube, second sample too small to test; another sample sent in wrong tube so needed to be repeated

Logistics

These included situations where there had been no one available to transport the relevant components to the clinical area from the laboratory. These were related to staff shortages. There were some cases where incorrect assumptions had been made causing delays.

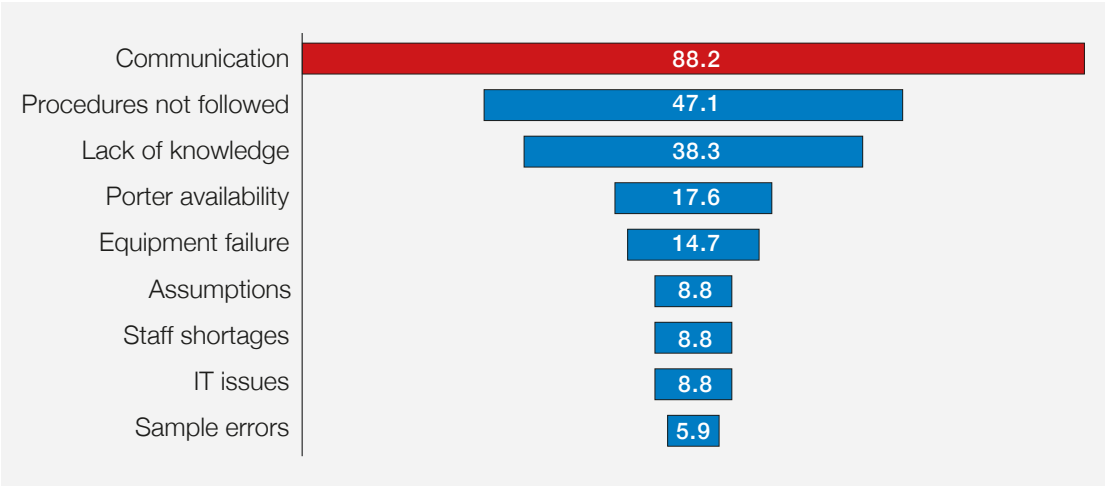


Figure 10a.4: Poor communication is the most common factor contributing to errors in MHP-related reports (results as %)

IT=information technology

Major bleeding without activation of the MHP was reported in 7/34 (20.6%) cases.

There were 6 cases that occurred in theatre and 1 case in the delivery suite.

There were overall 9/34 cases of major haemorrhage that occurred in trauma patients, all associated with delay.

Commentary

It is disappointing that there were so many problems reported in the management of major haemorrhage, most resulting in delayed transfusion. In major bleeding every minute counts. A published review of 680 trauma patients noted that every minute of delay from activation of the MHP to delivery of components increased the odds of death by 5% (Meyer et al. 2017). It is now more than 8 years since the National Patient Safety Agency published their Rapid Response (NPSA 2010). This alert was issued in relation to 11 deaths and 83 incidents of harm due to delays reported over a 4-year period. Here we report 34 incidents related to major haemorrhage in a single year, 19 resulting in delay. There were 16 reports to SHOT of delay in 2016, and 19 in 2017, in total 54 over the past 3 years. The most important factor contributing to delay is poor communication, as shown above and similarly in previous years.

Guidelines published in 2015 recommend that all staff 'involved in frontline care must be trained to recognise major blood loss early, know when to activate/trigger the local major haemorrhage protocol and take prompt and appropriate action' (BSH Hunt et al. 2015) and good communication is essential. One centre has devised a transfusion prescription template which improved balanced transfusion (FFP:RBC ratio) in trauma cases monitored 2012-2016 (Swieton et al. 2018). This template includes reminders about what blood samples to take and which patients might be eligible for group O D-positive rather than D-negative emergency units. A recent review addresses the many advances in management of major haemorrhage in trauma but not these basic issues of communication and logistics (Curry and Davenport 2019). The key components of a MHP are listed in another recent review (Booth and Allard 2018) and include scope, activation method, choice of components, communication, stand-down and regular review including training and drills. The evidence from SHOT reporting suggests that there is room for improvement.

Additional cases related to errors in major haemorrhage protocol activation are found in Chapter 14, Laboratory Errors, Case 14.7, and Chapter 13, Right Blood Right Patient (RBRP), Case 13.1.

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