10. Acute Transfusion Reactions (ATR)

Definition

Acute transfusion reactions are defined as those occurring at any time up to 24 hours following a transfusion of blood or blood components, excluding cases of acute reactions due to an incorrect component being transfused, haemolytic reactions, transfusion-related acute lung injury (TRALI), transfusion-associated circulatory overload (TACO), or those due to bacterial contamination of the component.

DATA SUMMARY

Total number of cases	**300**	*Implicated Components*		*Mortality / morbidity*	
		Red cells	**180**	Deaths due to transfusion	**0**
		FFP	**33**	Deaths in which reaction was implicated	**4**
		Platelets	**69**	Major morbidity	**9**
		Cryoprecipitate	**0**		
		Other *(multiple components)*	**18**		
		Unknown			

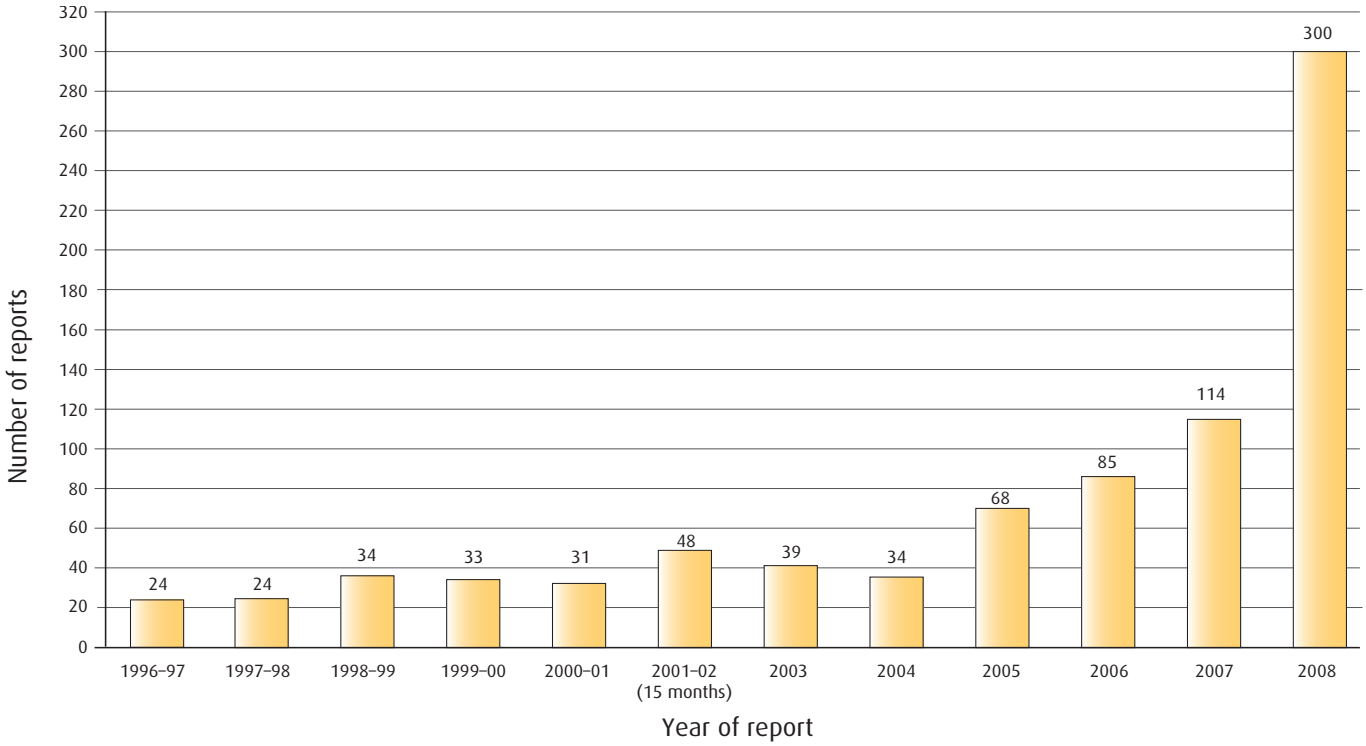
Gender		*Age*		*Emergency vs. routine and core hours vs. out of core hours*		*Where transfusion took place*	
Male	**160**	16 years+ to 18 years		Emergency	**58**	ED	
Female	**140**	1 year+ to 16 years	**23**	Routine	**221**	Theatre	
Unknown		28 days+ to 1 year	**3**	Not known	**21**	ITU/NNU/HDU/Recovery	
		Birth to 28 days	**1**			Wards	
				In core hours	**229**	Community	
		Total	**27**	Out of core hours	**69**	Other	
				Not known/applicable	**2**	Not known	**300**

A total of 310 questionnaires were received. On review, 8 were withdrawn, 2 were transferred to the TACO chapter, 1 was transferred to the haemolytic transfusion reaction (HTR) chapter, and 1 case that was originally reported as a HTR was transferred to this chapter.

The 300 completed questionnaires reported in this section represent a marked increased from the previous year, in keeping with the total increase in SHOT reports. ATR reports represent 28% of the total, compared with 20.4% of the 114 reports in 2007.

The age of patients ranged from 1 day to 93 years, with a mean age of 58 years. There were 160 male and 140 female patients. The data include 25 paediatric cases.

Figure 9
ATR cases 1996–2008



Reporting patterns and incidence

There are a total of 237 reporting organisations making haemovigilance reports to SHOT in 2008. Of these, 105 have sent all 300 reports in this category. Furthermore, 3 reporting organisations supplied 76 reports (25.3% of cases), and 1 submitted 35 case reports.

Reporting patterns this year and previous years strongly suggest that ATRs are still being significantly under-reported, with 103 reporting organisations having sent no physiological reaction reports in 2008. One possible reason for under-reporting may be that symptoms, signs and laboratory investigations cannot be used to prove that a reaction is or is not caused by the transfusion, except in rare cases of IgA deficiency in the recipient. But in spite of this, and although the threshold for submitting a SHOT/SABRE report may vary from one hospital to another, it is hard to understand how so many hospital transfusion teams thought they had nothing to notify, even if imputability proved low on further analysis. Details of reporting to SHOT are available on the SHOT and MHRA/SABRE websites, as well as in this Annual Report and Summary.

Types of acute transfusion reaction

The classification of acute transfusion reactions can be difficult, as inevitably they are often seen in patients with intercurrent illness who may have other causes for their symptoms. Classification does not necessarily have any bearing on the management of the acute reaction or of future transfusions. The International Society for Blood Transfusion (ISBT) has developed standard definitions for non-infectious adverse transfusion reactions in order to help national haemovigilance organisations worldwide to generate data that will be comparable internationally.

The current SHOT categories of acute transfusion reactions are as follows:

- **Isolated febrile** – rise in temperature >1ºC with or without minor rigors and chills.
- **Minor allergic** – skin irritation with or without rash.
- **Anaphylactic** – hypotension with one or more of: rash, dyspnoea, stridor, wheezing, angioedema, pruritus or urticaria, during or within 24 hours of transfusion.
- **Severe allergic** – a severe reaction with immediate risk to life occurring during or within 24 hours of transfusion, characterised by bronchospasm causing hypoxia, or angioedema causing respiratory distress.
- **Hypotensive** – a drop in systolic and/or diastolic pressure of >30mm Hg occurring during or within 1 hour

of completing transfusion, when all other categories of adverse reactions and any underlying conditions that could explain hypotension have been excluded.

- **Febrile with other symptoms/signs** – rise in temperature >1°C, with no features of an allergic reaction, but with one or more of myalgia, nausea, change in blood pressure or hypoxia.

Table 43
Categories of ATR by component

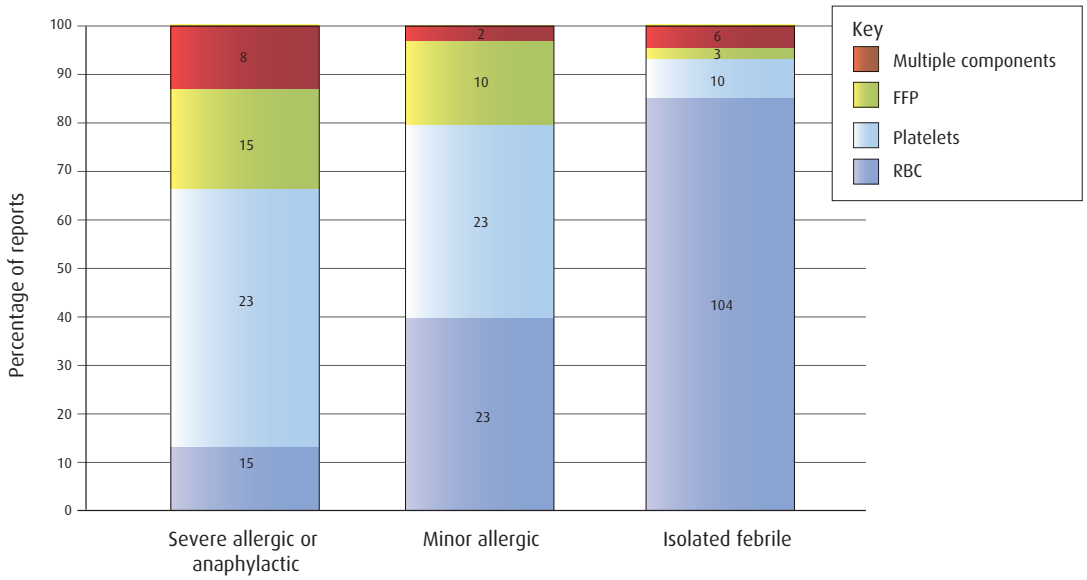
Reaction	Red cells	Apheresis platelets	Buffy coat platelets	Platelets unspecified type	Plasma	Multiple components	Total
Anaphylactic	7	8	4		8	5	**32**
Severe allergic	8	8	3		7	3	**29**
Hypotensive	5	1			2	1	**9**
Febrile with other symptoms or signs	23	2	4		2	1	**32**
Minor allergic	23	15	8		10	2	**58**
Isolated febrile	104	6	4		3	6	**123**
Unclassified	10	3	2	1	1		**17**
TOTAL	**180**	**43**	**25**	**1**	**33**	**18**	

The variation in reaction type between red cells and plasma-rich products is illustrated in Figure 10. Febrile reactions are encountered more frequently with red cell transfusion, and severe allergic and anaphylactic reactions are seen more frequently with platelet and plasma transfusions.

Reactions to platelets

This year there were 69 reported reactions to platelets. The percentage of reactions attributed to apheresis rather than pooled (buffy coat) platelets has risen from 47.5% in 2007 to 62% this year. This is likely to be explained by the percentage of apheresis platelets issued, which in England has risen over the same time period from 52.3% to 60.3%. However, a sustained increase in reactions to one component type would indicate a need to assess the effect of any changes in processing.

Figure 10
Commonest reactions by component type



'Unclassified' reactions

There were 17 reports recorded as 'unclassified' – mostly relating to elderly patients with intercurrent illness and atypical signs. Two unclassified reports are in children: a 3-year-old with AML and chest symptoms, and an 8-year-old on chemotherapy who developed a rasping cough. These cases are all included in this chapter as the hospital transfusion teams involved, using the information present at the time, thought that a diagnosis of ATR was most likely. Further attempts to classify these reactions were not made, as management of the patient and the exclusion of other potentially serious causes of the symptoms were the main priority of the clinical team, and these are not dependent on the classification of the reaction.

Deaths

There were 5 reports concerning patients who died shortly after transfusion. All the patients were either frail or had serious underlying illness. In 4 cases the transfusion reaction might have been a contributory factor in the patients' deterioration. These 4 cases include 2 hypotensive reactions, and 1 classified as a febrile reaction with other symptoms or signs. In Case 3 below, it is not possible to state whether the severe facial swelling was due to angioedema (a severe allergic reaction) or due to venous obstruction. Unfortunately it was not possible to trace the deceased patient's clinical notes.

Case 1 raises an important issue. This patient had been the subject of a SHOT report in 2007, with a hypotensive reaction. On that occasion, HLA antibodies were negative, mast cell tryptase (MCT) was normal, and IgA levels were low but no IgA antibodies were detected. Washed platelets were subsequently transfused without problems. This second episode may have been due to severe intercurrent illness, but it highlights the fact that the mechanism of hypotensive reactions, along with other reactions classified as acute transfusion reactions, is poorly understood.

Case 1

Hypotensive reaction to platelets may have contributed to death of septicaemic leukaemia patient

A 29-year-old man, seriously ill with relapsed leukaemia, was transferred to ITU with respiratory distress and septic shock. He was transfused a unit of platelets with chlorpheniramine and hydrocortisone cover because he had experienced an episode of hypotension following unwashed platelets in the past. Within 30 minutes he developed severe hypotension and back pain and was treated with intravenous colloid and metaraminol. His condition further deteriorated and he suffered a fatal cardiac arrest six hours later. Cultures of the unit and giving set were negative, but blood cultures revealed pseudomonas septicaemia, which was likely to have predated this transfusion. Although the patient was seriously ill, the hypotensive episode may have contributed to his death.

Case 2

Possible transfusion reaction may have contributed to death of patient with myeloma

An 80-year-old woman with myeloma was admitted for a single-unit red cell transfusion, which was completed without problems. Twenty minutes later she developed pyrexia, rigors, back pain and nausea. She was treated with antihistamine, hydrocortisone, adrenaline and salbutamol, but rapidly became very ill and was transferred to ITU, where her condition deteriorated further. She died 2 days later and at postmortem the cause of death was established as cardiac failure. Cultures of the patient's blood and the red cell unit were negative. Repeat red cell serology was not performed. It is not possible to state whether all these symptoms were related to the transfusion, but this episode may have contributed to her death.

Case 3

Transfusion of man later found to have possible SVC obstruction may have contributed to death

A 70-year-old man with pneumonia received 1 unit of red cells over 5 hours. Towards the end of the transfusion he became severely dyspnoeic with facial swelling and subsequently died. At postmortem, he was found to have a large chest malignancy. Further details of the malignancy, or whether there was any evidence of vascular obstruction, are not available. The possibility that the transfusion caused the facial swelling and subsequent deterioration cannot be excluded.

Case 4

Hypotensive reaction to red cell transfusion may have contributed to death from cardiac failure

An 88-year-old woman with a Hb of 6.3 g/dL post hip replacement received 2 units of red cells over 5 hours and then a third unit was commenced. Within 15 minutes, her blood pressure fell from 100/59 to 68/40. She was treated with intravenous hydrocortisone and piriton, but her condition deteriorated over the next 24 hours and she died. Blood cultures were negative. The cause of death was stated to be cardiac failure. It is possible that the hypotensive event contributed to the patient's death.

Case 5

Minor allergic reaction probably did not contribute to death of terminally ill patient

A 77-year-old woman receiving terminal care experienced a minor allergic reaction during a red cell transfusion. Her overall condition subsequently worsened and she died the following day. Although the allergic reaction was likely to have been related to the transfusion, it is unlikely that this resulted in the patient's death.

Reports of major morbidity

This year there were 9 cases of major morbidity either because patients suffered cardio-respiratory arrest, or because they needed admission to intensive care because of the new symptoms. There were 3 patients who had anaphylactic reactions, 3 had allergic reactions, 2 had febrile reactions with other symptoms or signs, and 1 had a hypotensive reaction. Of these, 7 cases – 3 of which are described below – had an imputability level of 3.

Case 6

Severe allergic reaction following multiple component transfusion

A 57-year-old man experienced major haemorrhage while on ITU following sigmoid colectomy. He required rapid transfusion with 11 units of red cells, 2 units of apheresis and 3 of buffy coat platelets, 8 units of FFP, and 2 pools of cryoprecipitate. During these transfusions he developed bronchospasm and ventilation became very difficult. The reporting team could not identify which of the components caused this reaction. He was treated with antihistamine and hydrocortisone and subsequently improved. Cultures of the patient and units were negative, and serum IgA was normal.

Case 7

Severe anaphylaxis with full recovery following FFP infusion

A 75-year-old female patient required FFP for postoperative bleeding and developed an anaphylactic reaction with rash, dyspnoea and profound hypotension. Her blood pressure fell from 110/70 to 55/35 and she required cardiopulmonary resuscitation. She received noradrenaline and dobutamine and her condition improved over the next 2½ hours. Investigations were normal.

Case 8

Inappropriate transfusion of FFP for warfarin reversal results in anaphylaxis

A 75-year-old woman was given 3 units of FFP to reverse warfarin prior to an amputation. She developed a severe anaphylactic reaction, with a rash, dyspnoea and angioedema. Her blood pressure dropped from 109/82 to 67/40. She was admitted to ITU and treated with hydrocortisone, antihistamine and adrenaline. Her condition improved over the next 2 hours.

Case 9

Hypotensive reaction in a child following MB-FFP infusion

A 1-year-old male infant with Fallot's tetralogy received a unit of paediatric MB-FFP. During the transfusion he became hypotensive. Initially this was thought to be due to hypovolaemia, and the rate of transfusion was increased. Ten minutes into the transfusion, after 50 mL had been transfused, his blood pressure fell further from 80/43 to 55/20. He suffered further deterioration and circulatory collapse requiring cardiopulmonary resuscitation. Serum IgA was normal, and cultures from the FFP unit and patient's blood were negative.

Anaphylactic reactions *n* = 32

There were 32 patients who experienced anaphylaxis. One case (Case 3 above) involved a patient who died soon after the transfusion. The death may have been related to a large chest neoplasm found at postmortem. Four suffered major morbidity, involving ITU admission or a callout of the cardiac arrest team.

The imputability was given as zero in 2 cases, including 1 death, described above (Case 3). In 1 case, the reporting team changed the imputability from 1 to zero as investigations had proved negative. However, it must be stressed that investigations rarely have a role in the confirmation or classification of acute transfusion reactions. Imputability was given as 1 in 13 cases, 2 in 16 cases and 3 in 1 case.

Case 10

Anaphylaxis following multiple components may be due to FFP

A 75-year-old man required transfusion with 6 units of red cells and 4 units of FFP in theatre. He developed an urticarial rash over his trunk, his systolic blood pressure dropped from 120 to 40 mm Hg, and his oxygen saturation from 96% to 89%. He was treated with intravenous hydrocortisone and adrenaline and his condition improved. Serum mast cell tryptase was raised at 17.7 units immediately after the event, falling to a normal level of 4.4 units several hours later. The transient rise in MCT is in keeping with an anaphylactic reaction, and the reporting team attributed this to the FFP.

Case 11

Unknown significance of HLA antibodies

A 34-year-old woman had had an emergency Caesarean section for HELLP syndrome. Two days postoperatively her platelet count was 45 x10^9/L. She was given a unit of apheresis platelets over 20 minutes. Immediately after the transfusion she developed a rash, angioedema, chest pain and dyspnoea. Her blood pressure fell from 128/83 to 90/48 and her oxygen saturation fell to 87%. She was treated with 2 doses of hydrocortisone 100mg and her blood pressure and oxygen saturation returned to normal within 25 minutes. Culture of the patient's blood and the apheresis unit were negative. Blood was sent for HLA, HPA and HNA antibodies and the patient was found to have anti-HLA B37. As the HLA status of the donor was not determined, it is difficult to determine the significance of this.

Severe allergic reactions *n* = 29

There were 29 cases of severe allergic reactions, including 3 with major morbidity. One is discussed in the section on major morbidity (Case 6). The other 2 cases are described below:

Case 12

Severe allergic reaction leading to cardiac arrest after platelet transfusion

A 56-year-old man with consumptive thrombocytopenia was given 1 unit of pooled platelets in theatre immediately before a knee arthroscopy. He developed a rash and hypotension (although not to the degree required by the definition of anaphylaxis) under anaesthetic, followed by cardiac arrest, from which he was successfully resuscitated. Treatment included intravenous adrenaline and nebulised salbutamol via the endotracheal tube. His vital signs returned to normal within 30 minutes. Serum IgA level was normal. It was decided to use washed blood components for future transfusion.

Case 13

Severe allergic reaction following transfusion of FFP

A 40-year-old man with alcoholic liver disease and hepatorenal syndrome was given 2 units of FFP to correct his INR prior to ascitic tap. Within 1 hour, he developed urticaria and bronchospasm, and was reported to have a respiratory arrest. He responded to intravenous chlorpheniramine. Investigations were negative except for a low haptoglobin, probably due to his severe liver disease.

There were 12 paediatric patients suffering severe allergic reactions, 7 of which were associated with apheresis platelets with 1 involving transfusion of multiple components, described below. Imputability of all cases was given as either 2 or 3.

Case 14

Severe allergic reaction in boy receiving multiple blood components

A 13-year-old boy had been stabbed and needed emergency angiography. He had received a rapid transfusion of 6 units of red cells, 4 units of MB-FFP and 2 pools of cryoprecipitate. It was not known which of the latter components may have caused the reaction. While in the radiology department he developed urticaria, angioedema and dyspnoea, but maintained good oxygen saturation. He was managed with hydrocortisone, antihistamine and adrenaline and made a good recovery. Investigations revealed a non-specific HLA antibody. The clinical team had considered whether intravenous contrast medium had been a cause of his reactions, but he went on to receive further contrast medium without any problems.

Management of transfusion reactions

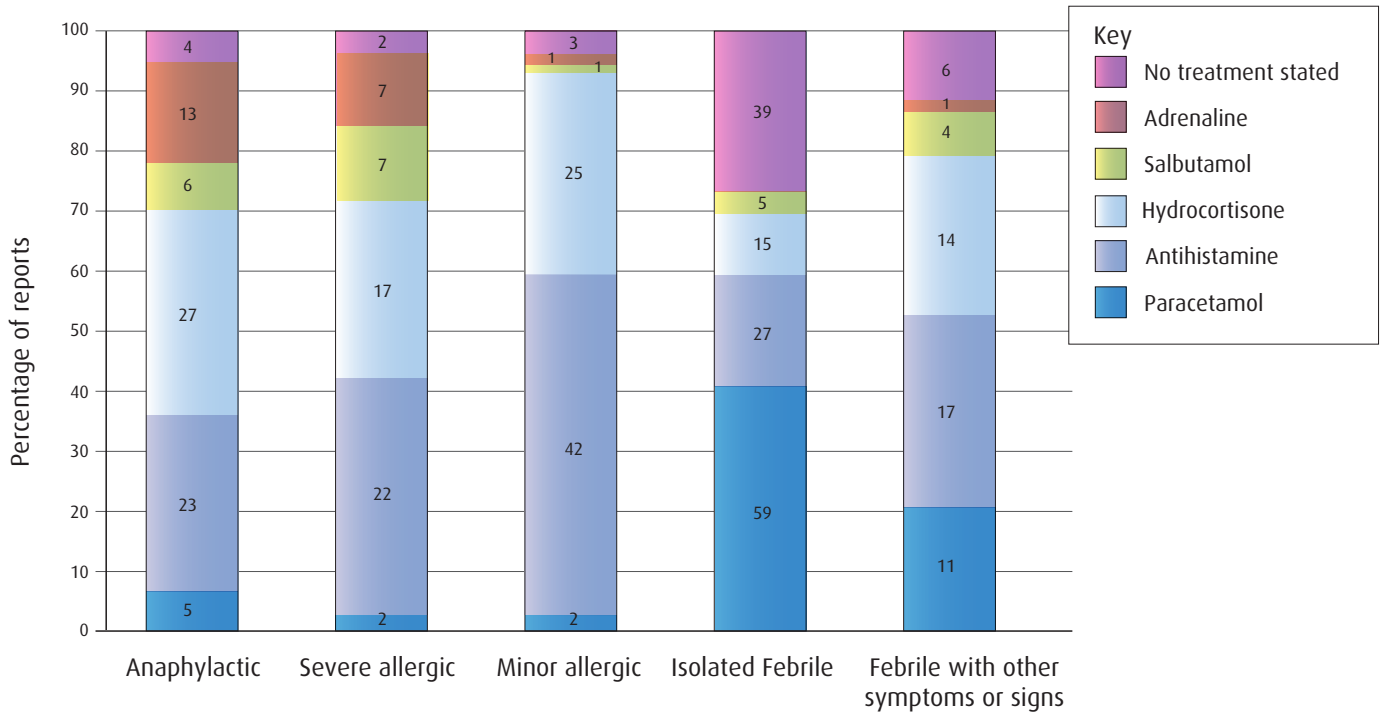
Management of the transfusion

In 180 (60%) of reported cases, the transfusion was stopped completely because of the reaction. In 6 cases (2%) the transfusion was stopped temporarily, and in 23 cases (7.7%) the transfusion was already complete. In only 10 cases (3.3%) was the transfusion continued. In 81 cases (27%), no information was given.

Drug Treatment

Figure 11 shows that treatment given for the more severe forms of transfusion reactions differs from that given for isolated febrile or minor allergic reactions. It is appropriate that treatment in the acute situation is aimed at relief of symptoms and signs. Paracetamol was the most widely used drug for febrile reactions, being given in 50% of simple febrile reactions and nearly 25% of febrile reactions with additional symptoms or signs. An antihistamine, usually chlorpheniramine, was prescribed to alleviate allergic types of ATR, being administered in nearly 60% of minor allergic, 40% of severe allergic and 30% of anaphylactic reactions. This is accepted practice, but its considerable use in isolated febrile reactions (27 patients) and in febrile reactions with additional signs of symptoms is not evidence based.[14] Salbutamol and adrenaline have a role in more severe reactions.

Figure 11
Drug treatment and type of reaction



Treatment of anaphylactic reactions

Management of anaphylactic transfusion reactions should be based on guidelines produced by the UK Resuscitation Council.[15] Treatment involves initial resuscitation, administration of high concentration oxygen, and consideration of a rapid IV infusion of saline or Hartmann's solution. Adrenaline is the first drug of choice, with antihistamines as a second line treatment. Steroids may help prevent or shorten protracted reactions. Consideration should be given to the use of bronchodilators, adrenaline or other cardiac drugs as set out in the Resuscitation Guidelines.

Management of subsequent transfusions

All but 5 cases were reviewed by the HTC or by the HTT. In 3 cases the decision was made to use washed components in the future, and in 3 cases it was decided to give prophylaxis with hydrocortisone and antihistamine. In 1 case, the clinical team was advised to request HLA matched components. The majority of the cases with a management plan for future transfusion involved patients with anaphylactic or severe allergic reactions, but there was 1 case each of isolated febrile or minor allergic reactions. In 1 case, it was ensured that all clinical departments were aware of the availability of prothrombin complex concentrates (PCCs) in preference to FFP for serious bleeding due to warfarin. In response to a case involving an anaphylactic reaction related to FFP, an HTT circulated a reminder that non-urgent transfusions should not be performed at night.

Investigations

The most commonly performed investigations are shown in Table 44.

Table 44
Commonly performed investigations

Investigation	Number of reports	Number of positive or abnormal results
Culture of patient's blood and/or component for bacterial growth	173	Patient blood cultures were positive in 13 cases, none of which were associated with positive blood component cultures. Of these, 9 were isolated febrile reactions reported with red cells, which suggests that the fever was related to sepsis rather than transfusion and highlights the difficulties in ascribing imputability. In 1 case, a hypotensive reaction to apheresis platelets, there was a fatality. This is described in the section on patient deaths. Cultures of the blood component were positive on 7 occasions, in all cases thought to be due to contaminants (4/7 components were red cells)
Red cell serology	45	Nil significant
Mast cell tryptase assay	25	In 6 cases MCT rose then returned to baseline
Serum IgA levels with or without antibodies	54	Nil
HLA antibody screen	29	Non-specific positive in 9 cases. In 1 case, anti-B37 demonstrated.

Value of investigations

Mast Cell Tryptase (MCT) assay

A transiently raised MCT, returning to baseline levels a few hours after the event, is suggestive of mast cell activation.[15] However, the test cannot determine the cause of the mast cell activation.

IgA levels

The prevalence of IgA deficiency is approximately 1 in 700, with about 30% of individuals with low IgA levels having IgA antibodies. Not all individuals with anti-IgA antibodies will experience transfusion reactions. The incidence of acute transfusion reactions due to anti-IgA is estimated to be between 1 in 20,000 and 1 in 47,000.[16] Transfusion recipients who have experienced anaphylactic or severe allergic reactions, especially if repeated, should be investigated for possible IgA deficiency.

Bacterial culture of the patient's blood and the implicated unit

The possibility of transfusion-transmitted bacterial infection should be considered when a patient with ATR is being assessed, especially if platelets are involved. The blood component should be inspected for signs of contamination, e.g. partial clotting, cloudiness or discolouration, or gas formation. The visual inspection of a component is a critical part of the pre-administration check. Patients with pyrexia and rigors severe enough to cause the transfusion to be stopped must have blood cultures and the implicated unit must be cultured.

Repeat red cell serology

The possibility of an ATR, including ABO incompatibility, should always be borne in mind especially in patients who are experiencing sudden onset of back pain, rigors, wheeze or hypotension. The patient's details and the compatibility label on the unit must be checked as part of the initial assessment of the patient.

HLA antibodies

HLA antibodies are commonly found in transfusion recipients and are rarely of clinical significance. There is no strong evidence base linking HLA antibodies to acute transfusion reactions. However, some patients who are refractory to platelet transfusions and who have HLA antibodies experience symptoms suggestive of an acute transfusion reaction. In patients who experience repeated severe allergic reactions to platelets, it may be helpful to check platelet increments within 24 hours of a platelet transfusion before proceeding to measure HLA antibodies. The HLA type of the implicated donor will also be required before any inference regarding causation can be made.

Timing of transfusions

The time of day at which the implicated transfusion was commenced was recorded in 298/300 cases.

- between 08.01 and 20.00 hours in 227 (76.2%) cases
- between 20.01 and 24.00 in 43 (14.4%) cases
- between 24.01 and 08.00 in 28 (9.4%) cases

The proportion of urgent transfusions was higher between 20.01 and 08.00 (42%) than during core hours of 08.01 to 20.00 hours (12.7%).

Timing of reaction after start of implicated unit

The time between commencement of the implicated transfusion and the start of the reaction was noted in 274 cases, with an average of 66 minutes, with a range of <1 minute to 440 minutes (7 hours and 20 minutes). Crucially 199 reactions (72.6%) occurred more than 15 minutes after commencing the transfusion, which highlights the need for proper regular monitoring of the patient and the requirement for transfusions to be carried out where there are sufficient trained staff to observe the patient.

Imputability

It can be difficult to ascribe imputability (i.e. the likelihood that a blood component has caused the reaction) as there are no diagnostic tests that will confirm or exclude a blood component as the cause of the reaction. In addition, most patients have intercurrent illness, or are receiving treatments that could have induced the reaction. Imputability, where given, has been assigned by the reporting teams as follows:

- 0 (unlikely) 37 cases
- 1 (possible) 152 cases
- 2 (likely or probable) 98 cases
- 3 (certain) 9 cases

In several cases the reporting team changed the imputability from a higher score to zero when investigations proved

negative. However, as discussed above, diagnosis of an acute transfusion reaction is based on a clinical diagnosis of symptoms and signs. Investigations are of use in excluding other potentially serious causes for the symptoms, but not often in proving the reaction to have been transfusion related.

Appropriateness

The appropriateness is hard to judge in many of the cases both for the reporter (usually the HTT) and for SHOT. However, there are 6 reports (the same number as in 2007) of transfusion reactions associated with the use of FFP for warfarin reversal, 1 of which was a severe allergic reaction. FFP is not indicated for this purpose, except when life, limb or sight-threatening haemorrhage occurs and prothrombin complex concentrates are not available.[17]

Acute transfusion reactions with development of antibodies

In 1 case initially reported as HTR, a patient with an isolated febrile reaction was found on repeat red cell serology to have developed anti-Co(b). There was no evidence of haemolysis, and the antibody formation was unlikely to have been incidental.

Paediatric cases

There are 25 cases of ATRs in patients under 18, representing 8% of the total ATR cases, compared to 6% (7/114) in the 2007 report. These cases are discussed in full in the paediatric chapter.

Serious Adverse Reaction reporting

There were 49 'Serious Adverse Reaction' (SAR) events reported to SHOT only, and not to the MHRA. Although many were too minor to be considered SAR events according to the MHRA definition, 4 patients had their hospital stay prolonged as a result of a reaction and these should have been reported to MHRA as well as to SHOT.[18]

RECOMMENDATIONS

New recommendations this year

- Initial management of a suspected transfusion reaction should be directed towards rapid assessment of the patient's condition, and treatment of their symptoms and signs.

- It cannot be assumed that all adverse reactions to blood components are due to an ATR in a category defined in this chapter. Unless the diagnosis is clear, patients whose reactions are severe enough to warrant stopping the transfusion should be fully investigated to identify other potentially serious causes of the symptoms such as TRALI, bacterial contamination, TACO or haemolysis. In addition, it should be borne in mind that symptoms may be due to, or augmented by, the patient's underlying condition or other intercurrent illness. Hospitals should have a policy for the investigation and management of ATRs based on current best practice. An update of BCSH guidelines is in progress.

- As the mechanism of ATR is still not clear, the role of unselected testing for HLA, HPA or HNA antibodies appears very limited. Patients who experience anaphylactic or severe allergic reactions after platelets should have an increment measured between 1 and 24 hours after transfusion. A severe reaction could indicate platelet refractoriness, in which case HLA matched components would be indicated. Otherwise, the next step should be a trial of PAS-suspended platelets, or washed components, before embarking on HLA testing.[19]

- ATRs that meet the MHRA criteria for SAR, i.e. those that are '... fatal, life-threatening, disabling or incapacitating, or that result in or prolong hospitalisation or morbidity', should be reported to MHRA as well as SHOT through SABRE.[18]

  Action: HTT and HTC

- The ISBT reporting categories for transfusion reactions[4] are being promoted by ISBT and IHN to be adopted internationally to facilitate comparison of data. SHOT analysis categories will need to be adapted to fit with this classification.

  Action: SHOT

Recommendations still active from previous years

Year first made	Recommendation (Previously Learning Points)	Target	Progress
2006	Serious transfusion reactions can occur at any stage during the transfusion, emphasising the need to keep all patients visible and accessible to nursing staff. Out-of-hours transfusions should be avoided unless essential and where there is adequate monitoring.	**HTTs**	The national comparative audit of overnight transfusion has added to the evidence that overnight transfusions need to be monitored as closely as those carried out during the daytime.
2007	Prothrombin complex concentrate (PCC), rather than FFP, is the product of choice for the reversal of oral anticoagulation (warfarin) in patients with major bleeding. In the absence of major bleeding, PCC could be used for warfarin reversal for emergency surgery, and FFP used only if concentrate is not available.	**Consultant haematologists with responsibility for transfusion**	There are still some ATRs reported relating to inappropriate use of FFP, although the proportion of cases is lower relative to the increased overall reporting in 2008.
2007	Hospitals should have a policy that ensures that serious adverse reactions to transfusions are recognised and reported. This is a legal requirement under the BSQR.	**HTCs, HTTs**	BCSH guidelines on the investigation and management of transfusion reactions are in development. All ATRs fulfilling the BSQR definition of SAR must be reported to MHRA.