Donor Haemovigilance

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Key SHOT messages

- Blood donation is generally a safe process; however, donor complications sometimes do occur. Donor haemovigilance systems permit monitoring of donor safety, developing mitigating actions and evaluating the success of these interventions designed to further improve donor safety. This also allows international benchmarking of donor adverse events
- Reducing human errors: Human errors contribute to donor adverse events. Blood Services must ensure staff are adequately trained and comply with standard policies and procedures which are essential in promoting donor safety

Introduction

The blood supply depends entirely on the invaluable commitment of volunteers, who ostensibly gain little personal benefit from blood donation but are exposed to the risks of discomfort, complications and injury resulting from the collection procedure.

Donor safety is paramount and is ensured by donor selection guidelines, standard policies and procedures, trained staff and appropriate facilities. National and international standards exist for donor selection, blood collection procedures and quality management. Despite these measures, adverse events will occur in a number of donors either at the time of or shortly after donation. About 2–6% of donors experience an adverse event. Most of these are classified as non-severe and resolve promptly but are still unpleasant for the donor. Serious adverse events occur infrequently. Rarely, these reactions may result in long-term or permanent disability or injury to the donor. These donor adverse events may also lead to cessation of collection and loss of the donation, and decreased likelihood of donor return. Blood Establishments also face reputational risk with legal claims and these adverse events may also negatively impact donor recruitment. Preventing these adverse events must be a priority and when donor complications do occur, they should be managed promptly and appropriately.

Donor haemovigilance systems permit monitoring of donor safety, assessing frequency of risk factors, developing mitigating actions and helps evaluating the success of interventions designed to further improve donor safety. Standardised definitions facilitate international benchmarking of donor adverse events and promote best practice.

Regulation and guidance on donor haemovigilance

The current European Blood Directives, issued and enforced between 2003 and 2005 (2002/98/EC and 2005/61/EC), which describe the basic regulatory requirements and standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood components also provide the regulatory bases of haemovigilance requirements for traceability and notification of serious adverse reactions and events (EU Directives).

The EU Directives were transposed into UK law through the Blood Safety and Quality Regulations (BSQR) 2005. The Blood Safety and Quality (amendment) Regulations 2006/2013 further amend the BSQR 2005 (SI 2005/50) ('the principal regulations') to make a number of changes to the provisions governing the operation of Blood Establishments relating specifically to traceability requirements and notification of adverse reactions and events and introduced standards and specifications relating to a quality system for blood establishments (BSQR 2005).

Standard definitions for surveillance of complications related to blood donation

Standard definitions of donor reactions allow each Blood Service to monitor donor adverse events and compare with other organisations to develop and promote best practices. The 2008 International Society of Blood Transfusion (ISBT) standard for surveillance of complications related to blood donation introduced a classification with descriptions of types of complications. Two problems were however identified with these definitions:

- Descriptions were not sufficiently specific to permit standard classification and comparison of different donor surveillance programmes
- Definitions were difficult to apply because they required information not easily obtainable in many countries

The ISBT Haemovigilance Working Party subsequently led a multi-organisational effort to update the 2008 ISBT standard for surveillance of complications related to blood donation and revised definitions have now been developed (Goldman et al. 2016, ISBT 2014).

The goals of this revised classification system were to:

- Provide simple definitions that are easy to apply in a standardised way
- Provide minimal requirements for international comparison that meet the needs of a basic surveillance programme
- Provide additional attributes that may be collected nationally if possible which would be important to make improvements by the blood centre or lead to relevant research in donor reactions
- Align definitions with those used in the American Association of Blood Banks (AABB) Donor Haemovigilance System to permit comparisons

The new classification system provides clear, standard definitions for donor adverse events. The revised classification scheme and abbreviated definitions are shown in Table 29.1. The recommended numerator and denominator parameters and basic information about donor screening and collection practices are shown in Table 29.2. Optional categories are shown in italics. The mechanisms and signs and symptoms of each reaction, as well as a data entry form, are included on the ISBT website (ISBT 2014).

Table 29.1: Definitions of donor complications, optional categories in *italics*

Donor adverse event categories (optional categories in *italics*)				
A	Local symptoms	A1	**Blood outside vessels**	
			Haematoma (bruise)	Accumulation of blood in tissues
			Arterial puncture	Puncture of brachial artery or brachial artery branch
			Delayed bleeding	Rebleeding after initial bleeding has stopped
		A2	**Arm pain**	
			Nerve injury/irritation	Injury or irritation of a nerve
			Duration < or >12 months	
			Other arm pain	Pain without characteristics of nerve irritation, large haematoma or other possibly painful complications
		A3	**Localised infection/inflammation of vein or soft tissue**	
			Localised infection/ inflammation	Inflammation along the course of a vein, which may progress to localised infection; there may be clotting
			Optional split into two categories	
			Thrombophlebitis	Redness, swelling, tenderness extend along the vein
			Cellulitis	Redness, swelling, tenderness not localised to the vein
		A4	**Other major blood vessel injury: must be medically diagnosed**	
			Deep venous thrombosis	Thrombosis of a deep vein in phlebotomy arm
			Arteriovenous fistula	Acquired connection between vein and artery
			Compartment syndrome	Increased compartment pressure leading to necrosis
			Brachial artery pseudoaneurysm	Collection of blood outside an artery contained by adventitia or the surrounding tissues alone
B	Generalised symptoms-vasovagal reactions: General feeling of discomfort and weakness with anxiety, dizziness, and nausea which may lead to loss of consciousness (faint)			
	Vasovagal reactions		No loss of consciousness	The donor does not faint
			Loss of consciousness	The donor faints for a period of time
			>60sec, and/or complications	
			<60sec, without complications	
			With or without injury	Injury caused by falls/accidents
			On or off collection site	Before or after donor has left donation site
C	Related to apheresis			
			Citrate reactions	Neuromuscular hyper reactivity related to reduced Ca^{2+}
			Haemolysis	Damaged donor red cells, releasing haemoglobin
			Air embolism	Air bubble introduced to donor's circulation
			Infiltration[a]	Intravenous solute (saline solution) enters tissues
D	Allergic reactions			
			Local	Red or irritated skin at venepuncture site
			Generalised (anaphylactic)	Anaphylactic reactions may begin soon after starting the procedure, progress rapidly to cardiac arrest
E	Other serious complications: must be medically diagnosed, imputability assessed[b]			
F	Other			
			Major cardiovascular event	MI[c], cardiac arrest, other acute symptoms, TIA[d], CVA[e], or death within 24 hours after donation

[a] *When return fluid consisting of red cells in plasma and citrate goes extravascular, report under A1 Haematoma*

[b] *Only cases with definite, probable, or possible imputability included for international reporting*

[c] *MI=myocardial infarction*

[d] *TIA=transient ischaemic attack*

[e] *CVA=cerebrovascular accident*

Table 29.2: Recommended numerator and denominator data, optional data shown in ***italics***

Numerator data about each complication		Denominator data about all donors	
Type of donation		**Total donations (proceed to phlebotomy)/year**	
a) Whole blood	*i. Allogeneic*	a) Whole blood	*i. Allogeneic*
	ii. Autologous		*ii. Autologous*
a) Apheresis	i. RBC+*plasma+platelets*	a) Apheresis	i. RBC+*plasma+platelets*
	ii. Platelets+plasma		ii. Platelets+plasma
	iii. Plasma only		*iii. Plasma only*
Gender of donor		Gender of donors in each donation category	
First time versus repeat donor		First time versus repeat donors in each category	
Age group (16–18, 19–22, 23–29, 30–69, >70 years)		*Age group of donors (16–18, 19–22, 23–29, 30–69, >70 years)*	
Type of complication		*Total number of donors/year by type of donation, gender, first time versus repeat, age group*	

Timeline of the significant milestones in donor adverse event reporting by UK Blood Services to SHOT

Each of the UK Blood Services has their own system for recording and investigating donor adverse events. Serious adverse events of donation (SAEDs) are recorded as quality incidents, investigated in a timely manner, corrective and preventative actions instituted and reported by each Blood Service respectively to the Medicines and Healthcare Products Regulatory Agency (MHRA). All known events relating to whole blood and component donations should be recorded.

Following ISBT definitions of donor adverse events in 2008, at the request of the Joint United Kingdom (UK) Blood Transfusion and Tissue Transplantation Services Professional Advisory Committee (JPAC), Standing Advisory Committees on Care and Selection of Donors (SACCSD), a working group with representatives from each of the UK Blood Services was established to harmonise donor adverse event reporting to SHOT and to allow benchmarking of donor adverse events both internally in the UK and internationally. The four UK Blood Services agreed to the definitions of SAEs in 2010 and have been using these since then. Following the introduction in December 2014 of the new ISBT/IHN/AABB-endorsed classification of donor complications, the working party has been re-established with representatives from all the four UK Blood Services to facilitate the same process. It has been agreed that a collated report of SAEDs from the four UK Blood Services will be reported to SHOT in the first instance and the working party will continue to look at expanding this and streamlining the process in the future. The UK Blood Services are in the process of incorporating these new ISBT definitions into the reporting system.

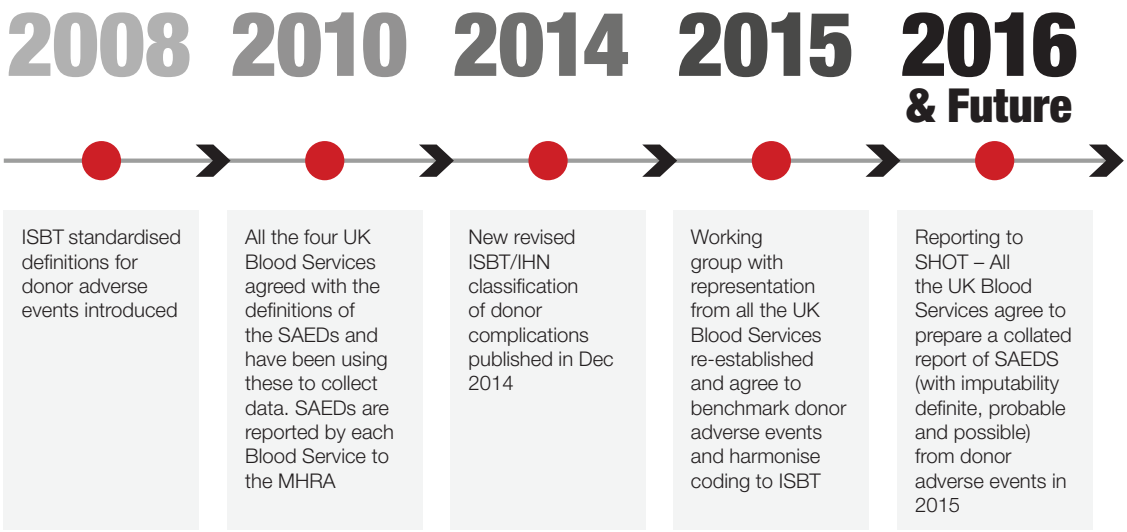


Figure 29.1: Timeline of significant milestones in reporting and benchmarking donor haemovigilance data

Serious adverse events of donation (SAEDs) reporting categories agreed by the UK Blood Services:

The donor SAEDs agreed by the UK Blood Services to be reportable if definitely, probably or possibly linked to donation are shown in Table 29.3.

SAED categories 2016	
1	Death within 7 days of donation
2	Hospital admission within 24 hours of donation
3	Injury resulting in a fracture within 24 hours (including fractured teeth)
4	Road traffic collision (RTC) within 24 hours of donation
5	Acute coronary syndrome (ACS) diagnosed within 24 hours of donation
6	Problems relating to needle insertion persisting for more than a year or requiring hospitalisation/intervention
7	Anaphylaxis (component donation, CD)
8	Haemolysis (CD)
9	Air embolism (CD)
10	Other event linked to donation resulting in hospitalisation, intervention or disability/incapacity for more than a year after donation, not included above

7, 8 and 9 previously one category and 10 a new category

Table 29.3: SAED categories 2016

All SAEDs will be investigated within each Blood Service, and will be notified to the MHRA. Imputability is defined as the strength of the relationship between the donation and the event and is graded as:

- Definite or certain: when there is conclusive evidence beyond reasonable doubt for the relationship
- Probable or likely: when the evidence is clearly in favour of a relationship
- Possible: when the evidence is indeterminate for attributing the complication to the donation or an alternative cause
- Unlikely or doubtful: when the evidence is clearly in favour of attributing the complication to other causes
- Excluded: when there is conclusive evidence beyond reasonable doubt that the complication can be attributed to causes other than the donation

Only cases where the imputability is ‘definite’, ‘probable’ or ‘possible’ are reported to SHOT.

Review of SAEDs reported to the UK Blood Services from January to December 2015

The following are the four National Blood Services/Blood Transfusion Services in the UK:

- NHS Blood and Transplant (NHSBT), a Special Health Authority within the NHS, which provides Blood Services and tissues in England and North Wales, and organs for the whole of the UK. From 1 May 2016 however, North Wales was transferred over to the Welsh Blood Service
- The Scottish National Blood Transfusion Service (SNBTS), which is managed by NHS National Services Scotland
- The Northern Ireland Blood Transfusion Service (NIBTS), which is managed by the Northern Ireland Blood Transfusion Special Agency
- The Welsh Blood Service (WBS), which is provided and managed by Velindre NHS Trust

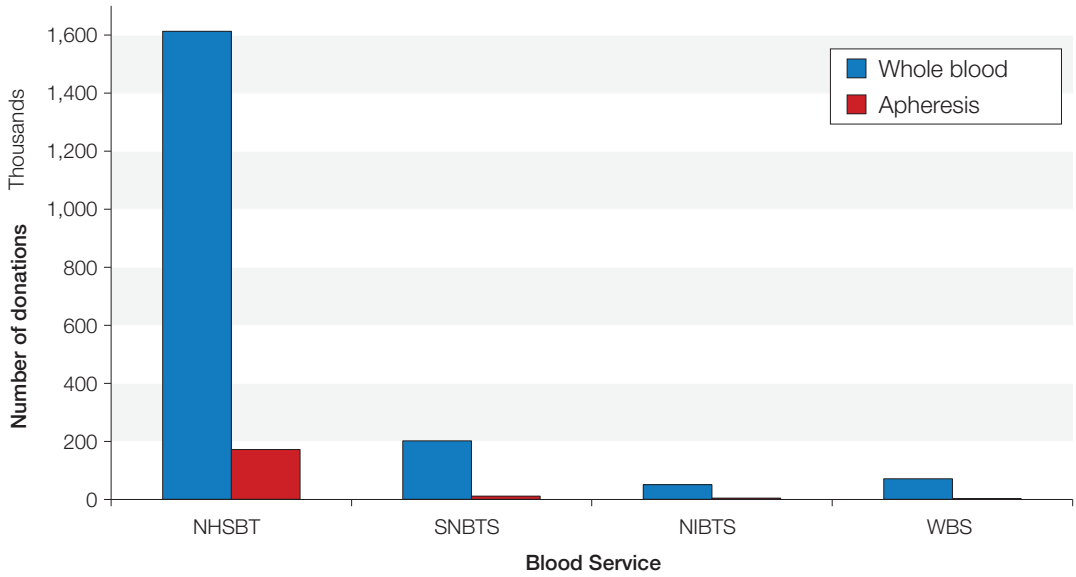
The following table provides information relating to the total number of donations, number of whole blood donations, component donations and total number of SAEDs reported by each of the UK Blood Transfusion Services for the calendar year 2015 (January–December).

Table 29.4: Summary of SAEDs from the UK Blood Transfusion Services for the calendar year 2015

	NHSBT	SNBTS	NIBTS	WBS
Whole blood donations	1,611,930	201,403	50,791	71,833
Apheresis/Component donations	171,790	11,536	4,497	3,028
Total donations	1,783,720	212,939	55,288	74,861
Total SAEDs	**37***	**0**	**0**	**0**

**This equates to a rate of 0.2 SAEDs per 10,000 donations*

Figure 29.2: Donations collected by the UK Blood Services in 2015



The SAEDs reported from NHS Blood and Transplant are shown in Figure 29.3. None were reported from the other Blood Services.

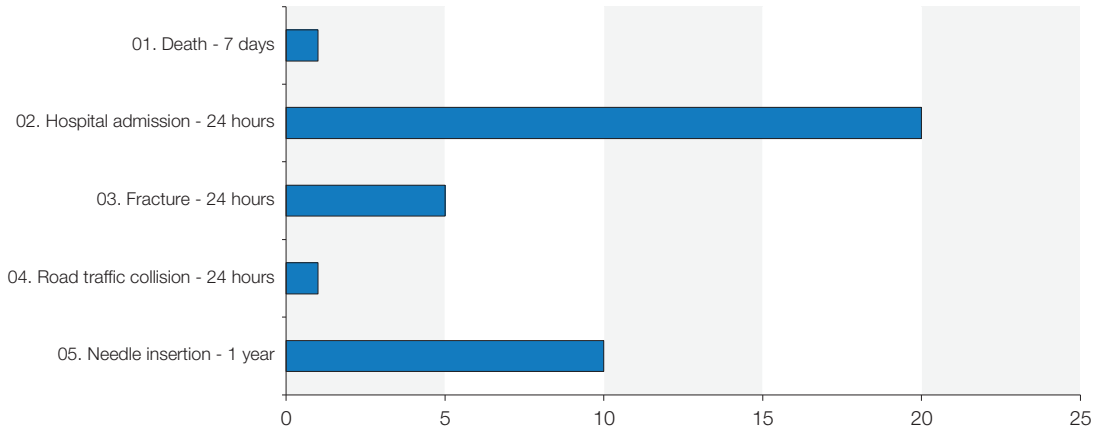


Figure 29.3: SAEDs reported from NHSBT in 2015*

**There were no reported cases of other events including acute coronary syndrome, anaphylaxis, haemolysis or air embolism*

Further details on donor demographics

The following table provides further details regarding donor demographics for the donations from 2015 from the four UK Blood Services:

Table 29.5: Data from the UK Blood Services 2015

Donations in 2015		NHSBT	SNBTS	NIBTS	WBS
Whole blood	Donations from male donors	762,099	93,043	28,259	37,502
	Donations from female donors	849,831	108,360	22,532	34,331
	Donations from new donors	194,496	22,359	5,858	5,775
	Donations from repeat donors	1,417,434	179,044	44,933	66,058
Apheresis	Donations from male donors	133,531	9,881	3,730	2,601
	Donations from female donors	38,259	1,655	767	427
	Donations from new donors	278	0	0	6
	Donations from repeat donors	171,512	11,536	4,497	3,022
Total donations in 2015		**1,783,720**	**212,939**	**55,288**	**74,861**

Some examples of donor serious adverse events

Case 29.1: Donor death within seven days post donation but not directly linked to donation

The donor death reported last year was a 65 year old regular whole blood donor who died suddenly five days after donation. The donor had not reported any diagnoses of iron deficiency, had no visit to the doctor for heart problems, attendance at hospital for any new illnesses and did not report symptoms associated with iron deficiency. This donor's general practitioner has confirmed that his death was a sudden and unexpected event in a 65 year old man with moderately well controlled hypertension and no other known significant medical problems. The cause of death was a large myocardial infarction. Root cause analysis was undertaken. It was concluded that it was unlikely that giving a donation of blood was a contributory factor in this man's death.

Case 29.2: Delayed vasovagal reaction in a regular blood donor resulting in injury/fracture within 24 hours post donation

This was a 55 year old female donor who had given 45 previous uneventful whole blood donations. The donor was in good health and reported no active problems. The donation was uneventful. The donor had received her post-donation drink and had been informed of the applied muscle tension (AMT) exercises. No bruise was recorded and the donor felt well before leaving the session. The donor woke up the morning after donation, fainted in the bathroom and fractured her fibula. She was taken to hospital, reviewed by the orthopaedic team and had her leg put in plaster. The injury in this case was secondary to the delayed faint which is an unpredictable complication of donation. The donor reported that she did not take much fluid after donation, possibly contributing to this. A root cause analysis confirmed that that there was nothing further that could have been done by session staff on the day to prevent this SAED from occurring. All standard NHSBT procedures were followed.

Delayed vasovagal reactions are a well-recognised but poorly understood complication of blood donation. It is thought that they occur as a result of failure of the donor's normal compensatory reflexes to respond to the volume loss associated with donation. Inadequate fluid intake post donation, prolonged standing, high environmental temperature, and alcohol ingestion all increase the risk of a delayed vasovagal reaction. Delayed reactions occur more frequently in female than in male donors. Unlike immediate vasovagal reactions, the risk of a delayed reaction is not significantly higher in first time and inexperienced donors compared to experienced and older donors. It is possible that experienced donors become less attentive about following advice to increase their fluid intake following donation, thereby increasing their risk of a delayed reaction.

Donors should be provided with post-donation information relating to the risk of delayed reactions and advice on prevention, in particular advice on maintaining post-donation fluid intake, and avoidance of known precipitating factors such as overheating, prolonged standing and drinking alcohol.

Case 29.3: Venepuncture-related persistent arm pain more than 1 year post donation

A 56 year old male whole blood donor had donated eight times in the past without event. In this instance, the donor complained of immediate severe pain on needle insertion described as a shooting/stabbing pain radiating down his forearm coupled with an immediate warm and burning sensation around the wrist area of left arm. The donor had reported this to staff at the session but the donation was allowed to complete, contrary to standard procedures. Following donation, he complained of an extremely painful left arm with loss of sensation over the forearm with weakness. He had no local bruising or swelling and no overt problems with perfusion. Although the symptoms have gradually improved, the donor continues to experience occasional shooting pains.

Venepuncture-related arm problems do occur and can have debilitating long term effects due to ongoing pain and restricted function. These could either be arm soreness related to soft tissue injury/injury to a tendon or ligament or secondary to nerve injury. The clinical symptoms usually help differentiate between these. Good phlebotomy technique can minimise the incidence of painful arms. Multiple needle punctures or needle adjustments theoretically increase the risk of nerve injury. Nerve injury is usually immediately apparent with donors reporting a sharp, burning or electrical pain radiating to the lower arm or into the hand/fingers and in some cases also proximally. Donors may also experience paraesthesia. This complication must be recognised by staff who insert needles. When donors report severe pain the needle should be removed immediately. Nerve injuries may not be completely avoidable because the nerve anatomy can be variable and the nerves cannot be palpated. However, venepunctures, when performed correctly, carry a low risk of any type of injury. Staff should demonstrate that they have achieved and maintained competency, and should be conversant with the care of donors at session including prompt recognition of donor adverse events and their management.

References

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EU Directives: http://ec.europa.eu/health/blood_tissues_organs/key_documents/index_en.htm#anchor0_more [accessed 29 April 2016] Then click Blood-Legislation and Guidleines to expand list and select each option below:

Directive 2002/98/EC of The European Parliament and of the Council of 27 January 2003 **setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood components** and amending Directive 2001/83/EC [2003] OJ L33/30. Available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0098&from=EN [accessed 7June 2016]

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